UNECE/FAO
Green Economy Policy Brief

2012
INTERNATIONAL YEAR OF
SUSTAINABLE
ENERGY FOR ALL

FOR A STRONGER AND GREENER ECONOMY
UNECE

Wood Energy: Opportunity or Risk?

Introduction

Wood is the leading source of renewable energy in the UNECE region and it is likely to remain so in the near future. It currently provides almost half of the total renewable energy consumed in the region and although generation of other types of renewable energy such as solar or wind power will grow at a faster pace, wood energy is expected to continue to account for the largest share of renewable energy by 2020. The growth of wood energy is primarily driven by the European Union's 2020 commitments and by incremental targets in the use of cellulosic fuels for transportation in the ECE region. Next to these policy drivers, other important factors affecting wood energy markets include the expected growth in demand for wood energy from Asia, the output of the pulp and paper and other wood manufacturing industries, as well as prices of competing fossil fuels. The UNECE/FAO European Forest Sector Outlook Study II estimates a 3.5% annual growth rate for wood energy such that by 2030 the wood supply required to satisfy corresponding renewable energy demand will have to double from 435 million m^3 in 2010 to 860 million m^3 in 2030.

According to the findings of the UNECE/FAO Joint Wood Energy Enquiry most of the wood energy in the ECE region is used by the residential (39%), industrial (38%) and power and heat (20%) sectors. Of the three, power and heat generation is the most heavily targeted by public policy. Any changes in public policy approaches, including treatment of greenhouse gases (GHGs) and the carbon neutrality of woody biomass, modification of energy targets, and shifts in financial incentives can affect the future prospects for wood energy, as lack of stable policies can deter private investments.

Use of wood, following sustainable forest management practices and minimum energy efficiency thresholds, is a largely amenable source of renewable energy. Wood energy provides for greater production of locally-generated energy, diversifies renewable energy portfolios and reduces dependence on fossil fuels. Private forest landowners in the ECE region have favourable views of wood energy given the current positive growth/harvesting balance of standing biomass in forests and the potential for a new source of revenue.

Growing wood energy markets have allowed for the creation of jobs along the wood supply chain, which in turn has slowed a decline of human capital working in the harvesting, processing and transport of wood. Wood energy can also have important environmental benefits such as reducing fuel loads in forests that can diminish the incidence and magnitude of wildfires.

Nonetheless, greater use of wood energy can also have negative impacts. Growing demand for wood, partly triggered by incremental targets for renewable energy, can create additional price pressures affecting the profitability of manufacturers of material wood products such as the pulp and paper, panel, lumber or furniture industry. Sourcing all wood necessary to meet renewable energy targets from ECE forests may pose a high ecological risk linked to negative impact to nutrient cycling, soils, water resources and wildlife habitat, among others. Allocation of land to dedicated energy crops and the import of greater amounts of wood to the region are among the potential tools to reduce this risk. Short-rotation energy crops could reduce the harvest pressure for wood from ECE forests but trade-offs caused by land competition with food crops must be evaluated. Imports of wood energy feedstock need to be certified to meet sustainable criteria.

Trade in wood energy feedstock over long distances can significantly reduce the potential of wood energy to ameliorate GHG emissions. The carbon neutrality of wood energy using material transported over long distances and converted to energy at low-efficiency levels has been questioned. There have also been concerns raised about the impacts of particulate matter emissions from wood combustion on human health.

This Policy Brief summarises the views and recommendations of the various stakeholders that participated in a policy debate held in Geneva on 8 May 2012. The objective of the policy debate organised by the UNECE/FAO Forestry & Timber Section was to provide policymakers in the ECE region with a set of views from a wide group of involved sectors to address the economic, environmental and social aspects of the growing demand for and use of wood for energy.

