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GENEVA TIMBER AND FOREST DISCUSSION PAPERS 48

MOBILIZING WOOD RESOURCES:

CAN EUROPE'S FORESTS SATISFY THE INCREASING DEMAND FOR RAW MATERIAL AND ENERGY UNDER SUSTAINABLE FOREST MANAGEMENT?

WORKSHOP PROCEEDINGS - JANUARY 2007

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Timber Section, Geneva, Switzerland

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Edited by

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Note

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Abstract

These proceedings, from the January 2007 workshop *Mobilizing Wood Resources*, provide background information and summarize the main presentations given at the event as well as the discussions. They also present the strategies and recommendations from the working groups on how to mobilize additional wood resources in Europe to meet the needs of wood manufacturers, who want to remain vital and competitive, and the bioenergy sector, who would like to produce more energy from carbon neutral sources such as wood.

Keywords

wood energy; bioenergy; biofuel; mobilization; Europe

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UNECE/FAO Timber Section

FAO Rome

Confederation of European Paper Industries (CEPI)

Ministerial Conference on the Protection of Forests in Europe (MCPFE)
Liaison Unit Warsaw

Joint FAO / UNECE / ILO Expert Network

This event was supported by the Swiss Confederation Federal Office for the Environment (FOEN).

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Abbreviations

BAP	Biomass Action Plan
BIOFRAC	Biofuels Research Advisory Council
BTL	Biomass to Liquid
CEEC	Central and Eastern European Countries
CEPI	Confederation of European Paper Industries
CHP	Combined heat and power
CIP	Competitiveness & Innovation Programme
CTL	Coal to Liquid
EC	European Commission
ECE	Economic Commission for Europe
EEA	European Environment Agency
EFI	European Forest Institute
EFSOS	European Forest Sector Outlook Study
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAP	Forest Action Plan
FOEN	Swiss Federal Office for the Environment
GDP	Gross domestic product
GHG	Green house gas
GIS	Geographical information system
GPS	Global positioning system
IEA	International Energy Agency
ILO	International Labour Organization
LULUCF	Land use, land use change and forestry
LUW	Liaison Unit Warsaw (of the MCPFE)
MCPFE	Ministerial Conference on the Protection of Forests in Europe
mtoe	million tonne oil equivalent
NFP	National Forest Programme
NGO	Non-governmental organization
NRW	North-Rhine Westphalia
ÖBf	Österreichische Bundesforste (Austrian Federal Forest)
PPP	Public private partnerships
R&D	Research and development
RES	Renewable energy source
RTD	Research and technological development
SFM	Sustainable forest management
SRA	Strategic Research Agenda
TP	Technology platforms
UNECE	United Nations Economic Commission for Europe
UNFCC	United Nations Framework Convention on Climate Change
WRME	Wood Raw Material Equivalent
WWF	World Wide Fund For Nature

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The moderators of the working groups facilitated in-depth discussion and the production of policy recommendations: Bo Dahlin, Wilhelm Vorher, Duncan Pollard, Heikki Pajuoja, Christian Salvignol, and Piotr Paschalis-Jakubowicz. Bernard de Galembert and Kit Prins chaired the workshop.

Yves Kazemi along with many members of the UNECE/FAO secretariat played a vital role in the organization and conduct of this workshop. Cynthia de Castro assisted substantially in making the practical arrangements for the workshop. Sebastian Hetsch bore the main burden of organizing the workshop.

The secretariat wishes to place on record its appreciation of the financial contributions from the Swiss Confederation, Federal Office for the Environment and the Confederation of European Paper Industries without which it would not have been possible to have staged this successful event.

The background paper was prepared by Gero Becker, Evelyn Coleman, Yves Kazemi, Kit Prins, and Sebastian Hetsch.

1. Introduction

1.1 Background of the workshop

Forests have always been a major source of wood, providing raw material for a range of wood processing industries, as well as for energy. More recently, in the framework of discussions about climate change and rising concerns about energy security, wood has received greater attention as a carbon-neutral energy source (when sustainably produced), which could help to replace the fossil fuels currently being the mainstay of our energy needs. The actions of policy and decision makers have added further impetus to the already increasing use of wood as an energy source. This, combined with rising energy prices, as well as an expanding requirement for wood from the wood-processing sector in Europe (sawmills, paper, panels) is swelling the overall demand for wood. Thus, as the competition for wood increases, the challenge facing politicians, forest owners and wood processors alike is how to satisfy the demand without compromising the other vital roles that forests perform, without impacting the ability of forests to meet future wood requirements and without damaging the existing forest-based industries or the burgeoning energy sector. All the evidence from forest inventories points to the fact that in most European forests, the additional volume of wood derived from annual tree growth is far more than the volume of wood that is harvested each year. The standing volume of wood has been increasing steadily over many years. In theory at least, there could be enough wood to satisfy everyone's needs. Therefore, Governments and stakeholders are now considering how to make sure this additional wood finds its way to the market in quantities that will satisfy the demand for both raw material for industry and energy. This has also raised questions about the extent to which this additional harvest can be achieved without having adverse impacts on other sectors, on the other values of forests and how to deal with any emerging conflicts? How can we succeed in finding 'win-win' solutions for all stakeholders that will not threaten sustainable forest management?

It was to discuss these questions that over 100 decision-makers from Governments, industry, forest owners and NGOs gathered in Geneva for this two-day workshop. On the first day, speakers from different sectors presented relevant background information, case studies in Europe and possible strategies to approach the issue. This was the basis for fruitful, although sometimes controversial, discussions in working groups on the second day. At the end of the two days, participants drafted recommendations to policy makers and to the Ministerial Conference on the Protection of Forests in Europe.

This workshop also served to implement Vienna Resolution 5 "resource mobilization and comprehensive wood utilisation strategies in support of SFM " called for in the MCPFE programme of work.

The workshop was organized jointly by the UNECE/FAO Timber Section, the Confederation of European Paper Industries (CEPI), the Ministerial Conference on the Protection of Forests in Europe (MCPFE) Liaison Unit Warsaw, FAO Rome, and the Joint FAO/ECE/ILO Expert Network, and supported by the Swiss Confederation Federal Office for the Environment (FOEN).

1.2 Purpose of this report

The report sets out recommendations and conclusions from the workshop based on the discussions that took place. It highlights the background information and case studies presented by the speakers and prepared beforehand, and summarizes the outputs from the working group sessions.

The presentations are available on the homepage of the UNECE/FAO Timber Section [www.unece.org/trade/timber/workshops/2007/wmw/documents.htm].

2. Presentations

2.1 Welcome statement

The workshop was opened by the Chairman Bernard de Galembert (Confederation of European Paper Industries, CEPI) and welcome statement were given by the co-organizers: Christopher Prins, UNECE/FAO Timber Section; Hikojiro Katsuhisa on behalf of Wulf Killmann, FAO Rome; Piotr Borkowski, MCPFE LUW and Michael Gautschi, Swiss Federal Office for the Environment.

The speakers highlighted the increasing significance of bio-energy and wood energy in particular, as a key contribution to reducing greenhouse gas emissions and achieving greater security of energy supplies as also stated in the MCPFE Vienna resolution 5. This increased focus is creating a rising demand for wood, which has begun to push up prices in some regions where supplies of raw material have not kept pace with the increased demand. For forest owners, the increased demand and higher prices are seen as an opportunity; for wood processing industries (sawnwood, panels, pulp & paper, etc), higher raw material costs and supply shortages are understandably a major source of concern. Coupled with rising energy and transport costs, it could affect their competitive position in what is very much a global market.

However, the region's forests have the capacity to supply more wood without endangering sustainable forest management (SFM). Government regulations can be encouraging the development of the sector, but if solely the use of wood for energy is promoted, this may be a cause of concern. Opportunities and constraints in Europe should be further studied by this workshop and lay the groundwork for further work on the issue.

Panellists expressed the hope that the workshop's discussions and findings would be fed into the policy development processes at the European Union level as well as the MCPFE with the 5th MCPFE Ministerial Conference due to be held in Warsaw in November 2007. The linkages between forestry and policy measures to mitigate climate change as well as the importance of the long-term contribution of forests to sustainable energy supplies in Europe need to receive careful consideration.

Piotr Borkowski, the Head of the MCPFE Liaison Unit Warsaw explained that this workshop was a response to policy commitments from the 2003 Ministerial Conference in Vienna 2003 where ministers had committed themselves to promote the efficient and sound use of wood. The topic of biomass and energy was included in a draft Ministerial resolution for the 2007 Conference.

2.2 Summary of presentations

2.2.1 Mobilizing wood resources — What's the big deal?

Presentation given by Sten Nilsson, International Institute for Applied Systems Analysis, IIASA

The entire paper "Mobilizing wood resources - What's the big deal?" written by Sten Nilsson is attached in annex 2.

Energy is vital for the world economy. A major concern for economic development is not necessarily high prices in themselves, but price volatility and energy security. Currently, fossil energy from coal, oil and gas is by far the most important energy source. There are different views about how long fossil

fuel reserves will last - some commentators predicting a peak in fossil energy supply in the near future (2010 -2040), while others predict no shortages in the near future at all. In addition to potential shortages of resources, there are other constraints, which might prevent fossil energy sources from meeting future demand. One is the need for substantial investment to access future energy reserves. Furthermore, there is a lack of maintenance and investment in the infrastructures for oil, gas and electricity, leading to insecurity of supply and loss of resources. The risk of sabotage is also a concern for security of energy supplies, especially for pipelines through insecure regions. The measures that would be necessary to protect this infrastructure have not yet been undertaken. Last but not least, energy supply is used as political pressure tool. All these factors combine to make it impossible to predict how energy prices might develop in the future.

The Stern report[1], published in October 2006, estimated that, "…the overall costs and risks of climate change will be equivalent to losing at least 5% of global gross domestic product (GDP) each year, now and forever." However, currently energy policies are powerless, since they are mainly concerned with high prices of energy. Instead overall energy policies and strategies should be developed, based on an integrated analysis of economic growth, energy security, and climate and environment. Energy from biomass is an opportunity to reduce the dependency on fossil fuels and insecure supply. However, its economic competitiveness is crucial for the development of this energy source. Biomass supply has to be seen in a global view, since most of the biomass production for bioenergy worldwide is in tropical countries.

The supply of woody biomass in pan-Europe is outlined in the European Forest Sector Outlook Study (EFSOS)[2]. However, taking other studies into account (like the EEA study[3]) may lead to different results: an increase in total growing stock, land use change and a potential to use forest harvesting residues could potentially lead to the increased availability of woody biomass in the order of 100 - 265 million m^3 per year in pan-Europe, even allowing for existing harvest restrictions. The demand for wood from forest-based and related industries might not be as high as expected. Taking these numbers together, it can be shown, depending on the scenarios used, that that there may be no need for any additional wood to be mobilized. Under certain assumptions the volume of wood needed might even be less than now. However, if there is to be a sensible contribution to resolving the demands of economic growth, energy security and climate change/ environment, then enormous quantities of wood would be needed.

2.2.2 EU policies influencing the use and mobilization of wood, including for energy purposes

Presentation jointly given for the European Commission by Jeremy Wall, DG Enterprise and Industry, and Ignacio Seoane, DG Agriculture

A more detailed version of the presentation is attached in annex 3

European energy policy faces several challenges: on the one hand high and volatile prices for oil and gas are driven by a growing global energy demand, whilst the EU's dependency on imported energy, much of it supplied from insecure regions, is predicted to rise dramatically over the coming decades. On the other hand, against the background of increasing atmospheric CO2 and greenhouse gas (GHG) emissions, the EU's commitment under the Kyoto Protocol requires a reduction of CO2 and other GHGs.

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[1] Stern, Nicholas (2006):The Economics of Climate Change - The Stern Review. Cabinet Office - HM Treasury. Cambridge University Press. 712pp.

[2] UNECE/FAO (2005): European Forest Sector Outlook study. Geneva Timber and Forest Study Paper 20. United Nations, Geneva. 234pp.

[3] EEA (2006): How much bioenergy can Europe produce without harming the environment? European Environment Agency, Report 7/06. 67pp.

To help achieve these goals, the EU has chosen to strengthen the role of renewable energies (RES) in meeting an increased proportion of future final energy consumption and among these is bio-energy, i.e. energy from biomass. The European Commission, together with the EU Member States, has developed a number of political and legislative instruments to promote the efficient generation and use of bio-energy, including indicative targets. Thus, an overall "target" for the contribution of biomass and other RES (in terms of Mtoe[4]) was set for 2010 in the European Commission's "White Paper" on new and renewable energies, produced in 1997. However, no specific targets were set for the different sources of renewable energies. So there has been no specific target for the contribution of biomass in general or more specifically for wood for their contributions to meeting EU energy needs. Although a relatively small portion of projected available biomass would logically have come from wood – some estimates indicate 27 Mtoe from 150 Mtoe of total available biomass, the reality is that 80% of all bio-energy has continued to be produced from woody biomass.

Europe's forests contain substantial unused wood growing stock, much of which could be harnessed to meet some of the increased demands for wood, which come partly from renewable energy needs and also from wood-processing industries. In addition to the wood currently harvested from EU forests, extra wood could be derived from: harvesting and processing residues or co-products, biomass outside the forest, and from post-consumer recovered wood.

Even if increased by these means - and also in the long term by improved and expanded silviculture, ultimately, the EU's renewable wood supply is limited; even if all the wood supply were used for energy, could not fulfil the biomass requirements of the White Paper.

Even so, early in 2007, in the light of reinforced concerns about global warming and energy security, new binding RES targets for 2020 have been developed, whereby 20% of the EU's overall final energy consumption should come from renewable resources, with burden-sharing between Member States. However, for transport bio-fuels, a binding commitment for them to comprise a minimum of 10 % of overall transport fuels would apply to all Member States.

Thus, in the context of allocating wood supply between competing uses, the vital need to consider the supply of wood raw material for the EU forest-based industries is reinforced. After all, forest-based industries contribute significantly to EU wealth generation, employment and income, especially in rural areas. Hence to help maintain the competitiveness of the EU forest-based industries, the use of incentives for the encouragement of wood-based energy needs to be carefully analysed and implemented, so as to avoid undue distortions of competition. This is so as to ensure a viable wood supply at affordable prices to both wood-processing industries and to wood-based energy producers. Accordingly, such measures should ideally focus on wood mobilization, so as to improve the overall wood supply, instead of being targeted at only some wood consumers such as energy producers.

Several European policies and measures provide a framework for the development of the forest-based sector and energy production from woody biomass. One key action of the EU Forest Action Plan (2007-13) focuses on the promotion of forest biomass for energy generation. Recent reforms in EU Agricultural Policy aim inter alia to increase the agricultural production of biomass for energy. Rural Development Policy also offers possibilities to farmers and forest owners to develop the use of forest resources for energy. A forthcoming communication document on innovative and sustainable EU forest-based industries shall focus on meeting the challenges facing the EU forest-based sector. It will analyse the competitiveness of the sector and identify remedial actions, including ways to mobilize additional wood resources in an equitable way. These and other EU policy initiatives will link to the development of national Biomass Action Plans (nBAPs), seeking to identify strategies for all stakeholders involved in the production and use of bioenergy, including those from the forest-based sector.

[4] Mtoe = million tonnes of oil equivalent.

2.2.3 Mobilizing Wood Resources in CEEC[5] – Slovenian Example

Presentation given by Jurij Beguš, Slovenia Forest Service

Slovenia is one of the smallest EU countries, 58% is covered by forest belonging to more than 300,000 owners, and 75% of the forest is in private ownership. Slovenia's main sources of woody biomass are forest, non-forest land, wood residues, black liquor and charcoal.

In 2002 the Slovenian government together with FAO launched a project on the supply and utilisation of bioenergy to promote sustainable forest management. One major output is a wood energy information module, assessing the woody biomass potential of the country. The module consists of two parts: a planning tool (WISDOM) based on a Geographical Information System (GIS), and a database containing information about the forests (SWEIS). WISDOM consists of wood demand and supply modules, and the integration of both allows the identification of priority areas for action, pointing out differences between increments and harvesting.

The National energy strategy states that wood has to be used for energy production. Simulations show that an increase in annual allowable cut can be expected, as well as an increase in the percentage of harvested wood related to the increment. Therefore more wood can be utilized in the future. However, it has to be stressed, that there are a number of limiting factors; first and foremost the sustainability of forest management is determining the maximum of wood supply. Further, not all forest will be harvested due to regulations or due to the aims of the forest owner. Finally, national energy strategies have to recognize that not all wood can be used for energy. Summing all this up, Slovenia can increase its wood supply by 3 million m^3 in the long term and up to 1 million m^3 in the short term. There may be emerging conflicts between forest-based industries and the energy sector. Also the export of wood for energy to other countries is a problem for Slovenia's forest based industries, as foreign companies are often willing to pay higher prices than indigenous businesses can afford to pay.

The challenge is to mobilize more wood in total. Therefore on the production side an appropriate legal framework is needed, including proper legislation, strategies and incentives for wood biomass production. Forestry has to provide adequate information and data, provide professional service in forest management and cooperate with other relevant sectors. Extension activities in the forest and energy sector can contribute to enhanced wood mobilization as well. An important challenge is to reach out to small-scale forest owners. Therefore forest owners association have to be prompted; incentives and market mechanism (prices) contribute to increased harvesting of wood resources.

Based on previous workshops and seminars [6] Mr. Beguš summarized the main problems in forestry and wood mobilization in Eastern and Central European countries. A major problem is the lack of cooperation between government agencies and the main local stakeholders. Limited market infrastructures and inadequate regulations of new market opportunities also limit wood mobilization. Inadequate taxes and incentives for efficient energy use and sustainable production of wood fuels have negative effects on wood supply. In general the absence of national wood energy policies and strategies are disadvantageous, as well as a lack of knowledge about wood fuel production, trade and consumption.

2.2.4 Mobilizing Wood in Russia in the light of the new forest code

Presentation given by Maria Palenova, Ministry of Natural Resources of the Russian Federation, Agency of Forestry

The total roundwood produced from Russian forests is 3% of the world's total production. However, the productivity as well as the quality of the forests differs markedly between different parts of the country.

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[5] Central and Eastern European Countries

[6] Working meeting on Supporting Wood Energy Planning in Eastern Europe - COFO 2005 and Second Working Session on Sustainable Wood Biomass Management in Central and Eastern European Countries Bled Slovenia November 2005

The main factors that influence the extent to which wood resources are utilized are accessibility to a transport network (mainly road and railway), expenses for the companies for forest protection and reproduction (planting), as well as the stumpage price. Generally, road densities are very low compared with Europe, so this is one important issue to expand and enhance the infrastructure. Taking account of over-mature deciduous stands, damaged forests and harvesting residues, the potential for additional harvesting adds up to a staggering 4.8 billion m^3 unused wood in accessible zones.

After an initial decline with the break up of the Soviet Union, the Russian forest sector and wood market has been increasing since 2000 and stands now at approximately the same level as existed in1990. Exports have risen since 2000 as well, in particular for roundwood and sawnwood, which are also the major commodity from forest products (97% of the exported wood volume). Russia is currently trying to reduce exports of roundwood through increasing custom duties and certain diameter sorting for export. The purposes of development of the Russian forest industry are to replace imports of wood products, expand the presence in the world market and to meet the growing needs of the domestic market. The new forest code is expected to improve the situation for the Russian forest sector. A controlled reduction of roundwood exports should lead to increased domestic wood processing and an expansion in the value added industry. In addition, more wood should be mobilized through more intense forest utilization and harvesting in areas that are not currently harvested

The new Forest Code came in force in January 2007 and will be implemented on both the regional and local levels from July 2007. The new code states that forests will remain the property of the Russian Federation. It will be divided into different zones of protection (exploitation, reserved and protected). Forest leases will be given through open auction for 10- 49 years, or payment for stumpage. Important strategic investors can also obtain a lease without auction.

The organization of the forest administration is regulated by the new forest code. The new code will delegate the administration of forests to the regions, and the local level administration to "Lesnitsestva". "Leshoz" will become state-owned enterprises to provide silvicultural activities. Federal forest administration will be free from operational functions and can concentrate on strategic issues. As an important part of the wood chain and wood mobilization, Leshoz will work as before. In order to promote further wood mobilization, a new law for investment projects will be issued. This law will provide privileges such as forest resources without an auction, possible tax redemptions, and support to infrastructure investments. Priority investment projects for forest development are sawmills, the panel and pulp industry. All forest leases need to be renewed during 2007. This is not an automatic procedure and it will favour enterprises with wood processing. Leases with less than 10-years to run will not be renewed.

There are currently two forest sector development programmes under preparation, the forest industry strategy, and the forest sector target programme. The plans target to strengthen value added production and a strong increase in production (16 billion Euro in 2010). Therefore the interaction between state and business should be improved through favourable investment conditions (long-term agreement), encourage the use of wood, infrastructure development, decrease of import customs for harvesting machines, and decrease of export custom duties on value added products.

However, there are certain financial, organizational, social and industrial risks deriving from the transition process in the forest sector, for example the risk of a decrease in overall level of timber cutting, decentralization of actions on protection of forests, a loss of quality of forest inventory and forest statistics, and a decline in area of protected forests.

Simulations and forest models combined with geographical information systems (GIS) can be used to assess different strategies of forest management and could be a crucial tool for policy and decision makers at different levels. Also for the private sector these can be important tools for long-term planning and investment.

2.2.5 Mobilizing wood resources in Mediterranean countries

Presentation given by Iñaki Isasi, Union of Foresters of Southern Europe, USSE

The Union of Foresters of Southern Europe (USSE) is an inter-regional organization with members in Spain, Southern France, Portugal, Italy and Greece. Their main objective is to provide information to members, unite the forest owners economically speaking, contribute to fire prevention and develop training.

In 2005 USSE conducted a socio-economic analysis in the "Atlantic Arc" (northern Portugal, northwest Spain and southwest France), which is an important region for forests and the forest industry. The analysis includes information about the population, the environment (topography, precipitation, land cover), as well as information about the forest and forest industry. The important type of forest is plantations, especially pine and eucalyptus, which account for roughly 70% of the annual harvest (30 million m^3 in 2000) in the region. The majority of the forest is privately owned.

The mobilization of wood is characterized by the challenge to deal with mostly private property, that is very scattered and small, the average size of one parcel is around 0.5 ha. Therefore many industries (sawmills and pulp and paper) have their own harvesting companies, or use an intermediate entrepreneur. Small-scale forest owners often sell standing timber and thus rely on contractors to determine the wood volume and prices, since the owners often have no adequate training. Wood from state-owned forests is mostly sold by auction.

In the last year with a dramatic increase in fossil-fuel prices many projects for wood energy have been planned. However, none is operational at this point, and no influence on the market can be observed (January 2007). USSE sees wood energy as an opportunity to secure additional income that would allow more silvicultural activities. Harvesting small diameter wood for energy may also lower the risk of forest fires. Since currently only 60% of the net annual increment is harvested, there is space for new players.

To increase the amount of wood harvested from the forest it would be advisable to encourage forest owners to cooperate to work bigger harvesting units and to increase the level of mechanization of the companies engaged in harvesting. The logistics of the supply chain in harvesting and transport should be optimized through cooperation between forest administration, forest owners and industry, including an improvement in infrastructure. A geographical information system would be an important tool to allow "win-win" situations and to give transparency to a market that is only mastered by the industries.

2.2.6 Focus on the future - Mobilizing wood: Industry viewpoints

Presentation given by Elisabet Salander Björklund, StoraEnso

Stora Enso is one of the leading forest based industries, consuming overall 47 million m^3 wood, and additionally purchasing 1 million tonnes pulp and 2.5 million tonnes recovered fibre. The company has wood supply units worldwide (North America, Brazil, China), but is focussing on Europe. In Europe, the pulp and paper industry is characterized by a large number of companies and mills, offering jobs in particular in rural areas. However, a process of consolidation is taking place in the sector.

The main need of the forest-based industry is to maintain a competitive platform to serve the customers. This includes a healthy demand for products, a cost competitiveness in inputs, manufacturing processes and logistics, cost efficient capital, labour and energy, and a superior sustainability performance. Therefore supportive public policies are an important prerequisites. Policies to promote wood mobilization have to be seen within this context.

In paper and paperboard, most of the growth (70%) takes place outside the mature market in developing countries. Products from mature markets in developed countries are often exported to developing regions such as Asia. The demand for solid wood products is currently rising again, mainly

due to the increased use and development of wood-based building systems. Product prices have declined, especially in the paper market. One reason might be competition from production in the southern hemisphere.

Wood supply is crucial for the forest-based industry, and the available supply in many areas in Europe could be increased. However, apart from quantity, also quality, sustainability, cost-effectiveness and good public perception are important. The main challenge in wood supply is the highly fragmented private ownership. It needs to be organized in a way that the forest owners have a possibility to harvest efficiently. Both forest owners associations and companies can play an important role to activate forest owners. Restructuring forest tenure may be another possibility. The motivation of the forest owners is crucial; often the price elasticity is negative, meaning that higher prices do not necessarily lead to an increase in wood supply.

Another factor for wood supply is harvesting and transport costs. In particular in central Europe these costs are high partly due to administrative regulations/costs and partly due to old-fashioned forest management methods, compared with e.g. northern Europe. Adequate training of forest workers and increased mechanized harvesting would decrease costs substantially.

There are other factors that may limit supply and lead to competition for wood. Protection of ecosystems and biodiversity is an important factor in some countries, since up to half of the potential wood for harvesting could be under some kind of protection. Energy generation presents the main competition for raw material at present. Subsidies and incentives would lead to market distortion and thus should be abolished, in the speaker's opinion. Policies to support wood energy and their targets for the amounts of wood needed, promoted through subsidies, may present an extreme risk of local wood shortages, a sharp increase in raw material prices and a risk to forest sustainability. An increase in wood prices has already been seen, in particular in 2006 and early 2007. Therefore bioenergy issues have to be handled in a way that does not put the competitivity, economic and environmental contribution of other forest-based industries at risk, as also stated in recommendations by WWF and CEPI [7].

In terms of sustainability the forest-based industries are almost carbon neutral, since most of their energy needs are met by bioenergy. A study by Jaakko Pöyry also shows the social and economic benefits in terms of wealth and employment of pulp and paper industries in comparison to bioenergy production.

These therefore are the main conclusions and leading messages for policy makers:

A healthy demand is needed by the industry, which could be supported for example through wood-friendly procurement policies for construction. Production has to be cost efficient and a high sustainability level has to be secured.

Since the forest industry operates with a long-term perspective, and in particular the paper industry is capital intensive, stable situations are needed. Therefore hastily enacted policies might have negative impact on the forest-based industry sector.

Policies should not discriminate against industrial wood use through subsidies. They should rather stimulate forest owners to produce more wood for the market, as happened in Finland where the annual allowable harvesting was increased due to the foreseen increase in wood demand. Considering the superior sustainability performance of forest-based industries, policies should not weaken their competitivity, and in addition should recognize the carbon life cycle benefits associated with forest products, and assist in the recovery of used wood and fibre.

[7] WWF and CEPI recommendation for an effective implementation of European Renewable Energy Sources (RES) policies

2.2.7 Strategies for supply of raw material in the energy industry

Michael Deutmeyer, CHOREN Biomass GmbH

Choren Biomass GmbH, a 100 percent owned subsidiary of CHOREN Industries GmbH, has developed a biomass gasification technology that converts biomass into a tar free syngas on an industrial scale. This syngas can e.g. be transformed into liquid hydrocarbons so-called biomass to liquids (BTL) or synthetic biofuels. Together with Shell it has set up the first BTL plant in Germany, producing synthetic fuel not comparable to conventional biofuels, because of several advantages, like low particle and sulphur emission, higher quality than conventional fossil based diesel, compatibility with standard diesel engines, and the ability to use all types of biomass for the process, leading to a high yield per hectare. Thus this technology can contribute to employment in rural areas and energy security.

The first industrial site is currently being developed with Shell, VW and DaimlerChrysler in Freiberg, Germany and is expected to be finished in 2007, using 67,500 bone-dry tonnes of biomass per year. Further plants using up to one million tonnes of dry biomass per year are planned in Lubmin, Germany, at a site with good infrastructure and logistic conditions, close to a sea harbour on the Baltic Sea and favourable agricultural conditions. Another possible plant is planned for Dormagen, Germany, in an area where other chemical industries using biomass are already located or could be attracted.

A variety of biomass sources can be used as feedstock, for example forest residues (bundles of harvest residues, stumps), roundwood from forest plantations, sawmill co-products and wood chips, wet agricultural biomass, as well as dry agricultural biomass (mainly straw) and energy biomass from short-rotation plantations.

Looking at The EU biomass action plan, biomass from agricultural land has the biggest potential to increase. There are already concepts worked out for straw, and Choren is currently developing concepts for biomass from short-rotation plantations on agricultural land with Miscanthus and Willow. Calculations show that biomass could be produced at 60-70 Euro per tonne dry matter, not considering the potential to increase yield per hectare through improved provenances for the trees or crops. Imported biomass from plantations outside Europe is expected to play a major role in future bioenergy production, where joint projects with the paper industry might also be possible.

The feedstock portfolio for the current plant is dominated by recycled wood, which is the most economical resource. However the amount of recycled wood currently available is very limited, and measures being taken to promote the availability of recycled wood will only take effect in the longer-term. Other sources are imported wood pellets, local biomass from energy crops, straw and to a small extent forest residues, due to high prices.

In future development in the bioenergy sector, Choren foresees that an increasing amount of biomass will be imported from outside Europe, through deep-sea harbours. There will be an increasing use of pellets due their superior handling, storage and transportation costs. Choren believes that industry will be the main user of bioenergy rather than individual homes because of emission problems and price competitivity. However, the industry is likely to re-locate to places where biomass is produced most efficiently. This might be the case particularly if, as seems likely, dedicated energy plantations in Europe and overseas become the main source of raw materials rather than wood industry co-products.

For policy-makers it will be important to develop market tools in order to regulate indirectly supply and demand without distorting the market too much. Clear long term targets in bioenergy have to be given to reach these goals, combined with a secure long-term profitability for specialized new investments, for example through secure prices.

It is not in the interest of bioenergy producers to harm and compete too much with existing wood-using industries. Therefore a minimum feedstock has to be secured, to minimize negative effects and ensure mutual prosperity. Additional resources can be mobilized by promoting biomass production worldwide and fostering the import of certified biomass, reducing pressure on domestic markets.

2.2.8 Wood supply chain in Södra today and tomorrow

Presentation given by Christer Segerstéen, Södra

Södra is a Swedish company owned by about 50,000 forest owners, possessing on average 50 ha, which adds up to about 2.3 million ha forestland. The company has its own forest industry including pulpmills and sawmills, interior wood production and pellet factory.

The wood supply chain in Södra delivers wood directly from the forests to the different processing industries of Södra; wood energy plays a very important part in the overall economic result. Most forest owners' forest management plans incorporate production and nature conservation. This plan is also the basis for harvesting operations, 80% of which is done by contractors from Södra. The level of mechanized harvesting is very high; in most cases harvesters are used. To maximize the efficiency of the harvesting operations, global positioning system (GPS) and geographic information system (GIS) are used to send the data collected by the harvester directly to the contractors transporting the logs to the mills. Once the logs reach the roadside, lorries pick them up, and send the information with modern technology to the mill where the logistics are coordinated. A close cooperation with competitors in transportation lowers costs and environmental impacts. The utilization of modern information technologies has led to increased productivity, expressed in cubic metres per working hour.

This efficient supply chain made it possible to come close to a balance between annual growth and harvesting in Sweden, taking into consideration that growth always exceeds the volume harvested because of the limited wood production from protected forests. The harvested wood is used for pulp and paper, sawmill and board industry and heat production. Future demand for wood will also come from combined heat and power plant, cellulose ethanol, black liquor gasification, biomass gasification, and possibly other uses. However, currently about 3 TWh[8] can be harvested additionally in primary forest fuels in Södra's forests by utilizing more forest residues. Wood supply can also be improved by increasing the growth of the forest, which could be by as much as 25 - 40%. Such increases depend partly on the effects of climate change, which will probably lead to higher average temperatures and an extended growing season in Sweden, which might increase forest growth by 15 - 20%. In addition, the existing forestland can be managed more intensively through improved silviculture, the use of improved planting stock, fertilizing, ditch cleaning, and more efficient nature and landscape preservation.

An expansion of the forest area by afforestation might also play an important role in increasing the overall wood supply. Afforestation would be on bare land as well as agricultural land with fast growing broadleaves like hybrid aspen or poplar, leading to high annual increments (25 m^3/ha/a).

In summary, the Swedish wood supply system is based on improved productivity in all parts of the chain, better silviculture and, most importantly, increased profitability for forest owners and companies. The strengths of the system are the long tradition in silviculture and logging operation in Sweden, family forest ownership willing to harvest their forest and a good dialogue with forest authorities and the forest agency.

Weaknesses in the wood supply systems are mainly on a political level, since policies have to be more holistic (e.g. taking water and biodiversity policies into account and vice versa) on a national, European and international level.

Södra sees bioenergy as an opportunity; their pulp mills are already selling energy to the market and are also interested in black liquor and biomass gasification. Thus, the forest industry, forest owners and society as a whole benefit mutually from these new developments.

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[8] Corresponding to roughly 1.6 million m^3

2.2.9 CEPF – The voice of European Family Forestry

Presentation given by Stefan Schenker, Confédération Européenne des Propriétaires Forestiers, CEPF

The Confederation of European Forest Owners (CEPF) represents the interests of the 16 million family forest owners throughout Europe, organized in 23 European forest owner associations and representing the interest of the forest owners.

Understanding the behaviour of forest owners requires understanding their background. People may become forest owners by inheritance or marriage, which often leads to a strong intergenerational thinking. Acquisition of forestland can be lead by different motives, like financial investments or hunting opportunities. Restitution processes in particular in CIS countries have resulted in many new forest owners who are often not familiar with forest management.

CEPF sees forest owners highly devoted to sustainable forest management, respecting ecological requirements, social obligations and the economic framework. Since the forest is seen as an intergenerational good, the focus of the management is not on short-term maximization of economic results, but to harvest as much biomass as possible without negative impacts on the stands and ecosystem and thereby to achieve a balance between all three pillars of sustainability. Landowners have to follow certain rules, imposed by policy makers, like the forest law, nature protection (e.g. Natura 2000), hunting rights and rights for recreation in the forest. These laws and regulations sometimes interfere with the aims of forest management and therefore CEPF calls for fewer regulations and in particular for no new ones.

Many forest owners are used to working in an open market without heavy subsidies. If incentives are considered, it is important to be certain what it is they are designed to promote. Rather than promoting a specific product, it is the infrastructure, research or investment that should be subsidized.

Now with the changing situation of increasing wood demand, the forest owners want to make their own decisions about forest management, harvesting volumes and how to meet the market demand, being aware that bioenergy is of increasing importance and that forest owners wish to contribute to this development.

