

# **Mobilisation and efficient use of wood and wood residues for energy generation**

Report to the Standing Forestry Committee

by the Standing Forestry Committee ad hoc Working Group II on mobilisation and efficient use of wood and wood residues for energy generation

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# Standing Forestry Committee ad hoc Working Group on mobilisation and efficient use of wood and wood residues for energy generation

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## **Executive summary**

The Standing Forestry Committee ad hoc Working Group on mobilisation and efficient use of wood for energy generation was launched in July 2007 with the aim to facilitate investigation and dissemination of experiences on mobilisation of low-value timber, small-sized wood and wood residues for energy production. In the context of the implementation of the EU Forest Action Plan, this activity falls within the scope of key action 4, which aims to promote the use of forest biomass for energy generation.

The work is also in line with the long-term strategy for renewable energy in the EU, outlined in the Renewable Energy Roadmap, aiming at increasing security of energy supply and reducing greenhouse gas emissions. The Health Check of the Common Agricultural Policy also identifies these major future challenges. There are also close links to the relevant measures provided in the EU Biomass Action Plan and to the proposal of the new EU Renewable Energies Directive.

The Working Group collected information through presentations by country and stakeholder group representatives as well as invited external experts. Discussions focused on country experiences and good practices on wood mobilization, including policy instruments promoting the use of wood for energy production and the environmental sustainability of forest biomass use for energy generation. The group analysed the influence of forest ownership on wood mobilisation and factors inhibiting removal of more wood and reviewed the use and the potential of forest biomass.

A clear potential to increase forest utilisation for energy exists in most countries of the EU as only 60 – 70% of the annual increment of EU forests is harvested. At present about half of the harvests are eventually used for energy, with by-products from higher value processing also having a significant share. Much of the potential for expansion can be found in small private holdings, comprising forest residues and complementary fellings, namely first thinnings. The pattern of supply of wood for energy varies widely between countries but is considerably more than previously expected, reducing the additional amount available. Calculations on EU – level on such a potential of wood for energy differ significantly and range between less than 100 million cbm and up to more than 190 million cbm per year.

For forest based biomass, the principles of Sustainable Forest Management safeguarding economic, ecological and social functions of forests must apply for all forest management activities. When extracting more wood for energy, site suitability has to be taken into account, comprising impacts on biodiversity, site fertility, soil and watershed protection.

Wood demand is forecast to increase in the future, specifically for energy generation. Questions of sustainability, competitiveness of the forest-based industries, efficiency and economic viability and fragmentation, organisation and motivation of forest owners represent the major challenges for wood mobilisation. Experiences from Member States indicate that action on wood mobilisation is already an ongoing process driven by increasing wood prices and domestic demand for wood for energy, often furthered by specific renewable energy support schemes.

Mobilising more wood is a general effort, which requires the cooperation of all relevant actors – forest services, forest owner groupings, forest industry and energy producers. Bearing that in mind, the Working Group has identified eight focus areas for action which relate to an increase of supply of wood for energy and for raw material together, resulting in synergies

both for the forest-based industries and energy producers. Accordingly, to improve mobilisation of wood the Working Group recommends:

### **Focus area 1: To improve data on supply and use of wood**

1.1 Better understanding of the resource is only possible with sound basic data, which are often lacking in the context of predicting wood potential for mobilisation. There is a crucial need to analyse in greater detail the potential of wood supply on **MS** and **regional level** taking into account local conditions such as costs, ownerships patterns, quality requirements, infrastructure and environmental considerations. **MS** and **regions** should also conduct surveys on household consumption of wood for energy to gain a clear picture on energy usage. The Commission can facilitate the efforts through information exchange. **Short to mid-term action required.**

1.2 Monitoring and evaluation data are continuously needed in order to follow the developments in wood potential, supply and demand and to evaluate mobilisation efforts. The current levels of activity need to continue and be developed further. The **Commission, MS and relevant international bodies** need to periodically (3 – 5 years) update wood supply and wood use information, including wood for energy, processed wood fuels, post consumer recycled wood and wood waste streams. **MS** should also undertake wood fuel market reviews based on standardised nomenclature for trade statistics and conversion factors (e.g. MWh/GJ into cbm solid wood) to increase market transparency. The Commission and the MS should continue to cooperate on renewable energy statistics. **Short-term and continuous action required.**

### **Focus area 2: To develop national / regional wood mobilisation strategies**

2.1 The proposed EU Renewable Energies Directive requires MS to set up National Renewable Energy Plans which would include the use of relevant biomass data and would balance wood mobilisation and nature conservation strategies. On that basis MS could carry out a prognosis of sustainable production, utilisation and demand of woody biomass for energy. **Short-term action required with periodic updates.**

2.2 The development of wood mobilisation strategies requires the co-operation of various actors. Therefore **MS** are encouraged to establish roundtables, task forces or similar initiatives, comprising relevant stakeholders and interest groups including the energy sector, in order to develop wood mobilisation strategies in an integrated way, possibly in the context of National Forest Programmes. This will help to improve co-ordination between energy plant development and wood mobilisation efforts. The WG also recommends that the **SFC** facilitate the process by exchanging experiences on good practices. **Immediate action required.**

### **Focus area 3: To increase the potential of wood for energy and material use**

3.1 Future wood supply potential should be positively influenced by afforestation and reforestation efforts as well as modified silvicultural treatment and active sustainable forest management in existing forests. **Rural development policies** should continue to support these activities. The use of improved trees through tree breeding programmes should be explored and supported. The WG also recommends that the **Commission** and the **SFC** facilitate investigation and dissemination of experiences on the silvicultural potential to increase wood supply taking into account regeneration from coppice, the choice of optimal rotation periods

and choice of adequate harvesting techniques. This should include the prospects of short rotation forestry. **Short to mid-term action required.**

3.2 Post-consumer recovered wood forms a resource for energy use underutilised in many MS so far. **MS** should work towards an increase in collection, update and usage of recovered wood for energy, by assessing the potential and encouraging technological development. **Immediate action required.**

#### **Focus area 4: To ensure sustainable provision of forest biomass**

4.1 The proposed EU Renewable Energy Directive calls for reporting to the European Parliament on options for the expansion of sustainability criteria to solid biomass production by 2010. The **Commission** should continue its work on the development of sustainability criteria for biomass for energy production, taking into account ongoing discussions on national and international bodies like MCPFE. **MS** and all other **stakeholders** need to actively participate in the process. **Immediate action required.**

4.2 In order to ensure sustainable forest management while providing increased amounts of wood, management practices need to be adapted. **MS** should continue to exchange experiences on harvesting biomass for energy, respecting the relationships between nature conservation, biodiversity and wood mobilisation strategies. Management practices may need to be adapted. The **Commission** should help to facilitate these efforts. To improve the knowledge on the long-term impacts of new technologies like stump extraction and whole tree harvesting, as well as GHG balances in harvesting biomass for energy, additional research projects are needed. **Immediate and mid-term action required.**

#### **Focus area 5: To develop and maintain efficient wood supply chains and markets**

5.1 Adequate infrastructure and transport facilities are some of the basic requirements for a properly functioning wood supply chain. **Rural development policies** should continue to support forest and other infrastructure development as well as investment in local bioenergy developments **MS** are advised to explore the options to improve road transport, including weight and dimension limits as well as diversification of transport means (railway, water transport). **Short-term and continuous action required.**

5.2 The forest and the energy sectors use different types of measurements, which hinder communication and coordination between both sectors and market development. **Forest industry** and **energy producers** should work jointly on the interoperability of specifications and measures (volumetric and energetic) for wood fuel and wood fuel products as well as common terminology and conversion factors related to wood for energy. The **Commission** should help to facilitate the process. **Immediate action required.**

5.3 Both techniques and technology have to be further developed in order to ensure that sustainable wood mobilisation for energy remains economically viable. The WG feels that **MS** should encourage and promote the introduction of innovative techniques and technologies for production including tree improvement, processing and utilisation of woody biomass for energy generation, particularly in deciduous forests and for small size trees (first thinnings). Similarly the development of biomass trading centres has the potential to optimise the acceptance, processing, refining and sale of energy wood assortments. **Short-term and continuous action required.**

5.4 Well functioning wood supply chains and markets require new approaches in cooperation between various actors. The open exchange of information, best practices and market instruments like long-term contracts could be used as one option to improve the cooperation between forest owners, entrepreneurs, forest owner groupings and forest industry in order to secure supply and demand. **MS** should encourage partnerships between private and public actors, namely state and municipal forest enterprises for wood mobilisation throughout the whole supply chain. **Continuous action required.**

5.5 The lack of an adequate workforce is a barrier to additional wood mobilisation. MS should ensure the provision of education and training for a skilled workforce. **Rural development policies** should continue to support such efforts. This would be made easier if **forest services** together with the **forest industry** were to conduct campaigns to improve the image and the attractiveness of forest related jobs, e.g. skilled workers, forest entrepreneurs and foresters. **Mid-term action required.**

#### **Focus area 6: To strengthen efforts for forest owner motivation, organisation and awareness rising**

6.1 The fragmentation of private forest ownership is a major challenge for increased wood mobilisation in most MS. To address this, the **Commission** should assess options applied in MS for coping with ownership and management unit fragmentation and discuss the results in the **SFC**. **MS together with relevant stakeholders** should explore how the use of forest management plans for individuals and groups of forest owners, specifically in areas with high ownership fragmentation might be introduced and encouraged. For that purpose access to basic forest owner related data <sup>could be eased</sup> while respecting national data protection requirements. **Immediate action required.**

6.2 Well functioning forest owner associations have proved their capability to increase wood supply from small scale private properties. **Rural development policies** therefore should continue to support capacity building of forest owner associations to encourage innovation. Furthermore **MS** should explore options to encourage and support the establishment of forest owner organisations, cooperatives and other groupings. The **SFC** is invited to exchange views and experiences on the subject. **Immediate and continuous action required.**

6.3 A lack of motivation on the part of forest owners to harvest wood has been identified. Moreover, some owners may have different management objectives other than wood production. The WG recommends that **MS** conduct national and regional awareness rising campaigns both targeted at forest owners and the general public to address the potential and need for increased wood supply from domestic (do we mean private here, or household?) sources. It would be advisable for **MS** to review how they communicate with their forest owners to achieve this. **Short-term action required.**

#### **Focus area 7: To enhance support means, incentives and coordination efforts for wood mobilisation**

7.1 In every MS support measures for sustainable forest management are in place. **MS** are encouraged to evaluate the impact of their supportive framework with respect to wood mobilisation in order to identify more effective measures. The **SFC** should facilitate the exchange of experiences on support options for wood for energy and wood mobilisation in order to ensure a coherent approach with respect to this. **Mid-term and continuous action required.**

7.2 Within existing support programmes several measures indirectly already relate to wood mobilisation. The WG recommends that **rural development policies** continue to support infrastructure development and improvement where relevant. The **Intelligent Energy Europe II Programme** should continue to fund actions to facilitate the uptake of renewable energy sources, including addressing the barriers identified by this report. **MS** should also try to focus specific measures for wood mobilisation on areas at high risk of forest fires and other threats as well as mountainous forests to maintain forest functions. **MS** could consider strengthening support for biomass production in any future revision of their Rural Development Programmes. **Mid-term action required.**

7.3 Capacity building, education and training is necessary to ensure that wood mobilisation is carried out in a sound way. Therefore, **MS** should ensure adequate education, training and skills programmes, allowing for minimum proficiency and health and safety standards, related to wood mobilisation, especially for wood harvesting. The **Commission** together with the **MS** should continue to support capacity building for sustainable forest management. **MS** are encouraged to strengthen and improve cooperation and coordination between the forest authority, owners and their organisations, the wider industry as well as education and training providers. **Short-term and continuous action required.**

#### **Focus area 8: To promote research and technological development in the field of forest production, harvesting technologies and wood utilisation**

8.1 Research and technological development are crucial for sustainable and viable wood mobilisation. The **Commission** should continue its support for forestry research and technological development with special regard to wood mobilisation questions, including biotechnology. **MS** and its research institutions should make full use of the Forest Technology Platform and its strategic research agenda to gain support through FP7 for innovative projects in wood mobilisation. In addition the WG considers the following research topics of major importance to be supported either through national and or EU research funds: The influence of wood use for energy on the overall raw material supply, sustainable harvesting techniques and technologies; technologies using forest biomass for efficient energy production, distribution and use of energy, carbon balances and sustainable forest management and wood utilisation, as well as work force related projects. **Short to mid term action required.**

8.2 Targeted distribution of up to date technical information is essential for policy making and enhancing forest management practices and with regards to wood mobilisation. **MS** should disseminate research results widely to the operational level and decision makers to encourage the uptake of the findings and adoption of best practice. The **SFC** can facilitate such activities through the exchange of research and experiences. **Immediate and continuous action required.**

The conditions for wood mobilisation can vary considerably from region to region and country to country. Supportive frameworks have to take that into account and be thoroughly adaptive. The WG considered that mountainous and other areas with high social functions as well as forest areas with high risks for forest fires, storms and other abiotic and biotic threats will require special emphasis.

In **Northern Europe** focus is needed on activities to motivate forest owners and the introduction of new innovative technologies including harvesting and logistics as well as maintaining well established wood fuel markets.

Activities in **Central and parts of Western Europe** should concentrate on improving forest owner groupings and other forms of co-operation, the introduction of new technologies, the motivation of private forest owners and maintaining markets.

For **Southern EU countries** facing high risks of forest fires, establishing wood fuel markets and initiating forest owner groupings and co-operation is most relevant in the context of wood mobilisation.

**In New Member States and Eastern European countries** where State Forests often dominate, emphasis is required to promote the use of forest residues and low value timber and related markets; additionally, activities to raise the awareness of private forest owners about options for wood utilisation including wood for energy and benefits of co-operation would be beneficial.

## 1. Introduction

The European Community has long recognised the need to further promote renewable energy. In December 2005, the Commission adopted a Biomass Action Plan (COM (2005) 628 final) designed to increase the use of energy from forestry, agriculture, and waste materials. The Action plan aims at reducing Europe's dependence on imported energy, cut greenhouse gas emissions, protect jobs in rural areas and extend the EU's technological leadership and competitiveness in these sectors. The Community objectives set up in the proposal for a Directive on the Promotion of the use of energy from renewable resources (COM (2008) 19 final) call for an overall binding target of a 20% share of renewable energy sources in energy consumption and an energy efficiency improvement of 20%.

Consequently, activities foreseen in the EU Forest Action Plan in relation to forest biomass are closely linked to the relevant measures outlined in the Biomass Action Plan and to the proposal of the EU Renewable Energies Directive. Under the overall objective to support and enhance sustainable forest management and the multifunctional role of forests, key action 4 of the EU Forest Action Plan aims at the promotion of the use of forest biomass for energy generation in order to help to mitigate climate change by substituting fossil fuel, improving energy self-sufficiency, enhancing security of supply and providing job opportunities in rural areas.

Forestry and wood already plays a prominent role in renewable energies, bearing in mind that woody biomass accounts for approximately 80% of the total use of biomass for energy in the EU. Moreover, the forest industries today account for nearly ¼ of the total biomass-based energy generation in Europe. However, it is considered that harvests in most EU countries' forests could be further increased in response to increasing demand for raw material. Also, there is room to improve the energy efficiency of wood combustion systems, especially in private households.

To facilitate investigation and dissemination of experience on mobilisation of low-value timber, small-sized wood and wood residues and efficient use of wood for energy production, the Commission together with the Standing Forestry Committee, has set up an ad hoc Working Group (WG) in May 2007 which consists of experts nominated by the Member States (MS) and relevant stakeholder groups. The members' list and dates of meetings can be found in annex 2.

