



UNECE



FAO

FORESTS AND ENERGY

Background document for the European Forest Week

Summary

The background paper for the plenary session has been issued as document ECE/TIM/2008/3, FO: EFC/08/3. It is being translated in all official languages of the European Forest Week. The background paper was based on a longer paper which had to be shortened for technical reasons. However as some of the material removed contained valuable information and ideas, the secretariat is circulating informally and in English only, the longer version for the use of delegates, if they wish. The main changes concern the two boxes, more detail on wood energy (section 2), the discussions of sustainability (2.1) and tradeoffs with biodiversity (3.1) and climate change mitigation (figures 2 and 3). This long version is a complement to, but does not replace, the official background paper.

1. Introduction

Renewable energy is an essential component of a national sustainable energy policy. As countries increase investments in renewable energies, tradeoffs become apparent, including costs but also potential environmental impacts.

It is anticipated that wood energy – still the most important form of renewable energy - will further increase its significance in the total primary energy picture throughout Europe and North America. Influenced by new processing technologies, wood fuels are changing. Besides the success of wood pellets and briquettes, it is expected that cellulose-based ethanol and biomass to liquid processes will become economically viable in the near future, further boosting the demand for wood fibre.

For an updated overview of this issue from a global perspective, refer to FAO Forestry Paper 154, *Forests and Energy: Key Issues (FAO 2008a)*. This publication was prepared for the High Level Conference on Food Security: The Challenges of Climate Change and Bioenergy, held in Rome in June 2008.

2. Contribution of forests to energy supply

The broad outlines of wood energy supply and demand are still not well known, partly because of inadequate basic information and partly because of the relatively low profile of the market until recently.

In 2006 the first Wood Energy Enquiry was jointly carried out on international level by UNECE, FAO, International Energy Agency (IEA) and the European Commission.

The enquiry aimed at giving a comprehensive overview on uses and sources of wood energy in the UNECE region. According to the enquiry, wood volumes used for energy generation, seem to be twice as high as previously reported to official international statistics (Steierer et al. 2007). Based on the results of the Joint Wood Energy Enquiry (JWEE) a European Wood Resource Balance (Mantau et al. 2008) was developed, analyzing comprehensively all different sources and uses of wood. The wood resource balance showed, that 332 million m³ of wood was used for energy in Europe in 2005, including wood from forests and trees outside forests (45%); residues from industry (49%) as well as recovered wood (6%). This corresponds to 42 % of total wood (Figure 1).

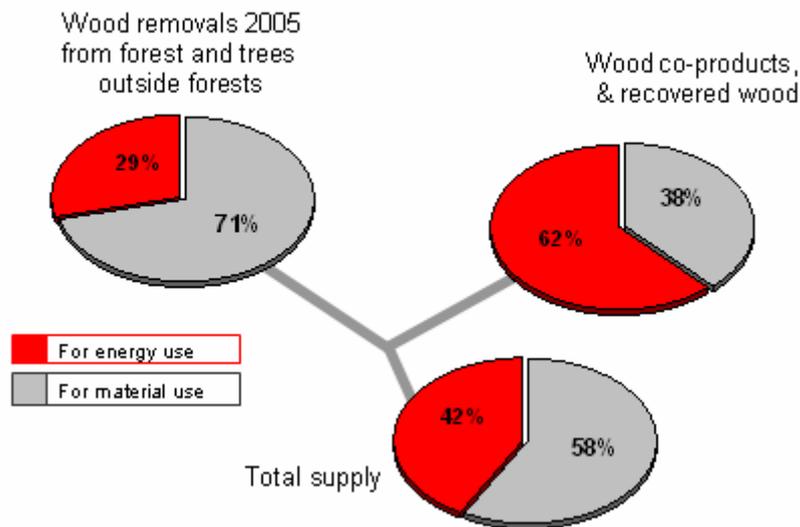


Figure 1: Share of wood use for energy and material use in the EU 27 / EFTA region in 2005 (Mantau et al 2008)

Nine percent of the final energy consumption in the EU 27 was generated from renewable sources. Wood played the most significant role in the renewable mix with 58%¹. Wood therefore accounted for just over 5% of total primary energy supply, a significant part, but much less than fossil energy sources or nuclear.