However, there are certain challenges that forest owners are facing. In particular small-scale forest owners need to cooperate and build networks, where they can get support and advice for forest management and harvesting activities, at the local, regional and national levels. These activities should be developed together with capacity building and educational programmes for the forest owners, but also for society. It is important to promote a positive public image of forestry to encourage forest owners to utilize their forest.

2.2.10 Regional approach for wood mobilization in North Rhine-Westphalia

Presentation given by Josef Herkendell, Ministry of the Environment, Nature Conservation Agriculture and Consumer Protection of the State of North Rhine-Westphalia, Germany

North Rhine - Westphalia (NRW) is a federal state in the west of Germany, densely populated with a high GDP, and a high level of energy consumption and generation due to the many industries located in the area. Forested area is a substantial part of the landscape[9] as well. Bioenergy is of increasing importance and it was realized that this issue is best tackled on a region level[10].

Therefore NRW developed a biomass strategy plan as part of the German biomass strategy. This strategy takes into account that wood can and should be used to generate all kinds of energy

[9] 27% of NRW is covered with forest

[10] regional level: "Sphere or level of governance of a territorial political subdivision immediately below the central government of an individual State represented at the UN, but above the municipal or local level"

(electricity, fuel and heat), as well as other products. Wood can be readily stored and transported. However, wood chips should not be transported over long distances as is happening now with chips imported to Europe from South America, for instance, due to their low energy content. Therefore industries utilizing biomass should have good infrastructure like railroads or harbours. Competition for industrial roundwood is increasing, in particular through bioenergy and chemical industry, but the ability to increase forest area is limited where land is better used for agriculture. One aim of the strategies is to support rural development and develop model regions with these biomass strategies.

So the challenge is to increase the supply of biomass and particularly woody biomass. This can be done to a limited extent through afforestation and energy plantations. Another opportunity would be to organize a cluster to mobilize biomass inside and also from outside forests, which it has been estimated could provide about 1 million m^3 in NRW. The key players in wood supply are the forest owners, and the question is how they can be approached and stimulated to produce more wood for the market.

To deal with this issue, the ministry is working in a network with other organizations. The most important network for biomass is the EnergyAgency NRW, which independently counsels all stakeholders involved in the biomass chain. The agency provides a communication platform, and promotes innovative ideas, approaches and techniques, through networking and communication. NRW is also part of an international network, the "Network of Regional Governments for Sustainable Development"[11], which launched a project on renewable energies at the regional level by creating a web page where information about projects and activities in other regions of the world are available[12]. In addition to that NRW is also cooperating with other regions bilaterally or multilaterally.

In summary, regional approaches are needed to effectively mobilize wood raw material due to differing forest conditions and underlying structures across Europe. Therefore continuous communication and intensive counselling among all stakeholders is essential. A step towards enhanced communication could be a web page for exchange of best practice experience on regional level in order to stimulate the process.

2.2.11 Interaction and conflicts in wood supply and policy measures - Experience from Vienna-Simmering and other ÖBf supplied CHPs

Presentation given by Winfried Suess, Österreichische Bundesforste AG

Austria was exporting energy until 2001 and is now importing energy. But the economic conditions changed again since the green electricity act and feed-in tariff came in place in 2002, guaranteeing a fixed price for feeding green electricity into the net. Therefore, for a fixed period of time, there was a boom of combined heat and power (CHP) plants. Due to staggered tariffs according to the size of the plant, many small and medium-size CHP plants were installed all over the country; the biggest plant was built in Vienna-Simmering.

Austrian Federal Forest (ÖBf) is state owned, but commercially run and it is the largest biomass producer. A total area of 860,000 ha is managed by ÖBf, but only 360,000 ha intensively for wood production, leading to an annual allowable cut of 1.7 million m^3. ÖBf also holds shares in biomass energy companies, for example "Strom und Wärme aus Holz" (SWH) and "Wien Energie Bundesforste Biomasse Kraftwerk GmbH". The latter is operating the largest forest biomass power plant in central Europe, based in Vienna -Simmering. It has an annual requirement of 250,000 m^3 roundwood; and provides 167 GWh, which is 7% of the Austrian target for renewable energy. Besides the contribution to energy supply, which is fairly small, compared to other energy generation plants, this is a model project to show a state of the art energy efficient bioenergy cogeneration plant. In order

[11] web page: [www.nrg4SD.net]

[12] web page: [www.regional.renewables.org]

to obtain the required biomass stakeholders were consulted and it was agreed to procure most of the biomass within 100 km around Vienna, possibly including imports form Czech Republic and Slovakia. The maximum supply distance for biomass is 200 km.

ÖBf has also other joint ventures in energy like the SWH. This joint venture is currently running more than 25 small to medium-sized plants, 17 of them directly under SWH. 102 million Euros were invested for the plants in operation to produce 70,000 MWh per year, which requires more than 1.2 million m³, out of which ÖBf delivers about 800,000 m^3. However, currently the planning stages for new plants are on hold, because the supply of biomass cannot be secured. 80% of the timber harvested by ÖBf is already committed to long-term contracts with timber and pulp and paper industry. Therefore free potential is very low, and ÖBf has no capacity to supply biomass plants that are not in their ownership with wood. An extension of the wood harvesting on state owned forest in Austria is not possible[13], since ÖBf is already harvesting at the maximum sustainable level. To a smaller extent small wood processing industries are also supply these plants by selling their co-products.

The competition for wood-processing industries from energy producers is beneficial for forest owners, since prices are not dictated by the wood-processing industry anymore. So the forest companies are happy to be a serious partner in the market. This increase in price for wood raw material is however not the reason why some industries relocate to other parts of the world, but it is rather the production costs as a whole.

In broad terms it can be observed, that local and regional demands exceed the traditional and readily available supply sources. Large forest enterprises have reached their allowable cut and can only increase available wood through support of know how, logistic support or in market exploration. Wood supply is often based on long-term contracts and is thus bound to certain price limits, so ÖBf for example does only benefit very slowly from increasing prizes. Industry reacts very flexibly and is trying to find new sources of supply in the Balkans, where they are facing other challenges, mainly lack of infrastructure. Importing biomass over such long distances is causing many to question how reasonable or how sustainable this is.

The ecological logic behind promotion of biomass is entirely sound, but strategies must be adapted to local conditions and address potential adverse impacts.

Subsidies have sparked a number of smaller CHPs but without a secure wood supply, they will probably vanish again with increasing wood prices. There will also be new uses and clients for biomass especially in South and Central Eastern Europe and an increasing demand for bio-fuels.

In summary, a stable tariff policy is essential to secure investment returns and to enable larger investments. Regarding subsidies, a focus on energy efficiency and supply security could avoid the misallocation of subsidies.

2.2.12 Increased wood mobilization and the environment - a WWF perspective

Presentation given by Karin Wessman, WWF International

Renewable energy, including wood energy, is a part of the WWF strategy to address climate change. However, it is important to stress that when talking about climate change and the use of renewable energy, reduced energy consumption and energy efficiency are the most important factors to tackle global warming. WWF strongly advocates an increased use of bio-energy, but bio-energy is not automatically sustainable. Social and environmental impacts have to be taken into account, as well as impacts on other geographical regions, since Europe should not export its problems to other parts of the world. Existing standards and tools, which enable local stakeholder involvement, should be applied or expanded to ensure adequate social and environmental safeguards. It is important to find win-win

[13] However, only 15% of the forest area in Austria is owned by ÖBf.

solutions instead of trade-offs between bio-energy and nature conservation. Long-term solutions have to be found in the context of energy efficiency and energy consumption at national or local level.

There are opportunities to increase the wood supply from commercial forests, in particular in small-scale forest holdings, which represent a key player in additional supply of biomass. However, unless properly planned and implemented, more intense forest utilization could result in reduced amounts of deadwood that is important for biodiversity in the forests[14]. An increased harvest of woody biomass in forests may also result in nutrient scarcity. Another impact of increasing wood demand is a risk of growing pressure on protected forests. Lower protection standards can lead to decreased ability of the forest to protect the soil and watershed. In this context, please note that many protection categories like Natura 2000 do not prohibit utilization of the forest, but set standards for their management.

Taking these aspects into account, the additional potential for sustainable harvest in the forest is unfortunately reduced. The EEA published a study[15] analyzing how much bio-energy could be produced in Europe without harming the environment. The study showed that there is a potential of 40 - 50 Mtoe (about 140 Million m^3) of wood additionally available in Europe.

Complementary to the production of biomass in Europe are production in other regions. In particular palm oil and soy plantations are rapidly increasing in Southeast Asia and Latin America. Again, these may lead to environmental and social problems in these regions, unless social and environmental criteria on the production are implemented.

Overall there are many potential benefits in the increased use of wood on a European level. It can generate more income for the forest owners and thus has a positive influence on rural economies and on nature conservation – if done in the right way. Additionally, an increasing use of wood, thereby replacing fossil energy sources, can be beneficial for the climate.

The key to success is to have an overall strategy keeping the goal to reduce GHG emission in mind, coordinated with all stakeholders, in particular at a local level, since this is where measures are implemented and where people are affected. Therefore key groups in Europe are small-scale forest owners and farmers, entrepreneurs and local communities. But NGOs also have a role to play, for example by mitigating possible conflicts and helping to identify sustainable solutions through constructive engagement.

It would be very important to ensure that all measures to increase the supply of biomass followed the principles and criteria of sustainable forest management and ensured compliance with other environmental legislation. Therefore existing standards, like certification systems, should be used for – and if needed expanded to include - all kinds of wood production, independent of the intended end-use of wood.

The same is valid for import of bio-fuels, which can lead to further deforestation and degradation of forests in other regions of the world. Therefore it has to be ensured that imports of bio-fuels (like palm oil) are based on environmentally and socially responsible principles and criteria – using existing standards where available.

WWF is currently working at the international level to avoid deforestation, analyse the opportunities of forest as a source of biomass and develop adaptive management in existing forests to tackle the loss of biodiversity because of climate change. At the European level WWF is working on certification, best management practices for forest and short rotation plantations, land use planning and high conservation value forests[16], as well as research on bio-energy and pulp and paper. WWF does not intend to work on these issues in isolation and is therefore looking for involvement from all stakeholders to develop solutions to these common challenges.

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[14] A WWF study showed, that that temperate forests need at least 20-30 m^3 /ha of deadwood.

[15] EEA (2006): How much bioenergy can Europe produce without harming the environment? European Environment Agency, Report 7/06. 67pp.

[16] web page: [http://hcvnetwork.org/]

2.2.13 The legend of the woody biomass reserve in Europe

Presentation given by Udo Mantau, University of Hamburg

The European Union has about 160 million ha of forest, leading to a net annual increment (NAI) of about 574 million m³. It is commonly presented that the official harvest (315 million m³) has been stable over many years, that NAI has been increasing and, therefore, that the percentage of cutting has been decreasing with only between 50-60% of the increment being harvested). By comparing inventory data with actual felling, the EEA analyzed how much additional wood could be used without harming the environment and concluded that there is about 40 mtoe (about 140 million m^3) of woody biomass that can be harvested sustainably [17].

However, there is a huge discrepancy between the definitions for the data collected for the inventory of standing volume and the data for the actual harvests. The EU inventory data are in general calculated over bark and include harvesting losses and unused stemwood, which do not appear in the data on actual harvests. Furthermore, the data on actual harvests do not include unregistered harvesting, which summed up to 16% in the last twenty years in Germany. Taking all this into account the there is probably only about 25 million m^3 stemwood left at a European level[18] if all resources are utilized and no further forest areas were taken out of production as stated in the EEA report.

However, there are existing reserves of woody biomass in Europe that could be made available. One source of additional wood fibre could be the wood that is currently not used by anyone e.g. branches and tops of trees, trees with less than 7 cm diameter and needles. However, even taking account of these sources, a realistic estimate for this reserve is unlikely to exceed 100 million m³. It is to be found in assortments that are hardly used today because of the cost-to-price ratio or the willingness of forest owners to harvest the wood. Trees beyond rotation length could offer another source of extra biomass. For example, if all trees in Germany that are past their rotation length were felled, approximately 400 million m³ in total could be made available equating to an extra 20 million m³ of felling for 20 years. Standard rotations in Germany are quite high. If agreement could be reached to reduce rotation lengths, this would lead to an increased wood supply. Energy plantations may also offer a source of biomass supply in the future. The definition of sustainability in wood production itself should be reconsidered and interpreted in a more differentiated manner. It can limit the availability of wood resources, since forests exceeding their average felling cycle lead to a decrease in NAI. If the level of harvesting is in balance with growth, this leads to decreasing quantities in harvested wood each year. In summary, annual net increment and actual statistical documented cuttings cannot be compared to determine the reserve in woody biomass in Europe. Taking this into account one might realize, that there are only very limited quantities that are currently not used. This is in particular true for Germany, where a reserve for "complementary fellings" is simply not available. However, new wood biomass resources can be found in resources inside and outside the forest, but these resources have to be developed or mobilized.

3. Discussion

3.1 Bioenergy targets and their impacts on wood-based industries

Mr. de Galembert (CEPI) pointed out that at the EU-level quite a number of instruments exist (e.g. the Forestry and Biomass Action Plan). Despite the fact that bioenergy targets for 2010 are far from being met, new higher 2020 targets have now been set. It has to be considered whether wood mobilization will be required under all of them and how a better contribution to wood mobilization can be made. Forestry is not covered in the Treaty of Rome and therefore this limits the scope for the EU to implement strong forest related measures.

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[17] EEA (2006): How much bioenergy can Europe produce without harming the environment? European Environment Agency, Report 7/06. 67pp.

[18] Number extrapolated from studies conducted in Germany

Mr. Wall (European Commission) referred to the necessity to take the needs of all wood suppliers and users into account. As part of its broader work on renewable energy, the Commission, together with the Member States, continues to work specifically on the issues of wood availability and competition between competing end users, seeking to anticipate problems and find solutions. One major vehicle for dong so has been the Working Group on Renewable Energy Sources of the Advisory Committee on Forestry Policy and the Forest-based industries, which has recently produced a significant report with conclusions and recommendations on the competition between the use of wood for energy and that for processing[19]. A range of different opportunities exist nationally and may be incorporated into national Biomass Action Pans (nBAPs). Most factors affecting the supply and demand for wood are determined at national level, so this is where individual RES targets, including those for biomass, really have to be set,. It is not the task of Brussels to devise targets and impose them. In any case, wood as a raw material is not targeted separately in the overall EU bio-energy targets.

Ms. Salander-Björklund (Stora Enso) pointed out that forest issues and industry issues are not in one place at the European Union, which is not beneficial for the forest sector. Mr. Seoane (European Commission) noted the importance of coordinating policies that impact the forest sector, which has happened on various levels and meetings at the EU; but pointed out that, at the community level there was a weak mandate on forest matters since it was primarily a Member State competence. He believed that useful progress had been made and cited the Forest Action Plan, which had involved five EU directorates in its drafting, showing a willingness to cooperate. The importance of coordination within the European Commission was acknowledged but there was also a need for coordination between Member States and even within countries. The Commission encourages people to raise specific issues of lack of coordination within the EU, if there are any, considering the weak mandate given to the EU in forest matters.

Mr. Wijnendaele (EPF) stressed that the workshop outcome should bring reasonable recommendations to those who set targets. In reality, 80% of biomass used for energy comes from wood raw materials, so there is no reason to believe that the percentage of wood used for bioenergy will change if the European Commission increases the targets for renewable energy to 20% of the overall energy consumption. The issues set out in the background paper revealed that it is not only the environmental issues that need to be taken into account, and this should be brought to the attention of the Director General of DG Transport and Energy of the European Commission who sets these targets. It is important to look not only at the forest, but also to consider crosscutting issues; this is not only a question of technology. He expressed the view that there are examples of wood-based panel production that have been shut down because of a lack of wood raw materials resulting from the installation of a new biomass energy plant. It has to be clearly stated, that sawlogs should not be burned for energy. Therefore, national biomass action plans are an important measure in helping to minimize negative effects on the forest-based industries. In developing the targets, the experiences from national biomass action plans as well as the results of this discussion and issues discussed in the background paper should be carefully considered if Member States are not to find themselves in a situation where they have not met the targets. As pointed out by the keynote speaker, policy setting is only one side of the coin, implementation the other.

Mr. Wall (European Commission) pointed out that the conclusions from the report of the Renewable Energy Sources Working Group are being made available to the Working Group on National Biomass Plans (nBAPs), managed by DG Transport and Energy and thus fed into the EU process for implementing renewable energy policies.

Mr. Döry (European Panel Federation, EPF) pointed out that there are not sufficient real data to allow decisions relating to additional mobilization and availability of wood to be taken. It needs to be ensured that the consequences of additional mobilization are being addressed when concrete targets

[19] report of the EU Advisory Committee on Forestry Policy and the Forest-based Industries: "Strategic supply and demand considerations on the competing end uses of wood for energy and wood-based products".

are being set. As pointed out in the background paper, up to half of forests may not be available for harvesting due to conservation and other reasons.

Mr. Nilsson (International Institute for Applied System Analysis, IIASA) stressed that politicians have to make difficult decisions; therefore it is important to try to help the politicians. The view was expressed that the forest sector needed to help politicians to find the sustainable path to the future.

3.1.1 Competition for raw material and prices

A question was posed about the struggle in Slovenia between the energy sector and the forest-based industries. Mr. Begus (Slovenia) described that the energy sector is able to offer better prices for raw material, leading to competition with the other wood processors. Therefore there is concern for the forest-based industries, acknowledging particularly the social and economic benefits that the industry provides. A balance is needed between biomass and wood industry. However in an open market it might be difficult to assure, since the forest owners cannot be forced to sell their wood to a particular consumer. A specific issue in this context is the export of roundwood, but again, in an open market, this cannot be regulated. Mr. Döry (EPF) expressed his view that the energy sector was only able to offer higher prices for wood due to subventions, causing a market distortion.

Mr. Nilsson (IIASA) challenged a comment from Stora Enso about a rise in price of by-products, suggesting that they have in fact been undervalued in the past and that the price changes simply reflect this. Ms. Salander-Björklund (Stora Enso) replied that a rapid development and change of prices of by-products is the problem, not necessarily the high price itself.

Mr. Deutmeyer (Choren) highlighted that currently there is a tax exemption of BTL until 2015 in Germany, therefore this source will be competitive with fossil based fuel. Compared with Coal to Liquid (CTL), BTL is a little bit more costly, in particular since the feedstock for biomass has doubled the price, and coal will last for another 700 years. Considering the price for CO_2 currently around $15 per tonne, BTL can be competitive without tax exemption with oil prices starting from 130 Euro per barrel. Sten Nilsson (IIASA) stressed the fact of enormous coal resources, which may lead to increasing use of coal and impose challenges to tackle climate change. Södra pointed out that black liquor would become important in the future, not immediately, but in about 10 years. However, biofuels would not replace fossil fuels completely.

Mr. de Galembert (CEPI) asked about pulp-mill/ biorefinery combinations as a future model for the sector. Mr. Segersteen (Södra) thinks that pulpmills will also produce energy in the future as additional input and especially second-generation biofuels and for Södra black liquor is very interesting. Life cycle analysis is important, black liquor is very good here, but also biomass gasification is of interest.

3.1.2 Subsidies

Mr. Prins (UNECE) mentioned the issues of subsidies as a delicate one, but it has to be noted that all sectors have subsidies. A study carried out by EFI on financial incentives in the forest sector has in fact noted that the incentives to the forest sector including fiscal incentives account for 80% of income from wood sales. The question to be addressed is whether subsidies are the right ones, coordinated and properly targeted for the public good (at the right beneficiaries) and not distorting but promoting the goals of public policies. Frequently, different subsidy systems contradict each other and those are the areas requiring attention!

Ms. Hendrickx (CEI-bois) mentioned the need to consider the additional value-added created by the wood processing and the energy industries. This is important also in the question of subsidies.

Mr. Döry (EPF) believed that the presentation by Mr. Süss had proven the effects of subsidy and their importance in helping forest owners and bringing more pressure to the wood-processing sector.

3.2 Environmental impacts of increasing demand for wood

Mr. Larsson (European Environment Agency) emphasized that environmental issues are more than just climate change related. Forest ecosystems, for example, are of concern as well and should not be destroyed through too intense management due to the need for additional wood mobilization. This is also reflected in the MCPFE declarations. Substantial parts of Slovenia (50%) for example will be under Natura 2000.

Mr. Begus (Slovenian Forest Service) was not sure about possible environmental impact yet, depending on how the increasing demand for wood will be dealt with nationally. However, he stressed, that the protection category of Natura 2000 does not exclude or forbid forest management.

Mr. Pajuoja (Metsäteho Oy) reminded the meeting of the decision by President Clinton to stop cutting state forests on state land 15 years ago. In the 5-year period covered by that ban, 20,000 jobs had been lost in the rural regions. Over the same period, however, growth in the wider economy had generated almost 700,000 jobs so the impact in the rural regions had been eclipsed. Measures had to be taken now to remove combustible material in the forest to reduce the risk of forest fires. This problem had not existed when the forests had been worked. He suggested there was perhaps a lesson to be learned.

Ms. Salander-Björklund (Stora Enso) contributed to the discussion that climate change will also change many habitats and ecosystems, this leads to the question of what should be protected, in particular aiming at conservation of biodiversity.

Several other participants stressed the importance of forest products in mitigating climate change. Mr. Döry (EPF) questioned why forest products have not yet been taken into account when discussing CO_2 sequestration, since wood products would help tackling climate change. He believed personally that the forest could do far more for ecology when it was not being burned.

3.3 Impacts on regions outside Europe

Mr. Katsuhisa (FAO) noted that some countries might find it easier to import from outside Europe in order to meet their bioenergy targets, for example through import of palm oil. The EU should consider this issue of sustainability as well. Most palm oil plantations had been converted from tropical forest. However, palm oil is one of the best energy crops in tropical countries. Another disadvantage of the import of biomass is the decreasing energy budget with increasing distance, since a proportion of the energy contained in the biomass is consumed in transporting it. Therefore thresholds could be applied when importing biomass for energy, since the energy balance is important. Mr. Deutmeyer (Choren) replied to this issue that sea transport is very cost and energy efficient. Since Europe will always have to import energy, it might as well import biomass for energy. Imports of certified biomass would also give countries worldwide the chance to export energy wood from dedicated energy farming and develop them.

Ms. Wessman (WWF) clarified that WWF does not oppose the use of palm oil for biofuel in Europe, but would wish to see the same standards and sustainability demands applied to imports as apply to production within Europe.

3.4 Economic and social impacts

Mr. de Galembert (CEPI) shared the outcome of a study by Jaakko Pöyry, comparing value-creation and job-creation between the pulp and paper industry chain and the renewable energy/wood biomass sector, which found that the pulp and paper industry creates eight times more added value and 13 times more jobs. Mr. Nilsson (IIASA) responded to this statement explaining that in earlier comparison between energy and forest based industry the rate of return on capital had not been considered. Short-term rotation should be forest as well, even though it may be on agricultural land.

Mr. Döry (EPF) expressed the view that the perspective of the forest-based industries had not been adequately considered in the discussion on wood energy. The industry was important not only because of climate and energy security, but because of the jobs it provides. Three to four million jobs in Europe are dependent upon the wood processing industries, which may suffer if the focus were on energy security and availability only, whilst neglecting the social impact. Ms. Salander-Björklund (Stora Enso) explained that in Sweden bioenergy had resulted in the entire panel industry being removed, apart from IKEA.

Mr. Ramsay (Building and Woodworkers International) expressed concern about the social impact on rural communities of rapid change, which might have effects on jobs and development in rural areas. He was concerned that it had not so far featured prominently in the workshop. Policies must be also socially sustainable. If more wood should be harvested, forest workers need to cut more, but also forest owners and society have to be convinced to utilize their forest more, but also have to be informed about the consequences of these changes.

Mr. Kastenholz (European Network of Forest Entrepreneurs) said it seemed clear that there would be an increased mobilization of wood from forests in Europe. The topic not mentioned was: how did all of this compare with the assumption that there may well be a lack of a qualified workforce in forestry in Europe. ILO made assumptions that a lack of qualified workforce might be a bottleneck for production goals in the future. He raised this issue as a concern that had not so far been taken into consideration. Sustainable forestry needed a sustainable workforce. Highly motivated, highly skilled people dealing with GIS, complex machinery, for example, will be needed. Therefore a necessary consideration would be how to develop a forestry-contracting sector to provide a service to the forest sector including all the work that the sector needed to maintain a level of profitability. The share of revenues from forest production passed onto contractors was meagre and carried the risk that the industry would lose its major human resource. The income for contractors has to rise; otherwise the whole industry will lose its major human resource. The social pillar is extremely important.

3.5 Mobilization of wood resources

In response to a question on the situation in Spain regarding incentives and measures by public authorities, Mr. Isasi (USSE) replied that for example in the Basque country local government plans to mobilize more wood by increasing the maximum load per lorry for carrying logs (decrease costs for harvesting) and improving certification schemes.

Ms. Salander-Björklund (Stora Enso) explained on the issue of wood mobilization of forest owners with small parcels one measure is to give access to data about forest ownership, like in Sweden. Another measure is to change the attitude of state owned forest towards more profit-orientated thinking, since sometimes if profit targets are reached, harvesting stops. For the industry continuous deliveries are needed. Transport efficiency is critical for mobilization. Currently regulations in most countries allow only very low loads on lorries, which is economically inefficient and disadvantageous considering the CO_2 emissions. Also infrastructure is important, in particular the ability of roads and bridges to carry heavy loads. Railways are also an important infrastructure for mobilization; but private companies often have difficulties to utilize railway systems, sometimes due to lack of wagons. An important factor determining availability of wood will be the increased export tax in Russia, which will have an impact on all of Europe.

Mr. Kosenkranius (EUSTAFOR) replied to an earlier comment that profit oriented state organizations are even more motivated to provide new services to increase income, because this means more investments and bonuses for management. However, they have more targets than profits, but also to secure a stable market supply in wood raw material. Some state owned forest services have long-term contracts, so they cannot just stop harvesting.

Mr. Vorher (Thosca Holz) questioned the statement from CEPF that the aim was not necessarily to maximize income and strongly felt that it ought to be. Subsidies should be given on the supply side,

not to consumers, as mentioned by CEPF. Forest owners are benefiting from an open market, and contributing to energy independency, but do they also think of the forest industry and help mobilizing more wood? CEPF pointed out that not only economic value, but all three pillars of sustainability were important for forest owners.

Mr. Döry (EPF) stated that forest owners can and should decide themselves what to do with their forest. This is generally not known, so scenarios should build on the assumption that the forest owner would utilize their forest.

3.6 Paradigm shift in the forest sector

The discussion gained new momentum when the attention of the floor was drawn to the question of whether one could regard the present situation (characterized by increasing prices for wood raw materials) as a paradigm shift, i.e. is the basis of operation of wood processing industries fundamentally changing, or is the situation rather one of incremental change?

Mr. Prins (UNECE) stated that adjustments in thinking appear to be needed along with consideration of the issue of forests within the broader question of energy security and climate change, because they will impact the sector to an even greater extent if ignored. Communication is crucial. Everybody has to make adjustments in the way they think. The present discussion has shown that there is an urgent need to improve information and analysis capacities, also in light of the important Brussels discussions.

Mr. Mantau (University of Hamburg) highlighted that the media is becoming interested in wood markets, and they start writing about resources, not only highlighting the environment and social factors. This is a fundamental change, since wood production gains increasingly more relevance. At the same time this development bears certain risks, since in the past foresters did not always reply in a timely and professional way to societal demands and now care should be taken to ensure that this does not happen in the wood market as well.

Mr. Nilsson (IIASA) pointed out that over the past 20-30 years, real prices have declined; they are now increasing, which could be considered a paradigm shift.

Mr. Wall (European Commission) explained that other material had been substituted for wood in the past decades. Now with increasing demand from the energy sector, the pressure is back on wood. However, with regard to the intensity of wood use from forests, the sector is not going into the unknown, but back to a level of wood use at which it had been some decades ago. The only difference is that there is much more pressure form the energy sector than before compared with that from other uses of small roundwood. Additionally, some former roundwood markets, like mining timber, had greatly shrunk.

Mr. Döry (EPF) sees a changing world due to the new situation in energy. Price volatility for wood implied risks for the industry. Also a change over time can be observed: in the 1950s and 60s, the industry was considered to be “wood murderers” and no one was interested in value-added, but the industry can now state confidently that much more wood is growing every year than is being cut, which should help to restore a more positive public image.

According to Mr. Höbarth (COPA/COGECA) the workshop should not only be talking about the problem of wood mobilization but also about the opportunity it presented for Europe to free itself from its dependence on the oil producers. This offers an opportunity for landowners and an opportunity for industry to play a lead role in new development and innovation. However, there are also conflicting interests or counterproductive situations as for example Natura 2000. Also certification could be a counterproductive tool if the benefits of the use of wood for society are not taken enough into account, but only environmental aspects.

4. Working groups

On the second day the participants were working in three different working groups on the topics of: a) Strategies to enhance wood mobilization at forest management and operational level (see 4.1.); b) Policy tools and mechanisms to promote wood mobilization (see 4.2.); and c) Implication of increased wood mobilization on different sectors (see 4.3.). Regional working groups were held in the afternoon as well as general discussions on the working group outputs.

4.1 Strategies to enhance wood mobilization at forest management and operational level (Working Group A)

4.1.1 Framework

About 30 participants of the workshop discussed this topic on the morning of the second day under the moderation of Professor Bo Dahlin from Helsinki University.

Question

What strategies can be used to enhance wood mobilization at forest management and operational level?

Objectives of the working group

- Identify factors and conditions that facilitate or limit mobilization of wood resources at forest management and operational levels.
- Identify positive/negative impacts of current forest-related strategies to enhance wood mobilization at forest management and operational levels.
- Define forest and forest-related strategies to enhance wood mobilization at forest management and operational levels.
- Define proposals for action, strategies for implementation and recommendations for the workshop.

4.1.2 Outputs of the working group

The three pillars of sustainable forest management, economic, social, and environmental, should be borne in mind when discussing policies to promote wood mobilization. The priority of these factors is dependent on local conditions.

Possible solutions

In the working group a number of possible solutions and strategies for enhanced wood mobilization were brought up. The main strategies were to: i) access more forest, ii) harvest more forest, iii) utilize more from each harvest, iv) grow forest faster, v) grow more forest, and vi) utilize trees on non-forest land. During the working group session at the workshop only the first two strategies where discussed due to time constraints.

Factors influencing wood mobilization

The working group highlighted several factors as having an increasing effect on wood mobilization:

- The amount of wood per area (m^3 per ha),
- Population density,
- Intensity and focus of forest management,
- Competing markets outlets,
- Information.

Factors having a decreasing effect:

- Fragmentation of forest and ownership,
- Management restrictions,
- Poor infrastructure and logistics,
- Availability and motivation of qualified contractors.

Bottlenecks can be described by three different factors:

i) Accessibility of the forest, including infrastructure and information,

ii) Usability of human resources and technology, and

iii) Availability of the forest, which is determined by the willingness to utilize the forest by the forest owner, and possible land use conflicts.

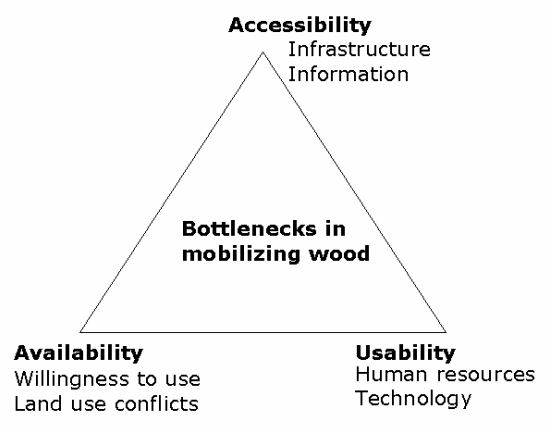

Figure 1: Bottlenecks in wood supply

The situation regarding wood mobilization in different regions can be described and analysed by using these three factors in a triangle.

Prices (and costs) affect all factors: if prices increase, more wood would be accessible (room for investments in machinery, infrastructure), available (higher willingness to use) as well as usable (easier to find personnel, to develop technology etc). And of course the opposite is also true. However, price relationship is not always logical, as price fluctuations may lead to uncertainty and speculations. It was assumed in this working group that prices and costs were fairly stable.

Main strategic issues/challenges to be addressed to promote wood mobilization

1) Access to the forest and extraction cost of the wood

Actions to be taken to increase wood mobilization:

- Access more forest
- Expand the forest area

Table 1: Policy tools and strategies for implementation: access to the forest

Proposed policy tools, mechanisms	Possible strategies for implementation
Public-private partnerships (PPP) / cost sharing	- Improve infrastructure - Prioritized and targeted (dis-) incentives
Information and networking	Difficult area harvesting courses
Research and development	

2) Availability

It is important to convince forest owners and society to take an active interest in forests, and explain that providing wood does not jeopardize other uses (biodiversity, hunting, landscape).

Actions to be taken to increase wood mobilization:

- Harvest more forest
- Utilize more wood from harvesting

Table 2: Policy tools and strategies for implementation: availability

Proposed policy tools, mechanisms	Possible strategies for implementation	Detailed actions
Private-Public Partnerships / cost sharing for harvest operations		
Information and networking	- Create information and network (who owns, how to manage, pictures, allowable cut) - Freely available - Local availability should be clear - Facilitate network - Take advantage of regional development plans	- Promote small scale forest owner associations (PPP) - Harvesting contractors need to have this information and incentives
Research development extension	- Reaching out to more forest owners using cadastral/ownership records - Absentee forest owners need to understand what they own and the possibilities of use - coordinate owner network	Local credibility

3) <u>Usability</u>

Human resources and technical/economic limitations

Actions to be taken to increase wood mobilization:

- Using non-forest land

Table 3: Policy tools and strategies for implementation: usability

Proposed policy tools, mechanisms	Possible strategies for implementation
Private-Public Partnerships / cost sharing	
Information and networking	- take advantage of efforts to encourage SME support - promote creation of added value
Research development extension	- invest in educating harvesters/field work - improve technical systems to compete with other biomass or renewable resources

General conclusions

- All solutions are local/regional depending on the regional conditions;
- Predominance of social factors, especially from forest owners;
- Owners can have different objectives compared to society or forest industry;
- Importance of networks/cooperation and coordination to enhance cooperation among forest ownership to overcome fragmentation and lack of education;
- Need for information and education among forest owners and the public;
- Need to facilitate and coordinate unknown forest owners (UFOs).

4.2 Policy tools and mechanisms to promote wood mobilization (Working Group B)

4.2.1 Framework

About 40 participants of the workshop discussed this topic on the morning of the second day under the moderation of Professor Dr. Vorher from Thosca Holz, Germany. The working group started with a presentation by Professor Mantau, showing that the numbers are often wrongly interpreted, better data is crucial for the discussion, and political activities have to be based on sound statistical data (see 3.2.13).