This ad hoc Working Group contributes to implementation of key action 4, in particular activity 4.1 of the work programme 2007-2011 of the EU Forest Action Plan. The purpose of this key action is to promote the use of forest biomass for energy generation by improving the mobilisation and efficient use of wood and wood residues, including low-value timber.

According to the terms of reference for the WG (see annex 3) the general objectives are:

- Exchange information and experiences on availability of forest biomass and the economic feasibility of its use for energy generation (building on on-going work);
- Analyse the application of sustainable forest management (SFM) principles to mobilisation of forest biomass and discuss the need for further recommendations in this area;
- Exchange and enhance information on the consideration of forest biomass in national Biomass Action Plans or similar national planning instruments.

The report is divided in eight parts: Introduction, scope of work, wood availability for energy generation in the EU, factors affecting supply and demand of wood for energy, elements of wood mobilisation approaches: experiences from Member States, challenges for mobilisation and, finally, overall conclusions and recommendations. Boxes at the end of each chapter summarise the content.

## **2. Scope of Work**

The WG met six times (22 April, 15 October 2007, 18 January, 14 March, 30 May, 4 July 2008). On the basis of the discussions during the first WG meeting, a draft short list of relevant topics was set up and commented (for full list see annex 4). Out of that list the following topics were quoted to form the core of the Working Group's efforts:

- Mapping good practices regards mobilisation including policy instruments promoting the use of wood for energy production
- Environmental sustainability of forest biomass used for energy generation
- Analysis of the influence of forest ownership on wood mobilisation and factors inhibiting removal of more wood
- Summary review on the use and the potential of forest biomass
- Demand of wood for energy generation building on existing information

Out of the variety of wood-based fuels, the focus of exploration was laid on the mobilisation of biomass from existing forests, encompassing forest residues (residues from fellings; stumps), traditional firewood and complementary fellings (for the complete structure and definitions refer to annex 5). Options to increase wood supply through afforestation and intensification of management practices through short rotation forestry have been considered only in the context of mid- to long-term measures.

Possible wood sources from outside the forest were not specifically addressed by the group. Though not considered further on in the discussion, the Working Group is well aware that industrial wood residues form a major source of wood biomass for energy. An increase there is limited in countries with highly developed forest industries (e.g. Nordic countries keep less than 5 % of the residues unutilised) and would have to rely on mobilisation of more forest raw material. In most of the other EU Member States (MS) room is left for expansion achievable through improved processing and further technological development for efficient use of existing wood resources. The same applies for post-consumer recovered wood and woody waste which is also not included in the reflections.

The Working Group (WG) collected information on the above mentioned topics through presentations by WG country and stakeholder group representatives as well as invited external experts. The interventions focused on country experiences and good practices on wood mobilisation, the role of actors, sustainability and wood mobilisation, study results and support measures.

The full list of presentations can be found in annex 6. Each meeting was documented by a report, all elaborated documents including presentations are posted on the CIRCA site of the Working Group (<http://www.circa.europa.eu>).

### 3. Wood availability for energy generation in the EU

#### 3.1 Potential

The growing demand for wood, both for the processing industry and for energy purposes over the last years has resulted in a number of studies and assessments on regional, national and international levels on available wood potentials in Europe. Due to different underlying assumptions and conversion factors as well as basic data shortcomings comparisons between the results and related assumptions have to be taken with care.

Diagram 1 shows the unused physical potential of wood in solid cubic metres (cbm) for the EU 27, calculated as the difference between the Net Annual Increment (NAI) and reported fellings 2000 and 2005 based on reporting by the Member States and compiled by the Temperate and Boreal Forest Resource Assessment (TBFRA) 2000<sup>1</sup> and UNECE / MCPFE enquiry 2005.

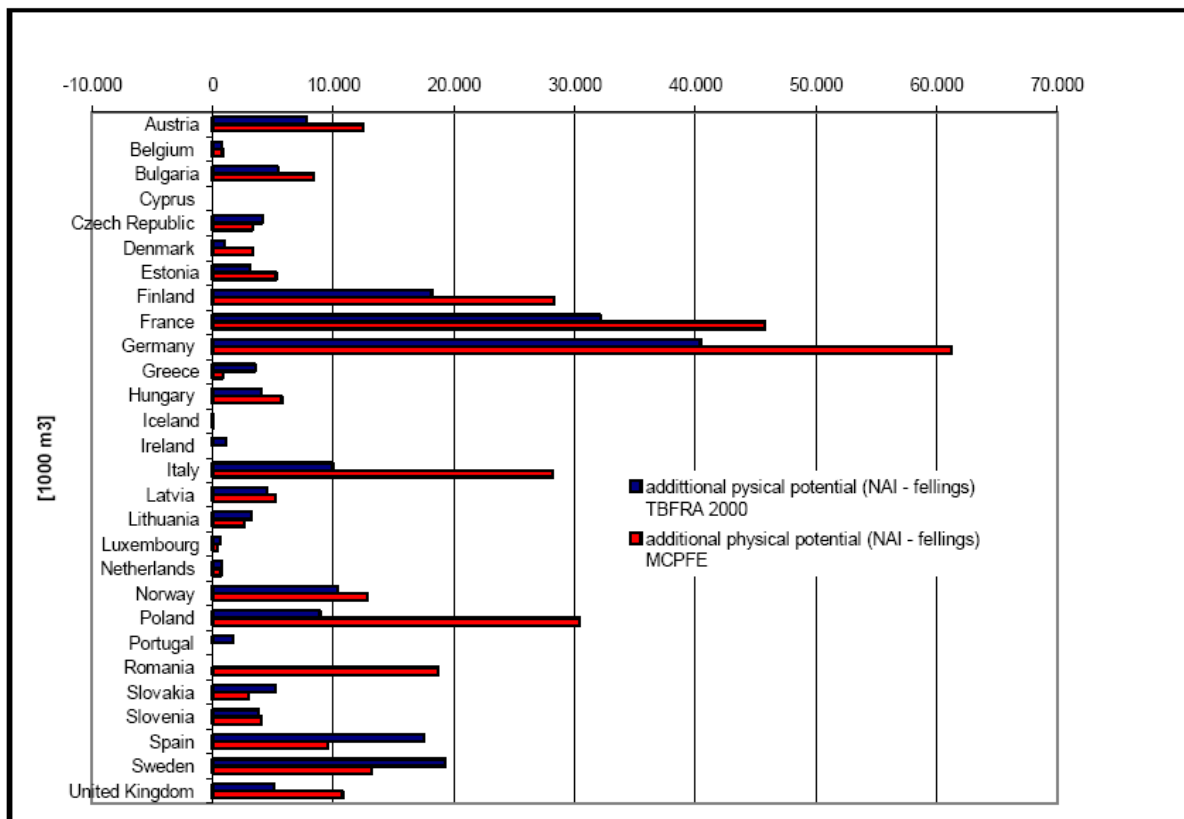


Diagram 1

Source: TBFRA 2000 / MCPFE 2005

According to these data the unused physical potential for the EU 27 mounts up to 212 million cbm (TBFRA) or even 315 million cbm (UNECE/MCPFE)<sup>2</sup>, which means that only 60 - 70% of the annual increment is utilised. It has to be noted though that the actual physical potential is very likely to be lower due to data shortcomings especially concerning utilisation of wood from small scale private forest properties (unrecorded fellings) and physical, economic and environmental limitations.

<sup>1</sup> UN-ECE / FAO (2000): Forest Resources of Europe, CIS, North America, Australia, Japan and New Zealand.

<sup>2</sup> MCPFE/UN-ECE/FAO (2007): State of Europe's Forests 2007.

More recently, several national studies have revised their wood potential assessment by also taking into account forest harvesting restrictions, like limited infrastructure and access, nature protection requirements etc. For Austria<sup>3</sup> for instance besides a “theoretical potential” of 33 million cbm, an “available potential” of 24,8 million cbm per year seems possible, and an additional potential of more than 7,6 million cbm compared to fellings 1992 -2002. In Germany almost 20 million cbm could be annually harvested in addition, data from France<sup>4</sup> calculate a physical potential of wood for energy, pulp and panels between 12 – 20 million cbm per year and a further roundwood potential of 12 million cbm. In Finland annual harvests are estimated to increase from 52,2 million cbm to 66 million cbm / year for the period 2005 – 2014 and up to over 70 million cbm for 2015 to 2034.

Discussions and decisions on targets for increased use of renewable resources including wood in overall energy consumption have also led to closer assessments of forest energy potential both nationally and internationally.

The study "Estimation of Energy Wood Potential in Europe" (Karjalainen et al. 2004) analysed the energy wood potential for the EU 25<sup>5</sup>, concentrating on available wood supply. The work was divided into estimation of roundwood balance and estimation of felling residues. According to the report, roundwood balance based on the difference between net annual increment (NAI) and fellings is approximately 186 million cbm per year or 32 % of the NAI. Annually harvestable residues were calculated to be 63 million cbm and about 9 million cbm of stump wood could be used for energy production. The overall potential for available forest fuel amounted to 140 million cbm / year. The 2008 revision of these data for the EU 27 estimated the potential available forest fuel at 101,6 million cbm / year. According to the results, an additional 25% of the unused NAI (residues and stumps which sum up to 85.1 million cbm) have to be added, raising the forest fuel potential calculation to 187 cbm / year.

A study<sup>6</sup> launched by the Confederation of European Paper Industries (CEPI) in 2007 for the EU 25 assessed the additional potential sustainably mobilisable forest biomass at 70 – 80 million cbm / year or 35% of the unused NAI.

The European Environment Agency (EEA) report (2006)<sup>7</sup> suggests that the environmentally-compatible bioenergy potential from forestry residues would be around 15 Mtoe (ca. 69 million cbm) in 2010, increasing to 16.3 Mtoe (ca. 75 million cbm) in 2030.<sup>8</sup>

The EEA report also says that an additional 28 Mtoe (128 million cbm) in 2010 and approximately 23 Mtoe (106 million cbm) in 2030 could be provided by complementary fellings and their residues. The highest resource densities for harvest residues would be located in Central Europe and the United Kingdom. Southern Sweden and Finland were

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<sup>3</sup> Preliminary results, 2<sup>nd</sup> interim report "Study on Wood and Biomass Supply for Austria" by the Austrian Federal Research Centre for Forest, Natural Hazards and Landscape; to be finalised in August 2008

<sup>4</sup> Cemagref, Ministry of agriculture and fisheries (2006): Study on forestry biomass availability for industry and energy in France.

<sup>5</sup> EU Member States except Bulgaria and Romania

<sup>6</sup> Preliminary results

<sup>7</sup> European Environment Agency (EEA) (2006): How much bioenergy can Europe produce without harming the environment? EEA Report No 7/2006.

<sup>8</sup> The main for calculation criteria were: No intensification of use of protected areas; foliage and roots were excluded from the calculations; the extraction rate of residues from stem and branches was limited according to the suitability of the site; a reduction of the area available for wood supply in each Member State by 5 % in order to allow for an increase in protected area; a set-aside of 5 % of wood volume as individual and small groups of retention trees after harvesting in order to increase the amount of large diameter trees and deadwood.

characterised by high energy potential mainly due to the high proportion of forest area in these countries, whereas in central Europe the average biomass volumes in forest stands were noted to be much higher. In the Mediterranean area, the potential for residue extraction was regarded as low due to the existing constraints, such as unproductive soils and low biomass density. However, it is noted that in some cases residue extraction would be beneficial to prevent forest fires.

Considerable potential for complementary felling could be found in many parts of Europe, particularly in Central Europe, Italy, France, and the United Kingdom. The study also signals that in Spain only a small share of annual growth would currently be utilised for felling so the felling level might be increased considerably<sup>9</sup>. In the Czech Republic a high share of the annual growth is already used today and according to the analysis, fellings in Portugal, Belgium, Estonia and Latvia, could be close to the maximum sustainable harvest level.

Most recent study efforts<sup>10</sup> question the numbers on the potential for forest biomass in Europe. Due to the inclusion of harvest losses and unused fellings and the exclusion of unregistered fellings in the calculations, the actual potential might be lower than expected. This study roughly extrapolates - by transferring estimates for Germany of around 20% harvesting losses and a 16% rate for unregistered fellings also to other MS - that the mobilisable potential for energy wood may be smaller than 100 million cbm per year in the EU.

A clear potential for increased utilisation of wood for energy exists in the EU, mainly related to forest residues and complementary fellings. The amount varies from country to country and region to region but it can be generally assumed that considerably more wood could be mobilised from EU forests, without damaging sustainability. Higher levels of forest use and their implications on biodiversity, site and watershed protection need careful assessment. However, to meet a growing demand for wood, additional measures aiming at increasing the production of woody biomass and efficient consumption are also needed. Due to the discrepancies in the data on wood availability it is impossible to estimate with high precision the sustainable potential of wood supply. The reviewed studies underline the need for better, harmonised and continuous information on wood potential for energy and material use.

### 3.2. Supply and use of wood for energy in Europe

The Joint Wood Energy Enquiry (JWEE, Steierer et al. 2007)<sup>11</sup> offers a comprehensive picture i. a. from 12 EU Member States available of wood energy in terms of the sources and volumes of wood that are directed to energy production and the share of wood in meeting overall energy needs. These countries account for 70 % of total EU 25 removals.

Annex 7 contains the tables with the country data on supply and use of wood for energy.

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<sup>9</sup> The results of Spain (as well as Italy) should be treated with caution since the national data did not allow to make any distinctions between regions, as the country was modelled as a whole.

<sup>10</sup> UNECE / FAO University of Hamburg (2008)- to be published: Wood resources availability and demands; see [http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood%20availability\\_part1\\_final.pdf](http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood%20availability_part1_final.pdf)

<sup>11</sup> Steierer, F., Fisher-Anker, A., Francoeur, M., Wall, J., Prins, K. (2007): Wood energy in Europe and North America: A new estimation of volumes and flows. Available: <http://www.unece.org/trade/timber/docs/stats-sessions/stats-29/english/report-conclusions-2007-03.pdf>

The results on supply show that most of the wood (49 %) used for energy comes from one or more of the co-products (residues) from the processing industries. In Europe, indirect wood energy is the most important source of energy in the countries with large and modern forest industries, such as Finland and Sweden.

Wood energy supplied directly from the forest is smaller (45 %) but plays an important role, especially in the countries with smaller forest industries or abundant forest resources, such as France, the Czech Republic or Slovenia. The precision of data with particular reference to household consumption influences that share significantly. The impressive figure in the case of France for instance can be explained by the importance of private households in using wood energy, thanks to the precise data sources provided by the country.

The supply data also show that recovered wood has been of relatively small importance as an energy source. The share of recovered wood in total wood energy supply is about 6 %. There are limits on the use of recovered wood, mainly referring to environmental considerations (contamination) and collection policies, although it is not yet clear how much this sector could expand.

Concerning use, there is a lot of variation between the countries in the patterns, which is influenced by the strength of the forest industries, the number of rural households and policies for supporting generation of heat and power from renewable energy sources (e.g. the feed-in price to the grid for electricity generated from renewables such as wood).

Private households account for 47 % of wood energy use (although the share is strongly influenced by the exceptionally high figure of France). The Czech Republic, Austria, Slovenia and Lithuania also have a high percentage of private household consumption. The countries with large forest industries, especially pulp, have a high share of internal consumption by the forest-based industries. Further, the share of "power and heat" which includes district heating based on wood energy is highest in the Netherlands, Switzerland and Germany.

The pattern of supply of wood for energy varies widely between the countries and is considerably more than previously expected.

Indirect wood energy is the most important source, notably in those MS with large and modern forest industries. Direct wood energy (traditional fuelwood) is relatively more important in European countries with smaller forest industries.

Recovered wood has been of relatively small importance as an energy source, but is growing significantly in importance, supported by strict rules on biodegradable waste disposal.