For 2020 the European Union has set targets calling for 20% renewable energy of the overall energy consumption. Assuming that the renewable mix would be as in 2005, an additional 353 million cubic meter wood equivalent wood be required. If wood declined in relative importance within the renewable mix by 25% (a plausible assumption), still 198 million additional cubic meters of wood will be needed. Biomass Action Plans are currently being developed in most countries of the EU, which will set the scene for the future contribution of wood to energy supply.

It is clear that wood cannot by itself supply the continent's energy needs, even if all wood were devoted to energy. If it were assumed that the entire increment of Europe's forest was efficiently used for energy generation² (including everything that is currently used in the wood processing industry), this would still only cover 9.5% of the total primary energy supply. Utilizing the entire growing stock in the EU 27 for

¹ based on 2008 Eurostat data (hydro not normalized)

² Assuming a net annual increment of 767 million cubic meter in forests available for wood supply (MCPFE/UNECE/FAO 2007) and 80% efficiency in energy generation

energy generation, the region's energy needs would be met for just 2.4 years³ before exhausting all the wood.

Wood energy and health issues

Indoor air pollution from wood is an important health issue for over two billion people, particularly in households in developing countries. Studies from the World Health Organization indicate that poor burning equipment and insufficient ventilation cause acute lower respiratory infections, chronic obstructive lung disease, lung cancer and a number of other direct consequences of energy use such as burns and poisoning, as well as less direct impacts resulting from time spent and risk associated with collecting fuel, restricted opportunities for economic activity, etc.

Small particulate matter (PM10) emissions have become an important health issue in Europe. Due to their small size (less than 10 microns), they settle in bronchi and lungs and can cause severe health problems, such as lung cancer. Even though open fireplaces are the least efficient heating method emitting a maximum amount of small particles they are still in use in Europe. Small-scale heating in private households is one of the most important PM10 emitters in some regions.

Improved burning and filter techniques can reduce PM10 significantly as emissions rely only partly on the fuel type. Modern wood fuel boilers without filters emit one third PM10 of open fireplaces. PM 10 emission of modern wood pellets stoves range already close to those of light heating oil furnaces.

Many European policies aim at banning PM10 emissions from burner and boiler by introducing national emission standards. Furnace producer for wood fuels such as pellets and solid fuel wood provide the required technical solutions.

Sources: Bruce N. et al 2002 & Bruce N. 2003

2.1 Potential sustainable wood supply

A central question is “how much wood could be provided for energy and forest products on a sustainable basis, and on what conditions?” To answer this question information is needed about prices, alternative energy sources, forest owners' behaviour, policy requirements for biodiversity and many other factors.

UNECE and FAO are preparing an estimate of potential sustainable wood supply, which will be the starting point for a process involving national contact points and sector specialists to provide a more precise quantified answer to this key question. This first estimate, based on internationally available data, will be presented at a policy dialogue during the European Forest Week.

2.2 What is “sustainable”?

Estimating potential sustainable wood supply (for energy or raw material) requires careful consideration of the deeper meaning of “sustainable” There are some complex silvicultural issues, notably as to whether it is sustainable to “over-cut” mature stands in countries with an uneven age class distribution to increase overall forest productivity (higher in younger stands). There are also questions of balancing the three aspects of sustainability (economic, ecological social) in the new context of high prices and demand. In the new circumstances however, sustainability cannot be seen only from the point of view of forest management, but also in the context of sustainable energy supply, and indeed sustainable development as a whole. Therefore, priorities arising outside the forest sector must be taken fully into account,

³ Growing stock of 19'660 million cubic meter in the EU 27 (MCPFE/UNECE/FAO 2005) and 80% efficiency in energy generation

alongside forest sector priorities. The need for a sustainable energy system for society as a whole, which certainly involves increased supply of renewable energies, including wood, could lead to different tradeoffs between the elements of sustainable forest management, possibly with higher priority being given to the wood production function.

Linked to this question is that of sustainability criteria for bioenergy in general, which are being developed, notably through a public consultation in the context of the EU renewables directive. Wood is one form of bioenergy and arises from a multi-functional source – the forest: what should be the relation between the sustainability criteria for bioenergy and for forest management? The work by the forest sector on developing indicators of sustainable forest management should be used in drawing up the sustainability criteria for bioenergy, but are unlikely to be maintained without change. If new criteria for sustainability of biomass sources are developed, how will they coexist with the existing sets, for sustainable forest management? Should the same criteria apply to domestic and imported biomass, and how should they be verified? These issues are being addressed by an ad hoc special group on sustainability criteria for biofuels under the European Council, as well as under the MCPFE process, which is looking at the issue from the forest perspective, but could also be discussed in the plenary session.