Question

What policy tools and mechanisms are required to promote wood mobilization?

Objectives

The participants of the working group were asked to identify forest policy tools and measures strengthening mobilization of wood resources, and respectively name forest policy tools and measures that may limit wood mobilization.

4.2.2 Outputs of the session

Forest policy tools and measures facilitating wood mobilization:

1) Information and knowledge dissemination

- Support for information gathering on forest land and harvesting possibilities (including mechanical use) in particular addressed to urban forest owners
- Knowledge dissemination on plantation forestry

2) Policies and strategies

- Development and implementation of balanced plans/programmes (e.g. NFPs, Finland) at the national and regional levels, in consultation with relevant stakeholders
- Simplify the administrative framework for the production of agro wood
- Create a cross-sectoral debate on biomass as an energy carrier
- Work towards a holistic strategy in forest utilization on a European level
- Knowledge on cascade of use of wood for possible more targeted subsidies
- Create higher engagements with the users of wood for energy to create responsibility for mobilization (e.g. France, leading to increasing harvesting volume)
- Development of necessary standards for the production of energy wood
- Impact assessments at the national and regional levels
- Creating a level playing field on the international level for sustainability
- Subsidies targeted directly at wood mobilization

3) Forest owners

- Economic incentives, e.g. tax relief (Norway)
- Support to facilitate possibilities to act jointly on the market, e.g. through building professional units such as forest owner cooperatives (Sweden)
- Services by larger functional units offered to smaller forest owners
- Create possibilities to sell cutting rights from small properties
- Create advisory services for forest owners (associations can be important)

4) Infrastructure and logistics

- Improving and making available logistical solutions
- Support to create forest infrastructure for enhanced accessibility

5) Research and Development, Education

- Support for research & development for the whole value chain, analysis, education (for workers & academia) and knowledge dissemination (e.g. France: study on national and regional approaches with research institutes, forest owners)
- Support to innovation for the development of higher value-added wood products
- Include wood energy issues in training

Forest policy tools and measures limiting wood mobilization

- Cooperatives as reliable market partners to ensure stable supply for energy and industrial use
- Administrative burden to forest owners emanating from EU and national legislation (e.g. Austria, uncertainty on regional Natura 2000 plans and other forest conservation measures)

- Lack of consideration of harvested wood products under Kyoto regime
- Better definition of waste wood and contaminants
- Market-distorting subsidies

Proposals for action and strategies for implementation

Main policy issues and/or challenges to be addressed as a means to promote wood mobilization policies:

1) Information gathering and dissemination, to obtain reliable data and information on forest resources:
   Build the knowledge base to construct a sound dataset on the existing and potential wood resource and base policies on it.
   To whom should this be addressed: the national governments should gather data (by including all stakeholders inc. industry), and then UNECE, FAO, MCPFE aggregation, coordination

2) Holistic and inclusive strategies and policies, including all the stakeholders
   Develop a holistic, inclusive and sustainable strategy towards an efficient utilization of forest resources at the European level. Covering NFPs, put in place an impact assessments, check policies on negative impacts, evaluation of subsidies focus more on production side than "end of the pipe", create a level playing field when it comes to compare the different countries.
   Responsible: national government starting the process and address it to MCPFE.

3) Empowering forest owners, these were among the most controversial issues that were discussed: Empowering forest owners to cluster and improve supply capacities, by mainly: (1) facilitating harveting, e.g. by creating servicing professional units (cooperatives); (2) Provide economic incentives to the supply side. In this way subsidies are incentives and can bring us forward.
   Responsible: national governments, forest owners and associations/ cooperatives.

4) Enhancing infrastructure and logistics for accessibility:
   Facilitate access to the resource and the utilisation of the resource. Bringing the wood to where it is used by improving forest road networks, considering environmental concerns, but if a forest road network is well defined then it has the least impact to the forest. Revising and improving transport conditions (truck weights, railways, etc).
   Addressed to regional and national governments, industry and concerned stakeholders.

5) R&D, education and training to develop and make use of innovative technologies; this is important and influence all the other dimensions. Stimulate innovation by supporting R&D along the whole value chain, by developing new value adding products and methods and by promoting the use of the best available technologies.
   Responsible: national governments, industry and EU.

4.3 Implication of increased wood mobilization on different sectors (Working Group C)

4.3.1 Framework

About 20 participants of the workshop discussed the topic the morning of the second day under the moderation of Duncan Pollard from WWF international.

Question

What are implications of increased wood mobilization on the main forest-related sectors and how to enhance positive, and reduce negative, resulting cross-sectoral effects?

Objectives

- Identify positive and negative impacts of increased wood mobilization on the main forest-related sectoral policies
- Identify positive and negative impacts of increased wood mobilization on sustainable forest management policies and strategies
- Define policy tools and mechanism to enhance positive, and reduce negative, effects of increased wood mobilization on SFM and the main forest-related sectoral policies
- Define proposals for action, strategies for implementation and recommendations for the workshop

4.3.2 Outputs

It should be noted, that the discussion and its results were limited to the stakeholders presented in this working group; e.g. no representative from the forest workforce joined the discussions, which led to less focus on this topic.

The working group split into two groups, one looking at different sectors and the impacts on them. The other group discussed the impact of increased mobilization on sustainable forest management, using the MCPFE criteria.

1. How to achieve increased income/value for **small forest owners?**

- Examine country specific issues and develop country specific solutions, recognizing that there are perhaps three different groupings of countries. (National governments, appropriate forest owner associations, and UNECE to provide overall framework and forum.)
- Give carbon a value at the time it is stored and then include it in the whole production chain. (Kyoto process)

2. Higher competition for wood and for the **existing forest-based industries**. How to mitigate the negative impact of higher competition for wood on the existing forest-based industries?

- Examine country specific subsidy policies and develop greater harmonization (European Commission, National Governments via UNECE)
- Promote the use of forest products that are not currently used by existing industries and perhaps regions where there is currently no existing market/competition for raw material. (National governments)
- Exploit fully waste products and other sources of biomass e.g. agriculture, post-consumer waste (National governments)

3. How to ensure **efficiency in sourcing raw material** (transport, allocation), efficiency in energy generation (electricity vs. heat, and question of scale) and greater efficiency in energy use?

- Introduce minimum standards of efficiency for energy and environmental criteria. Transport of wood and bioenergy over long distances should be avoided. Develop standards on efficiency, building on existing directives on efficiency, (via existing EU/National Govt. directives)

- Improve quality of information on best practice including education and professional associations, ensuring that this goes to the education systems of architects and builders.
- Use incentives in a targeted manner to encourage efficiency

4. Encourage **integrated planning** at the appropriate level (national, regional and local/landscape scale) (not only forestry, but also agriculture, forest planning, infrastructure and land use)

- Develop strategies for the development of bio-energy, that recognize the place of the existing forest-based industries, and the role that forestry can play in fulfilling the strategy
- Integrate issues relating to bio-energy into the existing planning frameworks, with the aim of securing sustainable development.

5. Recognizing the importance of **forest certification** to provide the safeguards to deliver sustainable forest management and to be able to communicate that, how to

a) review existing certification standards to encompass bio-energy raw material,

b) ensure a level playing field between forest and agricultural products.

Ensure that existing certification standards are able to deliver on bioenergy, there are many discussions ongoing within the bioenergy sector on certification schemes. This would be an unwelcome development, if the forest has to be certified twice (for timber market and for biomass market). Therefore a mechanism has to be found where raw material sources have appropriate certification at product level and harmonization between products.

No consensus could be found in the working group and subsequent plenary discussion on this point. During the discussion a representative from PEFC mentioned that no need was seen to review existing certification schemes. Existing system already cover everything, how products are used afterwards is not relevant.

It was mentioned that forest products have high standards, are now merged with products that have less public interest and thus lower standards. Therefore it is important to prepare a level playing field to allow wood to become the preferred product.

FAO explained that together with IEA they are working in a taskforce on criteria & indicators for sustainable production of biofuels, also to look if this can be encompassed by existing certification schemes, or whether something additional is needed. The intention is not to replace existing certification schemes, but to think about sustainability issue in bioenergy projects (e.g. A/R CDM).

5. Conclusions and recommendations of the Workshop

Preliminary conclusions and recommendations were drafted and discussed during the last session of the workshop. The comments of this discussion were incorporated in a new draft version and circulated by email to the organizing committee and later to the participants, who were invited to provide further input. Over 40 participants provided detailed comments on this second draft, which then let to the final conclusions and recommendations presented here.

The conclusions and recommendations are divided into three parts: conclusions, recommendations and a message to the MCPFE to consider for their resolution on "wood and energy". This document can also be downloaded separately under:
[http://www.unece.org/trade/timber/workshops/2007/wmw/recomm.htm]

5.1 Conclusions

1. **Demand for wood is growing**, driven both by the wood-processing industries and the energy generation sector. Relevant policies should therefore balance the needs for energy security and

the mitigation of climate change by reducing emissions from fossil fuels and guaranteeing the competitiveness of European industry put in the context of sustainable regional development. It should be kept in mind that wood is a valuable and versatile raw material and energy source. Wood's life cycle requires low energy input, it is carbon neutral when sustainably managed, and can be recycled and is renewable.

2. To **broaden the base for wood supply** and thereby decrease the competition between sectors for raw material, the potential of every component should be developed. In the medium term, wood supply in Europe to all end-users can be increased through more intensive use of existing forest resources, including:

   (a) The use of wood assortments that are not currently used;

   (b) The use of currently uncollected forest-based and related and industry residues;

   (c) Expansion of the harvested forest area;

   (d) The greater use of woody biomass from outside the forest;

   (e) The wider use of post-consumer recovered wood products;

   (f) The development of additional sources of non-wood biomass for energy purposes;

   (g) The development of short-rotation, wood biomass crops on agricultural land.

   In the longer term, wood supply can be increased through:

   (a) Expansion of the forest area;

   (b) Enhancements in the productivity of forest resource, including silvicultural and genetic innovations.

3. It is **not yet well known how much wood can be mobilized** in Europe on a sustainable basis while respecting environmental, social and economic constraints. Many factors should be taken into account in the complex analysis which will henceforth be needed, including but not exclusively:

   (a) The dynamics of forest growth and harvesting;

   (b) The accuracy, periodicity and comparability of national and regional forest inventories as well as the assortments they cover, including forest age-class structures, and wood categories (species, dimensions, quality, etc.);

   (c) Forest ownership structures, attitudes, goals and motivations, which may affect wood production and mobilization;

   (d) The likely structure and size of demand;

   (e) The fact that forests are not the only source of wood: woody biomass outside the forest, wood from short-rotation plantations on agricultural land, industry residues and post consumer wood products may all supply significant volumes.

   Therefore, there is an urgent need for reliable information on the realistic potential for future wood mobilization from these sources.

4. If demand were to outstrip supply, this would lead not only to higher prices for wood as a whole - especially low-quality wood - but also to an increasing amount of wood imports.

5. The workshop in Geneva made it possible to compare a wide range of perspectives and to analyse diverging interests.

6. To enhance better mobilization, one must address not only the above factors, but also:

   (a) Forest owners' willingness to harvest and sell their wood;

(b) Physical access to the forest, non-forest and recovered wood resources;

(c) The existence and availability of resource and market information;

(d) Cost and viability of harvesting and transport, including infrastructure;

(e) The effectiveness and efficiency of wood harvesting and marketing;

(f) The availability and motivation (including satisfactory remuneration and working conditions) of an adequately trained, skilled and equipped work force, including contractors.

7. The current situation presents, on the one hand, challenges in determining the way the factors mentioned above interact, but on the other, opportunities to find constructive "win-win" solutions for stakeholders. Resolving these issues in the right ways, and avoiding possible conflicts, will have major positive consequences for jobs, income and biodiversity in many parts of Europe.

5.2 Recommendations

5.2.1 Principles:

1. Strategies and measures to increase wood mobilization must be within **the limits of sustainable forest management**, keeping relevant environmental, social and economic constraints in mind.

2. Policies and practices should **avoid contradictory signals** and unwanted outcomes, including undue market distortions, while encouraging efficiency in fiscal policy and the use of public funds. In particular, Governments should use incentives and disincentives in a targeted and prioritized manner.

3. There should be **equity of treatment** between imported and domestic wood in terms or regulatory, technical and other requirements, as well as between forest and agricultural products for the biomass-based energy market.

4. All systems, whether for bioenergy or wood processing, should, as far as is practically possible, satisfy high standards for **energy and resource efficiency**, cost-effectiveness and environmental performance.

5. Bearing in mind the marked variations between and within European countries, **country-specific issues** should be examined and country-specific solutions should be sought.

5.2.2 Specific elements for implementation:

1. Governments, with the participation of all stakeholders, should take the lead to develop **policies and strategies** which are holistic and inclusive, co-ordinated with frameworks for other sectors and address issues at the appropriate level (local, subnational, national regional), and based on sound information. In particular:

   (a) Strategies for the development of woody biomass-based energy should recognize the place of all actors, including the existing forest-based and related industries and the role that forestry and forest-based and related industries can play in fulfilling these strategies. Issues relating to bioenergy should be integrated into existing and emerging planning frameworks, such as national biomass plans, with the aim of securing sustainable development.

   (b) Strategies for the efficient utilization of forest resources should be developed with reference to the national forest programmes (NFPs), including environmental and social impact assessments.

(c) Regional development plans, and programmes should be used in particular to facilitate small and medium-sized enterprises (SMEs), including forestry contractors.

(d) Governments should verify that strategies and legislation outside the forest policy area, do not have a negative effect on wood mobilization.

2. There is an urgent need for **reliable information** on the realistic potential for and consequences of increased wood mobilization. Key areas are:

   (a) Existing and future wood resources (forest, woody biomass outside forests, short-rotation plantation on agricultural land, residues and post-consumer material) as well as the potential to mobilize it, including not only physical availability but the economic, social and environmental conditions which must be satisfied to achieve higher levels of wood supply. UNECE/FAO should take the lead in bringing together partners to assess the feasibility of an international study to address these issues. To the extent possible, this should be aligned to current reporting processes, in particular the Forest Resource Assessment (FRA). In this analysis, there should be a clear distinction between woody and non-woody biomass.

   (b) Best practices in wood mobilization: there is a need for a comprehensive and structured exchange of information, possibly through a website, cooperating with educational institutions and professional associations.

   (c) Opportunities and threats for the energy sector resulting from the mobilization of wood resources, including the existing and potential wood-to-energy pathways with their respective economic and technical prospects and constraints.

3. There is a need to **encourage forest owners** to form "clusters" and improve wood-supply capacities, by cooperation and servicing professional units (cooperatives). A focus should be given to providing information and educational programming to forest landowners so that they can make informed decisions about forest management. Special attention should also be paid to the millions of small-scale forest owners, especially those created by the restitution programmes in several transition countries. Absentee forest owners need to understand what they own and the possibilities to use their resources. Associations and wood buyers could reach out to more forest owners using cadastral/ownership records, although, in the end, each forest owner should decide independently on the utilization of their forests, within the legal and institutional environment of the country.

4. **Education and training** should play a central role in mobilizing wood resources. Governments, academic institutions and professional bodies should address education, training and the need for the sensitization of forest owners, the forest workforce, SMEs involved in forest operations, and energy consumers with regard to skills and entrepreneurship. Wood energy issues should be introduced into national forestry training curricula.

5. Governments and industry should facilitate **access to and utilization of forest resources** by improving or securing:

   (a) Transport and handling infrastructures, including forest road capacities and network railway systems;

   (b) Transport and infrastructure limitations, e.g. allowable lorry dimensions, weights and axle weights,, road and railways capacities and dimensions;

   (c) The availability of a competent forest workforce.

6. Governments, the research community and industry should **stimulate knowledge development**, identification and transfer, as well as innovation, by:

   (a) Supporting research and development throughout the value chain, including development of new value-added products;

   (b) Promoting the use of the best available technologies and practices. In particular, there is a need for a comprehensive and structured exchange of information on wood mobilization, possibly through a website to foster cooperation between forest owners and contractors, industry, educational institutions, professional associations and others throughout the value-added chain;

   (c) Promoting, developing and applying models for forest resources and the forest sector.

7. The potential of **forest certification** systems requires analysis, to secure a level playing field for wood and woody biomass markets.

5.3 Message for the Ministerial Conference on the Protection of Forests in Europe, to be held in November 2007

Participants noted that all workshop presentations, discussions and conclusions were highly relevant to the input needed for MCPFE resolutions, notably the proposed general declaration and draft resolution on wood and energy. Workshop participants prioritized the following topics for the attention of the MCPFE conference organizers:

1. **Policy coherence** is needed, in particular the integration of wood mobilization strategies with biomass action plans, to avoid market distortions, particularly through the perverse (i.e., contradictory or leading to unintended consequences) use of incentives and disincentives, as well as fiscal measures.

2. An **involvement of the whole wood supply chain** is needed to develop and implement European, national and regional policies and regulations promoting renewable energy sources - in particular biomass action plans - in order to find optimum solutions for the increasing demand for wood.

3. Strategies and measures to increase wood mobilization must be within the **limits of sustainable forest management**, keeping environmental, social and economic constraints in mind.

4. There is a need for much more **comprehensive and reliable statistical information** on and analysis of available wood resources, as well as the realistic potential for their mobilization. Identification and exchange of information on best practices is also needed.

5. **Forest owners** should be encourage to form “clusters” and improve supply capacities, by facilitating cooperation and servicing professional units (cooperatives).

6. There is a need to recognize specific **regional, national and sub-national conditions** and objectives, and to develop level specific solutions.

7. The present situation represents a **major opportunity for the sector** to find new roles and to contribute to the security of energy supply and to the mitigation of climate change, by replacing fossil fuels and by sequestering carbon in forests and in forest products.

Annex 1 Background Paper for the Workshop

Mobilizing Wood Resources

Can Europe's Forests Satisfy the Increasing Demand for Raw Material and Energy under Sustainable Forest Management?

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This background paper has been prepared with the sole objective of stimulating discussion at the workshop. The themes, which the workshop addresses, are surrounded by uncertainty and are in some cases controversial: no comprehensive, accepted data and analysis exist, although many elements are available in different sources.

Rather than using weak data quality as an excuse to avoid meaningful analysis of the situation, the authors have preferred to make estimates and assumptions, as openly as possible. They are well aware of the weaknesses and dangers of such an approach, but ask workshop participants to use the arguments and data in a constructive manner. In any case, they hope it will be possible to make more detailed and solid analysis in the future.

Furthermore, very little time was available to complete this paper in time for the workshop. It is hoped that it will be possible to revise and improve the paper, possibly through a wider review process, later.

In any case, comments, suggestions and corrections are welcome.

The opinions expressed in this background paper do not reflect the positions of any of the sponsoring organizations.

A-1.1 Outlook for supply and demand for wood [20]

For several decades, the harvest from Europe's forests has been lower than the sustainable level and the sector's concerns in most regions have been more with finding outlets and remaining economically viable than with preventing over-cutting or mobilizing scarce wood supplies. However, the rapid increase in demand for renewable energy, including wood energy is profoundly changing the balance of the sector: concern has been expressed about increasing harvesting over sustainable levels to meet the demand for energy wood. Are such fears founded in reality?

Is there an imbalance between supply and demand of wood? Does such an imbalance exist now, or is it developing? And if so, where and how large? To answer these questions requires quantitative scenarios of supply and demand, and a good understanding of the assumptions on which these scenarios are based.

This section analyses separately the supply-demand balance for industrial wood and for energy wood, as the data quality and driving influences are very different. Then it assesses the outlook for wood supply as a whole, as industrial roundwood and energy wood are, at least in part, substitutes: all wood can be burned, and technical advances mean that lower quality wood, formerly only suitable for energy wood, can be used for panels, pulp and even sawnwood.

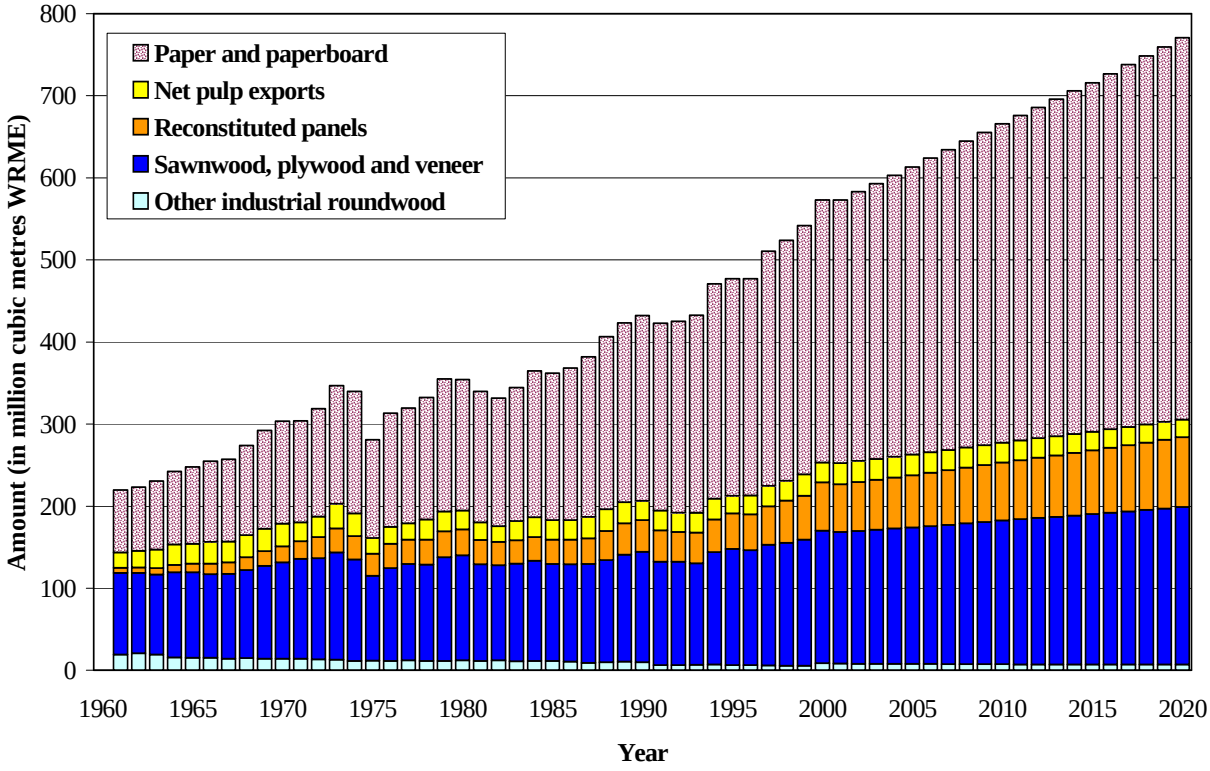
A crucial factor for both industrial and energy wood is the use of residues and recovered wood, which must be fully integrated into complex balance calculations.

This section does not present once again basic data on the forest resource or forest products markets, which are easily available in other ECE/FAO publications.

A-1.1.1 Supply and demand for industrial wood

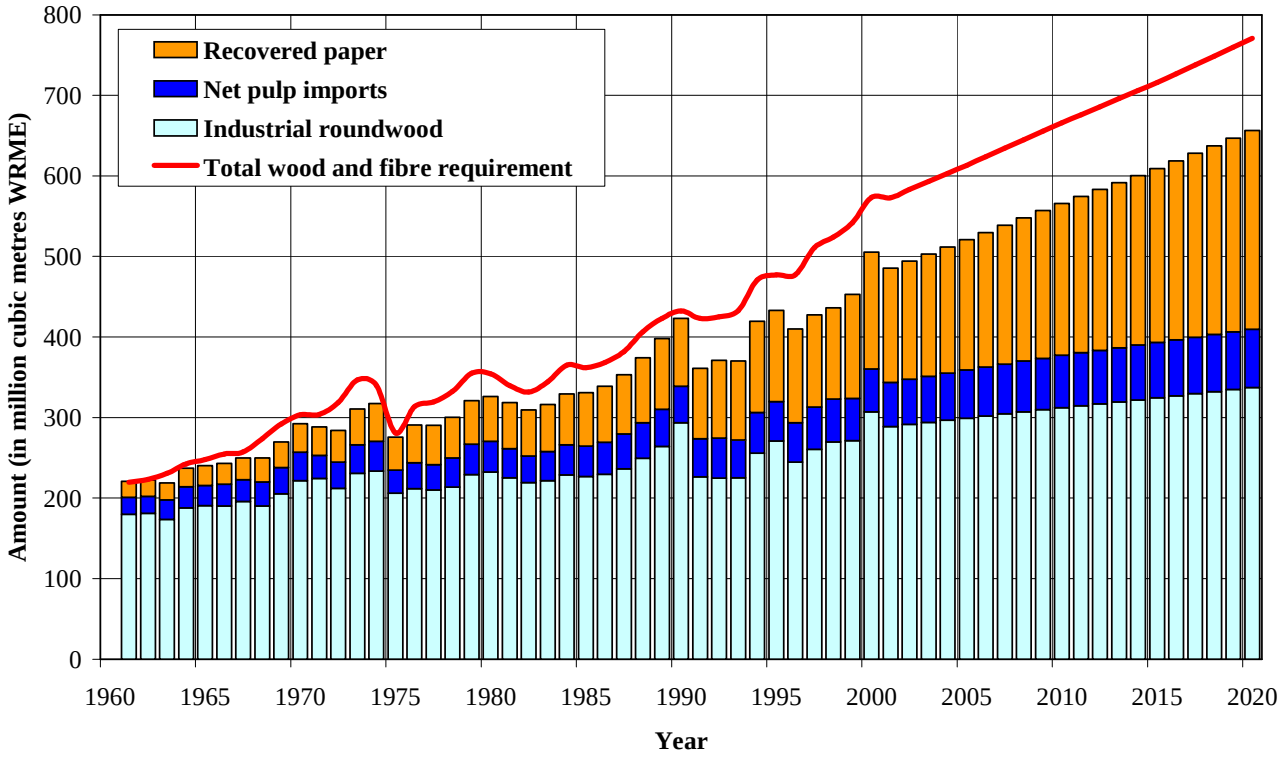
The European Forest Sector Outlook Study (EFSOS), published in 2005, prepared a baseline scenario for 2000-2020, based on assumptions of moderate economic growth (1.3% p.a. in Western Europe, and around 4% p.a. in Eastern Europe and CIS), unchanged competitivity of forest products and stable prices for roundwood and products. The basic developments, for Western Europe, are summarized in the two graphs (Annex figure 1 - A and Annex figure 1 - B). For full information on methods and assumptions and more detail, readers are referred to EFSOS and its accompanying documentation. In very broad terms EFSOS foresees steady growth of consumption and production of forest products (faster for paper and panels, slower for sawnwood) and a corresponding growth in all the components of fibre supply: recovery of paper and use of residues are expected to grow faster in Western Europe than removals from the forest. The latter are however expected to grow steadily.

[20] Chapter prepared by Kit Prins, UNECE/FAO Timber Section



Annex figure 1 - A: development of wood consumption in western Europe until 2020, (Source: EFSOS)

WRME: wood raw material equivalent



Annex figure 1 - B: Development of wood and fibre requirement in Western Europe until 2020 (Source EFSOS)

WRME: wood raw material equivalent

Recently, developments between 2000 and 2005 have been compared with the EFSOS scenarios (analysis to be published shortly as an ECE/FAO Discussion paper): this confirms that for production and consumption of industrial wood and forest products, real developments have been broadly in line with the EFSOS projections. One exception has been the gradual but steady rise in prices of roundwood and processed products, since 2000, whereas EFSOS assumed constant prices, and a long-term decline in real prices has been observed for several assortments

A-1.1.2 Supply and demand for wood energy

The situation and outlook for wood energy is less well understood and has far greater uncertainty, for at least three major reasons:

- The volumes and types of wood used for energy at present are not well measured;
- The factors determining trends are not well analysed or understood;
- The factors determining long-term trends appear to have changed radically with the rise in the price of fossil fuels, and the policies for climate change and renewable energies, all of which tend to encourage the consumption of wood for energy.

The questions facing the international community in Europe are therefore:

- How much wood is used for energy at present, from what sources, for what purposes? And how much of this comes directly from the forest resource?
- What is the future demand for energy wood, taking account of the policy goals?
- Can the forest and wood resource supply the expected demand and under what conditions?

A detailed and comprehensive quantitative study, along the lines of EFSOS, but with more robust scenarios for wood energy, would be desirable to answer these questions. Nevertheless, certain elements of a reply are now becoming available, which are presented and discussed below.

A-1.1.2.1 Present situation of wood energy

A study under way by a group of international agencies (ECE, FAO, IEA, European Commission) estimates the current pattern of supply and use of wood energy in 12 major European countries, accounting for 63% of European roundwood consumption (excluding Russia and CIS countries) (Annex table 1 - A).

Annex table 1 - A: Source of wood energy and users for 12 European countries (Source Joint Wood Energy Enquiry, under preparation)

[million m^3]	U1 Power and heat	U2 Industrial	U3 Private households	Sum (S1+S2+S3)	%
S1 Direct	3.7	1.4	81.5	86.6	44
S2 Indirect	18.2	71.8	6.5	96.5	49
S3 Recovered	12.9	0.4	0.1	13.3	7
Sum (U1+U2+U3)	**34.8**	**73.5**	**88.1**	**196.4**	100
%	**18**	**37**	**45**	**100**	

Source of wood energy:

S1 Direct, essentially wood used for energy directly from the forest

S2 Indirect, which is mostly residues from wood processing industries

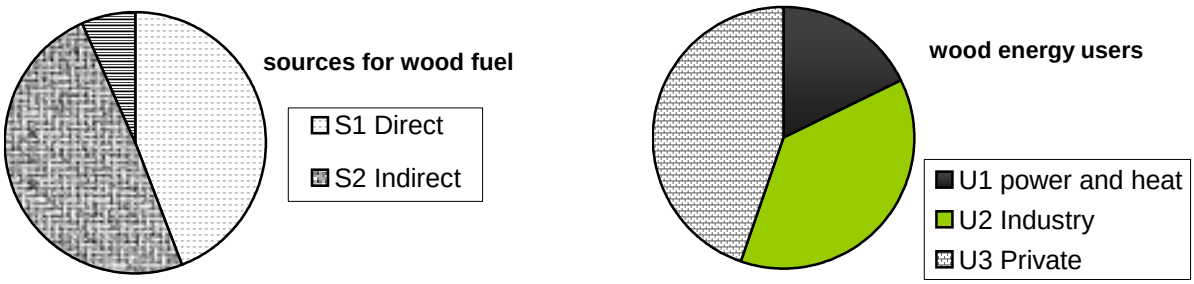
S3 Recovered, which is wood products, which have been used for their original purpose (e.g. pallets, construction wood, furniture) and are then used for energy

Use for wood energy:

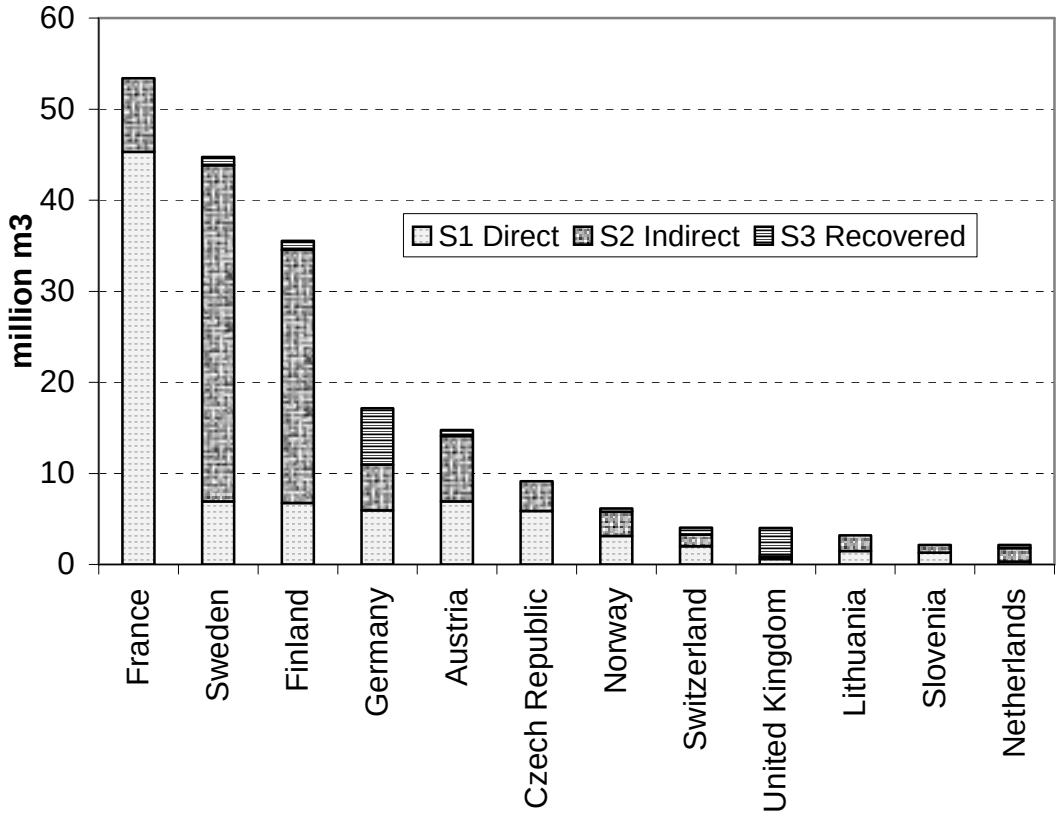
U1 Power and heat, which refers to the generation of electric power for the grid and heat for sale, outside the producing (forest) companies (industries).

U2 Industrial, which refers to energy used internally by the forest industries

U3 private households



Annex figure 1 - C: Source for wood fuel and wood energy users (see also Annex table 1 - A)



Annex figure 1 - D: Sources of wood energy in 12 European countries

This shows, among other things, that wood energy supply and use is much larger than previously recorded, and that in most countries "indirect" wood energy (i.e. by the forest industries) is the major component of wood energy supply. An exception is France, which estimates its direct wood energy supply (from forests and trees outside the forest) at over 40 million m^3/year.[21]

Extrapolating from the 12 countries studied to Europe (without Russia) as whole[22] gives a very rough estimate of the *direct* supply of wood energy of about 250 million m^3/year, as opposed to the figure used by EFSOS of about 60 million m^3. The higher figure appears to be more realistic. The complex, local, sometimes non-recorded, pattern of use of wood energy has developed over many years and is suited to local conditions, although those conditions have changed significantly over the past 10 years with the arrival of larger scale district heating and combined heat and power units.