In those countries which are most advanced in this field there are few opportunities to increase the energy use of residues of the forest products industry. There are also technical limits relating to environmental considerations and collection policies on the use of recovered wood, albeit the potential of this sector is not well known. However, further efforts are necessary to the increase collection and use of recovered wood.

Significant expansion of wood energy supply to meet biomass energy targets therefore may focus in the short-term on direct energy, from forest residues and complementary fellings, together with general wood mobilisation schemes for all wood usages.

### 3.3 Competing use of wood for energy and raw material

	2010	2020	2030
Austria	3.3	3.3	3.5
Belgium	0.1	0.1	0.2
Germany	6.3	5.3	4.8
Denmark	0.1	0.2	0.2
Spain	1.7	1.8	1.5
Finland	1.7	1.8	1.8
France	12.7	13.2	14.2
Greece	n.a.	n.a.	n.a.
Ireland	0.1	0.1	0.1
Italy	5.6	3.3	3.0
Luxemburg	n.a.	n.a.	n.a.
Netherlands	0.1	0.1	0.2
Portugal	0.2	0.2	0.2
Sweden	2.2	2.4	2.4
United Kingdom	1.5	1.5	1.1
<b>EU-15</b>	<b>35.7</b>	<b>33.2</b>	<b>33.3</b>
Czech Republic	0.8	0.8	0.9
Cyprys	n.a.	n.a.	n.a.
Estonia	0.2	0.2	0.2
Hungary	0.2	0.2	0.4
Lithuania	0.7	0.6	0.4
Latvia	0.6	0.6	0.6
Malta	n.a.	n.a.	n.a.
Poland	2.0	1.5	1.2
Slovenia	1.3	1.1	1.0
Slovakia	1.0	0.9	0.9
<b>New EU-10</b>	<b>6.8</b>	<b>5.9</b>	<b>5.7</b>
<b>EU-25</b>	<b>42.5</b>	<b>39.2</b>	<b>39.0</b>
Net competition effect from forestry		2.1	16.2
<b>EU-25</b>	<b>42.5</b>	<b>41.3</b>	<b>55.2</b>

The rise in fossil fuel based energy prices may indicate that substantial additional amounts of wood biomass resources will be used for bioenergy instead of going to traditional wood-processing industries. According to the EEA report<sup>12</sup>, the energy potential from competing use of wood may increase from around 2 Mtoe (9,2 million cbm) in 2020 to more than 16 Mtoe (73,6 million cbm) in 2030<sup>13</sup>. In the longer term, 2<sup>nd</sup> generation biofuel production can also have a significant impact on the price and wood resource demand.

Table 1<sup>11</sup> shows the environmentally-compatible wood energy potential (in Mtoe) at the level of EU25<sup>14</sup>, by using a set of environmental limitations<sup>15</sup> to wood availability. The estimation includes both the residues from fellings and complementary fellings. The 'net competition effect for forestry' includes an additional potential due to wood chips redirected from pulp and paper as well as wood-based panels sector to energy production, which is partly offset by a reduction in the black liquor potential due to the decrease in pulp and paper production.

In a further attempt to improve information on supply and use of wood for energy UNECE / FAO in co-operation with the University of Hamburg compared wood supply flows and wood use in Europe by using the "wood-resources balances" approach<sup>16</sup>.

The supply side for the EU 25 there shows 71% of the wood supply (512 million cbm) 2005 originating directly from the forest and 24% from industrial co-products. 4% are recovered wood (29 million cbm) and 1% is processed wood fuel.

<sup>12</sup> <sup>12</sup> European Environment Agency (EEA) (2006): How much bioenergy can Europe produce without harming the environment? EEA Report No 7/2006.

<sup>13</sup> However, the pulp and paper industry is questioning the indicated possible reduction in pulp and paper production.

<sup>14</sup> Wood harvested for household energy consumption is not included due to data restrictions. Examples like from France indicate that such usage may have a strong influence on the actual potential.

<sup>15</sup> No intensification of use on protected forest areas; foliage and roots left on site; extraction rates for residues limited to the suitability of the site; additional reduction of area for wood supply in each MS by 5%; set aside of 5% of wood volume after harvesting to increase the amount of large diameter trees and deadwood

<sup>16</sup> UN-ECE/FAO, University of Hamburg (2008)- to be published Wood resources availability and demands see also: [http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood%20availability\\_part1\\_final.pdf](http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood%20availability_part1_final.pdf)

According to the results industrial use accounts for 58% of the total wood use from all sources, 42 % are for energy purposes (341 million cbm). Some countries seem to have exceedingly high percentages of wood use for energy, accounting for more than 80% in Greece and Hungary and around 50% in Denmark of the total national wood consumption. In Belgium, Slovakia and the UK less than 25% relate to energy usage. While 71% of the wood removals from forests are used as raw material for industry, 29% count for energy use. Secondary fibres (recovered wood, co-products, industrial residues) are estimated to be mainly used for energy (62%).

On that basis the UNECE/FAO study on "Future wood flows in the forest and energy sector"<sup>17</sup> tries to give a forecast for future wood needs for energy and material use by combining forest sector outlooks and energy policy objectives. Under these premises for 2020 a total use between 1.219 and 1.061 billion cbm is calculated, with 43 – 49 % for material and 57-51 % energy use.

A study commissioned by CEPI on "Bioenergy and the European Pulp and Paper Industry"<sup>18</sup> forecasts a possible significant difference between wood supply and demand for 16 European countries for 2020 if the EU renewable energy targets are maintained. The study concludes that this may lead to an increase in costs for biomass which could risk competitiveness of the European pulp and paper and the panel board industries. The study also identified six core actions which could possibly help to avoid the forecast shortage: Additional mobilisation of round wood and forest residues alone could count here for 30 – 35 million cbm per year in the 16 assessed European countries.

A strong increase in wood demand is forecast specifically for energy generation. Reserves for mobilisation are seen in smaller private forest holdings, specifically in forest residues and first thinnings. There, by mobilising wood, synergies are possible regards energy and raw material use.

Results from empirical studies on wood energy at country level such as from Austria<sup>19</sup>, France and Germany show a higher direct use of wood for energy than previously assumed.

Unrecorded wood supply and demand may occur, especially for trees outside forest, logging residues and post-consumer recovered wood, unrecorded use of wood - in particular for energy in private households.

Information on household consumption and supply of firewood and wood based biomass from private forests differs significantly between different information sources; more information and research on the issue is needed to support the planning and development efforts.

An urgent need exists to analyse the potential of wood supply taking into account local conditions such as costs, ownership patterns, quality requirements, infrastructure etc. Institutional arrangements and allocation of resources should be secured to provide sufficient data in future

<sup>17</sup> UNECE / FAO University of Hamburg (2008)- to be published see also:

[http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood\\_availability\\_part2.pdf](http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood_availability_part2.pdf)

<sup>18</sup> Bioenergy and the European Pulp and Paper Industry – An Impact Assessment, McKinsey & Company, Inc. and Pöyry Forest Industry Consulting, 16 July 2007

<sup>19</sup> Preliminary data

#### 4. Wood markets and factors affecting demand and supply of wood for energy

The existence or establishing of markets for wood for energy is often formulated as a precondition for further wood mobilisation. While local and regional markets for traditional fire wood are well established and growing in importance in many MS, wood fuel markets for forest residues are unevenly developed. Varying energy policies to promote bio-energy, closely related to the differing national energy systems, stand behind such market developments. Record-high fossil fuel prices and government policies to achieve energy security and to mitigate climate change accelerated wood energy markets in 2006 and 2007, affecting the entire forest sector. Competition for wood raw material resulted in local supply shortcomings, codetermining to some extent also the escalation of roundwood prices. While advantageous for landowners and by-product producers, the panel and pulp and paper industry was negatively affected, also because downward trends of panel and sawnwood prices did not translate into corresponding raw material prices<sup>20</sup>. An increasing competition can be observed within and outside regions with lower raw material and production costs. Accordingly, besides affects on prices, the paper and panel industry also reports on impacts on raw material availability, stressing in that context the need for a cascading use of biomass and wood fibres as well as efforts to improve energy efficiency in wood combusting.

Rapid expansion in global trade in biomass is forecasted to continue over the next three to five years, following favourable renewable energy policies and depending on the available domestic biomass supply. Therewith wood mobilisation efforts will have a substantial impact on market developments. To gain a better insight in energy wood markets functioning, the Working Group closer explored factors affecting demand and supply of wood for energy.

##### *Demand*

Three main demand groups with different preferences can be identified for the wood energy market (Röser et al, 2008)<sup>21</sup>: Households, public authorities and industry. Households primarily use traditional fuel wood, if possible from their own resources. The volumes used are substantially higher than previously estimated, in some countries making households major consumers. In France for example this household consumption counts for 35% of the total wood use, for all the EU 11% have been calculated (UNECE/FAO, 2008)<sup>22</sup>. The amount is expected to grow significantly due to further rising prices for energy, improved combusting techniques and expansion of processed wood fuels like pellets and briquettes, overall increasing competition for woody material. With the growing number of decentralised local district heating units the demand from households will also further increase. In 2005 in Finland already 296 plants run either by co-operatives / limited companies or entrepreneurs / groups of entrepreneurs were set up. In this context public authorities play a two-fold role: Either as operators, co-operating partners and or (co-)financer on local and district levels, but also in setting the legal and supportive framework for biomass heating plants.

The forest-based industry provides an effective platform for the centralised generation of energy in combination with the production of wood-based products. New balances in the processing of wood for timber, pulp, green chemicals, liquid bio-fuels and green energy look likely. In this context, the sector has the potential to deliver increased amounts of energy as a

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<sup>20</sup> UNECE/FAO (2008): Forest products annual market review 2007 – 2008.

<sup>21</sup> Röser, D.; Asikainen, A.; Raulund-Rasmussen, K.; Stupak, I. (eds.) (2008): Sustainable use of forest biomass for energy.

<sup>22</sup> Amount to be taken with care as precise household surveys are missing in most of the MS

by - product of industrial processing and play an even more prominent role as supplier of renewable energy, provided a) the availability of sufficient and suitable additional wood and b) ensuring it is brought to market. Already in 2004, the members of CEPI all together committed to increase the share of biomass-based energy in their total primary energy consumption up to 56% by 2010.

The following critical factors for the development of successful bioenergy markets have been identified (Roos, 1999, amended)<sup>23</sup>: Integration with other industries, scale effects, competitive market, competition with other fuels/energy types, national policy, local policy and local opinion, reliable supply (quantity / quality).

In decentralised development a high degree of coordination between the forest industry and energy companies could decrease production costs and increase profits. In the initial phase investments in both heat and power plants are needed, which may be realised only through financial support. Therefore several countries already provide investment subsidies with different shares of the total investments in bioenergy systems. In France for example public tenders are used to install district heating systems running with biomass; the 2000-2006 wood-energy programme permitted to install 1800 residential and industrial heating systems and a recent new programme has been launched for CHP plants. Some countries indicate that incomplete information could be one main reason behind market failure in the bioenergy sector, as well as uncertainty about fuel quality.

Standardised measures and specifications for wood fuel and wood fuel products are indispensable for larger-scale wood-fuel markets  
Long-term supply relationships/contracts and trading of standardised wood fuels are critical to enable the operation of local/district heating facilities and their suppliers.  
An annual review of wood-fuel markets on national and international levels should be established to increase market transparency.

### ***Supply***

Besides the wood potential in forests, factors either furthering or hindering the supply of wood can be structured as economic, social and organisational, structural, technical, informational and supporting framework, all interlinked to a certain degree.

#### **Economic:**

As a result of the low prices currently obtained for wood for energy use, and the relatively high costs of production for wood chips and pellets, little additional material has come to market in central and northern Europe. Increasing transport costs can also limit further expansion. In the case of whole-tree harvesting in first thinnings forest fuels are still associated with high harvesting and transport costs which lower the competitiveness of the product. Shortage of skilled entrepreneurs / harvester operators and harvesters as such (especially in Nordic countries) suitable for harvesting of small-sized trees and for broadleaves provide a bottleneck for further wood mobilisation. In case of logging residues from final fellings the situation is more favourable, though transport costs/distances form the limiting factor here. Further analysis of the correlation of the costs of wood supply and wood mobilisation may be important in order to provide appropriate information for related policies. Often actual prices for wood, but also the lack of appropriate market structures,

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<sup>23</sup> Roos, A.; Graham, R.L.; Hektor, B.; Rakos, C. (1999): Critical factors to bioenergy implementation. Biomass and bioenergy 17: 113-126.

market transparency and market information reduces the motivation of forest owners to harvest timber for market supply.

#### Social:

A large amount of (country specific) literature describing factors influencing the supply of wood from private forest owners is available. Occupation, membership in forest owner associations or co-operatives, age, standing volume, size of the property, operational costs, actual or even more expected wood prices do play a significant role. Decoupling of forests from farm enterprises and absentee ownership often leads to decreasing knowledge and skills about forestry and also changes in management objectives away from income generation, usually combined with decreasing management intensity. Generally the supply from larger holdings does not vary much, while harvests on smaller estates may differ significantly, due to the lack of market access and information or interest. Private forest owners are often not market-driven actors, showing a less price elastic market behaviour. Therewith price increase and additional market supply of wood is not necessarily connected. Harvesting for traditional fire wood for instance is (in Central Europe) often the only management activity, carried out just for self supply. Data for Latvia show that 78% of the forest owners collected firewood in the last years (average of 26 cbm per year) but only 12% mentioned that they gain income through this activity. A reserved attitude towards closer co-operation with the wood industry also hinders the establishment of constant forest owner – forest industry relationships, both in terms of steady wood supply and price arrangements. Migration (rural exodus) and aging of forest owners (average age of private forest owners in Europe is ca. 56 years) reduces the available labour force for family forests in many parts of Europe.

#### Structural and organisational:

The high fragmentation of private forest ownership in the EU also influences management intensity. Ownership sizes vary considerably between private and public forest owners. The average size of public holdings in the EU is about 975 ha while the average size of private holdings is 12.7 ha. Moreover, the median size of private forest holdings in many countries is around 5 ha or less. For instance, the average size of private properties in the Czech Republic and Slovenia is 3 ha. In the near future, a further increase in the number of private holdings is expected in several Eastern European countries, because of the continuing restitution or privatisation processes. Inventories confirm, that the reserves for additional wood mobilisation relate to smaller scale private forests, to a large extent in first thinning age classes. To cope with the negative impact of fragmentation – economies of scale, inconsistent forest management – the voluntary formation of forest owner association / co-operatives is fostered throughout the EU; though there is a clear indication of increased market supply from small private properties through such organisations, the grade of organisation differs widely between countries: While e. g. in Austria 35% of the forest owners and 80% of the forest area co-operate under the roof of forest own associations, in Estonia only 2 percent of forest owners (9 % of forest area) are organised<sup>24</sup>. But also the forest-based industry, forest entrepreneurs and partly State Forest Enterprises are undertaking efforts to reach critical mass in assembling wood from fragmented private properties. The existence of appropriate forest infrastructure (forest road network) forms another precondition for effective harvesting and transport of wood for all purposes. Such infrastructure is still underdeveloped specifically on small scale private forest properties therewith hindering active forest management and market supply.

#### Technical and human resources:

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<sup>24</sup> CEPF (2008) preliminary data, to be published

Notes specifically from Nordic countries indicate that in order to match the renewable energy targets and increase biomass supply from forest residues and first thinnings as well as deciduous stands the available machinery is insufficient or unprofitable to operate and has to be improved both in number and operational efficiency. Also personal capacities – the availability of a skilled work force – whether at forest enterprise, contractor or forest entrepreneur’s level – form a bottleneck for effective wood mobilisation not only in small scale private forests but for all property types and sizes.