Will wood energy fuel world hunger?

The Food Price Indices of the FAO show clearly that oil, fats and cereals have seen an exceptional increase in 2007 and 2008. These steep price increases are linked to various reasons, such as weather-related production shortfalls, reduction in the level of stocks, decreased size of reserves, increasing fuel and fertilizer costs, speculation and also biofuels. Rising food prices are causing severe hardship and suffering. For many of the 800 million people who are already affected by chronic hunger, higher food prices can be devastating.

The High-Level Conference on World Food Security discussed the Challenges of Climate Change and Bioenergy and concluded that it is essential to address the challenges and opportunities posed by biofuels, in view of the world's food security, energy and sustainable development needs.

Public awareness of possible drawbacks of liquid biofuels is steadily rising. Public opinion generalizes all biofuels into the same category and thus the once positive reputation of the entire bioenergy sector is declining. However not all biofuels have a negative impact on world food prices and it is important to clearly distinguish between each fuel type and fibre source.

Second-generation liquid biofuels are produced from cellulosic materials, crop residues and agricultural and municipal wastes, unlike first generation liquid biofuels, do not compete with food. Even though not economically viable, yet, it is expected that these will be significantly more efficient in terms of raw material input per unit produced. Thus, second generation liquid biofuels could replace significant share of starch and vegetable based first generation liquid biofuels and help mitigating demand on cereals and vegetable oils in the future.

Sources: FAO 2008a & FAO 2008b

3. Forests and Energy – increasing demands on a limited resource

In the general context of increased demand for wood energy, a tightening supply situation and the appearance of new actors and new policy imperatives, tensions and even conflicts are probable. Set out below are some of those issues which seem most urgent, in the form of questions to which delegates are invited to answer.

3.1 Forest biodiversity and wood energy production – how to manage the tradeoffs?

Increasingly the concept of balance between economic, environmental and social dimensions of sustainability has been accepted. Sets of criteria and indicators have been drawn up to measure sustainability of forest management at the national level, and certification systems inform consumers that the wood they consume comes from sustainably managed forests. The report to the ministerial conference in 2007 on the state of Europe's forest confirms that, with some exceptions, Europe's forests are being managed sustainably.

However, the rising demand for wood energy could lead to adjustments in both policy and management practice. In particular, higher targets for renewable energy implies increased wood harvests, perhaps bringing into production hitherto neglected forests, extraction of residues from the forest, more intensive silviculture, and establishing plantations on non-forest land. This trend is already becoming apparent, even with the existing imperfect statistical systems: Europe's removals, excluding Russia, have risen between 2004 and 2007 by 73 million m³, with particularly steep increases in Germany, whose removals rose 50% between 2003 and 2007.

More intensive forest management sometimes conflicts with targets for biodiversity or habitat protection; currently 17% of the forests in Europe (excluding Russia⁴) are classified as not available for wood supply, mostly due to some kind of protection status. In addition, environmental standards might decrease wood supply, e.g. deadwood / habitat trees in the forest, limiting clear-cuts, distance requirements for harvesting near streams, or not planting genetically improved tree species. EFI recently published a study (co-funded by the European Paper Industry - CEPI) concluding that 68 million cubic meter of wood would not be felled in Europe (EU 27) due to protection of biodiversity and landscape diversity (Verkerk et al (2008).

This is leading to the question on possible tradeoffs between mobilising more wood for energy or raw material and biodiversity, in particular:

- To what extent will the more intensive practices associated with wood mobilisation influence biodiversity (some intensive methods, such as coppicing in certain circumstances, may increase biodiversity by letting more light into the stands, whereas others favour uniformity).
- Will the stronger demand for wood energy slow or stop the expansion of protected areas?
- Will “new forests” on former non-forest land have to reach the same standards as regards biodiversity as existing forests or will agricultural biodiversity standards be considered appropriate?
- Will the same biodiversity standards be applied to biomass imported from other parts of the world, and if so, how will this process be managed?
- Finally and perhaps most challenging, who will decide on these tradeoffs: forest owners, local communities, national governments, stakeholder dialogues or a combination of these?