A-1.1.2.2 Future demand for wood energy

The future level of supply, consumption and price of wood energy will be determined by a multitude of factors, but especially by:

- The price of competing energy forms, notably fossil fuels
- The nature and level of policy support for wood energy, whether for reasons of renewability, security of energy supply or other reasons (see chapter 2 and 4)
- Competing demands for wood, notably from the "traditional" wood using industries
- The composition, needs and attitudes of forest owners
- Degree of constraint on intensity of forest management set by biodiversity conservation and/or protection requirements (see chapter 5)
- The ability to mobilize the resource: marketing and logistical infrastructure, at present, in many regions, is extremely weak and inflexible (see chapter 3).
- The behaviour of forest owners and managers and their willingness to harvest/supply

The strongest motors for change are undoubtedly the energy price and energy policy objectives. The present high energy prices are already causing investment in wood burning equipment and a rapid, even if unmeasured, increase of wood used for energy.

To assess the strength of future demand for wood energy, it is necessary to examine the multiplicity of targets and plans at national and international level for renewable or biomass energy. Unfortunately for the calculation of the supply demand balance for wood, few of these specifically identify wood biomass, which is included alongside agricultural residues and crops, municipal solid waste and other types of biomass, all with very different supply characteristics. (In the EU, up to 2004, wood has consistently been recorded as providing about 80% of the biomass used for final energy consumption) Within wood biomass, little distinction is made between wood from the forest, from industry or recovered wood. The EU Biomass Action Plan estimates the potential for biomass energy as shown in Annex table 1 - B, and provides an order of magnitude of what policy makers for the energy sector expect from wood. Although, the plan refers to "potential", these figures coincide roughly with the overall biomass targets. The supply of direct wood energy (not including the expected contribution from industry residues or recovered wood) may therefore be expected – by policy makers - to increase from about 160 million m^3 in 2003 to about 260 million m^3 in 2010, an increase of 100 million m^3 (60%) in 7 years.

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[21] It is not yet clear whether France is a special case in its wood energy supply pattern or whether there are other countries with similar under estimations which have not yet "discovered" the size of rural wood energy use, as well as wood from urban and amenity trees).

[22] Assuming an average of 1.5 m^3/year of direct energy supply per rural inhabitant.

Can the European forest expand its supply by such a large amount in such a short time? To obtain a preliminary response it is necessary to look at the overall wood supply/demand balance, while bearing in mind not only the considerable uncertainties but also the major local and regional variations.

Annex table 1 - B: potential for biomass energy as estimates in the EU Biomass Action Plan (conversion to WRME and breakdown direct wood/organic wastes estimated by ECE/FAO)

* Mtoe: million tonnes oil equivalent ** WRME: wood raw material equivalent

	Consumption 2003 [Mtoe*]	**Potential 2010** [Mtoe*]	**Potential 2020** [Mtoe*]	**Potential 2030** [Mtoe*]
Wood direct from forest (increment and harvest residues) (converted into million m^3 WRME**)	27 (= 160)	43 (= 260)	39-45 (=240 - 270)	39 - 72 (= 240 - 450)
Organic wastes, wood industry residues, agricultural and food processing residues, manure	40	100	100	102
Energy crops from agriculture	2	43-46	76-94	102-142
TOTAL	**69**	**186-189**	**215-239**	**243-316**

A-1.1.3 Supply and demand for roundwood as a whole

Bringing together the estimates from the previous sections, gives the greatly simplified, picture in Annex table 1 - C.

It is necessary to bear in mind that:

- 2010 data for industrial roundwood are EFSOS baseline projection
- 2010 energy estimates for western Europe are based on the EU Biomass Action Plan (there is insufficient information on non-EU countries to make a corresponding estimate for eastern Europe)
- much of the wood used for energy comes from non-inventoried sources (tops, branches, stumps, small trees, hedgerow and amenity trees, orchards etc.), so the net annual increment on forest available for wood supply is not sufficient to estimate the sustainable harvest level.
- The table only covers wood supply direct from the forest, not the use of residues and recovered wood, for energy or raw material.

Annex table 1 - C: Direct wood supply scenarios (forests and trees outside the forest only, excluding residues and recovered wood)

	Western Europe[2]		Eastern Europe[2]	
	2000[1]	**2010**[1]	**2000**[1]	**2010**[1]
Industrial roundwood consumption	271	312	81	107
Energy targets (direct wood energy only)	139	210[3]	114	?
Total direct wood supply for industry and energy	411	522	195	?
Net annual increment on forest available for wood supply	515	505	230	219

[1][million m^3WRME/year]
[2]EFSOS country groups (new EU members are in eastern Europe)
[3]Very rough estimation on basis of EU25 Biomass Action Plan potential

Annex table 1 - C shows that according to the assumptions set out (i.e. steady growth of forest products markets, ambitious programmes to develop wood energy), supply of both raw material and energy from wood would rise, especially wood energy. Biomass energy plans call for a near doubling of the use of wood for energy in less than 10 years.

It appears that the forecast levels of demand for industrial wood with the **present** levels of wood energy supply can be supplied sustainably from the existing forest resource, with the existing level of management However, achieving the **target** levels of wood energy supply (for instance those in the EU Biomass Action Plan) would involve significant changes:

1. Volumes of wood significantly greater than the EFSOS baseline would have to be supplied, from industry, recovered wood, directly from the forest and trees outside the forest, hence potentially putting at risk SFM..
2. Schematically, the main options for increasing the volume of wood made available, whether for energy or raw material, are:
    a. Ensuring that no forest industry residues are wasted
    b. Developing the use of recovered post consumer wood for energy or raw material to high levels (as in countries like Germany, the UK, Switzerland or the Netherlands)
    c. Expanding harvest from existing forests: increased harvesting, recovery of more parts of the tree etc. (see also chapter 3)
    d. Expanding harvest of trees outside the forest
    e. Expanding the area used for wood/fibre production (these may not be conventional “forests”) (see also chapter 5)
3. If the ambitious biomass energy targets are to be met, all the above may be necessary unless the increase in biomass energy comes exclusively from non-wood sources, such as agricultural energy crops.
4. Large volumes of forest industry residues are already used for energy, so the potential for developing this resource may be limited (and dependents on levels of industry activity)
5. The availability of recovered wood is also limited, notably by the volumes of products consumed.
6. Thus any significant increases in wood supply, if they were considered necessary , would have to be generated from the existing forests, trees outside the forest and an expanded forest area.
7. In any cases, market conditions and prices are bound to be affected.

Is wood supply sustainable?

At present, information is not sufficient to say whether the figures tentatively suggested for 2010 (i.e. with a considerably higher level of wood energy supply) are sustainable or not. Certainly net annual increment on forest available for wood supply is an inadequate indicator because of the many dimensions it does not cover (trees outside the forest, harvest residues, stumps etc.) and the multiplicity of unrecorded and unmonitored sources. There is also a need for better monitoring information on use of residues and recovered wood products, both for raw material and energy.

However, the emerging situation would require consideration of sustainability more detailed than the simple question of physical wood availability. All the dimensions of sustainability, as listed for instance in the MCPFE criteria and indicators should be taken into account.

Questions about compatibility of sustainable forest management and increased wood supply are further discussed in chapter 5.

A-1.2 Relevant policies and framework conditions[23]

A-1.2.1 Regional and Pan-European level

Within Europe, national forestry policies are the most important statutory instruments directly determining the goals and principles of forest management. Nonetheless, other policies may have a greater indirect influence on the forest-based sector as a whole, thus having an impact on forests themselves.

At the Pan-European level, some elements of forest policy based on common national interests is formed at "Ministerial Conference on the Protection of Forests in Europe" (MCPFE) through ministerial declarations, several non-binding resolutions and relevant tools for sustainable forest management (SFM) implementation. Key messages from the MCPFE resolutions should be kept in mind when discussing about wood mobilization and intensified forest management.

In the resolutions of the Second Ministerial Conference in Helsinki (1993) the signatory states commit themselves amongst others to follow guidelines for sustainable forest management and conservation of forest biodiversity.

At the Third Ministerial Conference in Lisbon (1998), the states put special emphasis on socio-economic aspects of sustainable forest management - focusing on the relationship and interaction between forest and society.

The principal goals of the Fourth Ministerial Conference in Vienna (2003) include protecting the biological diversity of forests in Europe and further, creating an awareness of the value of forest goods and services and encouraging their marketing, as well as clarifying the cultural significance of the forest. Multiple roles that are played by forests and SFM in relation to climatic change are also addressed in the Vienna commitments.

A-1.2.2 EU level

A-1.2.2.1 Introduction

This part is focussing on existing and emerging EU policies relating to energy from biomass and their effects on forest based industries, based on a presentation given by Jeremy Wall (EC DG Enterprise) at the 'International Seminar on Energy & the Forest Products' Industry' in October 2006 in Rome.

Although there is no specific mandate for forestry policy in the EU Treaties, there are several EU policies, which together with the individual EU Member State forestry and other policies, concern

[23] Chapter prepared by Jeremy Wall, EC DG Enterprise and Industry and Sebastian Hetsch, UNECE/FAO Timber Section.

forests and the forest-based sector directly or indirectly. Moreover, in recent years, forests have been considered as potential "carbon sinks" in the international discussions on climate change. Concomitantly, wood has gained attention as a carbon-neutral energy source to replace non-renewable energy sources in the framework of climate change discussion on the one hand, and security and diversification of energy supplies on the other hand. However, so far the role of forests in international carbon accounting has been limited and up till now wood products have been excluded.

Within this overall framework several policy elements in different fields (e.g. Environment, Agriculture, Regional policies, etc.) have been drafted at European level that have either a direct influence on the forest or an influence on the wood market through the promotion of wood biomass as renewable energy source. So-called EU Energy Policy is probably the most influential as regards this last area. However, the EU mandate for energy policy, although legally limited, is in practice quite extensive. Other EU policies aiming at maintaining and enhancing the competitiveness of the EU economy vis-à-vis international competition (e.g. EU Internal Market, Industry, Employment, Information Technology, and Research and Development policies) all seek to redress the balance of the three pillars of sustainability by adding economic and social dimensions to the environmental one. In so doing, they have important consequences for the forest-based sector as a whole.

A-1.2.2.2 Examples of relevant EU legislation and other policy elements

Energy Policies:

The major pieces of EU legislation concerning bio-energy:

Green Electricity Directive (Directive 2001/77/EC)
Directive on Renewable Energy Source-Electricity: to establish a framework to increase the share of "green" (i.e. renewable) electricity from 14% to 21% of gross electricity consumption by 2010

Directive on Transport Bio-fuels (Directive 2003/30/EC)
Member States shall ensure by the end of 2005 a 2% and by the end of 2010 a 5.75% minimum proportion of bio-fuels of all petroleum gasoline and diesel fuels sold on their markets

Directive on Taxation of Energy Products and Electricity (Directive 2003/96/EC)
Article 16 allows Member States to apply exemption or a reduced rate of taxation on "bio-fuels and other products produced from biomass"

Combined Heat and Power Directive (Directive 2004/8/EC)
Directive on Co-generation of Heat and Power: to create a framework for the promotion and development of high-efficiency co-generation of heat and power.

Other EU Policy instruments:

Biomass Action Plan (COM (2005) 628 final): As foreseen in its report on the development of renewable energy in May 2005 (COM 2005/366), which recognized the shortfall from EU targets for various renewable energy sources, notably biomass, the Commission published an EU Biomass Action Plan (BAP) in December 2005. This stated that the Commission would work towards a proposal for European Community legislation in 2006 to encourage the use of renewable energy, including biomass, for inter alia heating and cooling. It should be borne in mind that whilst the BAP addressed the potential for biomass as one renewable energy source, it did so in the context of a number of types of end-use applications, which are governed by different pieces of existing (or future) legislation, as listed above. Thus, for heating and cooling, the possibility of a new directive to cover this area was raised. The exact outcome has been foreseen to be announced early in 2007 as part of a more comprehensive EU energy and climate package, including policy and legislative review, as well as

action proposals. A large part of the package is foreseen to cover renewable energy sources and uses and would be incorporated into a Renewable Energy Source (RES) Road Map.

Bio-fuels Strategy (2006), COM (2006) 34: In concert with the BAP, the Commission launched the EU Bio-fuels Strategy in January 2006. This too foresaw a report with a view to a possible revision of the existing EU Bio-fuels Directive. This would inter alia address the issues of bio-fuel targets, bio-fuel obligations, minimum sustainability requirements, etc. As for the BAP, with which the Strategy is cross-referenced, detailed reporting and new proposals would form part of the RES Road Map (for RES from 2010-2020) under the new EU energy and climate package.

Sustainable, Competitive & Secure Energy Strategy (COM (2006) 105, SEC(2006) 317): This examines the whole issue of the EU's increasing dependence on imported energy, the variety and risk of sources of supply and the role of energy in maintaining and enhancing the competitiveness of the EU economy. It has helped to pave the way for the more wide-ranging Strategic Energy Review, due in 2007.

Ahead of the energy and climate package, the following policy element was announced:

Action Plan for Energy Efficiency (COM (2006) 545): this outlines measures through which the EU could save 20% of it energy consumption by 2020.

CO_2 Emissions Trading System (Directive 2003/87/EC) (ETS): Establishing a scheme for a greenhouse gas emission allowance trading within the European Community.

EU Forest Action Plan (COM 2006, 302 final)

The overall objective of the Action Plan is to enhance sustainable forest management and the multifunctional role of forests.

The four main thematic objectives are:

- to improve the long-term competitiveness of the forest sector,
- to maintain and enhance biodiversity, carbon sequestration, integrity, health and resilience of forest eco-systems,
- to contribute to the quality of life by preserving and improving the social and cultural dimensions of forests and forestry,
- to improve coherence, co-operation and communication in forest related matters

More specifically, the Forest Action Plan has proposed 18 key actions to be implemented jointly with the Member States during the five-year period 2007–2011, including, Key action 4:

- Promote the use of forest biomass for energy generation, notably by means of:
  - support for implementation of the EU Biomass Action Plan
  - investigate mobilization of small/low-value timber and residues for energy
  - gather information wood and residue availability and use for energy
  - assess energy feasibility of using tree biomass & forest residues from sustainable forest management
  - support research and development for heating and cooling, green electricity and bio-fuels.
- facilitate Climate Change compliance & encourage adaptation to climate change,
- study effects of globalisation on economic viability of EU forestry,
- other goals and actions for multi-functional forestry.

Principles and objectives of an EU forest-based industries strategy

The Commission is due to produce in 2007 a communication document on the "Innovative and sustainable forest-based industries in the EU". Its overall principles and objectives are:

- To enhance competitiveness by taking care of the advanced know-how and competences that the EU forest-based industries possess while also taking into consideration related competences in the chemical industry and the machinery industry.
- To recognize the forest-based industries strategic role in mitigating climate change, enhancing a sustainable energy supply, promoting sustainable forest management and in supporting generally a sustainable development.
- To support an enhanced level of innovation and research and technological development.
- To facilitate the forest-based industries' access to a sufficient raw material supply, both new fibres and recovered, at reasonable costs.
- To facilitate an energy supply at competitive prices.

Research and Innovation Policies

The main instrument for EU Research and Technological Development (RTD) policy is the Seventh RTD Framework Programme (FP7). In concert with the "FP 7" are technology platforms (TPs). These are sectorial vehicles for stakeholder co-operation to develop Strategic Research Agendas, which set research and development goals and priorities based on long-term vision. Examples of TPs relevant to the forest-based sector (forest resources, ownership and forest-based industries) are the:

- Forest-based Sector Technology Platform (web-site: www.forestplatform.com)
- Bio-fuels Technology Platform, seeking inter alia an increased profile for biomass research e.g. bio-refineries. This TP also incorporates the "Biofuels Research Advisory Council" (BIOFRAC): launched June 2006

As a further complement to FP7, there is also the Competitiveness & Innovation Programme (CIP), under which specific projects can be developed.

A-1.2.2.3 Outlook and open questions

Major issues arising for the EU forest-based sector from the EU Biomass Action Plan & Bio-fuels Strategy were identified by the Renewable Energy Sources Working Group of the Advisory Committee on Forestry Policy and the Forest-based Industries:

- EU-level figures hide: complex market structures; national and regional variations related to extent, intensity and location of forest resources, population density, financial and fiscal régimes giving rise to several identifiable regions within Europe (NB cross-border effects in Central Europe)
- There are both risks and opportunities for the forest-based sector, esp. industries
- Scales and costs need to be assessed, esp. in context of national biomass plans
- The use of high feed-in tariffs for the production of "green electricity" can raise wood energy demand
- How to determine optimal use/full added value from wood and achieve it?
- There are other new business opportunities from current and new technology e.g. "bio-refineries" (bio-fuels (m)ethanol-based on cellulose and gasification of black liquors)

Questions arising:

- How can the overall 2010 biomass "targets" best be met?
- How much wood should be used as renewable energy source and how can that best be managed? i.e. at national, regional, local and company levels
- Which other kinds of biomass should be developed to fulfil the remaining biomass needs, and how can that be done rapidly on a commercial scale?

A-1.3 Approaches and strategies to mobilize additional wood resources in Europe's forests[24]

A-1.3.1 Forests and Wood: The underused European natural resource

European forests are a significant resource. Key parameters like absolute and relative forest area, forest area per capita, standing volume and potentially sustainable annual cut all show upper ranking in the worldwide context. European solid-wood, pulp and paper and the related manufacturing industries are world leaders, showing a high competitive potential. Sufficient wood supply becomes a crucial issue for the future development of both the wood industry and rural areas. National inventories and statistics show, that the European forest resources are increasing and that substantial more wood can be harvested on a sustainable level, than currently harvested in most of European forests. However there are significant regional differences: Northern and North-Western Europe (Scandinavia, UK) actually tend to use their forest potential to the actual limits of sustainability. Eastern and Central Europe, including the mountain areas, show significant under-utilization, while in general the Mediterranean countries (perhaps excluding Northern Portugal and North-West Spain) utilize less of their potential due to climatic and historical reasons.

Expanding wood harvest to forest areas currently not or under utilized is one strategy to expand wood supply. Another approach would be to intensify the utilization of forests by using small trees and harvest residues (limbs, foliage, substandard material), which currently remain in the forest. A third aspect is the utilization of trees and other woody biomass which grow outside the forests, e.g. in parks, on agricultural land, parallel to roads, railways etc. The above scenarios are three alternatives, which can be implemented using a short-term approach (1-5 years).

Medium terms strategies (5-20 years) would include the establishment and management of short-rotation plantations on land, which had formerly been used for agriculture. The products may be energy wood, but also fibre production for pulp and paper.

In a long term perspective (over 20 years) a more intensive classical forest management may contribute to increased wood supply, e.g. by replacing low productive tree species by species with higher productivity; by introducing genetically improved material, or by more intensive silvicultural treatment of existing stands.

The following chapter concentrates on the short term to medium term approach of wood mobilization, but will also touch long-term options to enlarge European forest and wood potentials.

A-1.3.1.1 Mobilization of wood from currently underused forest areas

Four elements are necessary to form and implement successful strategies for the mobilization of wood from forest areas, which are underutilized so far: Information, Motivation, Legal Framework Property Rights, and Technical Instruments.

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[24] Chapter prepared by Gero Becker, University of Freiburg, Germany

Information about the wood resource

A series of national and European forest inventories have been conducted, which give a sufficient general overview on the status of the existing forests and the possibilities to use these resources. Based on statistical sampling with a relatively wide grid, these inventories can only give reliable results for relatively large areas (countries, major geographical or administrative units like provinces, departments, cantons, Bundesländer etc.). This information is helpful to outline general or regional policies, but does not support mobilization as an operational activity. To inform decision makers (forest enterprises, wood industry, forest administration) and stakeholders as to where forests with significant underused potential are located, a much denser survey and analysis is necessary, since national inventories mostly do not provide this kind of information.

Management plans for large forest enterprises and holdings exist in many countries, but these management plans are often not consistent in space and time, and many, especially small and private forests holdings - where the wood reserves are supposed to be concentrated, do not have such management plans at all.

Given the above situation, new concepts and tools for quick and up to date assessment of existing forests are needed, which cover all forests and give rough, but well localized information about the status of the forest resource and the possibilities of additional utilization. The minimal data set for such a rough forest resource assessment would be tree species or group of tree species (conifers, broadleaves), height of the stand, density of the stand, accessibility (road network) and basic terrain information (slope). With this data, a first estimate of the locally existing volumes would be possible. Wherever possible or appropriate, this data could be linked for verification with existing grid points of national or European inventories, and can also be ground checked and verified with existing management plans.

Technical solutions for this type of inventory are high-resolution satellite images, air photography, air borne laser scanning, etc. If this data is geo-referenced and linked to a GIS-system (preferably including a digital terrain model and the vectorized road network), this information is an excellent basis for operational activities to mobilize wood from existing, but underused forests.

Information about ownership and legal constraints

Because mobilizing wood means contacting and convincing forest owners to cut trees in their forests, detailed information about ownership is as important as information about the forest itself. This includes not only legal ownership (name, address, profession, age of the owner and / or person to contact), but includes also background information about family and neighbours, the motivation of the respective forest owner including the size of his property, and his willingness (or un-willingness) to utilize his forest etc. Without this information, a targeted motivation of the forest owners is not possible.

A large information and knowledge gap concerning these aspects exists. Only a few regional studies are available about the social structure of public and private forest owners. Many forest owners do not live anymore close to their forest, and it might be difficult to find and contact them. In many countries (especially Eastern European countries in transition), land tenure and property rights are not clear, borders of forest areas are uncertain and the legal frameworks for sustainable utilization of the forest are changing. Without knowledge of ownership and the owners, and without a clear legal framework and secure property rights, the mobilization of the potential of these forests is doubtful. Policy makers as well as associations and companies need this information to focus their mobilization policy and activities.

In addition to the lack of valid information about ownership, legal constraints may also limit efforts to mobilize more wood in areas, which are up to now underused. Forests do not only produce wood, but also supply society with a wide range of goods and services. Watershed, erosion prevention, wild life habitat, recreation and aesthetic values are only some examples. Furthermore, forests are often

managed as areas with a high ecological value, which closely follows natural dynamics. A whole set of local, regional, national and European categories of protection has been established to secure these most appreciated social and environmental goods and services for the society. Depending on the objective and degree of protection, forest management activities can be restricted by type, intensity and area. Recent enquiries and surveys show, that more than 50% of the total forest area in central Europe are influenced by at least one or more restrictions. More intensive management will in many cases raise conflicts with the protection purpose, thus reducing opportunities for wood mobilization.

Motivation

Physical information about the forest resource, social information about the ownership and a stable legal framework are not enough to effectively mobilize additional potential from European forests. In the majority cases, it is necessary to convince those who are the owners or are in charge of the forest management on behalf of the owners, that more intensive utilization is possible, advantageous and desirable. This is especially true in areas, where the forest ownership is highly fragmented and a large proportion of the forest is owned by private individuals. National inventories for many Central and Western European countries show that small forest holdings, which are owned by private individuals, i.e. farmers, have by far the most significant potential for additional harvesting within the framework of sustainability. Research results and practical experience in several mobilization projects show that economical considerations alone (i. e. an acceptable market price for round wood) is not sufficient to mobilize under-used forests. Often the situation is more complex: Many private forest owners do not regard their forest property as a source of continuous income, but manage it as a set aside resource for future needs. Other owners do not see any rationale for using their forests at all, because they are too small and the additional income would be relatively insignificant compared to their primary income. Other forest owners live in urban areas rather than the areas where their forests are situated and do not have the knowledge and the desire to actively utilize and manage the forests. On the other hand, many rural forest owners use the forest for their own purposes, namely as a source for fire wood, so the cuttings are not reflected in the official statistics even if the potential of these forests is used internally. Finally, many forest owners do not want to harvest their forest at all, because they believe in nature conservation, recreation or other non-wood values of the forests. They simply do not like to actively manage the forest resource as a forest professional would, and often believe, cutting trees is in defiance of nature and ecology.

The variety of these notions makes it difficult to convince the forest owners with one single approach. It is absolutely necessary to classify forest owners into groups with similar backgrounds and motivation, and develop customized approaches to convince them that utilization of the forest is not only good for the individual, but also of societal and ecological benefit. There are some scientific studies on approaching forest owners in this manner, e.g. in Austria, Germany, France, and Finland, where this motivational aspect is addressed. First encouraging results are now available and should stimulate further research and discussion in forest policy.

Motivating forest owners to utilize their forests, and the individual attitude of each forest owners is an important part of an integrated forest information system. Consistent strategies and operational programs to promote the mobilization of wood resources from small private forest owners will only succeed, if the basic physical information of the forests is linked (preferably on the basis of GIS) to the motivation and attitude of the respective owner in respect to utilization.

A-1.3.1.2 Intensified Forest Management – short term strategies

Even in intensively managed and harvested forests, the extracted volume is in many cases lower than the sustainable allowable cut. This is mainly due to technical and/or economical reasons: compared to the market demands and market prices, the dimension and / or the quality of these trees or parts of trees which remain in the forest today are too low and / or the costs are too high to justify a processing and marketing. There are estimates that the volume of timber left in the forest harvest area may be

20% of the total harvest volume. As wood prices increase, the wood industry can profitably utilize more of this previously unused wood and thus remove a bigger part of the resource for the mill. Higher market demand and higher prices also encourage the development of adapted techniques to use these additional trees / part of trees in a more economic way. Chipping and bundling are only two possibilities, and even stump harvesting for energy use has been implemented as a possible source for wood supply in some areas, like Finland.

Ecological constraints

To use more trees, even if they are small or of lower quality, and to use a bigger part of the trees which are harvested today (mostly culled portions near the butt of the tree due to rot, and the topwood including branches) can create ecological concerns. Nutrient export (especially on poor sites), which is linked to whole tree or full tree harvesting, may be higher than the natural nutrient supply from the soil and the subsoil. Careful soil and nutrient balance analysis on a short and long term basis is needed and may lead to the result, that more intensive utilization is not in line with long term sustainability of the soil. The use of fertilizer and recycled ash from wood energy plants may be an option, and are proven, but still raise technical and economical questions.

A more intensive utilization compared to the actual level of harvest may also raise concerns about the question of biodiversity. Standing dead trees (snags) and lying dead trees contribute significantly to the biodiversity of our forests. To leave back a certain amount of this material in the forest is required by all certification standards. Appropriate strategies and clear guidelines must be developed and implemented on the local basis to solve this conflict.

A-1.3.1.3 Wood resources from outside the forest

European and national forest inventories give a clear overall picture of the forest resource and potentially sustainable annual cut in these forest lands, but there exist a significant amount of the trees, shrubs and other woody plants outside the forest: parks, alleys, hedges, wooded land parallel to streets, channels and railway corridors are just some examples. Because these wood resources outside of the closed forests are very variable in size, structure, species composition and quality, there is almost no information available about the magnitude of this resource, and even less knowledge as to what degree this resource might be legally, technically and economically utilized. On the other hand this type of woodland is often managed regularly and intensively for many different reasons and according to different objectives such as: safety aspects along roads, railways and in parks and suburbs, and nature conservation aspects in urban and rural areas. The harvest costs linked to these specific management activities are generally high, and paid for by various public bodies. Methods for assessing these wood lands in terms of quality, quantity and accessibility have not yet been developed, because it is unclear to which extent and under what regulations this material could be used to expand the wood resource. Some projects have been carried out recently in Germany on the basis of remote sensing and GIS, which allow an assessment of both, quantity and management costs for these woodlands, with the aim to provide the additional wood material for industrial or energy use. The project results show, that costs do not really matter, but in many cases, legal and environmental restrictions limit an intensive use of this resource. Regardless, a significant contribution to the local wood supply is possible in many cases.

A-1.3.1.4 Short rotation plantations (for wood fibre and fuel wood)

Facing increased pressure on the existing forest resource, the possibility to expand the wood resource by establishing short rotation plantations on agricultural land is widely discussed in Europe today. The consequence of the new agriculture policy of the European Union will be that millions of hectares will fall out of the traditional food production. Vice versa, there is a growing demand for bio-resources for

both, cogeneration energy plants and BTL[25]-projects. Already today, short rotation willow and poplar plantations are established namely in Scandinavian countries, where they contribute to produce electricity and heat in biomass power plants. These plantations are still not economic without financial incentives from the public, but e.g. in the framework of the current Scandinavian programs to replace a significant part of fossil energy by biomass, these short rotation plantations will play a significant role, and are supposed to become economical soon.

Short rotation plantations in Central and Southern Europe have an even a bigger potential for wood production due to favourable site and climatic conditions. Annual biomass production of 25 tons/dry per ha and year seem to be feasible with existing provenances of poplars and willows, and genetic improvement will increase this productivity further. Nevertheless, there are many obstacles which have prevented investment in this new type of plantations. For many farmers, the steady yield of conventional annual food crops, which is at least partly guaranteed by the agriculture policy of the European Union, seems to be more attractive than the still uncertain yields of wood biomass harvested and marketed on a 5-7 years rotation period. Many studies and experiments have been done on marginal agriculture lands, where the fertility is not very favourable for fast grown tree species either. Furthermore, these marginal lands are often on steeper slopes and have a fragmented ownership, so the large scale management needs of short rotation plantations often face organizational and technical obstacles. Currently, there is no clear commitment from the wood and energy industries to buy this material at the end of the rotation time at a fixed price, so the economics of short rotation plantations are uncertain.

A special situation exists in South-West Europe (Portugal, Galicia / Spain) where a mild moist climate allows for subtropical fast-growing tree species like eucalypts, which have a well established utilization in the pulp and paper industry. It can be foreseen, that genetic improvement will develop clones, which are even better adapted to the specific climatic conditions of southern Europe, (and maybe show also certain resistance against occasional frost events), thus the growth area of eucalypt could be enlarged in the future.

Ecological aspects of short rotation plantations

Compared to traditional forest management systems, short rotation plantations are more “artificial” than conventional forests. Uniformity, a greater demand for nutrients and water, a higher export of biomass, the need to use herbicides and fertilizers are only some aspects. At least at young plantation, biodiversity tends to be lower compared to conventional forest ecosystems. In large scale operations, the consequences for landscape aesthetic and recreation also need to be taken into account. On the other hand, compared to conventional annual crop agriculture the impact of tree plantations is far less intensive. All these aspects have to be taken into account, if the public acceptance and the ecological sustainability of these plantations is discussed.

A-1.3.1.5 Intensified forest management – long term strategies

Traditional forest management offer some options to increase forest and wood resources in the long term (over 20 years).

Replacing less productive species with higher productive species (which often means replacing broadleaves with conifers) has been practiced for many decades with great success. There is a wide range of low productive forests namely in south-west, south-east and southern Europe (very often with shrubs or coppice) which could be transferred into forest of higher productivity by planting Douglas fir, Eucalypt and other exotic or native species. In these cases productivity will typically increase by more than 30-50%. The next step would be to use genetically improved material, which promises another 10-20 % gain in growth. Despite the fact that this systematic change of tree species is practiced successfully, there is also a lot of criticism, mostly from an ecological and nature conservation standpoint. Exotic

[25] Biomass to Liquid

species may not be adapted to the regional and local conditions, so that the whole ecosystem including fauna will be influenced. Major negative impacts from so far unknown diseases cannot be ruled out, even though such catastrophic events have not occurred thus far. Change of landscape, higher water consumption and negative impact on soil fertility are other concerns.

Fragmentation of forest ownership may also prevent the change to more productive species, because the transition is technically and economically only feasible in larger areas.

A practical and economical problem is the mode of financing the conversion: Clearing existing forests of low quality and productivity and replacing them by planting species of higher productivity means a substantial financial investment and long term commitment, which many private (and also public) forest owners are not willing or able to take. Subsidies can help to lower the risk and are in place in many European countries.

Intensified silviculture

Another option to improve forest productivity is to apply more intensive silviculture. This includes wider spacing, repeated thinning operations in young stands, and c shorter rotations. Thereby, tree growth is stimulated and the volume production is concentrated on a smaller number of trees, which grow faster into merchantable dimensions. Site adapted variation of this management practices and can contribute to making optimal use of the respective site conditions and may prevent risks. These more intensive management regimes are already standard in some areas of Central Europe (Germany, parts of France, Austria), but there are many countries and regions, where far less intensive management systems are still practised. Information, education, and the currently increasing wood prices may help to stimulate the switch to these new management practices in these areas. To avoid negative public reaction, stakeholders and the society needs to be informed about the possibilities and limits of such intense management policies.

An indispensable precondition for more intensive forest management is technical access to the forest. Stand management, harvest and transport activities heavily depend on all year round accessibility of the forests. Only with a network of acceptable quality forest roads is it possible to harvest trees at low cost and with low environmental impact, and to market those trees to a variety of customers. Because investment in forest roads is both, costly and environmentally sensitive, this becomes a bottleneck for many, especially small forest owners heading toward more intensive management. Public financial support (subsidies, long term loans) may be appropriate instruments to stimulate forest road construction and maintenance especially in remote areas and mountainous regions.

A-1.3.2 Successful Implementation of Mobilization Activities

The above analysis shows, that mobilization of additional wood resources for industry and energy is a complex issue. The following sections indicate which scientific, technical, financial, organizational and political measures and instruments have to be developed and implemented to make mobilization possible and successful.

A-1.3.2.1 Inform actors and the public

Industrial forest owners in Europe are only significant in a few regions (Sweden, Finland, Portugal), thus direct contact from the industry to the forest is only possible in these instances and most of these forests are already used to the limit of sustainability. The wide majority of the forests in Europe are owned by different institutions (State, communities) or private owners. The wood industry, which needs the additional resource, has no direct access to the forest, but has to negotiate and convince the forest owners to sell their wood. The income from the sale of the wood is a major incentive, however, practical experience and research results show that the price-elasticity of wood supply is quite low, sometimes even inverse. This is especially true for small and very small forest owners. Consequently a higher price is important, but not the only key to a higher degree of mobilization. Motivation

(convincing people to cut) is equally important. This needs general efforts on the societal and political level through all means of public relation, targeted to forest owners, and the public. Ways and means to mobilize the wood of their forests can be organized as a follow-up activity. All kinds of local networks (family, neighbourhoods, hunting organizations, clubs and other existing social structures) are useful platforms to bring forward the idea of mobilization. GIS and media supported background material which shows the areas where cuttings should take place, are very useful. Even though forest owners are typically of higher age and of conservative attitude, email contacts and informational websites have also proved to be of value.

A-1.3.2.2 Access to data and information

The high level of fragmentation of private forestlands is very often a serious drawback, since mobilization and harvest areas need a minimum size to be technically and economically feasible. A first step is to get the necessary information about the forest owners and their forest holdings (parcels). Depending on the legal situation in the respective European countries, this information is not often easy to get. Cadastre information is not public and personal information protection laws and practices make access to this data difficult. Normally, forest owners are reluctant to share their data to someone else, especially the wood industry. In this situation, there are two alternatives: In some countries, the State forest service has access to the necessary data by law and the legal question has to be solved how, in what format and under which conditions this service is authorized to forward this data to the wood industry or to other interested groups. The other solution is forest owner co-operatives, which act on behalf of their members (who trust that there will be no abuse of the data). Typically it is easier to get personal-owner information for a restricted area than for a whole region or country. Therefore it is recommended to plan mobilization step by step; defining areas where the next harvest activities would take place, getting the data for this area, and finally convince the respective owners that harvesting would be advantageous. Such a typical "mobilization area" would have a minimum size of 10-20 ha, depending on terrain and forest conditions, and produce between 300-700m³ of timber over a working period of one week plus (for a harvester-forwarder operation).