#### Informational:

The growing number of new forest owners, changing owner values and relationship towards their property but declining skills and knowledge constitute important reasons for lower levels of harvesting activity. The need for sound information on forest management options in general and wood for energy production has increased significantly. Specific information gaps have been identified for several important issues, such as the possibilities of utilising logging residues/ first thinnings for energy purposes, the production of processed wood fuel and knowledge about the economic opportunities also in heat entrepreneurship. This relates not only to forest owners but also forest owner associations, decision-makers and the general public.

#### Supportive framework:

Every country has set up its own support system for sustainable forest management in general and often for wood mobilisation in particular. This encompasses informational and planning instruments like wood mobilisation strategies including wood for energy, extension and training efforts and financial incentives for forest owners (either direct or indirect, furthering forest management, infrastructure etc. ), contractors (forest operations and logistics) or energy entrepreneurs (support for investments, feed in tariffs). The formation of regional or national forest clusters which include all relevant market partners and stakeholders could support sectoral co-operation.

Within the broad number of factors influencing wood supply, forest owners and their motivations play the most prominent role. Therefore it is essential to emphasise the improvement efforts in MS to address forest owner market involvement. Increases in the number and skill level of the workforce and adequate machinery may be necessary to bring additional amounts of wood to the market.

The owner characteristics are changing, including more and more non-farmers and absentee owners; local labour force is decreasing. The organisation of forest owners differs widely within the EU, being specifically poorly developed in the New Member States.

Means to encourage mobilisation should not concentrate solely on wood for energy but as an integral part of overall wood production. This implies synergies in wood mobilisation for energy producers and the forest-based industry.

The supportive framework for wood mobilisation may be evaluated on MS level in order to identify the most effective tools or combinations.

An annual up-date of wood supply distinguishing wood fuel and roundwood by forest ownership types and property size classes may be carried out on MS level to follow the effects of wood mobilisation efforts.

## 5. Elements of wood mobilisation approaches: experiences from EU Member States

The information provided in this section is based on the presentations of Working Group members and external experts; the full list of presentations can be found in annex 6). Wood mobilisation efforts have been undertaken in MS already for years, following national inventory results on substantial amounts of unutilised wood potentials in the EU especially on small scale private forest properties. Due to rising energy demand and energy prices as well as national and international renewable energy targets, these efforts have been even intensified. Harvested amounts all over Europe have increased, most recently, both for raw material and energy purposes, due to mobilisation efforts and increasing wood prices.

Further sustainable mobilisation of wood resources require overcoming legal and institutional constraints (e.g. forest ownership structures), access to data, forest infrastructure, adequate wood markets and prices, as well as motivating especially private forest owners to manage and utilise their forests. Partly, supportive laws, regulations and policies have been set in place, as well as efforts for information and motivation of forest owners and other actors, especially entrepreneurs. Conceptual targets include bringing more wood to the market (increase volumes), bringing a greater area under regular use and effective management (increase area) and motivating more forest owners to use their forests (increase number of people involved).

### *Markets, policies and initiatives*

The driving forces for wood fuel consist of market and market support elements and sets of steering political instruments. National energy systems and energy policies vary among countries but have an influence on the use of wood for energy; favourable policies are already in place since the 1980s and 1990s in parts of the Nordic countries, Austria and Germany; growing political interest can be observed in the Baltics and other countries. In Southern Europe the opportunities that wood mobilisation for energy offer for the prevention of forest fires are more and more appreciated. Cluster policies have been set in place in several MS encompassing both forestry and wood based industries. The proposed new EU Renewable Energy Directive<sup>25</sup> calls for the set up of national action plans for renewable energy by 2010.

Strategic planning exercises were carried out in a number of MS, to assess potentials, discuss options and risk areas for further wood mobilisation and suggest measures for action. For example in Austria in 2007 a Renewable Energies Task Force thoroughly analysed the options for biomass from forests. In Scotland the Wood Fuel Task Force worked on recommendations to increase wood fuel provision and use. Fora, consisting of representatives of all relevant groups like government, forest owners, forest industry etc., have been set up in other countries like France<sup>26</sup> or regions like Navarra in Spain to develop mobilisation strategies and targets. In France, the first forestry package (2008) aims to gain additional 12 million cbm a year within five years, potentially creating 40 000 jobs in rural areas. In Finland and Sweden strategies aim towards an increased production of wood chips and wood pellets from forest residues and first thinnings. In Finland today's wood chip production of 3,5 million cbm potentially could be tripled. Guidelines for the use of Renewable Energy Resources and Guidelines for the development of the Energy sector have been developed in Latvia.

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<sup>25</sup> COM(2008) 19 final, Article 4

<sup>26</sup> Grenelle Environment Forum; Forest Conference

*Support schemes for heat from biomass*

In order to increase the share of renewables in the overall energy consumption many MS have set up support schemes for renewable heat production from (woody) biomass. For example, in Finland and Sweden a CO<sup>2</sup> – emission-based tax for heat production was introduced, excluding electricity. Finland also provides grants for investments in boilers and machinery. The establishment of CHP plants for district heating on wood biomass basis is widely furthered throughout the EU, like for example in Austria and Germany (solely in Bavaria for 2008, 21 biomass heating plants have been approved , supported with 2,3 million € by the country. That adds to the already existing 270 H and CHP plants). To allocate public funds the most efficient way, France launches calls for tender for CHP plants.

Public heating systems play a growing role for biomass demand. In Latvia for instance the renovation of municipal heating systems is directed to biomass use. That switch may be financed by commercial loans, private investors, state support schemes, European Regional Development Fund as well as international donors. Heating of government buildings with forest biomass is used as a business incentive in the Navarra region in Spain to provide a reliable market for wood supply from private forest properties. The Scottish Biomass Action Plan and Renewable Heat Strategy accompanied by the Scottish Biomass Support Scheme facilitates the use of renewable heating. The increasing demand has lead to 67 projects under the Biomass Support Scheme encompassing not only plants but also supply chain and training initiatives. Finland has introduced a heat entrepreneurship (entrepreneurship of small companies in rural areas) concept, where the sold product is heat from biomass. In 2005 already 296 plants run either by co-operative / limited companies or entrepreneurs / ring of entrepreneurs were set up. These entities encompass a rather small number of owners though, often not exceeding three to four persons.

*Support for biomass supply*

Support schemes solely related to the production and harvesting of wood for energy are rare in the EU. In Finland support for energy wood harvesting from certain young stands and for wood chipping is granted, even though there are strict limits for the eligibility of young stands. All together less than 10% of forest chips production has been annually granted. The Czech Republic also provides wood chipping grants. In France tax incentives are available to carry out forestry work that will enable timber to be extracted. Forest owners also may apply for funding to help with forestry management contracts.

Several measures to foster and improve forest management and infrastructure as outlined in rural development programmes of all MS indirectly relate to the production of biomass for energy. Respective measures could be: improving the economic value of forests, improving and developing infrastructure, afforestation of agricultural land, restoring forestry potential and introducing prevention actions, as well as support for non-productive investments (e. g. first thinnings). Nevertheless it is felt that market forces and competition should prevail and that profitability may secure the supply.

*Information, education, training and capacity building initiatives*

Most of the technically and additionally available wood / forest residues in the EU are found in privately owned forests mainly characterised by small ownership structures, by owners with low motivation, decreasing skills and knowledge on forest management, and increasingly living away from their property. Therefore MS put major efforts on the

information, training and capacity building of forest owners and entrepreneurs to foster wood mobilisation, following the principle to encourage and not to enforce intensified forest management. Sweden emphasises the specific importance of information and capacity building through public forest service, forestry research institutions and forest owner organisations. This includes person to person contacts like individual advisory services, person to group exchange like meetings and excursions, as well as publications in newspapers, journals and books, leaflets and through internet.

Recommendations for forest energy harvesting were developed in several countries and include topics like (Roeser et al, 2008)<sup>27</sup>: Sustainable forest management (SFM), certification, criteria and indicators, legislation; soil fertility (site and stand classification); soil organic matter; wood production; biodiversity and wildlife; insect pests and fungi (usual national legislation to minimise/avoid forest pests in connection with harvesting and storage); hydrology, water quality, streams and lakes; landscape, archaeology, culture and leisure; nature conservation; silviculture; stump harvesting; production costs, sales and economies. Economic information over all seems of specific interest, as it is usually missing. Full scale demonstration sites have been installed to present bioenergysolutions.

In almost every MS, public forest services play an important role in providing basic information on the available resources and management options, bringing actors together and increasing the awareness and knowledge of forest owners. To improve efficiency in that context, in Scotland a target audience of forest owners owning at least 20 ha was formulated for information and capacity building efforts. In Finland capacity building measures are also related to energy wood advisers.

Specific events may also serve the purpose of information and capacity building. In Finland for example, forest owner associations have started a campaign to increase forest thinnings through a promotion week with organised events for forest owners all over Finland and following direct contact to forest owners (by phone or letter) with further information on thinning and possible service provisions. In Germany most recently regional "forest owner days" dedicated to wood mobilisation including wood for energy are organised, involving all relevant forest sector actors from educational institutions and service providers up to the industry. The event serves as a market place for forest owners to gain information and contacts, a theatre show intends to raise interest in forest management.

#### *Establishment of forest owner associations / owner groupings*

Due to the fragmented structure of private forest holdings, voluntary groupings of forest owners have been favoured and supported since years in all MS. Data on forest owner associations from Austria, Denmark, Spain, Finland, France, Norway and Sweden provided by the Confederation of European Forest Owners (CEPF) show a diverse picture in terms of organisation of owners (from 3% in France to 43% in Sweden) and area involved (9% in Spain; 80% in Austria). In general the grade of organisation is specifically low in the New Member States and the grouping process is still ongoing in many MS. In Hungary so far only 15 % of about 250.000 private forest owners are organised. Efforts are made to activate more owners through regional information campaigns, development of regional joint marketing structures and enhance co-operation with other actors like the state forest service.

The important role of forest owner associations and other owner groupings in the context of wood mobilisation was stressed throughout all country presentations. There are clear

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<sup>27</sup> Röser, D.; Asikainen, A.; Raulund-Rasmussen, K.; Stupak, I. (eds.) (2008): Sustainable use of forest biomass for energy

indications that wood supply from private forest properties has been most successfully managed in the countries with well established and functioning forest owner groupings such as in Finland, Sweden and partly in Austria, carried out in co-operation with other main players from industry and public authorities. Nevertheless, there still seems to be room for further improvement, both in terms of broader membership and service provision. Many of the organisations still lack professional management to coordinate the bundling and marketing of wood supply from fragmented member properties. Other activities encompass information and capacity building of members. In Sweden such activities are co-financed by the country and the Rural Development Programme. The area covered by a professional counsellor of an association differs from country to country; in Sweden at regional level one person is responsible for 1000 owners. Despite that, the co-operation with the state forest service remains important as the owner organisation can not provide advice for all owners.

In Germany support to forest owner associations is secured through membership fees (low), service fees and state support ("mobilisation premium"), which counts for about ¼ of the necessary amount. Mobilisation is a crucial issue for forest owner associations. At European level, CEPF is working on a mobilisation fact book (driving forces, available resources etc.) and on a co-operatives mobilisation action plan, both to be finalised and presented in September 2008. For France forest co-operatives launched a development plan dealing with topics like improved logistics and co-operation, forest management plan and support schemes in order to rise timber harvesting. Such an increase may reach 20 – 35% if implemented properly.

#### *Integrated approaches - pilot projects and evaluation*

Besides general efforts many MS have started integrated approaches and pilot mobilisation projects involving multiple partners on local or regional levels either guided by the forest authorities or scientific institutions. Examples have been presented from the Navarra region in Spain as well as from Germany.

Integrated general wood mobilisation efforts in Navarra include:

- The establishment of the "Timber Forum", a negotiating round consisting of private and public forest owner, industry and government representatives
- Creation of a sales catalogue
- Elaboration of sub-regional wood mobilisation plans in close co-operation with the forest owners. This action encompasses meetings, resource inventory and classification, establishment of joint selling procedures and sales contracts
- Forest certification efforts
- Changes in forest and timber sale legislation which include joint sale possibilities, more flexible sales procedures, increased competences for forest owners as well as the promotion of private owners "Forest management groups"
- Promotion efforts for the use of forest biomass by providing basic information on forest biomass availability, negotiating with the forest industry, furthering the use of forest biomass in public building and supporting the involvement of forest owners in forest biomass enterprises
- Education campaigns

Efforts have resulted in the successful establishment of sub- regional wood mobilisation plans (potential assessment via forest inventory, point selling procedure, long-term contracts for some products), the creation of private owner groups (collaboration of Forest Owner

Association and Government, elaboration of group management plans, first harvesting 2009). Specifically related to the mobilisation of wood for energy is a local market development concerning the process and final set up of wood pellet and chips production for district heating in the Pyrenees (advice for the development of the pellet industry, establishment of district heating; setting up of sub-regional harvesting plans). Extensive consultation, negotiation and information exchange is necessary to reach these achievements. In this respect governments / state forest services play an important role for mobilisation by providing basic information on the available resources, bringing actors together and increasing the awareness and knowledge of forest owners as well as reshaping the legal framework for wood sales necessary to enable increased transfers.

Local project results in different parts of Germany show that mobilisation is possible but only through joint efforts of various actors. These include the public forest service (identification of owners, first contacts, information), forest owner associations (co-ordination of wood harvesting, marketing of timber), entrepreneurs and industry (market partners). Constraints lay in the rather conservative attitudes of forest owners towards forest management and marketing of wood and in the lack of appropriate data on forest owners and wood potential to identify target areas and core clientele. Also a tradition of long-term partnership or co-operation with the forest industry is missing. Further the projects underline that initial wood mobilisation needs extensive information and consultation of forest owners. Harvesting units involving several proprietors have to be created to be economically viable. A basis for that could be the construction of a data base for all types of forest properties allowing the identification of the owner of a plot of forest land as minimum requirement. The availability of such basic data is different from region to region and depends on access to the land register, existing data bases of the State Forest Services or forest owner associations and is related to national data protection rules. In any case, specific information on the composition and management of forest properties should respect the national applicable rules of privacy. The forest owner associations need professional structures (skilled full-time managers, adequate office and equipment etc.) in order to cope with larger amounts of marketable timber from various properties.

Another example for public-private partnerships for wood mobilisation is the ongoing project "wald-wird-mobil.de" in Germany where public forest services, forest based industry and forest owner associations are bundling their competences to increase wood supply. Core of the efforts is the orientation towards the needs of forest owners and the usage of an IT system combining owner related information with forest resource data. Appropriate forest owner-related mobilisation activities are thus possible.

The "Northern Wood Heat Project" (NWHP) has built up sustainable wood supply chains and heat supply entrepreneurship in Finland, Scotland and Iceland. Co-financed by the EU (Rural Development Programmes, Regional Development Funds) the project surveyed the potential wood energy resources in selected areas, examined the prospects for viable supply chains and sought suitable locations for wood-fired heating schemes. Supportive publications on potential benefits of wood heating for energy users, forest owners and the environment have been elaborated and feasibility studies and cost estimates were compiled. The efforts resulted in an increase of wood chip heating plants in the Scottish Highlands from less than 40 to more than 80.

*Increase of wood biomass potential for energy*

Besides efforts to increase the supply from wood residues and first fellings, attempts are also made to raise the potential of wood biomass from forestry in the medium to long term. Measures encompass the support of afforestation especially in countries with low forest cover. Also potentials of Short Rotation Forestry (SRF) are explored. In Scotland SRF trials have been set up to gain better information on suitability, management and expectable yields and serve as an educational resource to demonstrate best practice. Up-take though is limited to date and cultural barriers to large-scale cultivation should not be underestimated. Possibilities to utilise genetically improved species or fertilisers are discussed. Forest management practices are under examination in order to be adapted to more intensive utilisation schemes.