⁴ If Russia is included, the share rises to 52%, as so many Russian forests are very remote and therefore not “available for wood supply” (MCPFE 2007)

3.2. What role should wood energy play in climate change mitigation?

In Europe's forests 9.8 billion tonnes of carbon are stored⁵, roughly seven times the annual green house gas emission of Europe⁶. Forest and plant growth is a major process to sequester atmospheric carbon. In the EU 27 on average the biomass in the forests has increased by 120 million tonnes per year over the last 15 years (MCPFE 2007). This is equivalent to 8.6% of Europe's annual greenhouse gas (GHG) emissions.

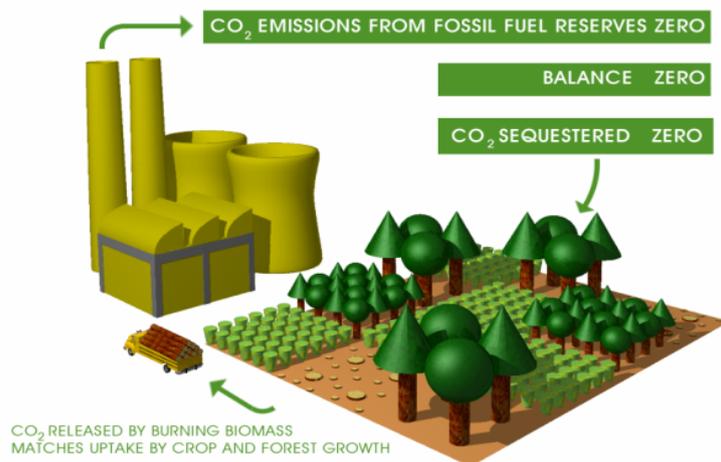


Figure 2: Energy from biomass: carbon cycle (Schlamadinger 2007)

However, forests are not only carbon storage, but also deliver wood, which can be used as a substitute for fossil fuels and non-renewable construction materials like steel or concrete. Utilizing wood instead of these materials (or fossil fuels) reduces overall GHG emissions, since carbon released when burning wood has already been recovered from the atmosphere while the tree was growing (see figure 2). In addition, the carbon stored in harvested wood products is bound for a certain amount of time, as it is not released immediately to the atmosphere once the tree is cut and harvested (figure 3). Thus the use of wood energy from sustainable sources is one way for the forest sector to mitigate climate change, alongside carbon sequestration in the forest, replacing non-renewable materials and storing carbon in harvested wood products.

⁵ Referring to EU 27 (MCPFE 2007)

⁶ Referring to EU 27: Green house gas emissions in EU27 were equivalent to 5'143 million tonnes CO₂ equivalent (= 1'403 million tonnes carbon) (EEA 2008)

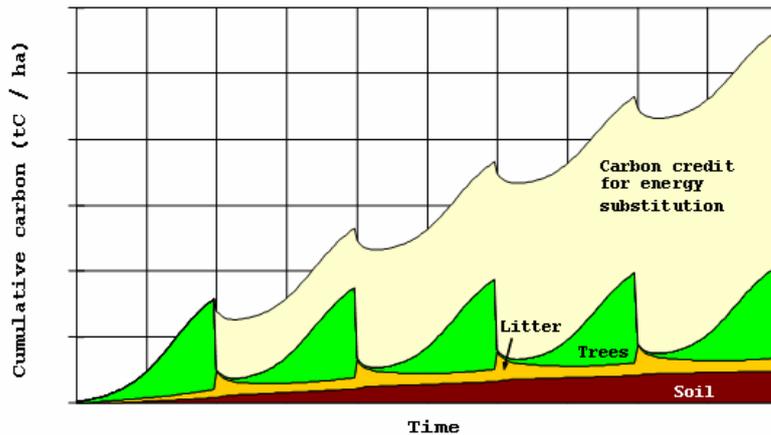


Figure 3: Carbon storage in forests and substitution effects from wood energy and wood products (Schlamadinger 2007)

From the point of view of carbon balance, a strategy for maximizing the contribution of wood to climate change mitigation would be a “cascading” pattern of forest growth and use of wood:

- maximise biological growth (biomass) in the forest,
- harvest and utilize as much as possible of the increment for wood products,
- recycle the wood products and at the end of their service life burn them for energy generation,
- utilize the biomass increment that cannot be used for wood products for energy generation directly, and
- throughout, avoid carbon loss to the atmosphere, notably through reducing conversion of forests to other land uses and avoiding silvicultural practices which release carbon from forest soil.