A-1.3.2.3 Establish a comprehensive forest information system

Information about both forests and their owners are crucial for successful mobilization. A consistent forest information system should be based on GIS, where every parcel of forest ownership is identified. Similar systems already exist in some areas of Europe, namely the Nordic countries. Because the system is GIS-based, environmental and other legal restrictions can be registered visually during the planning of harvest activities. The database should contain one set with forest information (species or group of species, age class, height, standing volume, silvicultural reason to harvest, risks, forest access) and a set with forest owner information. This information system should be installed on a regional level, preferably under the supervision of a forest owner association or a "neutral" State agency. Access to the data of this information system must be in line with national legal restrictions and controlled by representatives of the forest owners. The whole system, or selected part of the system, could be put on the web and serve as a platform for sellers and buyers of wood. The architecture of the system should be dynamic, meaning that contact with owners, harvesting activities and other events are controlled and warehoused within the system. Periodic data checks and updates (owners data: every year, forest data: every 5 year) must be carried out. The information system is the basis to organize operational mobilization activities in defined areas. It can help to bring supply and demand together in a "virtual market place". In separate areas of the system, contractors could offer their services, and forest owners who want to sell or buy their parcels could put these demands / offers on the web. All this makes the situation more transparent and allows to localize areas and volumes, which could be mobilized and allows easier access to the respective owners.

A-1.3.2.4 Building trust through service quality

Most small forest owners do not have harvest equipment or know-how, so the harvesting would typically be contracted out. Two systems of contracting are currently in place:

The first is where the contractor(s) work for and are paid by the purchaser who buys the wood on the stump; or secondly where the contractor works for the forest owners (or forest owner association) who sell the wood at road-side or mill-gate to the wood industry. Both systems have their advantages and disadvantages. To convince forest owners to harvest, it is important that the forest owners trust the quality of the operation and that "their wood" is measured and paid-for correctly. State forest services or independent certified measuring institution personnel might act as independent intermediates to establish this mutual trust. Certified harvester protocols or certified measuring devices at mill gate are also accepted methods of timber measure. More important than price paid is to assure that the money flow back to the forest owner is smooth and quick. Finally and most important, the harvested forest should be left without major disturbance of soil, roads, or damage to the remaining trees.

A-1.3.2.5 Technical Tools

The mobilization of additional wood resources is often restricted by incomplete access to the respective forest areas. Difficult terrain and / or fragmented forest ownership makes the establishment of an adequate road network technically difficult and expensive. Furthermore the fragmentation in many small private holdings makes road planning difficult, because the layout of the road may not meet individual interests and therefore can be blocked for many reasons. There are also conflicts with environmental groups, especially in mountainous regions, who oppose road building for conservation and protection reasons. Alternative harvest techniques like cable systems are expensive and difficult to use. Complex, expensive and long lasting programs are necessary to overcome these obstacles. Extensive discussion, moderation processes and subsidies from public financial resources may be necessary to plan and construct successfully a forest road network.

Harvest techniques, which are developed and used in large scale forest operations often do not fit with the situation of a fragmented and individually managed network of privately owned wood parcels. The need of the owners to be able to identify "their own wood" makes harvesting more complicated and expensive. Furthermore, many private forest owners prefer to do at least parts of the harvesting work themselves, because they have experience, time, the necessary tools and therefore prefer to earn the money themselves instead of paying contractors. Adapted small-scale technology, which is cheaper and less complicate to use may be a solution to mobilize successfully additional wood resources in these cases. More downstream along the forest-wood-chain, logs, which are offered in small quantities, are difficult to market. This problem will become more serious if the ongoing up-sizing and rationalization process in the wood industry continues. Traditional local saw mills and other small businesses disappear, and big mills with high market power are reluctant to source great quantities of wood supply in small portions. Furthermore the demand of these big mills with regards to quality and dimension is very often quite specific, leaving forest owners and harvest personal without expert knowledge and training often not able to fulfil these demands, which is another obstacle if it comes to market the wood at competitive prices. This leads, in many cases, to the solution that entrepreneurs buy the whole forest "on the stump" and do all the subsequent work of harvesting, grading, sorting and transport on their own, leaving only a stumpage fee to the forest owner. In this case many owners decide not to use their forest at all, because they feel treated unfairly.

A-1.3.2.6 Overcome fragmentation

One solution to overcome this problem is the formation of a forest owner associations., Forest ownership associations provide services and information to the it members and enable them to act as a bigger group with greater market power. This type of forest association exists only in some parts of Europe, primarily in Sweden, Norway, Denmark and parts of Germany and France. In other regions and countries there is a lack of active cooperation between forest owners. This is true especially in the

eastern European Countries in transition where all type of cooperation avoided because of bad experiences in the socialist period. Information, education and financial support are the only means to overcome these structural deficits. Policy makers as well as State forest services may play a role to overcome these obstacles but they have been (or still are today) too attached to the ancient structures.

A-1.3.2.7 The role of the forest industry

The ongoing wood industry expansion and capacity boost has increased current and future needs for wood, so it is in their interest to intensify efforts to mobilize additional forest resources. Paying higher prices has only limited success, as it has been mentioned before, and has a negative influence of the competitiveness of the industry. It would seem to be more promising that the wood industry cooperates actively with the forest side to overcome, in a joint effort, the obstacles which hamper mobilization so far. These efforts can result in supporting the development of a consistent forest information system or contributions to develop a regional GIS-based forest resource assessment. Wood industries could also support road building by financial contributions or long-term loans to forest owners. Together with State forest agencies, wood industries could form private-public partnerships to support better mobilization (as happens today in parts of Germany). The wood industry could also train forest owners, foresters and contractors to do the grading and sorting according to industrial needs. Last but not least, the wood industry could try to get long-term leasing contracts from public and private forest owners who are not able or willing to actively manage their forests actively. All these activities from the wood industry side should be introduced and accompanied by trust building measures, which would indicate, that the wood industry is aiming at long-term partnership and to create a win-win situation.

A-1.3.2.8 Financing mobilization

Given the situation and measures which are necessary to make mobilization effective, it is clear, that the cost of mobilization will be significant. Investments in the development and implementation of the necessary instruments, like forest information systems, web portals and small scale technology, needs to be in place before the first cubic metre is mobilized. Financial resources for these activities may come from both public and wood industry funding, which has an interest to get more raw material. In addition to the investment in mobilization, there are operational costs for the day-to-day work of mobilization. The wood industry is more and more influenced by globalisation via international competition, which limits their ability to pay high costs for the raw material. As a consequence, the operational activities and processes to mobilize wood must be cost-effective. Forest owners must recognize that expensive mobilization means lower prices paid to the forest owner. Experiences from Germany and other countries show starting costs to establish an effective mobilization system may be as high as 5 - 7 €/m³ in the first years, and after this period in the range of 2 - 4 €/m³ to cover the operational costs of day to day mobilization work. Whether or not these costs should at least partly be subsidized from public financial resources is a political decision. The arguments to do so would be both social and environmental, as it would strengthen and revitalize rural areas, and replace fossil energy and industrial material with wood, which is an eco-friendly and renewable resource with an excellent carbon balance.

A-1.4 Policies to promote wood mobilization[26]

A-1.4.1 Subsidies versus market driven processes

Because wood markets are basically free markets in most countries, market driven processes are in principle the first-choice solution to stimulate mobilization. Higher demand, expressed in higher prices for roundwood, will encourage harvesting and increase wood supply. Wood prices that do not cover the direct cost of harvesting (and at least partially the indirect cost of forest management) do not create enough incentives for increased wood mobilization. Consequently, forests which are difficult and expensive to harvest will likely not be utilized if the revenue received does not cover costs incurred. Early thinning, small dimensions, steep or inaccessible terrain, and remote areas are all typical examples of items that can contribute to low revenues and high costs. As wood prices go up, more of these difficult and expensive areas will be harvested.

These fundamental economic principles only apply, however, if forest owners demonstrate rational behaviour. Experience and research have shown that the price elasticity of the wood supply in many cases is negligible or even negative, which means that an increase in price does not stimulate additional cuttings in the same proportion, or can even result in reduced cuttings: Some private and in particular government-owned companies, tend to aim at a steady cash flow rather than maximum profit. Consequently, they will sell less volume if prices are higher, because their budget requirements have been met. They "save the wood for bad times in the future". Another reason for an under-proportional increase of cutting, in spite of rising prices, is the limited technical capacity of forest enterprises. There are not enough workers, harvesters, contractors and planning staff to bring a significantly greater amount of wood to market. Increasingly, wood markets are changing on an international and even global scale, but technical capacities are small in absolute figures and are not very flexible because they of the need for specialized equipment and workers. Building capacity in one area or relocating capacity, from one area to another, takes time and is risky. It also is costly, and restricts the ability to react quickly to increased market demands even at higher prices.

As has been discussed, infrastructure and technical considerations often limit the possibility of cutting more wood. If underused forests don't have good access to road networks, increased production is only possible after a time-consuming and expensive planning and construction of a new forest road systems. The ability of small and very small forest owners to participate in a growing market is also limited by the lack of organizational structures (such as forest owner co-operatives, etc.) takes time and costs money, so again, higher prices may not automatically result in increased cuttings.

A-1.4.1.1 Do subsidies make sense?

Public funding (subsidies) is one answer to overcoming these technical and structural deficits. These depend on whether subsidies are accepted as a means of economic policy by the government. In this context, the basic question has to be asked - if a country or a community of countries has an underused forest resource, is it the obligation of the State to mobilize this underused resource? The answer might be yes if growth and income, especially in rural areas, is taken into account, as well as the positive effects of replacing fossil fuels and non-renewable products by wood. The answer might be no if the priority of independent decisions about private property is a major principle of policy.

If subsidies are considered, however, they should be effective and efficient and granted only temporarily. In the long term, wood supply and the wood industries are economic activities, which must be able to survive without permanent subsidies.

[26] Chapter prepared by Gero Becker, University of Freiburg, Germany

A-1.4.1.2 Indirect subsidies

Because wood mobilization means to a great extent convincing people and society to cut their forests, information and even propaganda targeted to both forest owners and society is a typical activity that indirectly supports wood mobilization.

Research and development on attitudes, organization and adapted technologies connected with the forest and wood utilization is another important and effective way to make mobilization happen.

Up-to-date and precise forest inventories and subsidies to management plans are necessary preconditions to mobilize more wood, which should be organized (and perhaps also financed) at the national level to guarantee quality, compatibility and reliability of results.

Cost-free or low cost consultation by State forest agencies or other public bodies especially with smaller sized forest owners and companies is another indirect subsidy to support mobilization. This model has been quite common in many European countries for decades. However, it has not been entirely successful, otherwise there would not be such remarkable wood reserves in the forests as there is today. In spite of the fact that the State forest employees who consult with private forest owners are generally well educated, they often lack the private owner perspective and have little incentive to mobilize more wood. Furthermore, there has been a trend of downsizing public forest organizations and forest personnel, which has also led to less intensive consulting with private forest owners.

Tax reductions for forest owners who utilize their forests intensively is another option. This has only a limited effect on mobilization, however, because small and medium-sized forest owners very often do not pay taxes at all, so there is no direct incentive for them.

Programs for recomposing fragmented forest lands (land consolidation), funded by public money, are in place in several European countries (e.g.. Germany and France). Often, these programs are accompanied by incentives for land sales by individual owners or forest owners' cooperatives. In theory, this model leads to a less fragmented situation, which should result in a better mobilization of wood. Yet because all the parcels have to be surveyed and their value (in land and timber) has to be evaluated in financial terms, these programs are very costly and time consuming, so they do not seem to be very effective or efficient.

Financial support for forest road planning and construction is a typical public action to improve technical access and thereby facilitate wood mobilization. In Germany, for example, subsidies account for as much as 70 to 80 per cent of the total construction cost of roads. Experience has shown new roads usually stimulate wood mobilization.

Subsidies can also be conditional (e.g. a larger amount of wood must be cut in the 10-year period following road construction).

A-1.4.1.3 Direct subsidies

In lieu of State foresters providing free or cheap consulting service to private forest owners, vouchers can be given to forest owners who ask for consulting services, making the owners free to choose which consultant they want (private or public). Compared to the institutional system, this can prove to be more flexible and competitive. To make the work of the private consultants more effective, the State forest service must grant them access to its database on private forest owners and their forests. However, a crucial question is - under which conditions can this happen without affecting personal data protection laws? Another approach is to provide financial support for investment in technology that enables wood mobilization. This can be information technology (GIS, GPS), forest management planning and /or technical equipment such as chainsaws, tractors, winches, etc. Most private forests are too small to use this technology efficiently, so these subsidies would be generally limited to forest owner associations. Only recognized forest owner associations that fulfil minimum requirements (size, number of members, etc.) would have access to these subsidies.

A-1.4.1.4 Support of institution-building (e.g. building up forest owner cooperatives)

The management costs that private forest owner co-operatives have to spend to harvest and market the wood for their members could be subsidized. For example, in Germany forest owner co-operatives can receive these subsidies for a maximum period of 10 years. These start by covering 60 to 80 per cent of the cost of management and are gradually reduced down to 20 per cent towards the end of the 10-year period. This type of subsidy is beneficial for stimulating activity, but does not guarantee mobilization.

Direct subsidies for wood mobilization to forest owner co-operatives have recently been implemented. For a limited time span (e.g. 10 years), a premium of €-1-2 per cubic metre is paid for every mobilized cubic metre of wood. The subsidy can be limited to a maximum amount per forest owner co-operative (e.g. €80,000 per year). The subsidy per cubic metre can be varied to forest conditions (e.g. terrain). A minimum total amount of wood mobilized per year (e.g. 5.000 m^3) and/or a minimum size of the forest associations (e.g. 5.000 ha) can be tied to this premium.

We have no experience with the effectiveness of this new model. For new forest owner co-operatives, it can be difficult to mobilize quickly enough to start harvesting the wood required to get enough money out of the premium model. Thus, in some regions, the models of financial support to management and premiums for every mobilized cubic metre are combined.

Another type of direct subsidy is transport subsidies for wood removed from areas far from wood industry centres. This type of subsidy encourages the utilization of remote, underused forests.

A-1.4.1.5 Who gets the subsidy?

All the subsidies mentioned above are primarily targeted to the forest owners. This seems logical, as they are the ones who finally decide about cutting their forests. However, transport subsidies can also target the wood industry consumers or transport contractors.

There are also subsidies that go to energy providers, and even to end-consumers, to promote the use of wood. Usually these subsidies are linked to the objective of reducing CO_2 emissions. These subsidies tend to increase the demand for energy wood. Because prices for different wood assortments are closely linked, this higher demand will trigger higher prices not only for energy wood, but also for other wood assortments. This could have a negative influence on the competitiveness of the classic wood industry, e.g. particle board, pulp and paper and sawnwood for packaging. A macroeconomic evaluation of these effects (e.g. less CO_2 emissions versus less competitive wood industry) has not yet been done. Recently, the European wood industry has been advocating for reconsidering subsidies that promote wood as a renewable resource for energy.

A-1.4.1.6 Financing of the subsidies

Per definition subsidies are usually paid by the taxpayers. Because wood utilization also benefits the wood industry, the latter could be regarded as partly or even totally responsible for financial support. There are models of public-private partnership (PPP) where the wood industry or wood industry associations in certain areas support mobilization activities on the forest side to get more wood or to secure a future supply. These models are quite new, and it is not yet clear how well they work in practice.

Other possible financing models use a fee (per m^3) or a percentage of value, which are calculated according to every cubic metre sold by the forest and/or bought by the industry. These go into a fund from which mobilization activities are supported. This funding system could be organized on a totally private basis, or it could be legislated (comparable to road tolls for truck transport on motorways).

Another example of a PPP has recently been implemented in Germany:

The leading wood-consuming industry (Deutscher Holzwirtschaftsrat) and the leading forest owners association (Arbeitsgemeinschaft Deutscher Waldbesitzerverbände) jointly founded a private company that will provide the wood industry and related companies (e.g. contractors, transport companies) with

a digital road network and navigation system (NavLog). Forest owners agreed to provide maps of their respective forests in digital format and to collect field data about road quality. Access to this dataset is limited to wood-related enterprises, including wood energy companies, which pay an annual fee for using the system. The dataset is updated periodically. Both parties hope that this system will make wood transport easier and cheaper, saving time, money and reducing emissions. The system will also contribute to mobilizing wood from underutilized areas and private forest holdings.

A-1.5 Cross-sectoral implications of increased wood utilisation[27]

A-1.5.1 Interactions between increased wood mobilization and different sectors

As previously shown, increased wood mobilization is expected to have a positive - mainly economic - impact on the forest sector in general. However, the mobilization of additional wood resources to satisfy the demand for both raw material and energy is likely to have collateral implications on various sectoral policies and activities. This chapter aims at highlighting the possible impacts of increased wood utilization on biodiversity, energy, climate and agriculture. The listing below is not exhaustive, and aims at providing scenarios as regards to possible cross-sectoral implications of increased wood utilisation.

A-1.5.1.1 Biodiversity

Forest ecosystems offer diverse habitats for a large percentage of the terrestrial plants, animals and micro-organisms. Forest biological diversity thus provides a wide array of timber and non-timber forest goods and services, offers livelihoods and employment opportunities for people, and plays an important economic, social and cultural role for human societies worldwide. In this context, strategies to mobilize additional wood resources such as mobilization of underused forest areas, intensification of forest management or short rotation plantations are most likely to impact on forest ecosystems, landscapes and biological diversity:

- Increased economic interest for wood and wood products raises interest to mobilize additional forest resources in underused or unused forests. This trend may not only increase interest to mobilize wood resources in forests that were so far economically unprofitable (e.g. for topographical, ecological or technical reasons) but might reduce the interest of forest owner to set aside forest reserves or may raise the risk of illegal logging in protected forest areas and natural forest reserves.
- Experience has shown that intensive forest management (e.g. use of high productivity species, genetically improved forest plants or fast growing exotic species) is likely to have major negative impacts on forest ecosystems, landscapes and biological diversity. Intensified sylviculture (e.g. wider spacing, heavy and repeated thinning operations, shorter rotations or increased mechanization of forest operations) requires a dense forest road network that may have an impact in environmentally sensitive ecosystems, and increases the impact of intensive logging (soil compaction, disturbance, dead wood, etc.)
- Increased use of wood for raw material and energy implies an increased removal of biomass from forest stands. This biomass export may affect soil fertility by removing important natural nutrients from forest stands and reducing soil and subsoil fertility – especially in poor or already altered sites. A more intensive utilization of wood and wood products is thus likely to reduce the total amount of standing dead trees and lying deadwood that contributes significantly to forest biological diversity.

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[27] Chapter prepared by Evelyn Coleman & Yves Kazemi

- Short rotation plantations require a great amount of water, the use of herbicides and fertilizers, have a greater export of biomass and are more uniform - less diverse - than "natural" forest ecosystems. In this respect, increased areas of plantation forests may also render landscape patterns more monotonous – especially on agricultural land.
- On the other hand, improved wood mobilization may also impact positively on forest ecosystems, landscapes and biodiversity:
- In many forests, the growing standing stock has reduced light conditions in forest stands, leading to a reduction of plant and micro-organism diversity. Increased wood utilization may led to more open space and better light condition that can improve dynamic and diversity of forests.
- As regards to short rotation plantations, the impact of tree plantations is far less intensive and environmentally sensitive as compared to conventional agricultural production of annual crops.

The elements above show that despite existing principles of close to nature forestry and sustainable forest management, implications of improved wood mobilization on forest ecosystems, landscapes and biological diversity are not to be neglected and require strengthened cross-sectoral approaches and mechanisms.

A-1.5.1.2 Climate

Unused standing stock represents a potential to reach climate policy objectives, in particular the reduction of CO2-induced climate change (cf. UNFCCC and Vienna Resolution V5). An increased use of wood therefore has positive effects on the climate:

- The use of timber as a substitute for other materials has a positive impact on the CO2 balance in three ways: Firstly timber can replace energy intensive building materials such as concrete or steel, secondly it acts as a CO2 sink even when used in building, and thirdly construction timber can be used as source of energy when the time for its disposal has come.
- The use of energy wood as a substitution for fossil fuels has a direct positive impact on the CO2 balance.
- Afforestation and reforestation activities under the Kyoto Protocol (Land-use, land-use change and forestry LULUCF), particularly the establishment of plantations with fast-growing species, not only have a positive effect on the CO2 balance, they also increase the wood potential for timber and energy wood.
- However, there are some contradictions between climate policy and forest policy objectives, in particular as related to CO2 sinks and the sustainable management of forests:
- The setting aside of forests as CO2 sinks is done with the objective of conserving – or even increasing – standing stock, rather than decreasing it, as is the objective in regions where standing stock is unsustainably high.
- Under the Kyoto Protocol, wood utilization from the forest is in any case counted as a source of CO2, independently of the further use of this wood. Forests are considered closed systems, which is not in line with the notion of sustainable forest management, which also includes wood utilization. (Though if wood is used to substitute fossil fuels, the overall effect on the CO2 balance will still be positive.)

Thus climate policy is sending out ambiguous signals and is creating contradictory situations: On the one hand the climate debate is opening new perspectives to forestry, by giving positive incentives to an increased use of wood. (The recognition of wood as a CO_2 neutral substitute material is certainly one of the main reasons for the increased demand.) On the other hand however, the Kyoto Protocol

reduces forests to their CO_2 function, leading to a tendency to further increase standing stocks, rather than to use the full potential of forests.

A-1.5.1.3 Energy

The most relevant energy policy objectives are: climate protection (CO_2 reduction, see above), ensuring sufficient energy supply by reducing dependency on fossil fuels, remaining competitive on an international energy market, preventing air pollution, security of energy supply and reduced dependency on energy imports, and encouraging energy efficiency[28]. One of the measures taken is the encouragement of the use of renewable sources of energy, including wood.

Current energy policies, coupled with the current high prices for fossil fuels, are one of the main triggers for the increased demand for wood as a renewable and locally available source of energy. The EU for instance wants to double the amount of biomass used for energy purposes by 2010. Demand is however now getting so high that energy objectives might not be met: If a region cannot cover its needs in wood energy and has to resort to imports, it has done nothing more than change its dependency situation. Furthermore, transporting energy wood over large distances is hardly energy efficient.

A further objective of energy policy is the introduction of more energy efficient – and thereby less energy consuming – apparatus. In implementation of this objective, new wood heating systems are being developed, making it possible to replace inefficient installations, some of which are even dangerous (emission of carbon monoxide or toxic smoke). This would mean that less wood need to be mobilized for energy if the wood which is mobilized is used in efficient and safe installations. Growing markets for energy efficient wood heating systems would be possible with a slower increase in energy wood demand.

Another issue to be addressed is the effectiveness of different energy wood uses: energy wood can not only be used to produce heat, but also as a replacement for fossil fuels (as ethanol, methane), or as an energy source for electricity production. The effectiveness of such uses is however low (the degree of effectiveness in the production of diesel out of wood is below 50%). In light of the increasing demand for energy wood, it needs to be discussed which uses of energy wood are most effective and efficient.

Though energy policy strongly influences the demand for energy wood, it has to be noted that inversely, woody biomass is only a small part of energy policies (currently, biomass including agricultural energy crops meets 4% of the EU's energy needs, ditto for Switzerland). The political impact of difficulties in meeting demand for wood energy supply would therefore be great, in that it would reduce the trust in wood as a source of renewable energy.

A-1.5.1.4 Agriculture

The establishment of short rotation plantations on agricultural land is an option that is being seriously considered in many parts of Europe. This can mean a reduction of the pressure on forest areas as such plantations can contribute substantially to cover the growing needs for biomass and fibre. Though it is not the case yet, such plantations could within the near future become an interesting option for farmers.

Considering that such areas fall rather under agricultural than forestry legislation, the question arises as to how and to which extent such short-rotation plantations have to meet the standards of sustainable forest management. If such plantations are to be treated as equal to other forest areas, then the same instruments need to be applied in these plantations as in forest areas. From a purely ecological point of view, it can be argued that such forests are much more problematical than sustainably managed forests. In relation to other agricultural uses however, the ecological impacts of plantations compare favourably to other agricultural crops. There are currently no clear answers to this question in either forestry or agricultural policies, it is therefore a typically cross-sectoral topic that needs to be

[28] See e.g. EU energy policy objectives

addressed. Besides the economic possibilities and the ecological impacts, the concept of SFM requires considering also the social aspects of short-rotation plantations (contribution to farmer's livelihoods, impact on the landscape, and acceptance by the public).

A-1.5.2 Implications of increased wood mobilization for SFM

Forest management must be sustainable: there exist many references and definitions on this subject, notably the definition of sustainable forest management in Helsinki Resolution H1, which has been endorsed by all European countries and introduced into forest legislation in many countries. This is supported by a structure of criteria and indicators, laws and regulations, as well as a number of certification systems, which are now well established in most European countries.

Increased wood mobilization will certainly have an impact on sustainable forest management, be it positive or negative. This chapter therefore aims at highlighting the possible implications of increased wood utilization for sustainable forest management, using the structure of the six MCPFE criteria and improved quantitative indicators (see Annex table 1 - D). The listing below is not exhaustive, and only provides possible scenarios. Its objective is to provide food for thought and a basis further discussion.

C1 Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles

A greater mobilization of wood may have a number of positive effects on the forest resource, in that it can act as an incentive to increase the forest area (e.g. on agricultural land). Furthermore it may have a positive impact on growing stocks, where these are unsustainably high, and on age structure and diameter distribution in underused forests.

There are possible risks however: In forests with insufficient protection status (preservation of forest area) forests may be overused and thus degraded, with growing stocks sinking below sustainable level and an unbalanced age and diameter distribution.

Increased mobilization makes carbon stocks decrease. This may cause a problem in forests accounting under the Kyoto Protocol (see previous chapter). The overall influence on the CO_2 balance is however positive, due to substitution effects.

C3 Maintenance of forest ecosystem health and vitality

Increased wood mobilization may have an indirect positive influence on forest health and vitality, in particular if wood is used as a substitute for sources of energy with higher emissions. This however is only true on condition that installations are efficient and clean (see energy policy above).

There is however a risk of nutrient imbalance in forest soils due to the increased extraction of trees including branches.

C4 Maintenance and encouragement of productive functions of forest

An increased demand certainly boosts the wood production function of forests, thanks to better wood prices and higher wood sales. In underused forests, greater mobilization can improve the ration between increment and felling.

In forests with insufficient protection status (e.g. no management plans, greater mobilization may lead to overuse, and increases the risk of illegal logging.

With the economic interest in wood rising, the provision of non-wood goods and services may suffer, in that it may become less attractive to invest in them than in wood production.

C5 Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems

More intensively used forests may pose a problem for biological diversity. Tree species composition may be less varied, as choices concentrate on fast-growing species, leading to a reduction of genetic diversity; there might be less deadwood in forests and sensitive threatened forest species may suffer from the negative impacts of intensive logging. The larger economic value of forests for wood production also increases the pressure on undisturbed and semi-natural forests and landscape patterns may change (particularly if plantations outside the forest area become interesting. Forest owners will probably also be less motivated to set aside forest reserves, as this limits the production potential of their forest.

An increased use of forests for wood production may however also have positive effects, e.g. by increasing the area of (natural) regeneration in over-aged forests, or by creating more diverse and dynamic forests and landscape patterns. Some threatened species need light forests, so may profit from more intensive wood use. Introduced tree species with high production potential may help minder the pressure on other forests.

C5 Maintenance and appropriate enhancement of protective functions in forest management (notably soil and water) => add protective function of mountain forests (avalanches, rock fall) and erosion

Forests help to protect soil from erosion, and play an important role in the water cycle and in water quality. Intensive logging may however impair these functions.

Many forests with a protective function against natural hazards are over-aged. Increased mobilization can improve their structure by having more regeneration. However greater mobilization can also mean increased pressure on these forests, thereby possibly reducing their ability to fulfil their protective function if the status of these forests is unclear or insufficiently ensured.

C6 Maintenance of socio-economic functions and conditions

Wood consumption and energy from wood are expected to rise, possibly substantially. This will logically also boost trade in wood and – on condition that the increase in demand also means a rise in prices – net revenue for forest owners and thereby the contribution of the forestry sector to the gross domestic product of European countries should increase.

The higher income may give rise to greater investments of forest owners in long-term forest services, but may also mean a reduced interest in the provision of services, in view of short and medium term profits from wood production. Public expenditure for services is indirectly affected by this.

A greater focus on the wood production function may lead forest owners to be less interested in keeping or even opening their forests to the public for recreation. Recreation forests may be under greater pressure for wood use, which may impair this function.

The forest sector workforce may need to increase in order to meet demand, but may also be reduced due to investments in rationalized and highly mechanized forest management systems. The risk of occupational accidents and diseases may increase if demand is high (time pressure), but could also be reduced if more highly mechanized systems are used.

A medium to long-term effect of wood mobilization may be changes in the ownership pattern, with the creation of more rational management units, in particular in small privately owned forests.

Annex table 1 - D Possible "positive & negative" impacts of increased wood mobilization on sustainable forest management using the structure of the six MCPFE criteria and improved quantitative indicators.

MCPFE Criteria & Indicators	Possible positive impacts	Possible negative impacts
C 1 Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles		
Forest area	Possible incentive to increase forest area (e.g. plantations on agricultural land).	Assuming a high protection of forest land in Europe, low risk of deforestation, but possible risk of degradation if use is intensified above sustainable level. Higher demand and higher wood prices may also increase risk of illegal logging.
Growing stock	Increase in volume extracted (i.e. reduction of growing stock) possible without going above sustainable level in forests with high growing stock. Possible positive effect on biodiversity (lighter forests).	Unsustainable decrease of growing stock possible in forests with insufficient protection framework (e.g. management plans laying down allowed felling)
Age structure, diameter distribution	Possible positive effect on age and diameter structures in underused and over-aged forests.	Tendency to shorter rotation periods and less large diameters / old trees
Carbon stock	The overall influence on the CO_2 balance positive, due to substitution effects.	With intensified use reduction of carbon stock. This may cause a problem in forests accounting under the Kyoto Protocol.
C 2 Maintenance of forest ecosystem health and vitality		
Deposition of air pollutants	Possible indirect impact through substitution effects (fewer emissions).	
Soil condition		Possible nutrient imbalance through increased removal of biomass from the forest
Defoliation	Possible indirect impact through substitution effects (fewer emissions).	
Forest damage	Possible indirect impact through substitution effects (reduction of stress due to climate change).	Possible shift to fast-growing species with increased risk of pathogens.
C 3 Maintenance and encouragement of productive functions of forests (wood and non-wood)		
Increment and fellings	Better relationship between increment and felling in underused forests.	Risk of overuse in forests with insufficient protection status
Round wood	Increase and potential higher value due to rise in prices.	Higher risk of illegal logging.
Non-wood goods		Possible negative incentive on provision of non-wood goods (less attractive).
Services		Possible negative incentive on provision of non-wood services (less attractive).
C 4 Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems		
Tree species composition		Possibly less interest in diversification of species (concentration on fast-growing or introduced tree species)
Regeneration	More regeneration areas in over-aged forests.	Less natural regeneration in forests with intensified use (impact on species composition, soil condition)
Naturalness		Higher pressure on undisturbed/semi-natural forests.
Introduced tree species	Increase of production potential through introduced species (in particular fast-growing).	Risks linked to increased use of introduced species (pathogens, biodiversity).
Deadwood		Potentially less deadwood.

MCPFE Criteria & Indicators	Possible positive impacts	Possible negative impacts
Genetic resources		Possible reduction of diversity due to concentration on certain species and genetic types (plantations); environmental impact of new tree varieties with high production potential and GM tree crops
Landscape pattern	Increased diversity through more intensive management patterns.	Change of landscape pattern if plantations on agricultural land become interesting (see forest area)
Threatened forest species	More light in underutilized forests leading to positive effect on plant diversity. Increased utilization can lead to more dynamic forests (more open spaces, pioneer vegetation).	Negative impacts of intensive logging (soil compaction, disturbance, more limited choice of tree species, less dead wood)
Protected forests		Less interest of forest owners to set aside forest reserves
C 5 Maintenance and appropriate enhancement of protective functions in forest management		
Protective forests – soil, water and other ecosystem functions		Possible negative impacts of intensive logging
Protective forests – infrastructure and managed natural resources	Positive effect in over-aged stands (utilization = regeneration).	Risk of overuse and thus reduction of protective capacity in case of insufficient protection status (setting aside of, special rules for protective forests)
C 6 Maintenance of other socio-economic functions and conditions		
Forest holdings	Possible long-term effect of more rational units in small private forests	
Contribution to GDP	Increase of contribution of forestry.	
Net revenue	Increase, on condition of efficient structures / rising prices.	
Expenditure for services	Better income from wood sales may prompt forest owners to invest more in services, and make them less dependant on public funding	Short and medium term profits from wood sales may lessen the attractiveness of expenditure for long-term forest services
Forest sector workforce	Higher need of forestry workforce to cover demand.	Reduction of workforce through rationalized forest management.
Occupational safety and health	Incentive to more highly mechanized extraction systems, reducing risk of accidents and occupational diseases.	More pressure leads to increased risk of accidents.
Wood consumption	Increase.	
Trade in wood	Increase.	
Energy from wood resources	Increase.	
Accessibility for recreation		Greater focus on production function may affect forest owners' interest in making/keeping their forest accessible to the public; greater pressure on recreation forests.
Cultural and spiritual values		Possibly increased pressure on such areas for wood utilization may impair function of these forests.