*Wood mobilisation efforts on public forest land - State forest enterprises*

For most of the state forest enterprises supply of biomass for energy is a growing activity. The Austrian State Forests for instance even maintains its own biomass-based CHP plants. In other countries and regions similar investments are planned. According to representatives of European State Forests (EUSTAFOR) experiences with biomass supply for energy have been positive so far as this offers additional business opportunities and synergies with other forest operations. Reserves for mobilisation are seen in early thinnings and forest residues, including stumps. Crucial are contract arrangements between suppliers and industry. The availability of contractors often forms the bottleneck, as they need time to build up the necessary capacities.

The Swedish State Forest Enterprise (SVEASKOG), for example, not only operates on own forest land, but co-operates with about 8 000 private forest owners in the supply of wood, a challenging task. Regarding operational logistics (increased transport distances, biomass compacting systems) are of major concern. New techniques (bundling, compacting etc.) and shared infrastructure between supplier and buyer are key to reduce operation costs. Overall according to State Forest Enterprise representatives the increased demand for biomass will lead to more intensification of forestry, creation of significant additional value and revitalisation of the market for wood products.

Wood mobilisation is an ongoing effort in many MS, mobilisation of wood for energy can not be separated from mobilisation in general

Support schemes for biomass heating systems are widely implanted while direct support for wood supply for energy is rare.

Biomass mobilisation definitely needs support but besides a wide range of such measures, functioning markets should remain a main driving force for mobilisation.

Rural development measures specifically effecting wood mobilisation need to be identified and strengthened.

In many regions and countries, emphasis of public support is on information, education and training as well as capacity building. Forest services play an indispensable role for their provision.

Successful mobilisation requires the close co-operation of various actors in the value chain, including forest services, forest owner associations / owner groupings, contractors, forest based industry and energy entrepreneurs.

Forest owner associations / owner groupings have to be established and need to take a professional approach with regards to increased wood mobilisation.

Data shortcomings on forest resources and forest owners form a bottleneck for mobilisation and should be overcome for instance by support for inventories, GIS mapping, and management plans

Mobilisation of wood in areas at high risk from forest fire reduces costs of preventive measures by obtaining revenues and minimizing expenses. Wood fuel markets are indispensable to promote such further utilisation of scrub

Measures for mobilisation may be specifically directed to high-risk areas (forest fires, storms, insect infestations etc.) and mountainous forests to intensify forest management and reduce threats.

## 6. Challenges for mobilisation of wood

### 6.1 Sustainability

Mobilising additional wood resources will impact on forest ecosystems, landscapes and biological diversity if the efforts take place outside the margins of sustainable forest management. Two EEA reports (2006<sup>28</sup>; 2007<sup>29</sup>) and the review of WWF Hungary<sup>30</sup>, have identified potential impacts to be considered when extracting more wood for energy generation: biodiversity, site fertility, soil protection and erosion and watershed protection. These elements were also discussed in the WG.

#### *Biodiversity*

Application of the principles of Sustainable Forest Management (SFM) has maintained biological diversity in many cases. One of the indicators for that is the amount of deadwood. However, the complete utilisation of available biomass may run contrary to maintaining an adequate volume of dead wood in the forest. Moreover, the sustainability of soil quality and growth performance must be guaranteed by limiting the export of nutrients contained in foliage and small branches. Residue extraction and complementary felling may also affect the composition of flora and fauna through habitat homogenisation and more intense soil disturbance. When extracting forest residues, it is important that a certain amount of deadwood per hectare should be left on the site. Of particular importance is deadwood of a large diameter. Although the removal of fine and small woody debris also has an effect on biodiversity, there are many more species that depend on large dead trees. Currently, the amount of deadwood, particularly in commercial forests, appears to be low in many European countries. As an incentive, the Rural Development Programmes for 2007 - 2013 offer opportunities to compensate for income forgone for deadwood left in the forest. First thinnings are another way to increase wood mobilisation. Such thinnings for biomass utilisation both for energy and raw material could provide an opportunity to open very dense coniferous forests, and thereby improve the habitat value of these forests for many species.

It is encouraging that experience indicates that site adapted utilisation of residues after forest operations can limit the impact on biodiversity<sup>31, 32</sup>. It is expected that concerns over the

<sup>28</sup> European Environment Agency (EEA) 2006. How much bioenergy can Europe produce without harming the environment? EEA Report No 7/2006.

<sup>29</sup> European Environment Agency (EEA) 2007. Environmentally compatible bioenergy potential from European forests.

<sup>30</sup> Mathé, L. (2005): Ecological and environmental concerns of the forest biomass use for energy production - a critical review of the current situation. WWF Hungary.

Available: [http://www.efi.fi/projects/eea\\_biodiversity/results/constraints.html](http://www.efi.fi/projects/eea_biodiversity/results/constraints.html)

<sup>31</sup> EEA (2006): How much bioenergy can Europe produce without harming the environment.

<sup>32</sup> Meuleman, B.; Kuiper, L.; Nabuurs, G. (2003): EFFECT: Eu Forest for renewable energy to mitigate climate; p. 41.

compatibility of bioenergy and biodiversity can be met by keeping biodiversity as one of the determining factors in the forefront of production, planning and management, incorporated in the overall concept of multifunctional sustainable forest management. Nevertheless there is a clear need for additional research and monitoring information in this area, before the large scale implementation of techniques like whole tree harvesting and stump extractions. Best management practices may be identified. Natura 2000 sites are of specific interest in that context.

In relation to Forest Natura 2000 sites, the Commission recognised specific interest by publishing an interpretation guide<sup>33</sup>. This document gives general guidelines for the reconciliation of economic forest use and the achievement of nature conservation objectives.

#### *Site fertility*

Biomass removal from forest always results in the export of nutrients. The various parts of a tree contain different levels of nutrients. The lowest nutrient concentration is generally in the stem wood and the highest contents are located in the foliage. The nutritional impact of biomass extraction is therefore strongly influenced by the rate of extraction and the degree to which foliage and small branches are left on site. The site quality thereby also determines the extent of biomass utilisation. Site maps may give an indication.

Site productivity is usually not affected when removing woody biomass from forests managed with sustainable harvest levels. However, it is always beneficial to exclude small branches and foliage from the biomass removals. In the case of coniferous species this can be realised by extracting dry residues, which allows needles and small branches to drop before chipping. Additional research is needed to determine limits for removal of residues by site type in order to prevent fertility loss over a long time period.

#### *Soil erosion and compaction*

Soil is considered one of the most fragile components of forest ecosystems. Specifically on clear-cuts logging residues decrease the direct exposure of the soil to rainwater, sun or wind and thereby reduce the risk of erosion. Modern logging technologies could help to reduce the damage to forest soils. The negative effects of using heavy machinery can include alteration of physical properties (soil compaction) or the intensification of erosion. When harvesting wood for biomass, a much larger proportion of the biomass is removed. This means increased intervention and transport on the logging sites specifically with respect to whole tree harvesting and stump extraction. Good practice would require a proportion of branches to be used as "mats" on forwarder routes to protect the soil, which limits total removals.

#### *Water protection*

Forest have an important role in the protection of watersheds, and intensive logging activities may result in the degradation of water quality as well as increased frequency of floods in areas situated at lower altitudes of the watershed. Logging residues and deadwood play a role in regulating the water flows in the forest ecosystem, by maintaining a significant degree of humidity and reducing the effect of water run off on slopes. Thus, leaving small residues and dead wood on site helps prevent water flows. It has to be noted though that the overall silvicultural treatment has a much higher influence than harvesting intensity per se. On the other hand, extraction of residues can often have a positive effect on surface water quality by reducing the leakage of phosphorus.

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<sup>33</sup> [http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000/n2kforest\\_en.pdf](http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000/n2kforest_en.pdf)

Ground water areas should be treated with caution to avoid the acidification of water bodies. However, water protection areas are usually a rather local constraint for extracting forest residues.

#### *Environmental synergies*

Biomass removal may also bring positive environmental benefits. The decrease of nutrient leakage on eutrophicated sites is one of these effects<sup>34</sup>. Such gains in exporting nitrogen through residue removal are reported to be relevant for several countries such as Denmark, the Netherlands, Germany, France, Poland and southern Sweden. In some areas, particularly in Mediterranean countries, the extraction of forest biomass can reduce the risk of forest fires and facilitate fire extinction. Such fuel management implies significant costs, therefore its economic viability has to be increased, making it possible to obtain revenues and to minimise expenses. In consequence, priority should be given to create a market for forest fuels (including shrubs), which would promote the further utilisation of shrubs and reduce net costs of stand clearance.

To date, stump uprooting is not a commonly used method at European level. The longest experience of this practice has been in Finland and Sweden. The environmental effects of stump harvesting are currently being investigated in several ongoing research projects, notably in the Nordic countries and the UK. This includes research in relation to biodiversity as well as CO<sup>2</sup> emissions. Stump harvesting signifies a further intensification of forest management. There are many practical and perceived benefits of stump harvesting but there is also ample evidence to suggest that, in the absence of appropriate precautionary on-site measures, stump harvesting will lead to a range of undesirable environmental impacts. In order to ensure environmental impacts are minimised, best practice guidelines should be developed. Furthermore, additional research efforts are required in order to fully understand the range and intensity of environmental concerns, particularly the issue of how stump harvesting and overall maintenance of organic matter influences the soil carbon balance and forest nutrient capital.

#### *Forest health and forest restoration*

Intensified first thinnings can significantly reduce the risks caused by other abiotic threats such as storms by providing a higher level of stability for forests and to prevent not only from the large scale destruction of material assets but also from alterations to the CO<sub>2</sub> balance. However, operations in first thinnings may cause substantial damage if extractions are not carried out carefully and with appropriate machinery. Highly skilled operators and entrepreneurs are indispensable. Storage of energy wood, wood residues and wood chips must be carefully planned in order not to cause increasing secondary risks of damages by pest species. Recent research indicates that stump uprooting may eliminate some fungus-based forest diseases in coniferous forest. In areas where the *Heterobasidion* root-rot is a serious threat, removal of infected stumps prevents most inoculum from the site and reduces carry-over from the site. This is common practice in the south east of the UK. Stump uprooting may also reduce the breeding spots of pine weevil (*Hylobius abietis*). The bioenergy sector can also provide a useful market for the low quality wood from non-site-adapted stands and therewith offering an incentive for forest restoration activities.

Overall efforts have to be made to ensure that the supply of biomass is done in a sustainable way. This may encompass for example the elaboration of biomass utilisation intensity maps based on stand and site conditions. The European State Forest Organisations - managing

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<sup>34</sup> EEA (2006): How much bioenergy can Europe produce without harming the environment.

approx. 40 million hectares - use both the certification schemes of Forestry Stewardship Council (FSC) and Pan-European Forest Certification (PEFC) to assess and prove sustainable forest management also with respect to biodiversity and nutrition balances.

In the context of the proposed new EU Renewable Energies Directive<sup>35</sup>, reporting on possible sustainability criteria for biomass production for energy on EU level is requested by the end of 2010. Consequently, in July 2008 DG Energy and Transport launched an internet-based public consultation on requirements for a sustainability scheme for energy uses of biomass; there, indications on options for precise and measurable criteria for sustainable forestry are sought which could be applied globally and which would comply with the Ministerial Conference for the Protection of Forests (MCPFE) principles for sustainable forest management and related operational guidelines, developed for voluntary reporting on national level. In addition, most recently an MCPFE ad hoc Working Group on Sustainability Criteria for Forest Biomass Production, including bioenergy, was established to update and revitalise the existing criteria and indicators for forest biomass production.

## 6.2 Competitiveness of forest-based industries

Forestry and forest-based industries in Europe differ in their focus from region to region due to differences in natural conditions, ownership, industrial structure, markets, social demands etc. To maintain and strengthen the competitiveness of European forest-based industries it is crucial to secure a high-quality raw-material supply. Improved wood-supply-chain systems and adopted forest management models are therefore needed. In most parts of Europe, the links between forest owners, contractors and the industrial users of wood need to be strengthened. By providing raw materials, which are “tailor-made” for various end uses and by developing efficient and environmentally friendly forest operations, transport systems and management models for wood-supply chains, it will be possible for forestry and forest-based industries to maintain their viability and increase profitability.

Energy market data indicate that an increase in energy production from industrial wood residues is limited in many countries but specifically in Nordic Countries, where residues are already used very effectively (less than 5% unutilised); expansion therefore has to rely on forest residues and new plantations; that situation may differ in most of the other EU Member States. In certain countries, wood-based energy is mainly produced from industrial wood residues or by-products. In Finland the main provider of wood-based energy is the forest industry, which gets the wood fuels at a competitive price in connection with raw material procurement or as a by-product of wood processing. Pulp waste liquors are the largest single source of bioenergy in the country (ca. 45% of the total). The increased demand in combination with limited supply for wood for energy has in some places put pressure both on the quantities and prices of the raw material basis of the pulp and paper as well as the wood-based panel industry. Therefore the mobilisation of additional raw material is one of the most important efforts to safeguard competitiveness of EU forest-based industry.

Market mechanisms and competition primarily should stimulate mobilisation. Nevertheless, in order to reach targets of common interest as in renewable energies, appropriate support and public-private partnerships may be sought, taking into account that business environments differ all over Europe. Experience shows that rising wood prices bring some additional raw material to the market, but this is usually limited to larger forest properties and those small-

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<sup>35</sup> COM(2008) 19 final

scale private owners already active. It does not tend to create sufficient incentive for many owners to mobilise their wood resource for the bioenergy market. Security of supply, both quantitative and qualitative will be crucial for future competitiveness. Scotland for example with a fledgling woodfuel industry is currently trying to address issues of variable fuel quality, a lack of customer confidence in the security of supply and entrepreneurial uncertainty concerning long-term market development.

Improved co-operation between forest owners / forest owner association, entrepreneurs and the forest-based industry is key, for example through long-term contracts securing both supply and demand to build up and further develop mutual trust. One possibility to strengthen the links between primary production and processing could also be the shareholding of forest owners in wood industries; some examples are seen in Nordic Countries and Austria. Ways to further develop markets have to be sought, particular on a smaller scale. Considerable added value may be achieved through tailoring raw materials for end products and significant cost reduction as a consequence of more effective operations and logistics.

### **6.3 Efficiency and economic viability of wood mobilisation**

#### *Costs for processed wood fuel*

Wood chip production costs often almost equals revenues (20 – 33 € / cbm versus 30 -35€ / cbm in Germany, 9 – 29 € versus 31 €/ cbm in Czech Republic). Consequently, additional net revenues per hectare through the provision of wood chips are comparably low. New logistic solutions need to be sought to increase revenues. Often the critical available mass is low and road infrastructures are insufficient. For wood suppliers therefore, close co-operation and partnerships with heat / power entrepreneur are essential and binding long-term contracts on quantities and prices are necessary (contracting solutions). Finland has taken this up for its heat-entrepreneur concept. Such partnerships form a clear option for state forests, communal forests and larger private forest estates; for small-scale private forest owners this may apply only in the context of forest owner associations.

#### *Transaction costs*

In Germany costs of initial mobilisation via forest owner associations from establishing of a data base (forest owner, forest resource) to follow up contacts and controlling after billing and payment may reach 8 to 14 € per cbm depending on the preconditions like data availability, grade of organisation of owners as well as the ownership structure. Such transaction costs are typically large when a new market develops and decrease as the market matures. As the market develops there is usually intense competition in all parts of the value chain and standards need to be developed to secure deliverance quality. At the start though finances may be secured through a system of bonuses like marketing fees by the forest owner, a mobilisation bonus paid by the region / country and a bonus paid by the forest industry.