Policy suggestions:

- Promote more intensive silviculture to support carbon sequestration in forests (alongside payments for carbon storage).
- Promote wood mobilization and recycling;
- Promote the use of wood for energy through measures to reduce harvesting cost or consumer prices for wood energy buyers, or by stimulating installation of wood burning boilers;
- Incorporate replacement costs for non-renewable materials into their market price to improve wood products’ competitiveness;
- Ideal policy measures would not distort markets and would be graduated in their effect, possibly with correcting factors to prevent unintended results, and without excessive administrative costs and constraints which may hamper creative solutions;

One measure which satisfies most of these requirements is a carbon tax designed to provide the right price signals for all actors, by penalizing the end user for using materials or fuels emitting GHG. However, in many countries the introduction of a

comprehensive carbon tax (and a partial carbon tax is by definition a distortion) has proved politically very difficult as it creates numerous short term “losers” and the gains are diffuse and long term.

It should also be noted that none of the measures discussed above takes explicitly into account the biodiversity or socio-cultural aspects.

3.3 Will wood energy harm the forest-based industries in Europe?

For several decades, forest-based industries in the region have been managing the flow of their co-products for both raw material and energy uses, to reduce costs, and make the best use of the available material. Until recently, the raw material pathway dominated, technically and economically, with energy use getting lesser priority.

Increased energy prices have changed this balance, creating new markets and encouraging convergence between pulpwood and wood energy prices. In current conditions prices for low quality wood assortments are adjusting in correlation to the market value of its energy content.

European forest-based industries have become an important generator of wood energy for their own purposes and for external customers, and are among the beneficiaries of renewable energy support schemes. However, there are new actors: energy firms (including oil companies) expanding into bioenergy, who have different skills than the forest based industries and often have access to considerable capital.

Forest-based industries, notably those which rely on low priced wood for their raw material, have had to adjust to a double impact: supply scarcity and higher prices for raw material, as increasing volumes of wood (roundwood, chips and co-products) go to energy uses. Some industries, including the composite panel industries, have expressed concern about their long term viability in conditions of high energy prices,. Other industries, notably the sawmilling industry, have benefited from the higher prices and new markets for their co-products.

Industry representatives have called for a “level playing field,” claiming that energy uses are subsidised, whereas raw material uses are not (although forest management also receives significant financial support⁷). Forest-based industries are entering another period of structural adjustment, triggered by the change in the relative prices of wood energy and wood raw material.

Market actors will have to develop strategies which keep their enterprises competitive in the changing economic landscape. Possible ways forward for the forest-based industries include partnerships with forest owners or energy companies, product innovation and improved material efficiency, improving integration or sourcing raw material from new sources, or combinations of approaches.

One feature of the present situation is volatility, as policy instruments are changing rapidly. This makes it harder for market actors, whether forest owners, forest based industries or energy suppliers to develop and invest. Public policy makers should develop policies for wood energy adapted to the present situation and acceptable to most of the stakeholders, and then maintain them with minimal changes. These

⁷ EFFE: Evaluating financing of forestry in Europe (2003) Project under the Programme “Quality of Life and Management of Living Resources” of the European Commission, DG Research

policies should be firmly linked both to national energy strategies (especially national biomass action plans) and national forest programmes.

4. Conclusions: Towards a new equilibrium?

The changed situation for renewable energy is causing structural shifts, posing new challenges to the forest sector and creating opportunities to make a significant contribution to sustainable energy supply. Adjusting to the rapidly changing situation while maintaining a focus on sustainability will not be easy. A prerequisite is a realistic and well informed public policy dialogue. The plenary session of the European Forest Week is intended to contribute to such a discussion.

Delegates are invited to consider:

- Forest biodiversity and wood energy production – how to manage tradeoffs?
- What role should wood energy play in climate change mitigation?
- Will wood energy harm the forest-based industries in Europe?
- How can policy makers help the forest sector to find a new equilibrium?
- What is the role for international organizations?

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