A-1.5.3 Questions for further discussion

During the workshop, participants may wish to further discuss following issues:

a) Interactions between increased wood mobilization and different sectors:

- Despite existing principles of close to nature forestry and sustainable forest management, increased wood mobilization has implications for forest ecosystems, landscapes and biological diversity. How can cross-sectoral approaches and mechanisms be strengthened in order to avoid or at least control these effects?
- Climate policies are sending out ambiguous signals to forestry (increased use of CO2-neutral wood vs. carbon sequestration in forests). How can this problem be addressed? And by whom?
- Current energy policies are one of the main triggers for the increased demand for wood as a renewable and locally available source of energy, while forest owners have an economic interest in raising their income from energy wood. This seems like a win-win situation, if it were not for the potential implications for sustainable forest management, especially if demand for energy wood is covered by "energy plantations". How can energy and forestry authorities cooperate, and which instruments are best able to bring together these interests? Should energy policies incorporate the principles of sustainable forest management? Is there a need for ground rules or codes of practice for "energy plantations"?
- Not all uses of wood for energy are equally effective and efficient. Which uses (heating, electricity, replacement of fuels) are interesting and worth promoting? Which can be the role of the forest sector?
- An expansion of wood production outside the forest area is possible. This gives rise to a number of issues to be addressed, such as:
    - Should intensive wood crops on former agricultural land follow the principles of sustainable forest management or those of agriculture crops? There are significant differences, for instance on biodiversity, access, recreation, use of fertilisers etc.
    - Is there a need for ground rules or codes of practice for "energy plantations"? Recently an MCPFE workshop in Vilnius drew up a code of conduct for forest management for climate change (reference), which broadly confirms traditional forest practice (discouraging for instance the use of introduced species, and stressing the importance of biodiversity and social and economic criteria). Should this code, or a variation of it, be applied also to areas designed for the intensive supply of wood for energy, as well as to areas for carbon sequestration?

b) Implications of increased wood mobilization for SFM

- An increased demand for wood changes the balance between the different criteria defining sustainable forest management. Which aspects are most affected and what is the overall effect for SFM?
- By what means can positive impacts be enhanced and/or negative impacts be reduced?

Annex 2 Mobilizing Wood Resources - What's the Big Deal?

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A-2.1 Objective and Background

In Europe we have recently seen an increased demand on wood raw material due to increased demand for industrial forest products and a substantial increase in wood for fuel based on dramatically increased prices for traditional energy carriers such as oil, gas, and electricity.

Being somewhat involved in the pre-discussions of this conference, I know that the major driving force for the concerns regarding the need for mobilizing wood resources is the "conflict" between traditional forest industrial use versus energy use of existing and future wood raw material in Europe.

The organizers of the conference have charged me with the overall task of discussing whether there is a need for mobilizing wood resources in Europe and what the policy dilemmas are for the mobilization of more wood in Europe if needed. In fact, the organizers charged me with a number of questions to be answered within this framework. However, in order to elaborate on all of the questions, I am afraid that I would need something like a six-hour presentation. So there is a risk that the following discussion will be rather superficial.

A-2.2 The Heart of the Problem - Energy

Due to the fact that the perceived conflict and policy dilemma about the utilization of Europe's raw material stems from development in the energy sector, I see difficulties in discussing the policy dilemma without addressing the outlook for the energy sector.

Energy is the lifeblood of the world economic system. A number of experts argue that high energy prices reduce the possibilities for economic growth substantially (e.g., OECD/IEA, 2006). However, Nilsson (2006a) has analyzed existing studies on assessments of the empirical historical impacts of energy prices on economic growth over time. It can be concluded that:

- There seems to be a threshold value for sensitivity to energy prices and their impacts on economic growth.
- These thresholds vary with the robustness of different economies.
- The more robust economies are, the less negative impacts of economic growth.
- There seems to be a consensus that there may be short-term economic disruptions by high/increased energy prices but hardly any long-term negative impacts on economic growth.

However, it can also be concluded that the world's *different economies can perform and survive with substantial energy price rises but can not survive supply and price shocks of energy*.

The Financial Times (FT, 2006a) has later confirmed this conclusion by stating "*if stable, high energy prices need not to be a disaster. For the most part high prices provide the right incentives for consumers and producers. It is the volatility of energy prices, not their level, that is most damaging to the world economy*".

Thus, in discussing the energy issue, *energy security and price volatilities* are of major concerns. So what risks are we facing with respect to these entities?

The International Energy Agency (IEA) has recently released its new energy outlook study (OECD/IEA, 2006). They assess that the world demand on primary energy will increase from 11204 million toe in 2004 to 17095 million toe in 2030—an increase of over 50% in 25 years (see Annex table 2 - A). During the same period, the dependence on fossil fuel will increase from 80 to 81%. But there are a number of constraints making it possible to meet this demand especially with respect to fossil fuels. The constraints for reaching the demanded supply, according to Annex table 2 - A,

causing a lack of energy security and price volatilities are many and severe (especially with respect to fossil fuels):

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

Annex table 2 - A: World primary energy demand in the reference scenario (million toe). Source: OECD/IEA (2006).

	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.

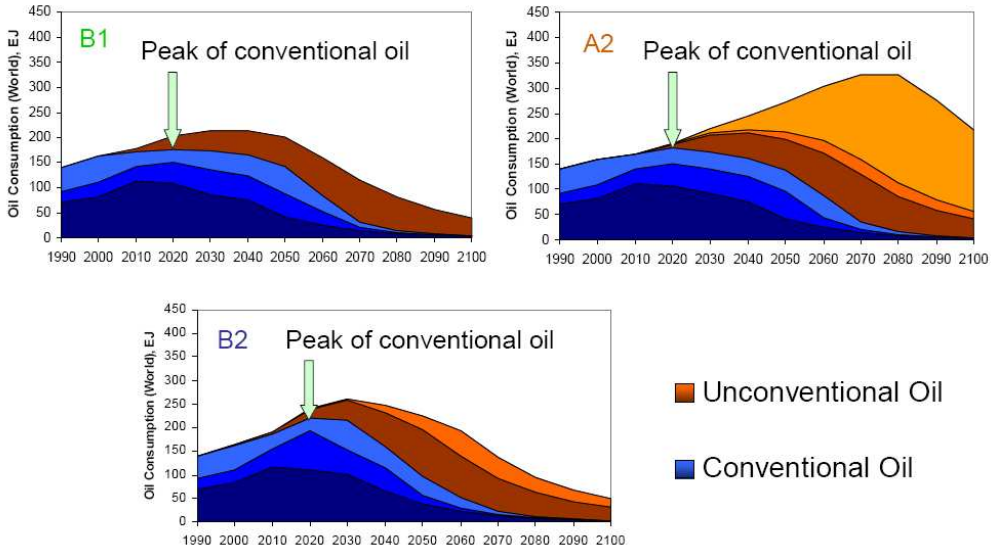
A-2.2.1 Economically Accessible Resources

There are especially concerns about the economic accessibility of fossil fuels in the future. One school is arguing that the conventional oil and gas production will peak any year now (e.g., ASPO). Another school is arguing that the conventional oil and gas resources will last for a substantial period of time (e.g., OECD/IEA, 2006). Nevertheless, there is consensus among the schools that at some point in time not too far away the production of conventional oil and gas will peak but unconventional and synthetic sources of oil could last for a long time to come — but at higher prices.

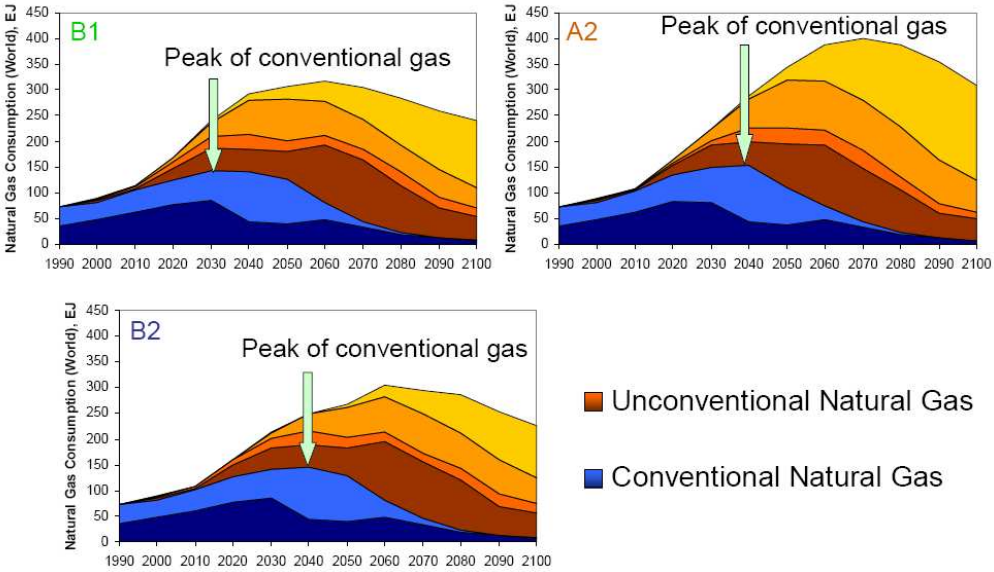
For many years at IIASA we have worked on global energy assessments and produced many scenarios. We also use the terms conventional and unconventional fossil fuels. Conventional resources are defined as fossil fuels that can be extracted with today's technology at competitive prices/economic viability (Rogner, 1997). In Annex figure 2 - A and Annex figure 2 - B we illustrate some of our scenarios on global oil and gas consumption. Scenarios B1, B2 and A2 are based on different assumptions of economic and social developments and a different future environment. Scenario B1 reflects a peak in global population in mid century with rapid changes in economic structures toward a service and information economy and the implementation of resource-efficient technologies. Scenario A2 describes a very heterogeneous world with continuously increasing global population and slower economic growth and technological change than in Scenario B1. Scenario B2 describes a world with lower population growth than in A2, intermediate economic development and less technological change than in B1. This scenario emphasizes local solutions to the overall sustainability issue.

In all scenarios, the peak of conventional oil consumption is around 2020 and the conventional natural gas peaks around 2030–2040. If the oil consumption level at the peak in these scenarios is compared with the IEA demand scenario (Annex table 2 - A) for 2030, it can be concluded that the assessed

demand can not be supplied with conventional oil. The deficit is 15 to 25%. This means a very difficult supply situation and increased oil prices and high risks for *supply and price volatilities* with respect to oil. The gap or deficit of conventional natural gas at 2030 is not as difficult as for oil but there is a deficit in the magnitude of nearly 10%, which again indicates risks for *supply and price volatilities* of natural gas.



Annex figure 2 - A: Global oil consumption (conventional and unconventional reserves and resources). Source: Riahi and Keppo (2006).



Annex figure 2 - B: Global natural gas consumption (conventional and unconventional reserves and resources). Source: Riahi and Keppo (2006).

Currently, global oil supply stands at 84 million barrels per day, with a spare capacity of only 1 to 1.5 million barrels per day - the lowest level during the last 30 years (Newell, 2006).

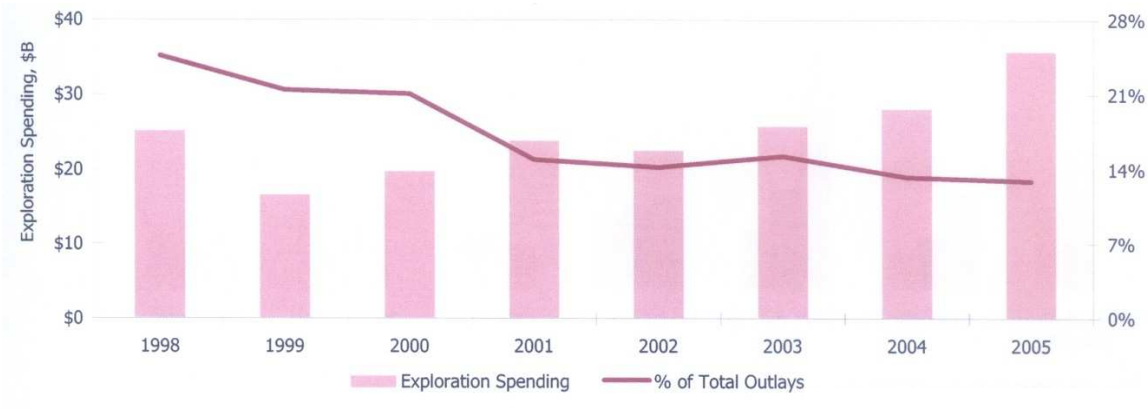
A-2.2.2 Lack of Investment Funds

The IEA states that to reach the primary energy supply, which will meet the demand of 17095 million toe in 2030 (see Annex table 2 - A), enormous investments in the energy infrastructure must be made (OECD/IEA, 2006). The accumulated amount needed to 2030 is over $20 trillion (2005 $). About half of the investments are needed in the electricity industry in the form of transmission and distribution networks and in power generation. The rest of the investments are roughly needed for the fossil fuel industry. Some $2.5 trillion of investments are needed in the European energy sector.

More than half of the investments will be allocated to just maintain the current level of supply. Much of the world's current production for oil, gas, coal, and electricity will need to be replaced. The IEA is quite frank that there is no guarantee at all that the needed investments will be forthcoming (OECD/IEA, 2006). The level of investments will in the end depend on government policies, geopolitical conditions, unexpected changes in costs and prices, new technologies, etc. It should be remembered that some 80% of the proven reserves of fossil fuels are concentrated in *volatile* regions (Newell, 2006). The IEA questions "whether investment in Russia's gas industry will be sufficient even to maintain current export to Europe and to start export to Asia" (OECD/IEA, 2006). Thus, also from a financial point of view there is a high risk that there will be *supply and price volatility* of the energy supply.

A-2.2.3 Maintenance and Efficiency

In spite of tremendous profits by the energy industry, the needed investments in maintaining the existing energy infrastructure have not materialized. Hautojärvi (2006) assesses that the productivity of the energy sector in the EU has improved by 15% during the last 45 years. At the same time, labour productivity grew by 350%. Herold and Lovegrove (2006) assess that the global petroleum industry needs to invest over $200 billion annually to maintain current reserves and current production rates but this has not happened during the last five years and in 2005 the upstream capital investment was $277 billion, whereby $128 billion was channelled back to shareholders through dividends and buybacks of shares. In fact, *buybacks* exceeded purchases of proven reserves by 20% and were nearly 80% higher than exploration outlays (see Annex figure 2 - C).



Annex figure 2 - C: More exploration is needed. Source: Herold and Lovegrove (2006).

As stated by the IEA, Russia has neglected maintenance investments in the infrastructure of gas, oil, and electricity (OECD/IEA, 2006). Several specialists have warned that there is the risk that Russia will have an oil and gas production crisis in the future due to the dearth of investments (e.g., Wood Mackenzie, 2004; Juurikkala and Ollus, 2006). Since the late 1980s, the Russian electricity sector has suffered from the lack of investments and the current generation capacity is deteriorating. Even a

moderate growth in Russian electricity consumption will lead to serious supply shortages already in 2008 (e.g., Kurronen, 2006). Gheorghe *et al*. (2006) have made a detailed review of the European electric power system. From this review, it can be concluded that the European electric power systems are bound to fall short in the coming years due to aging generation and transmission equipment. There are doubts that current and planned generation plants will meet demand. Political decisions were taken for the establishment of an internal market in electricity but nothing was made to remove the physical constraints of power transmission. There has been substantially increased interconnection of electricity systems but no central control mechanism has been established. Therefore, the European electricity market is not optimal and lacks efficiency which pushes the prices upwards. In the case of Europe, there is an urgent need to upgrade and secure the electric power system.

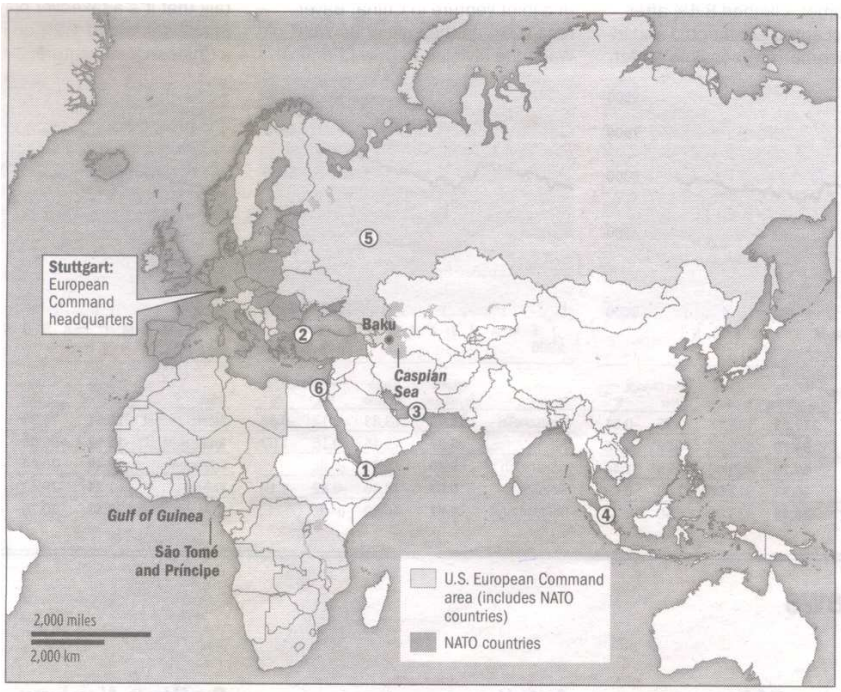
The neglect of maintenance of the energy infrastructure is causing disturbances and volatility in supply and prices. Recent examples are the explosion in March 2005 in BP's Texas City Refinery and a string of disasters in BP's infrastructure in Alaska in 2002, 2005 and 2006. All are the result of cost cutting in safety and maintenance (FT, 2006b, c).

The explosion in Nigeria of a pipeline during Christmas 2006 was claimed to be caused by thieves vandalizing the pipeline but experts are questioning this. Corruption and mismanagement have forced much of Nigeria's energy infrastructure into decay and this was the major cause for the explosion.

The lack of sufficient security and maintenance of the energy infrastructure will cause volatility in supply and prices of primary energy in the future.

A-2.2.4 Sabotage

As stated earlier, some 80% of the proven fossil fuel reserves are located in volatile regions. This, coupled with increased intensity in globalized terrorism, increases the risks for sabotage of the existing energy infrastructure. The risks for sabotage are illustrated by Annex figure 2 - D and Annex figure 2 - E with respect to oil and gas.



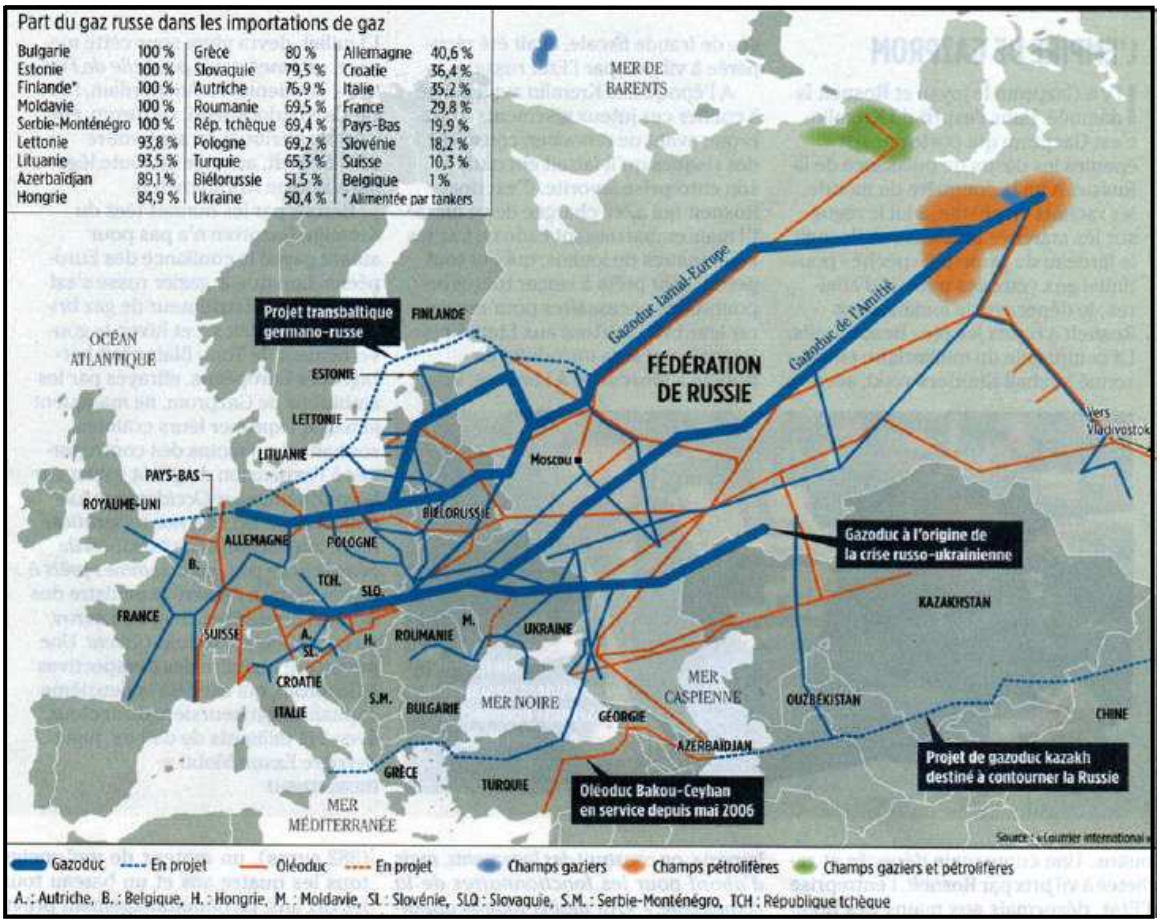
World oil transit choke points

CHOKE POINT	OIL FLOWS, millions of barrels per day*	SECURITY CONCERNS
① Bab el-Mandab	3.0	Terrorists attacked an oil tanker in the area
② Bosporus and the Turkish Straits	3.1	Less than a kilometer wide at narrowest point and difficult to navigate
③ Strait of Hormuz	17	In the midst of volatile region
④ Strait of Malacca	11.7	Piracy is frequent
⑤ Russia	2.0 (Also natural gas)	Gas supplies controlled by Moscow
⑥ Suez Canal/ Sumed Pipeline	4.2	If closed, some tankers would have to go around Africa

*2004 estimate.

Source: Energy Information Administration.

Annex figure 2 - D: World oil transit choke points.



Annex figure 2 - E: Russian gas pipelines. Source: Vasara (2006).

Nearly half of the total world daily production of oil has to pass through the choke points in Annex figure 2 - D.

The leader of Turkmenistan recently passed away, leaving a vacuum at the top of a dysfunctional institutional structure controlling the world's fifth biggest gas reserve. Political instability could threaten the gas supply to its main customer, Ukraine, with potential knock-on effects for the rest of Europe. Gazprom, due to lacking investments, relies increasingly on cheap central Asian supplies to meet domestic and international demands, including Europe.

The oil and gas infrastructure is too big to protect as a whole and the risks of sabotage must be counted for. The threats to oil supply multiply but the world is not ready to handle this development (Wall Street Journal, 2006).

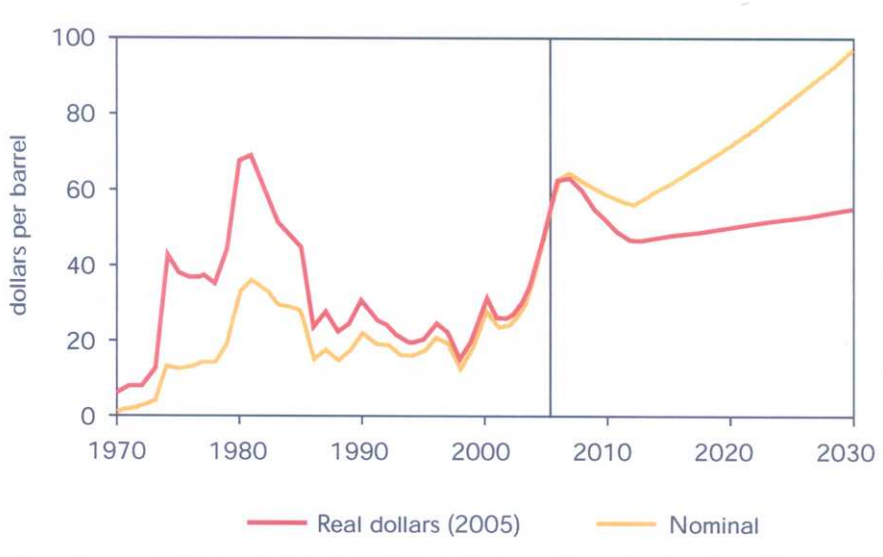
A-2.2.5 Energy as a Political Pressure Tool

A tight supply/demand situation, as described above, will open the possibilities for producers to use the energy supply as a political tool and the consumer countries may be forced to accept political and economic policies that are not really acceptable to the consumer countries.

A-2.3 Price Development

Under the conditions outlined above, the probability is high that the prices of primary energy will remain at a high level. But nobody knows what the price level will be in reality because the outlined development leaves room for a lot of speculation that could influence the price development strongly.

The IEA has been brave enough to present an assessment of future oil prices (OECD/IEA, 2006). It is pointing at a level of $50/barrel in real costs and $100/barrel in nominal costs in 2030 (see Annex figure 2 - F).



Annex figure 2 - F: Average IEA crude oil import price in the reference scenario. Source: OECD/IEA (2006).

A-2.4 Environment/Climate

Sir Nicholas Stern (2006) has recently made policy makers and the public aware that climate change presents serious global risks and requires urgent responses. The majority of the emissions of greenhouse gases (GHG) stems from the production and combustion of energy.

Some of the foreseen damages affecting the European forest sector will be highlighted. Ecosystems in Europe will be vulnerable to the foreseen climate change. Increases in the extent and intensity of storms and hurricanes are foreseen. Increased and perhaps dramatic outbreaks of insects and pests with climate change will also cause increased damage of infrastructure.

There is also a chicken and egg problem between increased climate change damage of infrastructure and the production of primary energy carriers, which can be illustrated by the shutdowns of refineries and pipelines caused by hurricanes Katrina and Rita in 2006 resulting in price spikes.

Stern (2006) estimates that emissions following a business-as-usual path will cause an average loss of global GDP of 5–10%.

Stern (2006) argues that the concentration of GHGs in the atmosphere has to stabilize at 500–550 ppm in order to avoid the huge economic losses of 5–10% of the global GDP by climate change. In order to achieve this, the global emissions need to be 25% below current levels by 2050. In this context, it should be pointed out that in 2050 the global economy may be 3–4 times larger than today. This means huge reductions of emissions in a business-as-usual development. This can be illustrated with the increase of CO_2 emissions according to the OECD/IEA (2006) scenario (Annex table 2 - A). This increase in primary energy demand will increase the CO_2 emissions by 14.3 billion tonnes (or 55%) during the period 2004 and 2030 and reach 40.4 billion tonnes. With the current pace of reductions in the EU, the reduction will be 1% in relation to the 1990 baseline instead of the EU commitment of a reduction of 8% in 2012 according to the Kyoto Protocol (EEA, 2006d). Stern (2006) claims that the above stabilization can be reached through emission reductions at accumulated costs of around 1% of GDP by 2050 (although Stern has been criticized for this estimate and it is argued that it is an under-estimate).

But the overall conclusion of the Stern review is that the costs for emission reductions will be substantially lower than the costs of the foreseen climate change. However, actions have to be taken now.

A-2.5 Energy Policies

Unfortunately, we do not have any solid energy policies or strategies either in the individual countries of Europe or in the EU. Without solid energy policies or strategies it is rather difficult (meaningless) to discuss mobilization of more wood for energy purposes. Without these instruments we do not know what magnitude we are speaking about with respect to possible mobilization. I regret to state that I am rather pessimistic about the establishment of efficient energy policies and strategies in Europe. Even if the politicians have identified the severity of the energy balance they do not know what to do. There is a political collective of no-action problem and "After you, Sir" syndrome with respect to energy policies and strategies.

I hope I have made it clear that the current situation is severe and that the policy and strategy setting has to operate within the *triangle of economic growth, energy security (vulnerability to supply disruptions)* and *climate and environment*. This means there is a need to reduce the vulnerability and to diversify the energy supply. It is far from enough to just look at "high oil prices" in setting priorities.

The key to effective policies and strategies is the correct identification of which parts of the energy equation or matrix to solve.

In order to start to make this kind of identification I have produced an "energy matrix" for 2030 at the Pan-European level, but excluding Russia, over economic sectors and different primary energy carriers (see Annex table 2 - B). The basic input for the "matrix" is the reference scenario of OECD/IEA (2006).

How much do we have to reduce oil and gas in Annex table 2 - A in order to avoid vulnerability/volatility in supply and prices? How much do we have to reduce the fossil fuels in order to make a contribution to climate stabilization? In which sectors can we make substantial reductions of fossil fuels? How much can we reduce fossil fuels and still maintain economic growth? How can we replace coal, gas, and oil in the generation of electricity? How much can the rate of renewables be increased in the generation of electricity without threatening economic growth? Should biomass come from agriculture or forestry? And so on.

Annex table 2 - B: Total final energy consumption in Pan-Europe in 2030 (million toe). Calculated from OECD/IEA (2006), EEA (2006a), Eurostat (2006) and IEA Energy Statistics (www.iea.org).

	Coal	**Oil**	**Gas**	**Electricity**	**Heat**	**Biomass**	**Biofuels**	**Other Renewables**	**∑**
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	
∑	**30**	**741**	**424**	**379**	**90**	**95**	**32**	**24**	**1815**
Renewables				49					
Nuclear				118					
Coal				117					
Gas				70					
Oil				20					
Others				5					

It is rather obvious that the forest sector alone can not address these kinds of questions for building energy policy and strategy frameworks. It must be done from a total societal point of view.

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.*

I will return to Annex table 2 - B later in the discussion of the wood balance for Europe.

A-2.6 Biomass Opportunities

The need for energy policies discussed in the former section is aiming at identifying an energy policy framework *but not to dictate in which sector which fuel and to what extent it should be used. The market should decide this allocation.*

So what can biomass contribute in the form of energy?

Bioenergy: Electricity and Heat from Biomass

With recent increases in energy prices, heating with modern bioenergy systems can compete with oil and gas and the generation of electricity with biogas from biomass undercutting costs of oil and gas-fired power plants. These technologies are well established and the development is on its way.

Liquid Biofuels for Transportation

Examples of liquid biofuels are ethanol, methanol, biodiesel (FT-Diesel), RME, DMR, etc.

The first generation of liquid biofuels is mainly produced from agricultural products like starch and sugar. Included in the first generation of liquid biofuels are ethanol and RME. The second generation of liquid biofuels (post 2010) will use woody biomass, tall grasses and lingo-cellulosic residues and wastes.

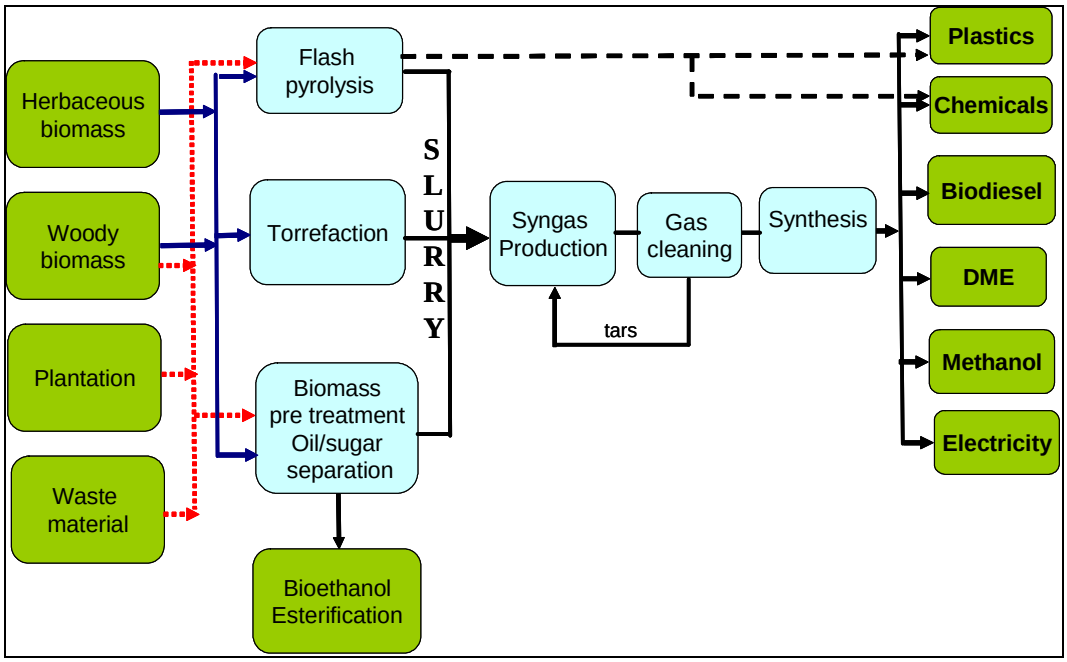
Biogas - An In-between Biofuel

Biogas can be upgraded to substitute natural gas and can feed into existing natural gas pipeline systems (local, national and international). It can be produced as compressed natural gas to be used in gas-engineered vehicles. But biogas can also be processed into a *gas-to-liquid* and be available as a powerful and very clean-burning liquid fuel.

Hydrogen

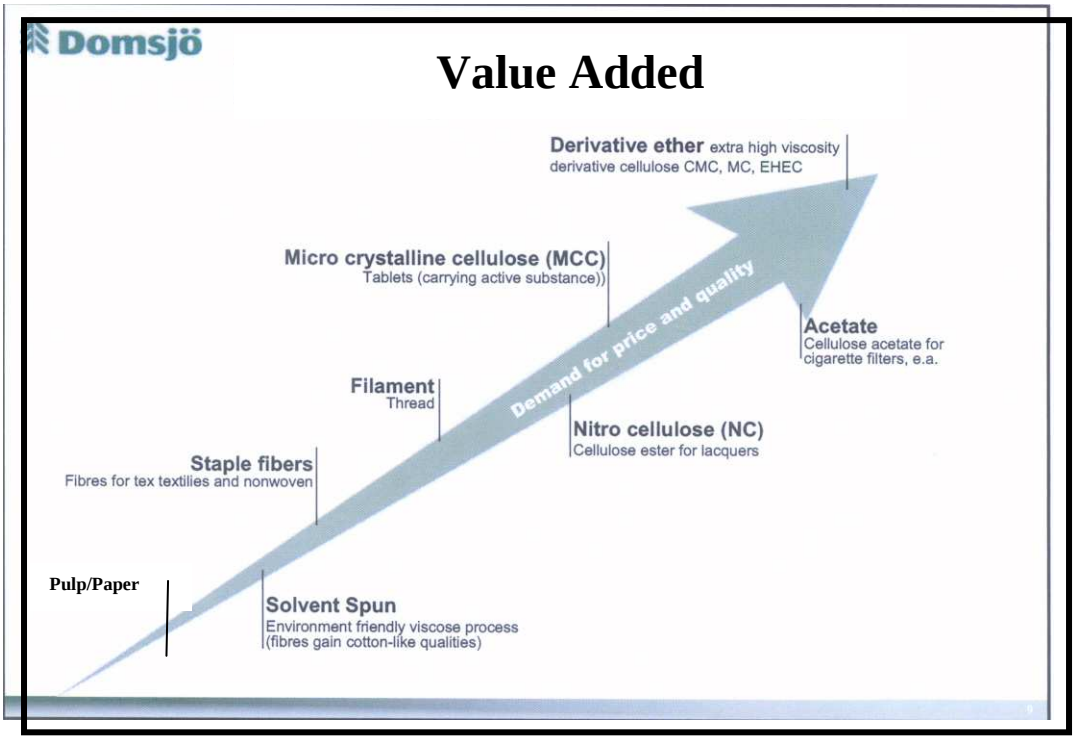
Hydrogen can be produced from biomass and coal and can be used as a transportation fuel. Hydrogen is classified as the third generation of fuels.