The involvement of forest owner organisations in wood acquisition from small scale private properties is indispensable. Their general co-operation and alliance with partners from the forest based industry, energy suppliers and public authorities can help to reduce transaction costs. In Nordic Countries, France, Austria and Germany forest owners and their organisations partly even operate the whole value chain from the forest to energy provision.

#### *Harvesting operations*

The transition to larger-scale production and use of energy wood will demand new equipment, new logistic solutions and market partners, i.e. an increase in mechanisation of forest

operations. For self-employed forest owners, modification of existing machinery for processing energy wood may be appropriate. Large-scale harvesting though deserves special equipment (e.g. for bundling, chipping, etc.) that may be financed and operated only by professional entrepreneurs. However, long-term perspectives and cost covering prices are needed to cope with such long-term financial liabilities. Over all forest biomass will be utilised most efficiently through small- to medium-scale energy production at local and regional levels in order to avoid long transport distances, which can limit economic feasibility.

#### *Work force*

In the EU an unbroken tendency to replace employed workers by entrepreneurs and contractors can be observed and increases in productivity have covered the reduction of the labour force so far. While the available capacities are able to handle the actual tasks, it appears that efforts to mobilise additional wood biomass will also require an expanded skilled work force. Both basic education and further advanced training have to be considered. The building up of new capacities will take time though. Experts report that it is not easy to recruit young trainees and entrepreneurs alone will not be able to qualify the needed personnel. The image and attractiveness of forest-related jobs should be increased in order to ensure sufficient labour force in rural areas. But also the profitability of services has to be improved. Partnerships and long-term co-operation between entrepreneurs and costumers may help to create more stability and long-term planning.

Increased harvesting in dense, young stands also implies a challenge; to reduce (mechanised) harvesting damage, training and further education of operators and careful planning of harvesting operations is necessary. Assessment of the number and skills level of the work force required should be carried out to gain sound information and a basis for the formulation of support initiatives.

#### *Innovative technology*

Data acquisition and information management plays a crucial role in planning and supporting efficient wood mobilisation activities and forest operations. Remote sensing solutions such as high-resolution satellite images and air photography may be used to create data bases on forest biomass resources. GIS mapping would be highly applicable in combining both natural and personal data in order to analyse the potential, the accessibility and operational features of potential extraction sites. This is of growing importance in highly fragmented ownership structures.

There is a lack of information especially among small-scale private forest owners about the options of forest energy utilisation. Wood for energy has to be planned together with other silvicultural activities as part of general forest management activities. No comprehensive decision support tools dealing with the economic, ecological and silvicultural aspects of forest biomass utilisation for energy have been developed so far. Such decision support systems need to be electronically available and used for increasing mobilisation.

### **6.4 Fragmentation, organisation and motivation of forest owners**

The fragmentation of private forest ownership in combination with underdeveloped forest infrastructure presents a major obstacle for wood mobilisation. This is a multifaceted issue that deserve a holistic approach to overcome it. As an example, land swaps, if possible in combination with infrastructure improvement, could help to ease that situation. Efforts so far

have been limited mainly due to the heavy administrative procedures involved, high expenses for assessment of forest value and strong emotional links of owners towards their property. Recently pilot projects have been started in Germany to test easier approaches to forest valuation and administrative procedures for land swaps and forest road construction in highly fragmented regions. Other approaches, building on business models, e.g. foundations, service companies, etc., or forest owner groupings, can help to address fragmentation, whilst preserving the fundamental property right of the landowners. Such an example can be found in Galicia in Spain, where the forest-based industry is offering the service of common forest management plans to forest owner groups. The approach shows a good up-take, resulting in better forest management and higher revenues for forest owners.

Improvement of forest infrastructure is an ongoing effort in many MS. Despite possible support through Rural Development Programmes, implementation in highly fragmented areas appears difficult though, as many forest owners have to agree and co-finance that initiative. Heavy and time consuming negotiating and persuasion procedures are almost inevitable for initiatives to succeed. Despite this in France an additional wood potential of 10 % has been made readily accessible through infrastructure investments. Public-private partnerships in investments for forest infrastructure and forest resource assessment may also add to improvement efforts.

The major instrument to cope with fragmentation of private forest properties and therewith increase market supply of wood is seen in the voluntary formation of forest owner groupings / forest owner associations. Despite the attempts that have been made for years acknowledging some visible achievements, the majority of private forest owners in the EU and specifically those in new Member States still refrain from getting involved. Such reluctance results from a general distrust of all kinds of associations, being somewhat associated with former collectivism. A closer analysis also reveals that in general larger properties and active owners seek the membership of owner groupings. In addition membership per se does not mean increased market supply activity unless all members are active.

Overall, an enabling framework seems necessary to enhance forest owner groupings both in terms of membership numbers and efficiency. Support has been advocated for the establishment of forest owner associations especially in new MS, as well as for capacity building and information exchange in older MS. Active purchasing policies of the industry specifically supporting owner groupings could add to such efforts. Additional measures, including introducing alternative internal management structures (forest management plan for the area; joint management of membership area), may also be discussed.

Ultimately, it is up to forest owners to decide on management activities and wood markets. Consequently, motivations play a decisive role in wood mobilisation. Often, due to fragmentation private forest owners do not necessarily regard their forest property as a source of income or see any rationality in using and marketing the timber from their forests. Specifically, those living in urban areas ("new forest owners") may not even be aware of their forest property and the potential it offers for example for energy generation. Also the connection between sustainable forest utilisation and climate protection is often not well understood and should be stressed and made much more explicit.

Research findings on forest owners' attitudes and perceptions can be translated into motivation campaigns, but information gaps on forest owners (addresses, forest ownership and personal data) and national data protection regulations could limit the numbers involved.

To increase the motivation of forest owners for market supply, joint efforts of the main players are necessary; National Forest Services are often looked upon as neutral and trustworthy by forest owners, so through personal contacts and information campaigns they may act as door-openers. It must be noted though, that such activities are time-consuming and need substantial personnel input, particularly when the growing numbers of absentee forest owners are taken into account. Results are unlikely to be visible immediately. Information campaigns to activate more forest owners may also be run by forest owner associations or other owner groupings in co-operation with the State Forest Services. Service centres aiming at advising the forest owner could be developed. Such public-private partnership for motivation may also encompass large-scale suppliers like entrepreneurs and wood industry to provide a broader insight into economic, ecological and silvicultural effects in order to rise willingness for market supply.

Forest owners, taking into account their changing values, knowledge and skills, may need additional services besides those mainly so far offered such as advice and wood marketing. This could range from full management offers to the provision of machinery or contractors.

Mobilisation of wood must take place within the margins of sustainable and multifunctional forest management. However, adapting criteria and indicators used by national or international bodies, such as MCPFE and credible certification schemes (FSC and PEFC) is strongly recommended. Wood harvesting-intensity maps, based on site-suitability analysis appear to be a valuable supportive tool for the management of wood mobilisation to safeguard sustainability.

Bringing additional raw material to the market is crucial for the competitiveness of the EU forest-based industry. Improved co-operation between forest owners, forest owner associations / owner groupings, contractors, forest based-industry and energy entrepreneurs for example through long-term contracts, is necessary to secure both supply and demand. Efficiency and economic viability of wood mobilisation is influenced by transaction costs, harvesting operation options, available work force and the use of innovative technology. Involvement of forest owner groupings and investments in appropriate harvesting machinery are necessary steps to reduce wood-retrieval costs. Recruiting, education and training initiatives have to be established to secure a sufficient work force for intensified wood mobilisation. Innovative technology should be applied, especially in the field of data acquisition and information management. Options to cope with fragmentation may be assessed and the potential of land swaps as one means further explored. The main instrument to ease the effects of fragmented private forest ownership structure and increase wood mobilisation is the establishment and further improvement of forest owner groupings or any other way to effectively bundle wood supply from dispersed sources. Appropriate support means need to be set in place.

The low levels of motivation of forest owners are a major challenge for further wood mobilisation. Joint efforts by all the relevant actors – forest service, forest owner associations and other groups, operators and forest industry - are necessary to address this situation. This could encompass the definition of core clientele for motivation campaigns and tailor made services for a changing forest owner clientele. Data shortcomings on forest owners and their motivations have to be overcome. Improved access to basic information on forest land ownership and contact information may be supportive. Overall, public forest services and forest owner organisations must play a prominent role to contact, inform and motivate forest

owners. National and regional awareness-raising campaigns, targeted at both forest owners and the general public, may address the need for increased wood supply from domestic sources, also stressing the role in CO<sup>2</sup> sequestration.

## 7. Conclusions and lessons learned

A **clear potential for increased forest utilisation** for wood for energy exists in the EU, mainly related to forest residues and complementary fellings, but also from first thinnings specifically on small scale private forest holdings. The amount varies from country to country and region to region but it can be generally assumed that considerably more wood could be mobilised from forests within the EU, without comprising sustainability. However, countries such as the UK have reported on a possibly tighter future supply. The discrepancies in the data on wood availability between different studies underline the need for better, harmonised and continuous information on wood potential for energy and material use.

The pattern of **supply of wood** for energy varies widely between countries and is considerably more diverse than previously expected. Indirect wood energy is the most important source, notably in those MS with large and modern forest based industries. Direct wood energy (traditional fuelwood) is of higher importance in European countries with smaller forest industries. Related statistical data are weak. In countries which are most advanced in this field there are few opportunities to increase the energy use of residues from the forest products industry. There are also technical limits related to logistics and contaminants on the use of post-consumer recovered wood, albeit the potential of this sector is yet unknown. Consequently, that resource has been of relatively small importance as an energy source, but is growing significantly in importance, supported by strict rules on biodegradable waste disposal. However, efforts are necessary to increase collection and usage of recovered wood. Significant expansion of wood-energy supply from forests to meet biomass energy targets therefore has to focus on direct energy, from forest residues and complementary fellings, integrated in general wood mobilisation schemes.

A strong increase in **wood demand** is forecasted specifically for energy generation. There is much potential for mobilising unused wood resources in the EU within the margins of sustainability specifically on smaller private forest holdings, mostly related to forest residues and first thinnings. Empirical studies on wood energy use at country level, such as from Austria, France and Germany<sup>36</sup>, show a much higher direct consumption of wood for energy than has been previously assumed. Unrecorded wood supply and demand may be occurring, for example for trees outside the forest, for logging residues and post-consumer recovered wood, and for private household use of wood for energy. Information on household consumption and supply of firewood and wood-based biomass from private forests by different information sources are often incomplete; more information and research on the issue is needed to support the planning and development efforts. There is an urgent need to analyse the potential of wood supply taking into account local conditions such as costs, ownerships patterns, quality requirements and infrastructure. Also, trade statistics are needed to up-date data on wood for energy, including wood chips and pellets. Institutional arrangements and allocation of resources should be secured to provide sufficient data in future.

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<sup>36</sup> Data basis: Household surveys; summarised in: UNECE / FAO University of Hamburg (2008)- to be published: Wood resources availability and demands; see also: [http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood%20availability\\_part1\\_final.pdf](http://www.unece.org/trade/timber/workshops/2008/wood-balance/docs/wood%20availability_part1_final.pdf)

In terms of **wood fuel-markets**, comparability of standardised measures and specifications for wood fuel and wood-fuel products is a prerequisite to larger scale wood fuel markets. Historically, wood suppliers are more comfortable selling timber products in cbm or tonnes, while energy producers look at energy efficiencies dependent on moisture content and calculated in GJ or MWh / tonne. Long-term supply relationships/contracts and trading of standardised wood fuels are critical to enable the operation of local/district heating facilities and to instill confidence in the marketplace. An annual review of wood-fuel markets on national and international levels may be established to increase market transparency.

Within the broad number of factors influencing wood supply, **forest owners and their motivations** play a most prominent role. Therefore, there is a pressing need for emphasis on efforts in MS which aim at forest owner market involvement. The characteristics of forest owners are changing to include more and more non-farmers and absentee owners. Also local labour forces are decreasing. The organisation levels of forest owners differ widely within the EU and are specifically less developed in the New Member States. The means by which mobilisation should be fostered ought not to solely concentrate on wood for energy but on overall wood production, as mobilisation for energy alone is less effective due to coupled products. Synergies in wood mobilisation for energy producers and the forest-based industry are evident and should be strengthened. The promotion of wood for energy though may function as a door-opener for increased market supply of wood for material use also. The supportive framework for wood mobilisation needs evaluation at MS level in order to identify the most effective tools or combinations. Consequently, an annual up-date of wood fuel and roundwood supply, distinguishing forest ownership types and property size classes ought to be installed on MS level to follow and assess the effects of wood mobilisation efforts. However, well functioning wood markets form a precondition for every mobilisation effort.

**Experiences from Member States** indicate that efforts to increase wood mobilisation are already an on-going. Support schemes for biomass heating systems are widely employed while direct support for wood supply for energy is less common. Biomass mobilisation definitely needs support but, besides incentives, well functioning markets should remain a main driving force for mobilisation. Measures from Rural Development Programmes specifically affecting wood mobilisation may be identified and strengthened. The emphasis that public support gives to information, education and training, as well as to capacity building, is very important, and state forest services play an indispensable role in providing them. Successful mobilisation of wood requires the close co-operation of various actors, including forest services, forest owners, forest owner associations and other groupings, forestry entrepreneurs and the wider forest-based industry. Properly functioning forest owner associations can play a major role in wood mobilisation from fragmented private forest holdings but they may need support for initiation and further capacity building. Forest entrepreneurs, the forest-based industry and State Forest Organisations also offer their services, logistic and organisational concepts for the additional wood mobilisation needed.

The lack of data on forest resources and forest owners form a bottleneck for mobilisation and should be overcome by support for inventories, GIS mapping, and development of management plans, by respecting national data protection rules. Mobilisation of wood in areas at high risk from forest fire reduces the costs of preventive measures by obtaining revenues and minimising expenses. The creation of wood-fuel markets appear to be crucial to promote further utilisation of biomass. Supporting measures for mobilisation may be specifically directed to high-risk areas (forest fires, storms, insect infestations etc.) and mountainous forests to intensify forest management and reduce threats.

Questions of sustainability, competitiveness of the forest-based industries, efficiency and economic viability and fragmentation, organisation and motivation of forest owners encompass the **major challenges for wood mobilisation**. Mobilisation of wood has to take place within the margins of sustainable forest management. Although experience indicates that site adapted utilisation of residues after forest operations can limit the impact on biodiversity, wood harvesting intensity maps, based on site suitability analysis appear to be a valuable supportive tool for the management of wood mobilisation to safeguard sustainability. According to the proposed new EU Renewable Energies Directive, possible criteria for the sustainable production of wood biomass for energy have to be reported to the European Parliament by 2010. A reference to criteria and indicators used by national or international bodies, such as MCPFE, and credible certification schemes (FSC and PEFC) is strongly recommended in that context.

Wood products can contribute to climate mitigation: Long-lived wood products form a storage pool of wood-based carbon, and as both raw material and energy source, wood can substitute more energy-intensive materials and fossil fuels. So far, however, international climate policies have only provided the possibility to account for carbon sinks in forests through the Kyoto Protocol. Accounting for harvested wood products (HWP) could help encourage silvicultural measures without losing the value of the forest carbon sink and therewith further wood mobilisation.

The forest sector will enhance its role as a major producer of renewable energy in Europe, while bioenergy will emerge as a significant source of revenue for forest owners and industry. The industrial activities based on bioenergy conversion will form the third pillar of the sector – standing beside those of the paper and the woodworking industry

Bringing additional raw material to the market is crucial for the competitiveness of the EU forest-based industry. Improved co-operation between the industry, forest owners, forest owner groupings, for example through long-term contracts is necessary to secure both supply and demand.