There is intensive development going on about biomass fuels and we do not know yet what will be the most efficient utilization of biomass in the future. One of these developments is the *biorefinery*. The concept of *biorefinery* is to optimize the output of the biomass feed-stocks so it reflects the highest revenues. The overall concept is presented in Annex figure 2 - G.



Annex figure 2 - G: The integrated biorefinery approach. Source: Girard and Fallot (2006).

The biorefineries are regarded as a second generation producer of biofuels. Biorefineries can be established and integrated with traditional pulp and paper production (the old Soviet combine concept). The biorefinery generates a substantial increase in value added production, which can be illustrated by the Domsjö biorefinery in Sweden (see Annex figure 2 - F).



Annex figure 2 - H: Example of value added production in biorefinery — Domsjö, Sweden. Source: Hildingsson (2006).

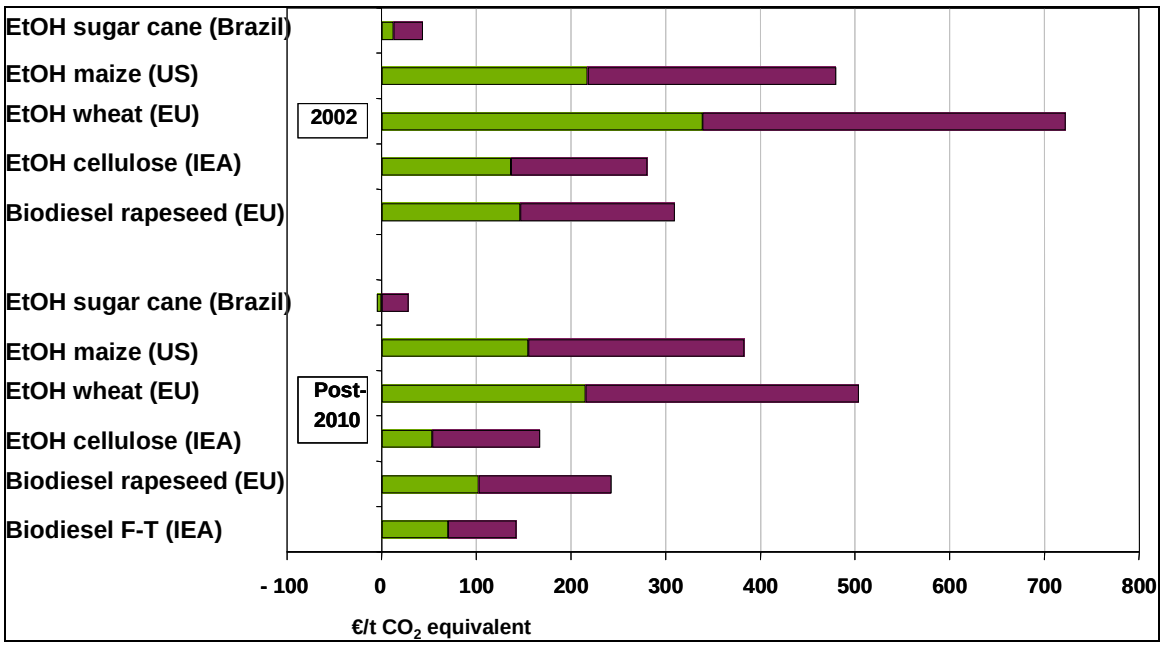
As seen from Annex table 2 - B, Europe is very dependent on oil and gas in the generation of energy. The costs of bioenergy have to be compared with the fossil fuel equivalents in order to identify how competitive these fuels are. I have already stated that heating and electricity generation from biomass are already competitive with gas and oil. For biofuels, the uncertainties and unknowns are much bigger. Annex table 2 - C is based on Fritsche and Jenseit (2006) giving an indication of the competitiveness of biofuels.

Annex table 2 - C: 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

If this is compared with IEA's long-term price development for oil around 50$/bbl in 2005 dollars, it can be concluded that biofuels from forest biomass feed-stocks may become competitive with oil and gas around 2020 (OECD/IEA, 2006).

There are also, however, other dimensions to this picture that need to be taken into account. For agricultural-based biofuels, the net energy balance and the resource efficiency is so bad that the net economy is insufficient. For example, Farrel *et al*. (2006) conclude that agro-based ethanol production in the USA requires a primary energy input corresponding to 80% of the energy contained in the ethanol output. This also means that the reduction costs for GHG emissions vary a lot among the fuels, which is illustrated in Annex figure 2 - I. But even in this respect the products based on cellulose seem too have a favourable outlook.



Annex figure 2 - I: GHG reduction cost expectations for 1st and 2nd generation biofuels (lower light green bars indicate lower limit, upper dark violet bars indicate higher limit). Source: Adapted from WWI/GTZ (2006).

If we specifically look into woody biomass, it can be assessed that one ton of wood replacing oil reduces the CO_2 emissions by 1.3 ton. If the same ton of wood replaces coal-based electricity production the CO_2 emissions are reduced by 1.5 tons. But, if that ton of wood is used for biofuel the reduction of CO_2 emissions will be only 0.8 ton.

In addition, we do not know today the technologies that will be the most efficient in 10–20 years. Perhaps the technologies of electric batteries and hydrogen will have breakthroughs, which would mean that biofuels are less interesting. Furthermore, the prices for biofuels will largely be determined by the international price of crude oil and we will not avoid oil price shocks of biofuels. The only way we can do that is to use alternative energy sources not competing with oil (like electricity and hydrogen).

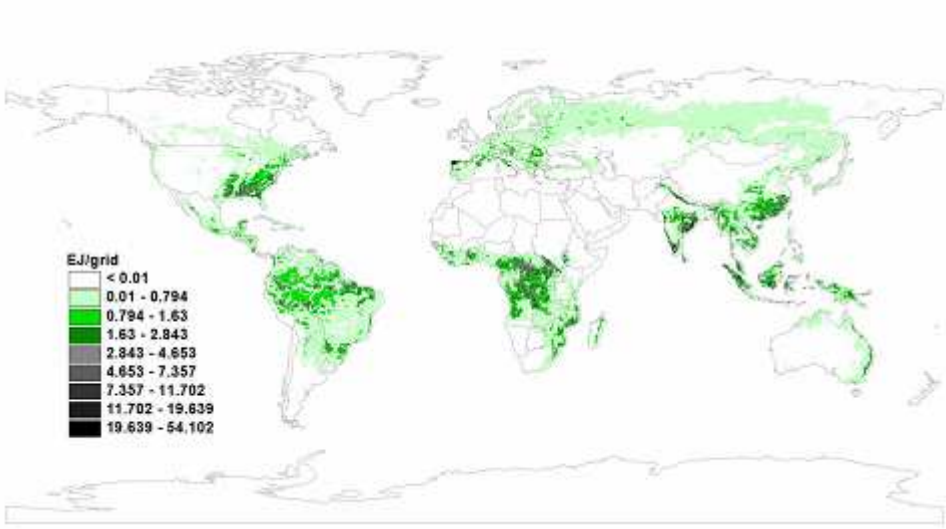
Based on this situation, it is important to keep high research intensity and a broad research agenda on many different kinds of energy sources from wood. If the other technological developments prove to fail we have to fall back to woody biomass for biofuel production.

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.*

A-2.7 Internationalization of Bioenergy Trade

I think there is a misconception in the debate today about bioenergy. My impression is that the bioenergy market is regarded as a European market, a national market, or a subnational market. Already today, there is a long-distance import of bioenergy from Brazil and Canada to Europe. The trade of bioenergy is one of the most rapidly growing sectors for international trade. It is not the transportation distance being decisive but the transportation costs and today there are many inexpensive options for long distance transportation of bioenergy due to globalization. There are many factors in favour of more efficient production of bioenergy outside Europe. For example, there are a lot of unutilized hardwood resources in Russia that could be used for the production of biogas, which could be transported in the existing network of pipelines for export to Europe.

The allocation of the bioenergy industry will, in the same way as the traditional pulp and paper industry, be driven by the costs of the production of the feed-stock of biomass. At IIASA we have made a large number of grid-based global scenarios on the most economically efficient future production of biomass for energy production. One of the scenarios is presented in Annex figure 2 - J.



Annex figure 2 - J: Cumulative biomass production (EJ/grid) for bioenergy between 2000 and 2100; A2r scenario (country investment risk excluded). Source: Obersteiner and Nilsson (2006).

All the scenarios show the same picture with the majority of the biomass production for bioenergy taking place in the tropical regions. An illustration of the internationalization of bioenergy was made on 9 January 2007 with the announcement of the agreement by the China National Offshore Oil Corporation and PT Sinar Mas Agro Resources and Technology of Asia pulp and paper to invest $5.5 billion in plantations of 1 million ha of palm oil, sugar cane and cassava and biorefineries for ethanol production in Indonesia. Therefore, from an energy, economic and climate point of view the question whether there will be sufficient wood resources in Europe for demanded energy production is not that exciting. A global view is required.

Policy Recommendation III. *Europe should globalize its view on future bioenergy and investigate future import opportunities for different bioenergy sources.*

A-2.8 Traditional Industrial Forest Sector in Europe

I will now turn to the other side of the coin, namely the traditional forest sector consumption of wood. After this assessment I can approach the issue of a wood balance for 2030.

In the discussion of the traditional forest industrial utilization of wood I will use EFSOS (UN, 2005) as a platform. But first I will describe the forest resources of Europe (see Annex table 2 - D). As a definition of Europe I have included EU/EFTA and CEEC (including Ukraine). Thus, European Russia, Moldova and Belarus are excluded in the analysis/discussion.

Annex table 2 - D: Forest resources of Europe around 2000 in million ha.

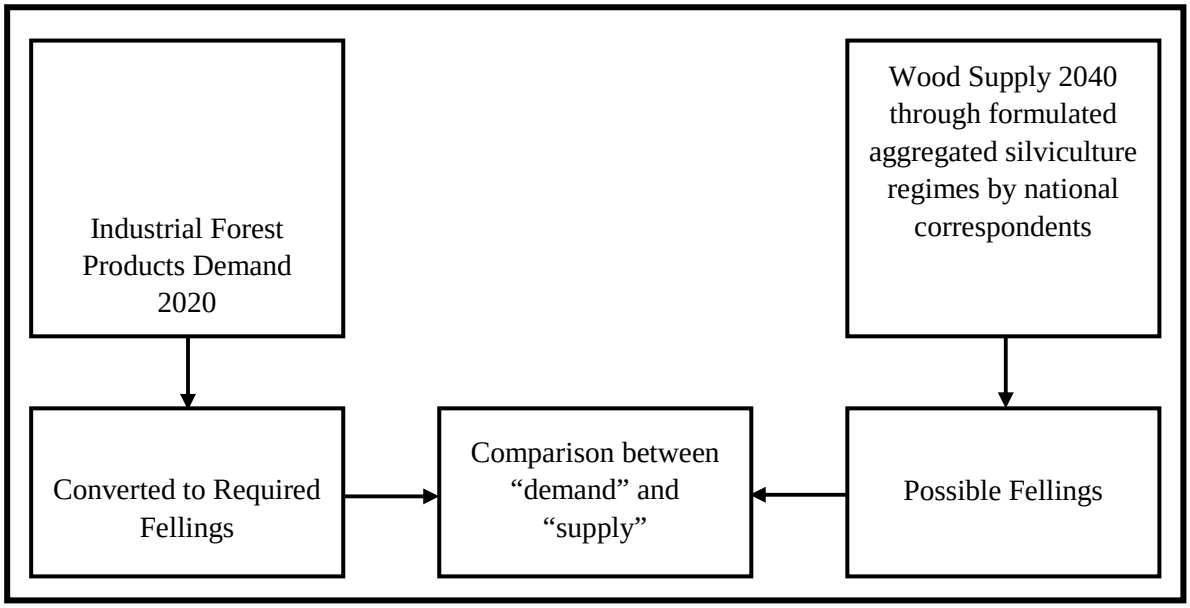
	Forests (FAO, 2006)	**Forests available for wood supply (FAWS)** (Schelhaas *et al*., 2006)	**Other wooded land** (FAO, 2006)	**Other land with tree cover** (FAO, 2006)
EU/EFTA	132.0	103.0	23.0	2.0
CEEC	52.5	47.5	2.5	1.5
Total	**184.5**	**150.5**	**25.5**	**3.5**

Thus, the Pan-European forest area available for wood supply is around 150 million ha, which is nearly 20% less than the total area of forests. In addition, there is 29 million ha of forests/trees outside the FAWS area also contributing to the wood supply in Europe.

A-2.9 The EFSOS Analysis

I am not able, in this connection, to carry out a complete evaluation of the EFSOS analysis. But I will bring up some aspects, which may influence the assessed possible wood supply for Europe.

The EFSOS analysis (UN, 2005) is using two independent models, as illustrated in Annex figure 2 - K. The demand model (Kangas and Baudin, 2003) is using an econometric approach in order to assess the industrial demand on industrial forest products through 2020. The demand on industrial forest products is converted to "required fellings". The wood supply model (Schelhaas *et al*., 2006) is a simulation model using aggregated silviculture regimes formulated by national correspondents and generates sustainable supplies of wood through 2040. The two models are not linked in an interactive mode. The "interaction" is made by comparisons of the demand requirements and the supply possibilities.



Annex figure 2 - K Main models used in the EFSOS analysis.

According to my opinion this approach generates rather conservative assessments of the wood supply possibilities. The "dynamism" of the forest resources is not fully utilized. I think Annex table 2 - E supports my argument.

Annex table 2 - E: Wood supply and forest dynamics on FAWS according to EFSOS (Schelhaas *et al.*, 2006) baseline scenario.

	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

As stated in EFSOS (UN, 2005), in spite of the fact that the levels of fellings can not be increased above the presented fellings for 2030 and 2040, there is at the same time a substantial increase of the growing stock of 5.5 billion m^3 between 2000 and 2040. There is no objective of the analysis in building up already high growing stocks during the assessment period. To me this is a strong indication that the wood supply possibilities are under-estimated. Back of the envelope calculations indicate that more dynamic management at a Pan-European level could generate at least an additional 90 million m^3 in 2030 and 65 million m^3 in 2040 compared to EFSOS without decreased 2000 growing stock levels. This is also supported by the alternative scenarios produced by EFSOS having lower growing stocks but higher fellings than the baseline scenario.

As seen in Annex table 2 - E, there is currently some 29 million ha of forests outside the forests, which contribute to the wood supply. The supply from this resource is rather unknown, and can not be treated appropriately in the existing supply model. The EFSOS (UN, 2005) has to some extent taken into account this resource but not fully. Back of the envelope calculations indicate that the harvest from this resource could increase by 25 million m^3 in 2030 and 30 million m^3 in 2040 compared to the EFSOS analysis.

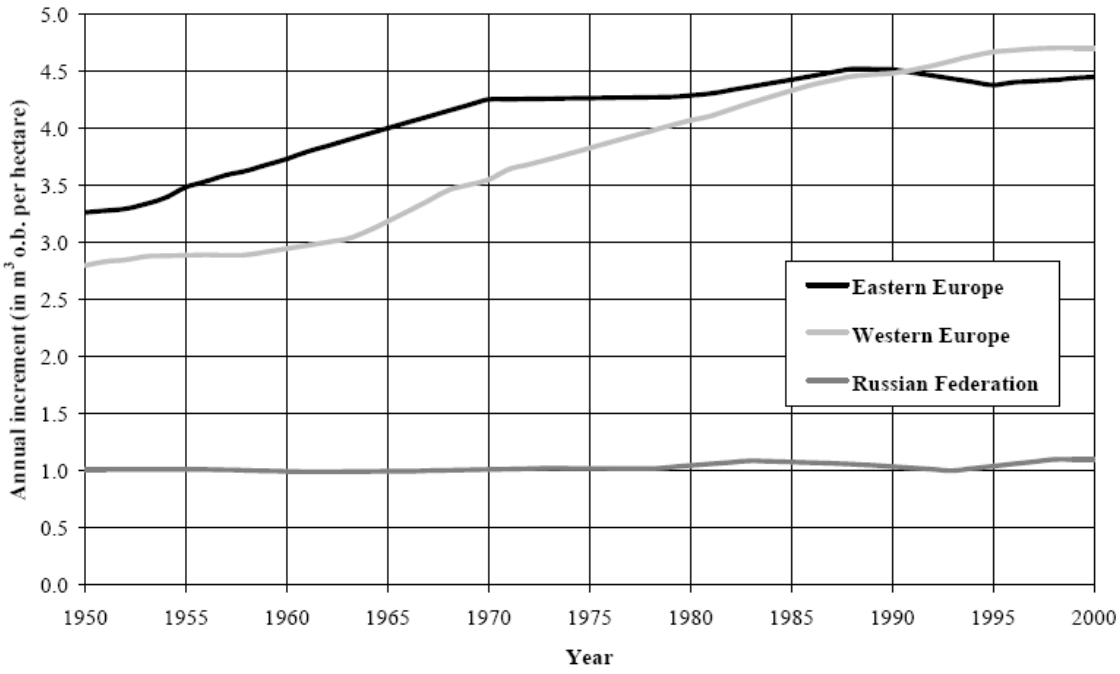
There is also a remarkable difference between "fellings" and "removals" in the analysis. This means that huge volumes are left behind in the forests. The difference for 2030 is 162 million m^3 or some 35% and for 2040 it is 59 million m^3 or 10%. If this is correct there is a big potential of bioenergy to secure at least up to 2030 in the magnitude of 125 million m^3/year.

A-2.10 Under-utilization of Forest Resources

Currently the European forest resources are under-utilized and under-managed. According to Annex table 2 - E the rate of fellings in relation to net annual increment in 2000 was 68% for EU/EFTA and 55% for CEEC. However, the EFSOS (UN, 2005) analysis assumes a much higher utilization rate in the future. In 2030 and 2040, the utilization rates for EU/EFTA are 84% and 89%, respectively. The corresponding rates for CEEC are 89% and 93%. If the net annual increment was going to be fully utilized on the FAWS, there would be an additional supply of some 105 million m^3 in 2030 and 70 million m^3 in 2040.

A more intensified forest management will also have a positive impact on the annual increment. Over time there has been a substantial increase in the increment/ha in Europe. This is illustrated in **Annex figure 2 - L**. EFSOS is *not* assuming any improvements in the future growth in the baseline scenario (Schelhaas *et al*., 2006). Also, the management regimes in the EFSOS represent the forest management in Europe in the 1980s and 1990s (Schelhaas *et al*., 2006).

If the long term trend would continue, and I see no reasons why it could not, the increment per hectare would increase by about 1 m^3/ha in 2030 and 1.5 m^3/ha in 2040 compared with 2000. This would mean an addition of some 160 million m^3 in 2030 and 240 million m^3 in 2040 of net increment and harvest potentials on FAWS.



Annex figure 2 - L: Trends in annual increment per hectare in selected European countries from 1950 to 2000.

Source: derived from Gold (2003, Annexes 5.1, 5.3). Note: the Eastern Europe region excludes the Baltic States and four of the five countries of the former Yugoslavia. The annual increment shown here is for FAWS, except for a few countries where statistics were provided for other definitions of forest area. See UN (2005, Section 1.4.1) for further details and explanation.

A-2.11 Land Use Change

The land use and corresponding land cover is not a fixed entity over time. It changes due to natural, anthropogenic and economic factors. EFSOS (Schelhaas *et al*., 2006) took into account the historical trend in land use change and historical increase in FAWS according to FAO statistics. By this Schelhaas *et al*. assume that the FAWS will increase by 8% in the EU/EFTA between 2000 and 2040, and by 1.9% in CEEC. The latter number seems low given that this is the region for which we can expect the most dramatic changes of agriculture land.

The EEA (2006b) has recently presented detailed land accounts for EEA-24 for 1990 and 2000 and by that an assessment of the land cover changes over this period. The assessment is based on CORINE land cover mapping. CORINE is a land cover inventory derived from satellite imageries. The land cover distribution for 2000 is presented in Annex table 2 - F.

Annex table 2 - F: Land cover account in million ha for EEA-24 in 2000. Source: EEA (2006b).

Artificial areas	17.1
Arable land and permanent crops	116.8
Pastures and mosaics	81.8
Forested area	103.6
Semi-natural vegetation	26.0
Open spaces/bare land	5.2
Wetlands	4.6
Water bodies	4.7
Total	**359.7**

During the period 1990–2000, there were substantial movements between the different land classes. Rough analyses indicate that the future trend increase, on average for the Pan-European level, of forest areas would be +11% between 2000 and 2040. This would generate an additional harvest in 2030 and 2040 of some 25 million m^3/year in comparison to EFSOS. Further down the road, the impacts would be substantially higher. Thus, this is just trend developments. Substantial land areas in Europe are not efficiently utilized. Active land use planning would probably allocate much larger areas to forestry, especially in trying to solve the issues of energy security, climate change and economic growth.

On the other hand, these are theoretical potentials from changed land use and increased FAWS. We know that there are major difficulties, due to socioeconomic constraints, to get full utilization of the FAWS (e.g., EFSOS, UN, 2005). Thus, one of the more difficult issues/questions is how to move the future "socioeconomic supply" to correspond to the "potential supply" from the future FAWS.

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.*

This means that land cover dynamics have to be linked to economic, social and environmental functions in order to suggest relevant future land use policies. In the end, future land use depends on choices made by the society. Thus, this requires a wide involvement of European stakeholders and not only "forestry".

A-2.12 Harvest Biomass Residues

EFSOS (UN, 2005) did not take into account any harvest biomass residues for bioenergy production. This utilization of the forest resources is taking place in a number of European countries but it is a sensitive operation with risk for harming the environment. EEA (2006c) has recently done a study on how much bioenergy EU-25 can produce without harming the environment taking environmental suitability into account. The environmentally compatible bioenergy potential from forest harvest residues in EU-25 is assessed to be 15 million toe in 2010 and 16.3 million toe in 2030. I have used this analysis and results for scaling up to a Pan-European level (Annex table 2 - G).

Annex table 2 - G: Assessed environmentally compatible bioenergy potential from forest harvest residues at Pan-European level in million toe.

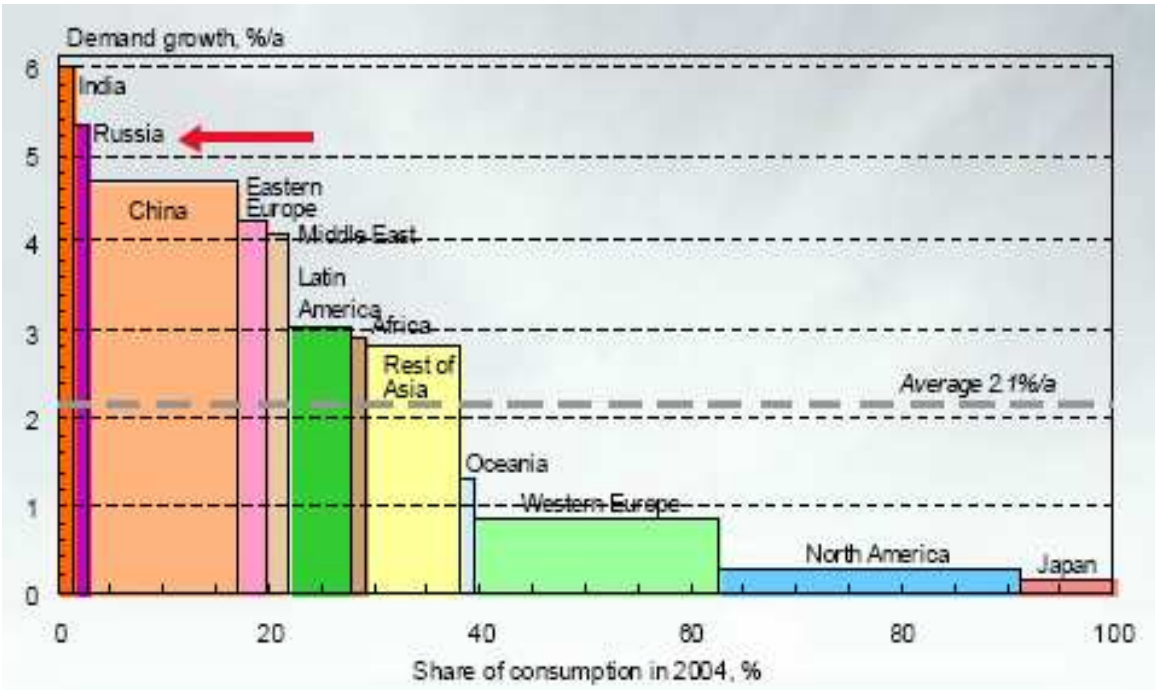
	2030	2040
Pan-Europe	22	22

A-2.13 Forest Industrial Product Demand

Forest demand model (see Annex figure 2 - K) in the EFSOS analysis is based on econometric demand analysis (Kangas and Baudin, 2003) with a time horizon of 2020. However, in the analysis of the wood balance for 2030 and 2040, the demand estimates for these latter years were just prolongations of the demand estimates for the period 2000–2020. This will probably give an over-estimate of the consumption of forest industrial products at the Pan-European level because rather dramatic shifts will take place in demographics during 2020–2040. The population will decrease in absolute numbers and it will grow older. The population of working-age people will decrease by 6–7% during 2020–2040 (UN, 2002) at the Pan-European level. This will result in less consumption of forest industrial products but also less available workforce for the sector.

The EFSOS analysis (UN, 2005) assumes an annual growth rate of the consumption of paper and paperboard in Western Europe of 2.3% during the period 2000–2020. This means an increase in consumption of 45 million tons during this period. Other studies (e.g., Juvonen, 2005) have a substantially lower growth rate in consumption during the same period for Western Europe, namely an annual growth rate of 0.8% in paper and paperboard consumption (see Annex figure 2 - M).

This corresponds to an increase of some 11 million tons, which means a difference of 34 million tons in the assessments. In turn, this corresponds to a difference in wood consumption of some 120 million m^3 of wood. Schulmeyer (2006) has, in an unpublished paper, compared the EFSOS scenarios with real development during 2000–2005. The paper and paperboard consumption has been flat in Western Europe during this period and is about 12% below the scenario (~10 million tons) after five years development. Thus, the real development speaks for the lower growth rate in consumption of paper and paperboard, which also is in line with the development in North America. On the other hand, during the period 2000–2005, Western Europe has managed to compensate the decreased "domestic" consumption of paper and paperboard by increased export resulting in a situation with a close correlation between scenario and real development for production of paper and paperboard. The question is how long Western Europe can keep this position given rapid globalization.



Annex figure 2 - M: Annual growth rates in consumption of paper and paperboard through 2020. Source: Juvonen (2005).

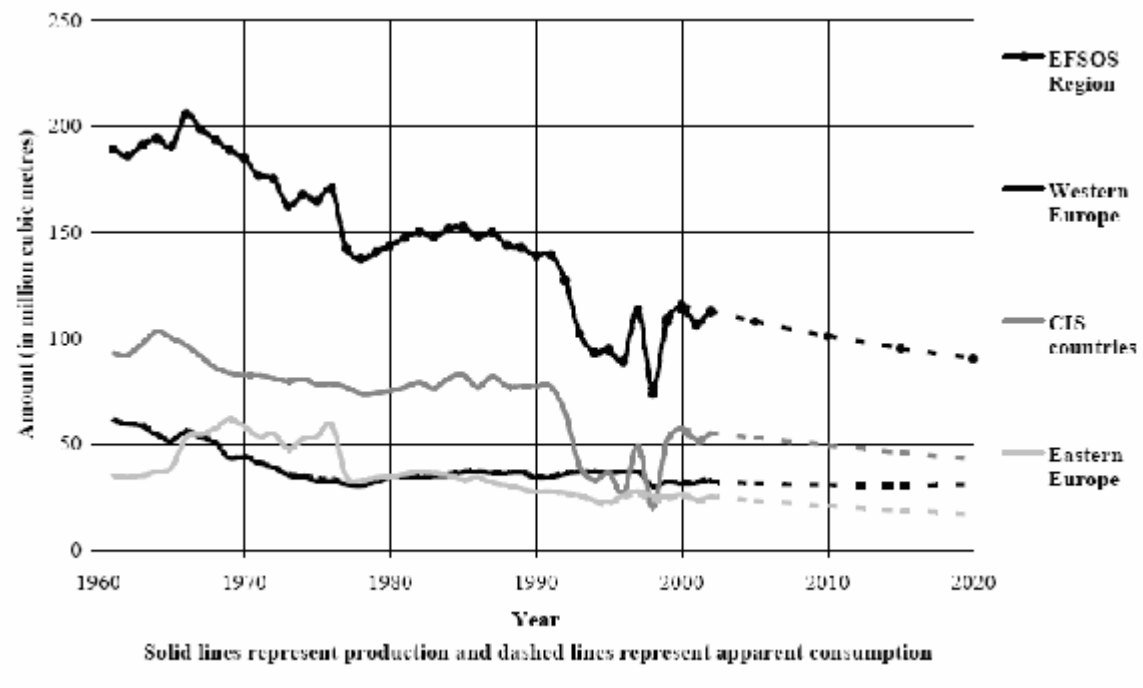
Given the demographic and related socioeconomic changes expected in Europe up to 2040, it is plausible to assume that the consumption estimates on industrial forest products in the EFSOS study are over-estimated.

A-2.14 Woodfuel Demand

The woodfuel demand was not included in the EFSOS demand model (Kangas and Baudin, 2003). Instead an FAO study (Broadhead *et al*., 2005) on global trends in the use and production of woodfuels was employed in assessing the woodfuel development in Europe. The result was an assessed decline in woodfuel consumption as illustrated in Annex figure 2 - N.

As demonstrated in the background paper for this conference by Becker *et al*. (2006), the wood energy supply and use is much larger than recorded (including the EFSOS study). This is not at all any new phenomena but was stressed already, e.g., by Nilsson (1996). Becker *et al*. (2006) present a rough estimate at the Pan-European level on the current woodfuel supply of 250 million m^3/year instead of the 60 million m^3 used by EFSOS.

The right approach with respect to bioenergy, as I see it, is to start from the overall energy demand and energy strategies (if available) and from that try to assess the contribution by wood fuel to the overall energy demand. And that platform I have tried to establish by the earlier discussed Annex table 2 - B.

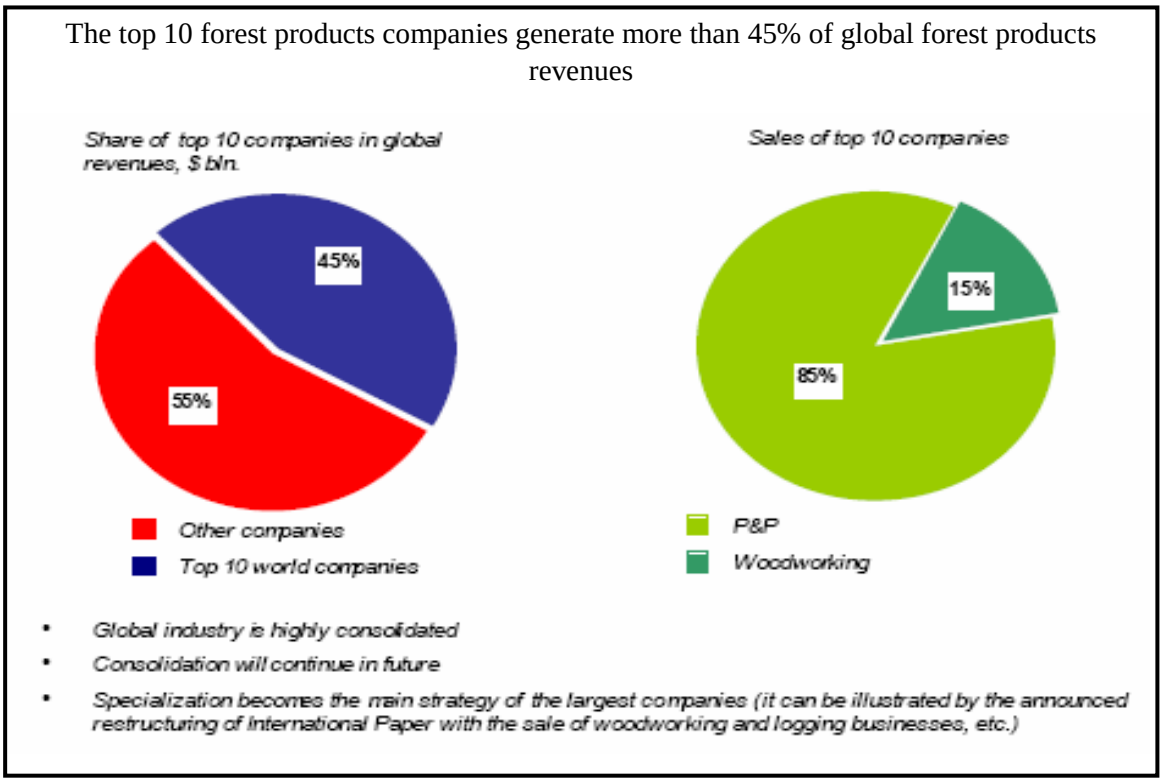


Annex figure 2 - N: Trends and projections for the consumption of woodfuel in Europe. Source: Broadhead *et al.* (2005).

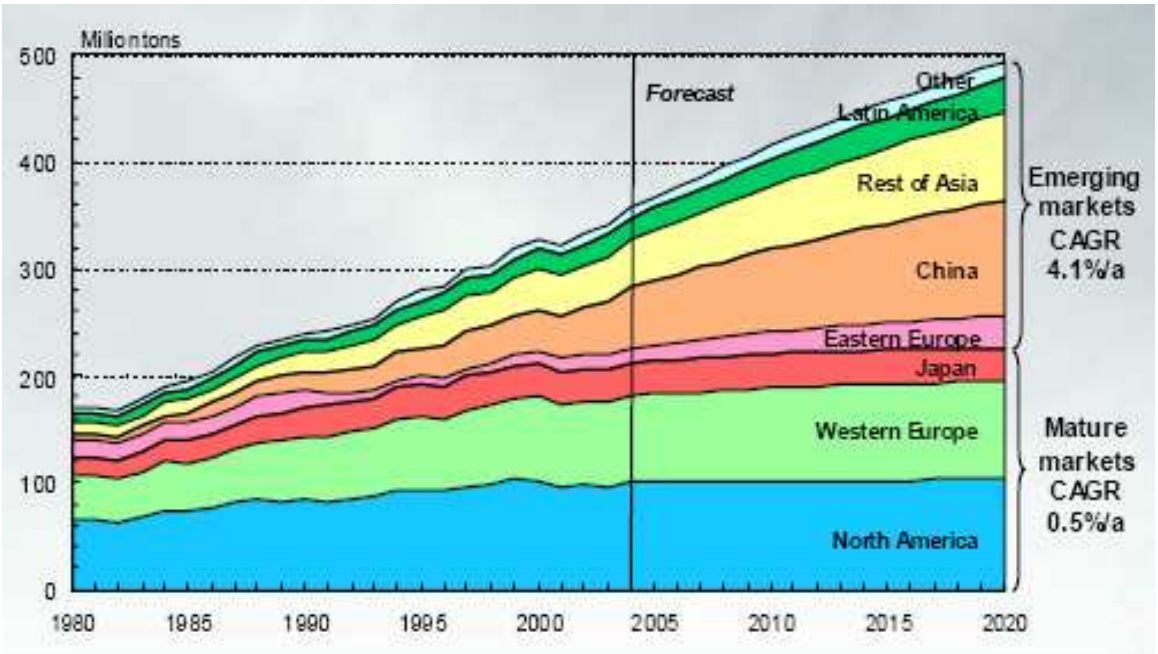
A-2.15 Globalization

The globalization process has changed the rules of the game of the traditional European forest sector rather dramatically. The long-distance transportation costs have been reduced, stimulating the trade of forest products. The globalization process has generated a consolidation of the forest industry, especially the pulp and paper industry, as illustrated in Annex figure 2 - O.

Globalization has also reduced the dependence by the forest industry on local supplies of raw materials. Companies are now utilizing materials from different sources and locate the manufacturing where the markets develop. Thus, the location and development of the forest processing sector is now influenced less by the availability of forest resources and more by the prevailing investment climate and general economic conditions (Brown, 2000). This has resulted in a shift, especially in the pulp and paper industry, from the traditional producer regions to the South. This is illustrated by Annex figure 2 - I.



Annex figure 2 - O: Trends in the Global Forest Products Industry. Source: Graves (2005).



Annex figure 2 - P: Scenario on world demand for paper and paperboard, 1980–2020. Source: Juvonen (2005).

This development is bringing in new global players. The development can be illustrated by China. China has limited forest resources, limited energy resources, limited water supply, etc., but has a rapid market development and access to inexpensive capital. The latter factor is crucial for the future development of the sector.

China has by far the fastest growing paper industry in the world. Recent expansion has been active with large, modern, high-speed equipment, which is very cost-efficient. This development can be illustrated by the capacity expansion in Annex table 2 - H.

Annex table 2 - H: Examples on paper and paperboard development in China. Source: after Flynn (2006).

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

Low labour costs have *not* been a driving force for this development and the competitiveness of the Chinese Pulp and paper industry. The key factor is *high and inexpensive* capital investments. The expansion can be explained by *inexpensive government loans and subsidies*. This results in an *overcapacity* and *skewed competitiveness* with major implications for the *global pulp and paper industry*. However, the resource-growing pattern of developing Asia in general, here illustrated by China, has created severe environmental problems in developing Asia like, land degradation, deforestation, water shortage, deteriorating water quality and vulnerability to natural disasters. Such growth patterns will prove to be unsustainable (Park and Zhai, 2006).

In the EFSOS (UN, 2005) study, it was concluded that the globalization process would have impacts on the European forest sector as illustrated in Annex table 2 - I.

Annex table 2 - I: Impact of globalization on the competitiveness of the European forest sector (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

However, I think, based on the most recent experiences of globalization, that another matrix can be produced, with respect to the impact of globalization on the competitiveness of the European forest sector (Annex table 2 - J). I have already discussed some aspects of globalization of the bioenergy in Section A-2.7.

Annex table 2 - J: 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. Pro-duction**	**Consump-tion**	**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.

Where does it leave us with respect to future demand on forest raw material?

I think there is a high probability that the demand on wood for traditional industrial products will be lower than assessed in the EFSOS baseline scenario due to increased globalization and competition during the period 2000–2040. But the question is for how long this increased competition will last. Nilsson (2006b) has demonstrated that there is a substantial over-harvest taking place in Asia and in large parts of Africa and that the demand/supply situation in Latin America will grow much tighter in the future. In the same document, Nilsson (2006b) points out that the rate of industrial forest plantations have decreased substantially during the last decade and are foreseen to decrease further in the future. Given the uncertainties surrounding the impacts of globalization on the traditional forest sector, I think it is wise for the moment to use the existing baseline scenario of EFSOS with respect to industrial production of forest products in Europe for planning purpose with respect to wood utilization. However, I think it is crucially important for Europe to try to do solid impact analysis of globalization on the traditional forest industrial sector in Europe.

Policy Recommendation V. *Urgently, Europe should carry out solid assessments of the impact of globalization on the competitiveness of the European forest sector.*

A-2.16 Conclusions on EFSOS

I have discussed a number of issues, although far from complete, of the EFSOS analysis which may affect the resulting wood balance for Europe through 2040. This should not at all be regarded as criticism of EFSOS but rather as identification of issues important for the wood balance and important to follow carefully in the future. Given the debate and the developments foreseen, I think it is important to do yearly updates of the EFSOS wood balance based on available knowledge. At the end of the day, EFSOS is the most advanced instrument we have with respect to consistent future wood balances for Europe.

Policy Recommendation VI. *The ECE should carry out simplified yearly updates of the Pan-European wood balance through 2040.*

A-2.17 European Bioenergy Production from Other Sources than Forest Biomass

In order to approach a future wood balance for Pan-Europe, I think it is also important to assess how much bioenergy Europe can produce from agriculture and biowaste. EEA (2006c) has, in the same way as for forest biomass residues, analyzed environmentally compatible bioenergy potentials from

agriculture and waste. I have used the data and results for scaling up to a Pan-European level and the results are presented in Annex table 2 - K.

Annex table 2 - K: Environmentally compatible bioenergy potentials from agriculture and waste at Pan-European level in million toe.

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

About 45% of the waste potential is stemming from forest related products like black liquor, waste wood and wood processing residues. Some 40–45% of the agriculture potential is assessed to come from short-rotation forest bioenergy and tall grasses.

Thus, there are huge potentials in agriculture energy production. However, earlier I have expressed concerns about energy farming because it is not energy, cost, and climate efficient. But there is a high risk that the current subsidies for traditional agricultural production will turn into subsidies for energy farming and in that case a development in this direction is difficult to change.

Policy Recommendation VII. *Europe should carry out Pan-European analysis of the energy, cost, and climate efficiency of agriculture energy farming.*

A-2.18 Wood Balance Through 2030/2040

In the following I will try to summarize the earlier discussion in the form of a calculation example of a wood balance at the aggregated level of Pan-Europe. The wood balance may give an indication of a possible need and magnitude of wood mobilization.

In this example, I will use EFSOS (UN, 2005) baseline scenario as a platform.

The industrial demand according to the EFSOS baseline scenario and the possible sustainable fellings according to EFSOS are presented in Annex table 2 - L.

Annex table 2 - L: Basic wood balance 2030/2040 in million m^3.

	2030	2040
Demand expressed as annual fellings (EFSOS, UN, 2005)	680	710
Over-estimated industrial demand (see Section A-2.13)	560	587
Sustainable fellings (EFSOS, UN, 2005)	630[a]	660[a]

[a] There is a variation in the EFSOS numbers depending on the sources used. The original Schulhaas et al. (2006) analytical numbers gives somewhat lower felling numbers than UN (2006).

If we take the baseline scenario according to EFSOS there are difficulties to meet the industrial demand after some time around 2020 and there will be a deficit in supply for 2030 and 2040 of some 50 million m^3/year. But if I am right in my assumption that the industrial demand of paper and paperboard is substantially over-estimated there is more than sufficient wood supply of industrial wood also in the future and no mobilization is needed.

The picture will be more complicated when we try to incorporate the energy sector to the wood balance. If we do a partial energy balance for 2030 based on OECD/IEA (2006) reference scenario

(Annex table 2 - B) and an allocation of assessed bioenergy potentials (Sections A-2.12 and A-2.17) in an "optimal" way we get a result in line with Annex table 2 - M. Of course, an "optimal allocation" will never happen in reality. But the approach will help in sorting out the magnitude of the problems concerning woodfuel demand.

Annex table 2 - M: Partial energy balance for 2030 and Pan-Europe based on the modified OECD/IEA (2006) reference scenario; expressed in 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			

As seen in Annex table 2 - M, an "optimal" allocation of the bioenergy potentials will cover the demanded amount of biofuels, biomass, heat generation and 76 million toe of the gas demand.

But this will not solve the overall problem of energy security in the form of volatility in supply and prices and improved climate. How much reduction of fossil fuels do we need in order to make a dent in the overall problem? Who knows?

But Stern (2006) assessed that to stabilize the climate by a GHG concentration of 500–550 ppm the emissions have to be *25% below the 2005 emission level by 2050*. It should be stressed that the increase of CO_2 emissions during 2005–2030 in the OECD/IEA (2006) reference scenario (Annex table 2 - A) increases by 55% at the global level. This means that the 2030 emissions should be reduced by 80% in order to reach a stabilization of the climate according to Stern (2006). This is more than a daunting task.

How much has the fossil fuel consumption to be reduced in order to avoid volatility in prices and supplies? I do not know. But based on the recent discussions in the EC and numbers released on 10 January 2007, it appears that the Commission's view is now that fossil fuels should be reduced by 20% by 2020. Half of the reduction should be through bioenergy and the other half by other renewables. Therefore, a reduction target of 25% of fossil fuels for 2030 does not seem to be out of scope. This reduction corresponds to a reduction of 295 million toe (after the existing bioenergy potentials have already been used). This amount of energy can theoretically be replaced by increased renewable energy of hydro-, geothermal-, wind-, solar energy, etc. It can also be replaced by increased nuclear energy production. But it will be difficult to generate all the

needed energy through these means. We assume 50% of the need can be secured this way. But this means 150 million toe needs to be covered by woodfuels. This corresponds to some 450 million

m^3/year in 2030. As discussed in Section A-2.7, some of this can be covered by import to Europe. Based on current trends, the import potential points may be in the magnitude of 50 million m^3 or 15 million toe in 2030. This means a needed additional demand of 400 million m^3 at the Pan-European level. If this additional "demanded" volume is inserted to our wood balance in Annex table 2 - L, it can be seen that there will be *substantial supply problems of wood* and that there *will be strong competition between traditional industrial use of wood and the energy sector*.

I am fully aware that this is just a calculation example with all kinds of deficits but I think it illustrates the magnitude of the problem.

Thus, I would strongly argue that there are strong reasons for wood mobilization at the Pan-European level if we are going to tackle the overall problems of economic growth, energy security and a stabilized climate.

A-2.19 The Story Line

The story line that can be made based on the earlier discussion can be summarized as outlined in Annex table 2 - N.

Annex table 2 - N: Story line summary.

Assumption	Need for Mobilization
1. EFSOS baseline scenario and environmentally compatible bioenergy from forest residues, agriculture and waste.	Moderate mobilization of industrial roundwood is required. Some 20–50 million m^3/year (depending on which EFSOS numbers for fellings are employed).
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.

A-2.20 Wood Mobilization

It is a Herculean task to find an efficient path of policies and actions for balancing energy security, improved climate, sustained economic growth and a sustainable industrial forest sector in Europe. The problem is not becoming easier by the fact that impacts of actions taken have to materialize rather soon in order to be efficient.

Based on the discussions in Sections A-2.8–A-2.11 a number of possible actions for mobilization of increased wood supply can be identified. The list of actions identified is far from complete and there are many other actions to take. But the following wood mobilizing actions have been identified (without priority):

- 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.

From a timing point of view, the highest efficiency in the mobilization will come through implementation of *management regimes with balanced development of growing stocks and intensified management and utilization of existing Pan-European forest resources*.

There are big potentials for increased forest biomass production by change and more efficient land use of the Pan-European land base. But the major impacts will come further down the road - beyond the time horizon discussed in this paper.

If we bring back the impact of the above discussed mobilization measures to the wood balance in Section A-2.18, a rough assessment indicate that these actions could generate some 325 million m^3 in 2030 and 425 million m^3 in 2040, meaning that the earlier discussed gap in the wood balance can be nearly closed.

Thus, in theory there are big potentials resting in the wood mobilization.

But the mobilization of wood will not come for free. It will cost a substantial amount of financial resources. There is a need to cost out the mobilization measures discussed in order to set the right priorities in a mobilization programme

Policy Recommendation VIII. *Europe has urgently to cost out available wood mobilization options and assess the impact over time of the different measures.*

A-2.21 Policy Implementation

Thus, I think an effort to mobilize more wood resources in Europe makes sense as we see the problems today.

Markets alone will not take care of the needed resource mobilization, policy interventions are needed. These policy interventions must be based on cross-sectoral coordination. As seen from the earlier discussion, the complexity of the problems requires not just a mobilization of the forest sector but a *mobilization of the society*.

The current policy debate is for the moment coloured as a conflict between traditional forest industry and energy interests. I think this attitude is dead wrong. *The current development will generate renewal of the existing industry with new businesses and products and enhanced competitiveness of the industry and forestry*. This should constitute the platform for the required future policy interventions.

Europe does not have any great record with respect to implementation of strong unified policies in the forest sector. Different policy formulations exist but the implementation is lacking (e.g., MCPFE process). The reasons for this are probably manifold. Among others, Nilsson (2005) and Byron (2006) have discussed the lack and difficulties of implementation of policies in the forest sector. One reason is that an economy- and society-wide approach in analyzing, formulating and implementing the policies is lacking. Another reason is lack of efficient institutions.

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 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?*

To finalize, I would like to make two citations.

Glesinger (1949) stated "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".

Nilsson (1996) stated: "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".

It seems like these insights are now becoming ripe for acceptance in the forest sector.

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Annex 3 EU policies influencing the use and mobilization of wood, including for energy purposes

Presentation jointly given by the European Commission: Jeremy Wall, DG Enterprise and Industry, and Ignacio Seoane, DG Agriculture

A-3.1 Background

European energy policy is facing several challenges:

- high and volatile prices for oil and gas,
- global energy demand - and thus CO_2 emissions - is predicted to increase by 60% over the next 30 years;
- over the same period EU energy dependency could rise from 50% to 70%, mostly from regions threatened by insecurity;
- matching sustainability with competitiveness, as in the Lisbon Agenda.

However, under the Kyoto Protocol, the EU has to reduce its greenhouse gas (GHG) emissions by 2012 by 8% of the 1990 level.

A-3.2 EU policies and targets

Already, in 1997 the "White Paper" set an indicative target of 12% of all consumed energy to be derived from renewable energy sources (RES) by 2010.

Biomass, as a major component of the renewable energy mix was foreseen by the "White Paper" to provide150 Mtoe per annum by 2010, made up from agricultural crops and residues, forest biomass, including residues, and bio-degradable municipal waste.

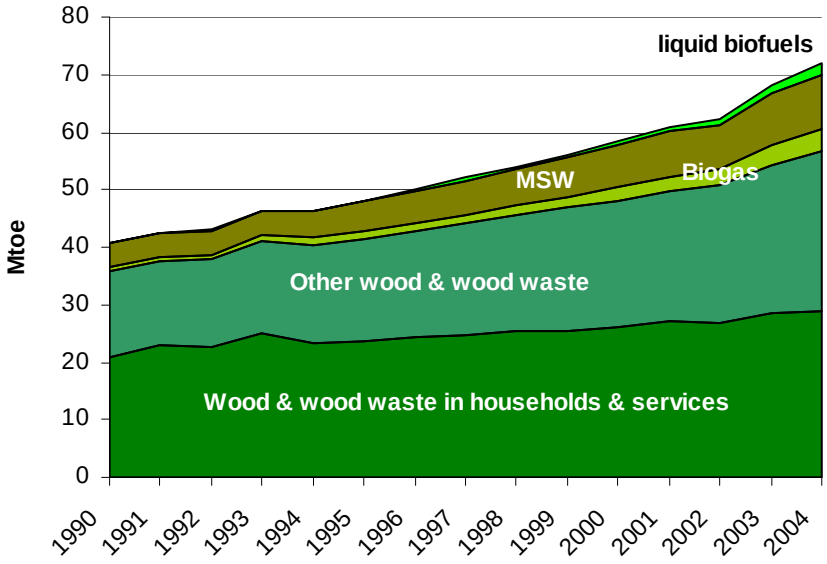
Each of these resources can be converted into any of the three universal types of energy output: heat, electricity and transport fuels. However, the related efficiencies and convenience vary enormously. No specific target was set, either for any of the different types of renewable energy or for any bioenergy source. However, certain estimates were made, including that 27 mtoe equivalent per annum of wood biomass could reasonably be used by 2010.

Since 1997 a number of different policy instruments, including legislation for renewable energy and energy efficiency, have been developed and agreed by EU Member States (Annex table 3 - A).

Annex table 3 - A: Political and legislative instrument for renewable energy and energy efficiency at EU level

		Sector	
Political and legislative instruments:	**Year**	**Renewable Energy**	**Energy Efficiency**
White Paper on renewable energy sources	1997	**X**	
Green Paper on Security of Energy Supply	2000	**X**	**X**
Directive on RES-electricity	2001	**X**	
Directive on Energy Performance of Buildings	2003	**X**	**X**
Directive on Biofuels	2003	**X**	
Directive on a Scheme for GHG Allowance Trading	2003	**X**	**X**
Directive on the Taxation of Energy Products	2003	**X**	**X**
Directive on Co-generation	2004	**X**	**X**
Green Paper on Energy Efficiency	2005		**X**
Green Paper on Energy	2006	**X**	**X**
2020 targets	2007	**X**	

Despite these measures, the 12 % "target" for renewable energy as a whole has remained a long way from being achieved, with biomass overall lagging far behind. (Even so, wood biomass has been widely used and indeed provided the mainstay - 80 % - of all biomass, as shown by Annex figure 3 - A). Thus, in 2004, the EC produced a report on RES generation and use as a prelude to subsequent policy instruments, notably the EU Biomass Action Plan (October 2005) and the EU Bio-fuels Strategy (January 2006). Amid increased concern about energy security and prices, as well as climate change, a binding target for RES under the energy and climate package was developed in early 2007, requiring 20% of overall energy consumed to come from renewable sources by 2020.



Annex figure 3 - A: Components of renewable energy from biomass and waste in the past

The new individual EU quantitative targets for each of green electricity, heating and cooling, and transport bio-fuels add up to an additional 80 Mtoe from biomass in 2010 compared to the 2003

consumption. This would correspond to 440 million m^3, if it were all wood, which should not be the case, but would be incompatible with wood-processing industries. (Annex table 3 - B)

Annex table 3 - B: "Targets" for EU Biomass Action Plan and Bio-fuels Strategy under the assumption that all biomass used were wood, which will NOT be the case (agricultural residues, municipal waste and liquid bio-fuels should also play significant roles).

	2003	**2010**	**Difference (2003 to 2010)**
Green Electricity	110 Mm^3	303 Mm^3	(35 Mtoe) +193 Mm^3
Heating & Cooling	264 Mm^3	110 Mm^3	(27 M toe) +149 Mm^3
Transport Bio-fuels	6 Mm^3	105 Mm^3	(18 M toe) +99 Mm^3
TOTAL	380 Mm^3	264 Mm^3	+440 Mm^3

A-3.3 Forest resources and their potential

The EU forest area is steadily increasing (about 400,000 ha/year) and less wood is harvested than annual growth (574 m^3 over bark on 160 million ha forest and wooded land). A recent study by the European Environment Agency[29] showed that there is potential to harvest another 40 mtoe (corresponding to about 200 million m^3) of woody biomass in the forest without harming the environment and respecting protected forest areas.

Additional sources for wood fibre could be forest-harvesting residues, additional wood sources inside and outside the forest (e.g. unutilized forest areas, short rotation forest and agricultural forestry plantations) and post-consumer recovered wood and fibre. It remains to be assessed at national level, through national biomass action plans (nBAPs) which strategies are feasible to mobilize additional wood resources, and which quantities are realistic to obtain. In order to address this issue, better statistical information is required.

Logistics and harvesting costs are also important factors for increasing wood supply, in particular in remote areas having low forest stocking densities and sub-optimal infrastructures. It has to be discussed how such costs could be overcome without unduly distorting the markets, recognising the higher added value chain to be achieved in the forest-based industries compared to the wood-based energy sector. Nonetheless, profitability, capital intensity and returns on investments have to be taken into account when comparing these sectors.

A-3.4 The forest sector

Forest-based and related industries (including woodworking, pulp & paper and printing) are an important economic element in Europe, considering their economic value and employment. Industry also plays an important role in co-ordinating and mobilizing wood raw material, as well as an energy consumer and producer. Thus, the competitivity of forest-based industries is vital to be maintained.

Biomass policies and strategies can be an opportunity as well a risk for the forest-based and related industries. Therefore, scales and cost of various bio-energy measures need to be assessed, in particular in the context of national biomass plans. Taking the heterogeneity of Europe's forest and market structures into account, it is important to develop strategies for biomass on national and regional levels.

Opportunities arising from the use of biomass for energy are foremost for forest owner, offering wider markets, but as well for sawmills, being able to sell their by-products. But there are also risks

[29] EEA (2006): How much bioenergy can Europe produce without harming the environment? European Environment Agency, Report 7/06. 67pp.

connected with the increasing demand for biomass. Additional wood mobilization may be inhibited through existing market, institutional and fiscal frameworks. Unfocused demand for wood, unmatched by supply, can create bottlenecks and high prices to the detriment of both the energy and forest-based and related industries. End-use subsidies, e.g. the use of high feed-in tariffs for the production of "green electricity" may not pull previously unused biomass from the forests or gather post-consumer residues, but rather compete with existing wood-processing industries. Energy efficiency may not be optimized and optimal use or full added-value may not be derived from the wood. As a consequence wood-based products may be priced out of the market in favour of less sustainable materials.

A-3.5 Forest Action Plan

The EU Forest Action Plan (FAP) was adopted in June 2006, following on from the Forest Strategy from 1998, and it should provide a framework for forest-related actions and serve as an instrument for co-ordination between EU actions and Member State forestry policies. Its main goal is to enhance sustainable forest management and the multifunctional role of forests through four operational objectives:

- improve long-term competitiveness of the forest sector;
- maintain and enhance biodiversity, carbon sequestration, integrity, health and resilience of forest ecosystems;
- contribute to enhancing the social and cultural dimension of forests; and
- improve coherence and coordination in forest related matters.

The FAP identifies 18 key actions that the Commission proposes to implement together with the Member States. Key Action 4 focuses on the promotion of forest biomass for energy generation, and within this point four main topics are identified:

1) assessment of the availability and possibilities for increased mobilization of small/low-value timber and harvesting residues for energy; disseminate good practices;
2) assessment of the feasibility of using forest residues and tree biomass for energy in the context of sustainable forest management; examination of environmental limits;
3) examination of possibilities for co-operation between forest owners in energy projects;
4) support for research and development for heating and cooling, green electricity and fuels from forest resources

In 2003 an important reform in EU Agricultural Policy was carried out, including to increase the agricultural production of energy biomass. The most relevant changes were:

- the de-coupling of subsides from production (now linked to the area),
- a scheme for the promotion of non-food crops on set-aside areas,
- an energy crop scheme (subsidies for energy crops) and
- a reduced scope for steering production, enabling farmers to act more independently and economically.

A-3.6 EU Rural Development Policy

The EU Rural Development Policy promotes sustainable development in rural areas. also It does so partly by integrating forestry with measures for renewable energy production. The EU Rural Development Regulation (2007 - 2013) supports farmers and the forest sector to increase the use of forest resources for energy, thus:

1) Competitiveness should be improved by restructuring physical potential and promoting innovation through a) investments adding value to agricultural and forestry production, b) cooperation for development of new products, c) processes and technologies (e.g. biomass for energy), and d) improving and developing infrastructures related to the development and adaptation of agriculture and forestry (e.g. energy supply).
2) In land management and environment the main activities are the first afforestation of agricultural land (including fast-growing species for short-term cultivation) and forest fire prevention (e.g.. removal of dry materials for preventative silviculture).
3) The regulation also provides support for diversification of the rural economy (diversification to non-agricultural activities; support for micro-enterprises), improvement of quality of life (basic services; small-scale infrastructure), and training and capacity building.

However, rural development is based on subsidiarity. Thus, the EU Member States themselves will finally decide how to implement policy, depending on the national characteristics and priorities. In any case, the financial support for forestry measures under the Rural Development Regulation between 2000 and 2006 was about 4.6 billion Euros.

A-3.7 Communication document on forest-based industries

As a complement to the Forest Action Plan, a communication document on "the Innovative and Sustainable Forest-based Industries is being developed, looking at the major challenges facing the sector and seeking to identify remedial actions. The main principals and objectives of this document are to enhance the competitiveness of the forest industries by inter alia:

- recognising their role in the mitigation of climate change,
- supporting research and development, and
- facilitating the industries' access to sufficient wood raw material supply, as well as affordable energy.

A-3.8 Conclusion

Four main conclusions should be noted:

1) Several factors influence the availability of wood and its increased use for energy. On the one hand there is the forest resource itself, its status and management, ownership structure, as well as growth and harvesting rates, all determining the amount of wood to be supplied. On the other hand, wood availability depends on demand, namely the presence, scale and intensity of wood-processing industries, the presence and intensity of energy-producing industries and the financial instruments supporting them, as well as population density and the demand for household firewood. But there are also other factors like access and transport cost in the forest, technical capability, market structure and, last but not least, the motivation of the forest owner to harvest.
2) More wood biomass can be mobilized by increasing the area and intensity of existing harvesting, by developing new forests and other wood-fibre crops, increasing the use of residues – both forest and post-consumer, and increase the source of recovered fibre. In any case, increased mobilization of the EU forest resources, both financially and physically is the responsibility of both the forest owner and the wood-using industries. In addition to these, raw material and energy efficiency in production and use is decreasing the pace of demand for wood raw material.
3) Economic instruments especially subsidies, should be used with caution with the aim to mobilize more forest resources, the wood supply chain including forest owners, and minimize undue distortions of competition and cross-border differentials.

4) Forest and agricultural energy resources can better be developed by using a package of co-ordinated measures including an appropriate European and national policy and institutional framework, including public authorities, forest owners, forest contractors and wood-processing industries. Financial incentives can support such development.

A-3.9 Future EU activities

The European Commission is working on different activities in this area. One task is to develop national Biomass Action Plans (nBAPs), integrating the implementation of different policies and legislative measures on renewable energy sources and energy efficiency. A special action by the Commission will be a review of the impact of the energy use of wood and wood residues on the wood-processing industries. Best practices on biomass action plans can be catalogued and disseminated, and RTD thematic programmes and calls can be used in a supportive way. Furthermore, “packages” of technical, institutional, financial and fiscal measures can be encouraged to enhance the competitiveness of forest-based industries and the wood-energy sector by optimising both resource use and society’s energy, job and product needs. As a platform of information exchange the Renewable Energy Sources Working Group (RES WG) has been reconvened. It involves all relevant forest-based industry stakeholders involved in bio-energy. A new working group under the, Standing Forestry Committee, including forest-based industries and member states, will focus on wood mobilization, whilst a third group will concentrate on national Biomass Action Plans, including the foreseen use of wood biomass.

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Workshop on Mobilizing Wood Resources

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Annex 5 Programme of the workshop

Thursday, 11 January: Presentations and Discussion	
Chairperson: Mr. Bernard de Galembert (CEPI)	
09:00 - 09:10	**Welcome by** **Michael Gautschi (Swiss Federal Office for the Environment),** **Roman Michalak (MCPFE, LUW) and** **Bernard de Galembert (Chairman)**
	Presentations and Discussion: Background
09:10 - 09:35	**Scientific / Market Background** Prof. Sten Nilsson, Deputy Director, International Institute for Applied Systems Analysis (IIASA), Austria
09:35 - 10:00	**Overview of Forest Sector and Bioenergy Policies** Joint presentation by EU: Jeremy Wall (DG Enterprise) and Ignacio Seoane (DG Agri)
10:00 - 10:30	Discussion
10:30 - 11:00	Coffee Break
	Presentations and Discussion: Case studies on Mobilizing Wood Resources
11:00 - 11:20	**Countries in Transition** Jurij Begus, Slovenia Forest Service
11:20 - 11:40	**Mobilizing wood in Russia in the light of the new forest code** Maria Palenova, Agency of Forestry, Ministry of Natural Resources of the Russian Federation
11:40 - 12:00	**Southern Europe** Iñaki Isasi Pérez, Executive President, Union des Sylviculteurs du Sud de l'Europe, USSE
12:00 - 12:30	Discussion
12:30 - 14:00	Lunch Break
	Presentations and Discussion: Strategies
14:00 - 14:20	**Organization of Sustainable Supply of Raw Material for Wood Based Industries** Elisabet Salander Björklund, Senior Executive Vice President, Stora Enso Forest Products
14:20 - 14:40	**Strategies for Supply of Raw Material in the Energy Industry** Michael Deutmeyer, CEO, CHOREN Biomass GmbH, Germany
14:40 - 15:00	**Wood Supply Chain in Sweden** Christer Segersteen, Vice Chairman of Södra Wood Products, Sweden
15:00 - 15:30	Discussion
15:30 - 16:00	Coffee Break
	Presentations and Discussion: Existing approaches and Impacts
16:00 - 16:20	**Increased Wood Mobilization - a Forest Owner's Point of View** Stefan Schenker, President of the CEPF
16:20 - 16:40	**Sub-national approach for wood mobilization in North Rhine-Westphalia, Germany** Josef Herkendell, Ministry of the Environment, NRW, Germany
16:40 - 17:00	**Interaction and Conflicts of Wood Supply and Policy Measures, a Case Study from Vienna-Simmering** Winfried Süss, Austrian Federal Forest AG (ÖBf AG)
17:00 - 17:20	**Environmental Impacts of Increased Wood Mobilization** Karin Wessman, Policy Manager, WWF international
17:20 - 18:00	Discussion
19:00 - 21:00	Evening Reception

Working groups:

Friday, 12 January: Working groups	
Chairperson: Mr. Kit Prins (UNECE)	
9:00 - 12:00	**Working Group Session:**
	A) Strategies for wood mobilization - technical focus working group moderator: Bo Dahlin, University of Helsinki
	B) Influence of policy / measures to promote wood mobilization - policy focus working group moderator: Wilhelm Vorher, Thosca Holz, Germany
	C) Implication of increased wood mobilization on different sectors - crosscutting focus working group moderator: Duncan Pollard, WWF international
12:00 - 12:30	**Drafting recommendations** within each working group
12:30 - 13:30	Lunch Break
13:30 - 14:30	**Regional Working Groups:**
	A) Northern Europe and Russia working group leader: Heikki Pajuoja, Managing Director, Metsäteho Oy
	B) Central and Southern Europe working group leader:
	C) Eastern Europe working group leader: Piotr Paschalis-Jakubowicz, Warsaw Agricultural University
14:45 - 15:30	**Presentation** of the results of the working groups
15:30 - 16:45	**Discussion** and **final recommendations**
16:45 - 17:00	**Conclusions** and closing of the workshop

Some facts about the Timber Committee

The Timber Committee is a principal subsidiary body of the UNECE (United Nations Economic Commission for Europe) based in Geneva. It constitutes a forum for cooperation and consultation between member countries on forestry, the forest industry and forest product matters. All countries of Europe, the Commonwealth of Independent States, the United States, Canada and Israel are members of the UNECE and participate in its work.

The UNECE Timber Committee shall, within the context of sustainable development, provide member countries with the information and services needed for policy- and decision-making with regard to their forest and forest industry sectors ("the sector"), including the trade and use of forest products and, when appropriate, will formulate recommendations addressed to member Governments and interested organizations. To this end, it shall:

1. With the active participation of member countries, undertake short-, medium- and long-term analyses of developments in, and having an impact on, the sector, including those offering possibilities for the facilitation of international trade and for enhancing the protection of the environment;
2. In support of these analyses, collect, store and disseminate statistics relating to the sector, and carry out activities to improve their quality and comparability;
3. Provide the framework for cooperation e.g. by organizing seminars, workshops and ad hoc meetings and setting up time-limited ad hoc groups, for the exchange of economic, environmental and technical information between governments and other institutions of member countries required for the development and implementation of policies leading to the sustainable development of the sector and to the protection of the environment in their respective countries;
4. Carry out tasks identified by the UNECE or the Timber Committee as being of priority, including the facilitation of subregional cooperation and activities in support of the economies in transition of central and eastern Europe and of the countries of the region that are developing from an economic perspective;
5. It should also keep under review its structure and priorities and cooperate with other international and intergovernmental organizations active in the sector, and in particular with the FAO (Food and Agriculture Organization of the United Nations) and its European Forestry Commission, and with the ILO (International Labour Organization), in order to ensure complementarity and to avoid duplication, thereby optimizing the use of resources.

More information about the Committee's work may be obtained by writing to:

UNECE/FAO Timber Section
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UNECE/FAO Publications

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Forest policies and institutions of Europe, 1998-2000	ECE/TIM/SP/19
Forest and Forest Products Country Profile: Russian Federation	ECE/TIM/SP/18
(Country profiles also exist on Albania, Armenia, Belarus, Bulgaria, former Czech and Slovak Federal Republic, Estonia, Georgia, Hungary, Lithuania, Poland, Romania, Republic of Moldova, Slovenia and Ukraine)	
Forest resources of Europe, CIS, North America, Australia, Japan and New Zealand	ECE/TIM/SP/17
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UNECE/FAO GENEVA TIMBER AND FOREST DISCUSSION PAPERS

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In all cases, the author(s) of the discussion papers are identified, and the papers are solely their responsibility. The designation employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. The UNECE Timber Committee, the FAO European Forestry Commission, the Governments of the authors' country and the UNECE/FAO secretariat, are neither responsible for the opinions expressed, nor the facts presented, nor the conclusions and recommendations in the Discussion Paper.

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Mobilizing Wood Resources: Can Europe's forests satisfy the increasing demand for raw material and energy under Sustainable Forest Management?

Workshop Proceedings - January 2007

These proceedings, from the January 2007 workshop *Mobilizing Wood Resources*, provide background information and summarize the main presentations given at the event as well as the discussions. They also present the strategies and recommendations from the working groups on how to mobilize additional wood resources in Europe to meet the needs of wood manufacturers, who want to remain vital and competitive, and the bioenergy sector, who would like to produce more energy from carbon neutral sources such as wood.

UNECE Timber Committee and FAO European Forestry Commission

Further information about forests and forest products, as well as information about the UNECE Timber Committee and the FAO European Forestry Commission is available on the website www.unece.org/trade/timber

Information about the UNECE may be found at www.unece.org and information about FAO may be found at www.fao.org

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