**Efficiency and economic viability** of wood mobilisation is influenced by transaction costs, harvesting operation options, available work force and the use of innovative technology. Involvement of forest owner groupings may help to reach economies of scale. Investments in appropriate harvesting machinery are necessary to reduce wood-retrieval costs. Recruitment combined with education and training initiatives are needed to reverse the long-term reduction in the work force, so as to enable intensified wood mobilisation. Innovative technology should be applied especially in the field of data acquisition and information management.

Uncertainty in wood supply is also caused by the fragmented forest ownership structure which compounds the difficulty to predict the behaviour of forest owners in terms of active forest management and marketing of wood. General options to cope with that fragmentation may be assessed and the potential of land swaps as one of the means further explored. The main instrument though to ease the effects of fragmented private forest ownership structure is the establishment and further improvement of forest owner associations and other groupings. Appropriate support means may be set in place to develop forest owner associations in order fulfil their role in wood mobilisation.

**Motivation** of forest owners is one of the key factors for further wood mobilisation. Joint efforts of all relevant actors – forest service, forest owner associations, operators and forest industry are necessary to cope with the current situation. This could encompass the definition of core clientele for motivation campaigns and tailor-made services for a changing forest

owner clientele. Data shortcomings on forest owners and their motivations have to be overcome.

Eased access to basic information on forest land ownership and contact information may be supportive. Overall, forest owner organisations and public authorities play a prominent role to contact, inform and motivate forest owners. National and regional awareness rising campaigns both targeted at forest owners and the general public may address the need for increased wood supply from domestic sources.

Mobilisation efforts often contain lots of "soft" elements which are time-consuming and personnel intensive, containing education efforts, information and technical advice, demonstration plots and training courses. Impacts may not be visible right away. In the end it is the forest owner to decide and MS may encourage but not enforce. Well functioning wood markets form a precondition for every mobilisation effort.

Overall regional approaches are needed to cope with the situation. Precondition for implementation is a sound assessment of possible options.

## **8. Recommendations to improve wood mobilisation**

Mobilising more wood is an effort of the whole forest sector. Therefore, most of the elaborated recommendations relate to an increase of supply of wood for energy and for raw material together, resulting in synergies for the forest based industries and energy producers. Measures with special reference to wood for energy are indicated accordingly.

To improve wood mobilisation the Working Group has identified eight focus areas for action and recommends:

### **Focus area 1: To improve data on supply and use of wood**

1.1 Better understanding of the resource is only possible with sound basic data, which are often lacking in the context of predicting wood potential for mobilisation. There is a crucial need to analyse in greater detail the potential of wood supply on **MS** and **regional level** taking into account local conditions such as costs, ownerships patterns, quality requirements, infrastructure and environmental considerations. **MS** and **regions** should also conduct surveys on household consumption of wood for energy to gain a clear picture on energy usage. The Commission can facilitate the efforts through information exchange. **Short- to medium-term action required.**

1.2 Monitoring and evaluation data are continuously needed in order to follow the developments in wood potential, supply and demand and to evaluate mobilisation efforts. The current levels of activity need to continue and be developed further. The **Commission, MS and relevant international bodies** need to periodically (3 – 5 years) up-date wood supply and wood-use information, including wood for energy, processed wood fuels, post-consumer recycled wood and wood-waste streams. **MS** should also undertake wood-fuel market reviews based on standardised nomenclature for trade statistics and conversion factors (e.g. MWh/GJ into cbm solid wood) to increase market transparency. The Commission and the MS should continue to co-operate on renewable energy statistics. **Short-term and continuous action required.**

**Focus area 2: To develop national / regional wood mobilisation strategies**

2.1 The proposed EU Renewable Energies Directive requires MS to set up National Renewable Energy Plans which would include the use of relevant biomass data and would balance wood mobilisation and nature conservation strategies. On that basis, **MS** could carry out a prognosis of sustainable production, utilisation and demand of woody biomass for energy. **Short-term action required with periodic updates.**

2.2 The development of wood mobilisation strategies requires the co-operation of various actors. Therefore **MS** are encouraged to establish roundtables, task forces or similar initiatives, comprising relevant stakeholders and interest groups including the energy sector, in order to develop wood-mobilisation strategies in an integrated way, possibly in the context of National Forest Programmes. This will help to improve co-ordination between energy plant development and wood-mobilisation efforts. The WG also recommends that the **SFC** facilitate the process by exchanging experiences on good practices. **Immediate action required.**

**Focus area 3: To increase the potential of wood for energy and material use**

3.1 Future wood supply potential should be positively influenced by afforestation and reforestation efforts as well as modified silvicultural treatment and active sustainable forest management in existing forests. **Rural development policies** should continue to support these activities. The use of improved trees, through tree breeding programmes, should be explored and supported. The WG also recommends that the **Commission** and the **SFC** facilitate investigation and dissemination of experiences on the silvicultural potential to increase wood supply, taking into account: regeneration from coppice, the choice of optimal rotation periods and choice of adequate harvesting techniques. This should include the prospects of short rotation forestry. **Short to mid-term action required.**

3.2 Post-consumer recovered wood forms a resource for energy use under-utilised in many MS so far. **MS** should work towards an increase in collection, up-date and use of recovered wood for energy, by assessing the potential and encouraging technological development. **Immediate action required.**

**Focus area 4: To ensure sustainable provision of forest biomass**

4.1 The proposed EU Renewable Energy Directive calls for reporting to the European Parliament on options for the expansion of sustainability criteria to solid biomass production by 2010. The **Commission** should continue its work on the development of sustainability criteria for biomass for energy production, taking into account ongoing discussions on national and international bodies, such as MCPFE. **MS** and all other **stakeholders** need to actively participate in the process. **Immediate action required.**

4.2 In order to ensure sustainable forest management while providing increased amounts of wood, management practices may need to be adapted. **MS** should continue to exchange experiences on harvesting biomass for energy, respecting the relationships between nature conservation, biodiversity and wood mobilisation strategies. Management practices may need to be adapted. The **Commission** should help to facilitate these efforts. To improve the knowledge on the long-term impacts of new technologies like stump extraction and whole-tree harvesting, as well as GHG balances in harvesting biomass for energy, additional research projects are needed. **Immediate and mid-term action required.**

**Focus area 5: To develop and maintain efficient wood supply chains and markets**

5.1 Adequate infrastructure and transport facilities are some of the basic requirements for a properly functioning wood supply-chain. **Rural development policies** should continue to support forest and other infrastructure development, as well as investment in local bioenergy developments. **MS** are advised to explore the options to improve road transport, including weight and dimension limits as well as diversification of transport means (railway, water transport). **Short-term and continuous action required.**

5.2 The forest and the energy sectors use different types of measurements, which hinder communication and coordination between both sectors and market development. **Forest industry** and **energy producers** should work jointly on the interoperability of specifications and measures (volumetric and energetic) for wood fuel and wood-fuel products as well as common terminology and conversion factors related to wood for energy. The **Commission** should help to facilitate the process. **Immediate action required.**

5.3 Both techniques and technology have to be further developed in order to ensure that sustainable wood mobilisation for energy remains economically viable. The WG feels that **MS** should encourage and promote the introduction of innovative techniques and technologies for production including tree improvement, processing and utilisation of woody biomass for energy generation, particularly in deciduous forests and for small-sized trees (first thinnings). Similarly, the development of biomass trading centres has the potential to optimise the acceptance, processing, refining and sale of energy-wood assortments. **Short-term and continuous action required.**

5.4 Well functioning wood supply-chains and markets require new approaches in co-operation between various actors. The open exchange of information, best practices and market instruments, like long-term contracts, could be used as one option to improve the co-operation between forest owners, entrepreneurs, forest owner groupings and forest industry in order to secure supply and demand. **MS** should encourage partnerships between private and public actors, namely state and municipal forest enterprises for wood mobilisation throughout the whole supply chain. **Continuous action required.**

5.5 The lack of an adequate workforce is a barrier to additional wood mobilisation. **MS** should ensure the provision of education and training for a skilled workforce. **Rural development policies** should continue to support such efforts. This would be made easier if **forest services** together with the **forest industry** were to conduct campaigns to improve the image and the attractiveness of forest related jobs, e.g. skilled workers, forest entrepreneurs and foresters. **Mid-term action required.**

**Focus area 6: To strengthen efforts for forest owner motivation, organisation and awareness-raising**

6.1 The fragmentation of private forest ownership is a major challenge for increased wood mobilisation in most MS. To address this, the **Commission** should assess options for coping with ownership and management unit fragmentation, as applied in the MS, and discuss the results in the **SFC**. **MS together with relevant stakeholders** should explore how the use of forest management plans for individuals and groups of forest owners, specifically in areas with high ownership fragmentation, might be introduced and encouraged. For that purpose,

access to basic forest owner related data could be eased while respecting national data protection requirements. **Immediate action required.**

6.2 Well functioning forest owner associations have proved their capability to increase wood supply from small scale private properties. **Rural development policies** therefore should continue to support capacity building of forest owner associations so as to encourage innovation. Furthermore, **MS** should explore options to encourage and support the establishment of forest owner organisations, co-operatives and other groupings. The **SFC** is invited to exchange views and experiences on the subject. **Immediate and continuous action required.**

6.3 A lack of motivation on the part of forest owners to harvest wood has been identified. Moreover, some owners may have different management objectives, other than wood production. The **WG** recommends that **MS** conduct national and regional awareness-raising campaigns, targeted at both forest owners and the general public to address the potential and need for increased wood supply from sources. It would be advisable for **MS** to review how they communicate with their forest owners to achieve this. **Short-term action required.**

#### **Focus area 7: To enhance support means, incentives and coordination efforts for wood mobilisation**

7.1 In every **MS** support measures for sustainable forest management are in place. **MS** are encouraged to evaluate the impact of their supportive framework with respect to wood mobilisation in order to identify more effective measures. The **SFC** should facilitate the exchange of experiences on support options for wood for energy and wood mobilisation, in order to ensure a coherent approach with respect to this. **Mid-term and continuous action required.**

7.2 Within existing support programmes several measures indirectly already relate to wood mobilisation. The **WG** recommends that **rural development policies** continue to support infrastructure development and improvement where relevant. The **Intelligent Energy Europe II Programme** should continue to fund actions to facilitate the up-take of renewable energy sources, including addressing the barriers identified by this report. **MS** should also try to focus specific measures for wood mobilisation on areas at high risk from forest fires and other threats as well as mountainous forests to maintain forest functions.

**MS** could consider strengthening support for biomass production in any future revision of their Rural Development Programmes. **Medium-term action required.**

7.3 Capacity building, education and training is necessary to ensure that wood mobilisation is carried out in a sound way. Therefore, **MS** should ensure adequate education, training and skills programmes, allowing for minimum proficiency and health and safety standards, related to wood mobilisation, especially for wood harvesting. The **Commission** together with the **MS** should continue to support capacity building for sustainable forest management. **MS** are encouraged to strengthen and improve co-operation and co-ordination between the forest authority, owners and their organisations, the wider industry, as well as education and training providers. **Short-term and continuous action required.**

#### **Focus area 8: To promote research and technological development in the field of wood production, harvesting technologies and wood utilisation**

8.1 Research and technological development are crucial for sustainable and viable wood mobilisation. The **Commission** should continue its support for forestry research and technological development with special regard to wood mobilisation questions, including biotechnology. **MS** and its research institutions should make full use of the Forest Technology Platform and its strategic research agenda to gain support through FP7 for innovative projects in wood mobilisation. In addition the WG considers the following research topics of major importance to be supported either through national and or EU research funds: the influence of wood use for energy on the overall raw material supply; sustainable harvesting techniques and technologies; technologies using forest biomass for efficient energy production; distribution and use of energy; carbon balances and sustainable forest management and wood utilisation; as well as work force related projects. **Short- to medium-term action required.**

8.2 Targeted distribution of up-to-date technical information is essential for policy making and enhancing forest management practices and with regards to wood mobilisation. **MS** should disseminate research results widely at the operational level and to decision makers to encourage the up-take of the findings and adoption of best practice. The **SFC** can facilitate such activities through the exchange of research and experiences. **Immediate and continuous action required.**

The conditions for wood mobilisation can vary considerably from region to region and from country to country. Supportive frameworks have to take this into account and be thoroughly adaptable. The WG considered that mountainous and other areas with high emphasis on social functions, as well as forest areas at high risks from forest fires, storms and other abiotic and biotic threats, will require special emphasis.

In **Northern Europe** focus is needed on activities to motivate forest owners and the introduction of new innovative technologies including harvesting and logistics as well as maintaining well established wood-fuel markets.

Activities in **Central and parts of Western Europe** should concentrate on improving forest owner groupings and other forms of co-operation, the introduction of new technologies, the motivation of private forest owners and maintaining markets.

For **Southern EU countries** facing high risks of forest fires, establishing wood fuel markets and initiating forest owner groupings and co-operation is most relevant in the context of wood mobilisation.

**In New Member States and Eastern European countries**, where State Forests often dominate, emphasis is required to promote the use of forest residues and low-value timber and related markets. Additionally, activities to raise the awareness of private forest owners about options for wood utilisation, including wood for energy and benefits of co-operation would be beneficial.

**Annex 1**

**SFC ad hoc Working Group II  
on mobilisation and efficient use of wood and wood residues for energy generation**

**Glossary**

**Conversion factors**

Applicable conversion rates to be used for converting tons of oil equivalent (toe) into cubic metres (cbm, m<sup>3</sup>) (Source: AEBIOM 2007), electricity (MWh) and heat (GJ).

1 toe = 4.6 m<sup>3</sup> round wood equivalent or 5,8 m<sup>3</sup> solid wood over bark or 14,5 m<sup>3</sup> wood chips

1 toe = 42 GJ, 1 m<sup>3</sup> wood (oven-dry) = 8,714 GJ

1 toe = 11,63 MWh, 1 m<sup>3</sup> solid wood = 2 MWh

Decimal prefixes:

10<sup>1</sup> Deca      10<sup>9</sup> Giga

10<sup>2</sup> Hecto     10<sup>12</sup> Terra

10<sup>3</sup> Kilo       10<sup>15</sup> Peta

10<sup>6</sup> Mega      10<sup>18</sup> Exa

**Abbreviations**

cbm: Solid wood under bark, cubic metre

CEPF: Confederation of European Forest Owners

CEPI: Confederation of European Paper Industries

CEIBOIS: European Confederation of Woodworking Industries

DG: Directorate General of the EU Commission

EEA: European Environmental Agency

EUSTAFOR: European State Forest Association

FAO: Food and Agriculture Organisation of the United Nations

FSC: Forest Stewardship Council

MCPFE: Ministerial Conference on the Protection of Forests in Europe

MS: Member States

Mtoe: Million tons oil equivalent

PEFC: Programme for the Endorsement of Forest Certification Schemes

SFC: Standing Forestry Committee

TBFRA: Temperate and Boreal Forest Resource Assessment

UNECE: United Nations Economic Commission for Europe

WWF: World Wide Found for Nature

### **Terms and Definitions**

Biomass (trading) centre: Focal point for biomass with differing layout from pure information provision to biomass collection and trade

CHP (Combined Heat and Power): Combined heat and power units are designed to produce simultaneously heat and electricity. For such units also the term co-generation is used.

Complementary fellings: The potential which lie between the maximum sustainable harvest level and the actual harvest level in the EU.

Deadwood: Any piece(s) of dead woody material, e.g. dead boles, limbs, and large root masses, on the ground in forest or in streams

Direct (wood) energy : Energy from wood directly from the forest (traditional firewood, forest chips, forest residues, complementary fellings)

Indirect (wood) energy: Energy from (processed and unprocessed) wood co-products (industrial residues) and postconsumer recycled wood

Forest owner association / owner grouping: Organisation of forest owners on local and regional level with voluntary membership, which provides, depending on structure and commitment, a variety of services to members reaching from sole common marketing of timber to full forest management offers upon demand.

Low value timber: Timber with minimal or negative returns after supply chain costs.

NAI (Net annual increment): Average annual volume of increment over the reference period of all trees less that of natural losses on all trees to a minimum diameter of 0 cm.

Short Rotation Coppice: Woody species grown on a repeated coppice cycle of 3 – 4 years specifically for the production of biomass. Productivity: ca. 9 t dry matter / ha / year; to produce 1 m<sup>3</sup> solid wood or 2 MWh 0,04 ha are needed.

Short Rotation Forestry: The cultivation of forestry for energy use using medium to fast growing species, grown on a reduced rotation length of 10 – 20 years.

Wood potential: Amount of wood available for harvesting, calculated as

a) physical wood potential (NAI by also taking into account age class distributions) and

b) realisable/mobilisable wood potential (NAI reduced by economically, ecologic and physically limiting factors).

Wood residues: The wood usually left in the forest after stem wood removal, such as stem top and stump, branches, foliage and root.

**Annex 2**

**SFC ad hoc Working Group II  
on mobilisation and efficient use of wood and wood residues for energy generation  
List of Working Group Members**

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### **List of meetings**

<b><u>Date</u></b>	<b><u>Content</u></b>
<b>22 April 2007</b>	<b>Terms of reference, background paper, list of topics,</b>
<b>15 October 2007</b>	<b>Country experiences, study results</b>
<b>18 January 2008</b>	<b>Country experiences, study results</b>
<b>14 March 2008</b>	<b>Country experiences</b>
<b>30 May 2008</b>	<b>Country experiences, first draft report to SFC</b>
<b>4 July 2008</b>	<b>Second draft report to SFC</b>

## **Annex 3**

### **SFC ad hoc Working Group II on mobilisation and efficient use of wood and wood residues for energy generation**

#### **Terms of reference**

##### **Background**

As part of the work programme for implementation of the EU Forest Action Plan, the Standing Forestry Committee (SFC) at its 97<sup>th</sup> meeting on 18 December 2006 decided that two ad hoc working groups should be set up in order to facilitate implementation of the Action Plan (point #3 of the meeting Agenda). The possibility to set up working groups is laid down in Article 7 of the rules of procedure of the SFC (AGRI/2001/53015/02 EN).

Considering the above, the Commission invited Member States to nominate relevant national experts to contribute to the activities of the two working groups. The second working group, established in parallel with the working group on mobilisation and efficient use of wood and wood residues, will be addressing issues of valuation and compensation methods of non-wood forest goods and services.

##### **Objectives and scope of work**

This working group will contribute to implementation of key action 4, in particular activity 4.1 of the work programme 2007-2011 of the EU Forest Action Plan. The purpose of this key action is to promote the use of forest biomass for energy generation by improving the mobilisation and efficient use of wood and wood residues, including low-value timber. In doing the above, the group will:

- Exchange information and experiences on availability of forest biomass and the economic feasibility of its use for energy generation (building on ongoing work);
- Analyse the application of SFM principles to mobilisation of forest biomass and discuss the need for further recommendations in this area;
- Exchange and enhance information on the consideration of forest biomass in national Biomass Action Plans or similar national planning instruments.

##### **Mode and timing of work**

The group is composed of experts nominated by the members of the SFC and of Commission representatives. The Advisory Group on Forestry and Cork and the Advisory Committee on Forestry Policy and the Forest-based Industries will be invited by the Commission to nominate three to four experts representing forest sector stakeholders, who will also contribute to the work of the group. In addition, the group may suggest other experts to be invited to talk on particular matters, if found necessary.

The mode and detailed timing of work of the working group will be decided by the group itself during the first meeting. The working group will hold between 4 to 6 meetings during a period of 18 months, starting the work in the first half of 2007. In the process of work, the group will periodically report to the SFC about the progress, completing the work and presenting a final report to the SFC by the end of 2008.

All experts are expected to contribute actively to the deliberations in the group as well as by providing the necessary information. Meetings will take place in Brussels and English will be used as a working language. Meetings will be chaired by the Commission. However, to facilitate the work, the working group may appoint *rapporteur(s)*, who will aid the chairman in reporting back to the SFC and preparing the group's final report.

Travel costs will be reimbursed to the participants of the working group meetings according to the same rules and procedure as applied to those attending SFC meetings.

### **Expected outcome**

It is expected that as an outcome of work this group will produce:

- Report on the potential for increasing the availability and use of forest biomass for energy generation, taking into account accessibility and economic feasibility;
- Draft opinion to be discussed in the SFC on the application of SFM principles to the mobilisation of forest biomass for energy generation.

## **Annex 4**

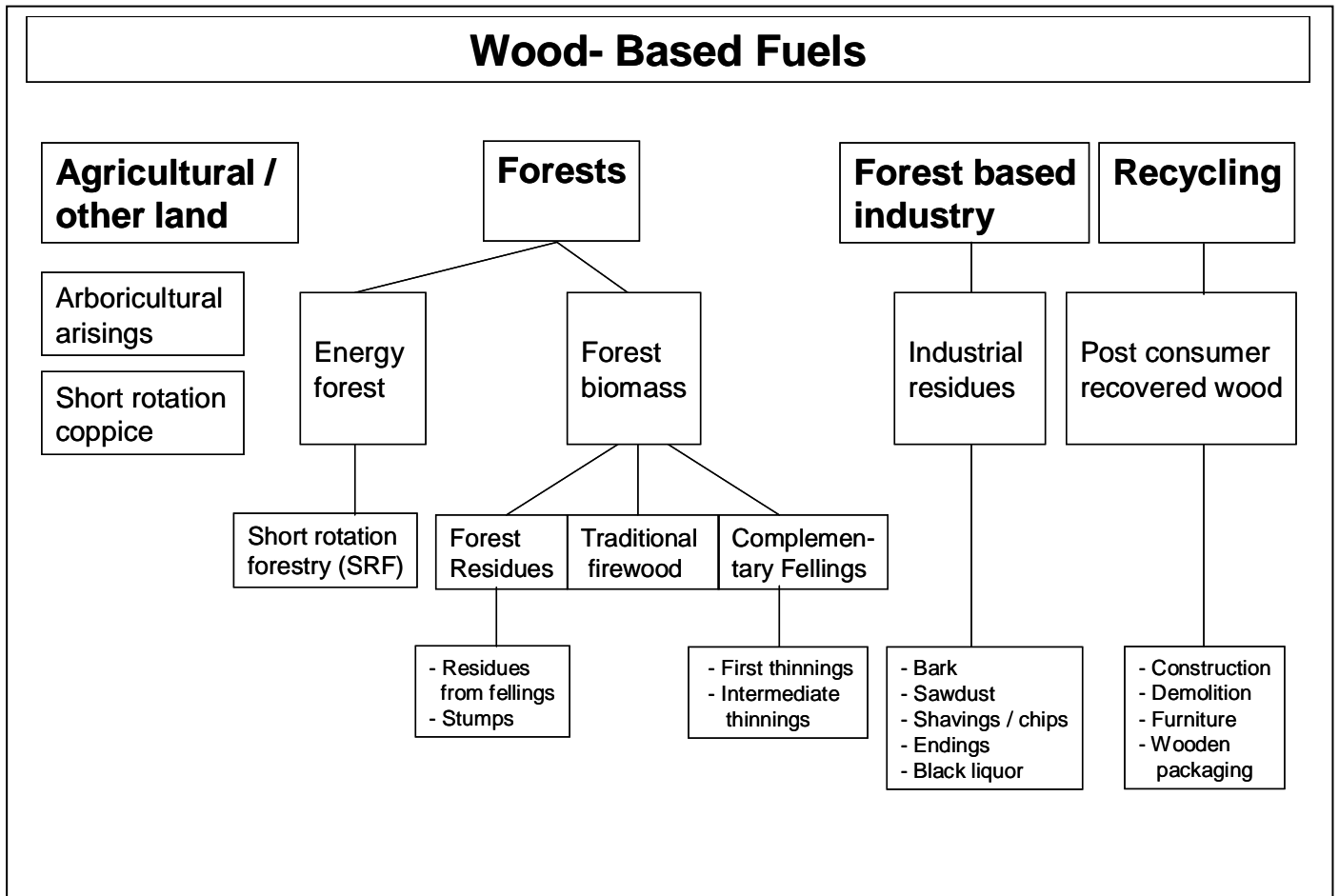
### **SFC ad hoc Working Group II on mobilisation and efficient use of wood and wood residues for energy generation**

#### **Draft short list of topics**

In the 1<sup>st</sup> meeting of the SFC ad hoc Working Group (WG) on mobilisation and efficient use of wood and wood residues for energy generation (22, April 2007), the participants decided to prepare a short list that facilitates the WG to focus on most important issues regarding the overall objectives of its work. This short list is based on the discussions in the meeting. Topics quoted to be of specific interest for the WG are highlighted in bold.

- **Review on the use and the potential of forest biomass for energy generation in the EU.**
- **Analysis of the influence of forest ownership on wood mobilisation.**
- Analysis of national Biomass Action Plans (BAPs).
- **Mapping good practices as regards mobilisation of wood in different MS.**
- **Analysis of factors inhibiting the removal of more wood from the EU forests.**
- Policy instruments for promoting the use of wood for energy generation.
- Examination of the wood resources outside forests.
- Climate change and forest biomass potential in the EU.
- **Possibilities for increasing the supply of wood.**
- **Demand of wood for energy generation.**
- **Environmental sustainability of forest biomass use for energy generation.**

**Annex 5**



Source: UNECE / FAO University of Hamburg (2008); modified

## **Annex 6**

### **SFC ad hoc Working Group II on mobilisation and efficient use of wood and wood residues for energy generation**

#### **Presentations**

##### **Study results**

- Bioenergy and the European pulp and paper industry: An impact assessment (CEPI)
- EUROFORENET: Cooperation between private and municipal forest owners in Europe (ELO)
- Mobilisation studies from Germany (University of Freiburg, Germany)

##### **Mapping of good practices**

- Woodfuel task force in Scotland
- Experiences from Finland
- Experience from Sweden
- USSE: Experiences from the South-West of France
- Experiences from Navarra region, Spain
- Examples from Latvia
- Availability of forest biofuels in the Czech Republic
- Example from Austria
- Example from Italy
- Experiences from Poland

##### **Role of actors**

- Forest Owner Associations and mobilisation of wood for energy (CEPF)
- Experiences in addressing forest fragmentation (CEPI)

##### **Potentials and sustainability of wood mobilisation**

- Wood residues (EUSTAFOR)
- Short rotation forestry – opportunities for mobilising wood fuel (UK)
- Sustainability considerations for wood mobilisation (WWF)

##### **Support mechanisms on EU level**

- Support measures in Rural Development Programmes (DG AGRI)

##### **Additional documents**

- Background paper (DG AGRI, 2007)
- Wood Fuel Task Force Final Report (Forestry Commission Scotland, 2008)
- Forest and Wood in French Renewable Energy Policies (France, 2008)
- A Review of the Potential Impact of Short Rotation Forestry (UK, 2006)
- BTG Final Report: Sustainability Criteria and Certification Systems for Biomass Production (2008)
- Forest Products Annual Market Review 2006 – 2007 (UNECE/FAO, 2008)
- Wood Fuel Mobilisation and the Carbon Balance (Forestry Commission Scotland, 2008)

**Annex 7****SFC ad hoc Working Group II  
on mobilisation and efficient use of wood and wood residues for energy generation****Results of Joint Wood Energy Enquiry (JWEE), 2006.**

In the study, the sources of wood energy were classified as follows:

- S1 Direct supply – wood directly from the forest
- S2 Indirect supply – (processed and unprocessed) co-products (residues) from wood
- S3 Recovered wood supply – post consumer recovered wood products having served their purpose for at least one life-cycle (e.g. pallets, construction wood, furniture), which are then used for energy.

**Sources of wood energy by country**

	S1 Direct		S2 Indirect		S3 Recovered		Total
	1000 m <sup>3</sup>	%	1000 m <sup>3</sup>	%	1000 m <sup>3</sup>	%	1000 m <sup>3</sup>
<b>Austria</b>	6.929	48,0%	7.025	48,6%	488	3,4%	14.443
<b>Czech Republic</b>	5.036	63,4%	2.903	36,6%	0	0,0%	7.939
<b>Finland</b>	6.803	20,7%	25.808	78,4%	303	0,9%	32.913
<b>France</b>	34.787	84,3%	4.979	12,1%	1.500	3,6%	41.265
<b>Germany</b>	13.023	43,0%	10.231	33,8%	7.017	23,2%	30.271
<b>Lithuania</b>	1.484	46,3%	1.724	53,7%	0	0,0%	3.209
<b>Netherlands</b>	313	15,9%	1.387	70,7%	263	13,4%	1.962
<b>Slovenia</b>	1.591	71,9%	596	26,9%	26	1,2%	2.214
<b>Sweden</b>	6.923	17,6%	31.760	80,7%	694	1,8%	39.377
<b>United Kingdom</b>	580	37,1%	532	34,1%	450	28,8%	1.562
<b>Norway</b>	3.128	54,2%	2.387	41,3%	258	4,5%	5.773
<b>Switzerland</b>	1.935	51,1%	1.250	33,0%	600	15,9%	3.785
<b>In European Countries</b>	<b>82.531</b>	<b>44,7%</b>	<b>90.581</b>	<b>49,0%</b>	<b>11.599</b>	<b>6,3%</b>	<b>184.712</b>
<b>Canada</b>	3.080	6,4%	44.730	93,6%	0	0,0%	47.810
<b>USA</b>	46.738	22,0%	163.231	76,8%	2.506	1,2%	212.475
<b>Total Northern America</b>	<b>49.818</b>	<b>19,1%</b>	<b>207.960</b>	<b>79,9%</b>	<b>2.506</b>	<b>1,0%</b>	<b>260.285</b>

**Uses of wood energy by country.**

	U1 Power and heat		U2 Industrial		U3 Private households		Total
	1000 m <sup>3</sup>	%	1000 m <sup>3</sup>	%	1000 m <sup>3</sup>	%	1000 m <sup>3</sup>
<b>Austria</b>	2.051	14,2%	3.855	26,7%	8.538	59,1%	14.443
<b>Czech Republic</b>	538	6,8%	2.270	28,6%	5.131	64,6%	7.939
<b>Finland</b>	8.594	26,1%	18.596	56,5%	5.724	17,4%	32.913
<b>France</b>	514	1,2%	3.825	9,3%	36.927	89,5%	41.265
<b>Germany</b>	15.364	50,8%	1.696	5,6%	13.211	43,6%	30.271
<b>Lithuania</b>	775	24,1%	422	13,1%	2.012	62,7%	3.209
<b>Netherlands</b>	1.400	71,4%	150	7,6%	412	21,0%	1.962
<b>Slovenia</b>	28	1,3%	531	24,0%	1.655	74,8%	2.214
<b>Sweden</b>	10.995	27,9%	19.458	49,4%	8.923	22,7%	39.377
<b>United Kingdom</b>	708	45,3%	235	15,0%	620	39,7%	1.562
<b>Norway</b>	595	10,3%	2.011	34,8%	3.167	54,9%	5.773
<b>Switzerland</b>	2.268	59,9%	224	5,9%	1.293	34,2%	3.785
<b>In European Countries</b>	<b>43.828</b>	<b>23,7%</b>	<b>53.272</b>	<b>28,8%</b>	<b>87.612</b>	<b>47,4%</b>	<b>184.712</b>
<b>Canada</b>	20.402	42,7%	24.178	50,6%	3.230	6,8%	47.810
<b>USA</b>	81.762	38,5%	87.470	41,2%	43.244	20,4%	212.475
<b>Total Northern America</b>	<b>102.164</b>	<b>39,3%</b>	<b>111.648</b>	<b>42,9%</b>	<b>46.474</b>	<b>17,9%</b>	<b>260.285</b>