Stakeholder Views

Forest management opportunities

Wood is a valuable, renewable and recyclable material suitable for a wide range of uses. It is a product that can generate significant added value, and its utilisation can contribute towards simultaneously solving environmental and energy problems. The forestry sector can make a significant contribution to a low-cost climate change mitigation portfolio that provides synergies with adaptation and sustainable development. A sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while at the same time producing an annual sustained yield of timber, fibre or energy from the forest, will generate significant climate change benefits while, at the same time, supporting economic development, especially in rural areas. European forest owners, about 16 million of them with an average land holding smaller than 10 hectares, see these as strong arguments for growth in this sector. In the EU alone, about half of the annual forest growth is currently being harvested, with strong potential to further increase the mobilisation of wood for energy and other industrial uses.

"The environmental sustainability of wood energy is not a problem. We should be concentrating on markets - on how we can increase the use of wood for materials and bioenergy uses."

Anssi Kainulainen
Central Union of Agricultural Producers and Forest Owners (MTK)

Alternative revenue source

Decades of declining wood prices have had a number of negative consequences, including a sharp reduction in the number of forest sector jobs. In recent years, the use of wood for bioenergy has increased the profitability of the forestry sector. In turn, increasing wood prices have led to an increased mobilisation of timber. So far, the increased use of wood for energy does not seem to have reduced material use of wood, which has declined since 2007 in the face of the economic crisis. Wood energy used at home may allow households to reduce residential heating costs.

"Bioenergy has increased the profitability of forests in the last couple of years without reducing material use of wood. On the contrary, we can only use more wood energy if we actually increase material use of wood."

Christian Rakos - European Pellets Council

Investment and Innovation

It is important, nonetheless, that the harvesting of wood must neither harm the supply to other industries, nor the sustainable vitality of forests. Harvesting wood for energy should make sense in how much energy goes into removing forest residues, including stumps. Wood mobilisation for energy has to be economically feasible. Harvesting cost is a determining factor for the economic use of wood for energy. To ensure this, new and more efficient harvesting technologies, working methods and logistics need to be researched and developed, particularly when it comes to collecting residues from harvesting. Similarly, capacity building, training for advanced skills of operators, and education along the supply-chain are needed to ensure a competent work-force and forest stewardship. When market prices are good enough in order to pay competitive prices for services, contractors can invest in personnel and technology. Reliable political targets for wood energy use and the specification of clear ecological conditions for wood use and forest operations are instrumental to generate a business environment where innovation, investment and development of service enterprises are encouraged.

"Rising demand for wood energy is good for forest enterprises. It provides additional income and work that contribute to livelihoods in rural areas. We need reliable political targets so that it is possible to make investment decisions."

Edgar Kastenholz
European Network of Forest Entrepreneurs (ENFE)

Certification of energy feedstocks

In the EU, over 10% of final energy use by 2020 is expected to be accounted for by bioenergy. Wood will likely remain the main source of bioenergy for power utilities, although the share is expected to decline from 80% in 2006 to 70% by 2020. Yet, the EU target of 20% renewable energy is not the same across energy types and uses: for instance, the target is 34% in the electricity sector. Power utilities face a penalty if they do not meet national mandates. Society demands more renewable electricity but in the current economic climate, most industries and citizens may not be willing to pay the price. Public incentives aim to improve cost efficiencies of renewables, but there is uncertainty about their medium and long-term availability which is detrimental to investment. In 2010 the six largest utilities in Europe started to develop sustainability principles. Sustainability schemes need to be (a) verifiable, with annual due-diligence by independent party; (b) practical, not cost-prohibitive and feasible to incorporate into current logistics; and (c) credible by users and other stakeholders. In addition to environmental concerns, utilities have two central motivations to adopt sustainability principles. First, sustainability of feedstock is central to risk management: power plants need to guarantee operations with biomass for at least 20 to 40 years. Second, wider sustainability certification of wood energy feedstock would spread sourcing of biomass beyond EU, enhancing resilience of biomass supply.

"Any kind of use of wood should be assessed for sustainability. When wood is sourced in the forest it is not necessarily clear what will be its final use."

Yves Ryckmans - GDF SUEZ

Trade and market efficiency

An additional uncertainty is the price for wood energy feedstocks, which typically exhibits annual and seasonal fluctuations. Greater price transparency in global markets is expected with the emergence and establishment of a global trading market in energy exchanges. Energy exchanges bring together commodity traders, thus improving market efficiency, while at the same time improving efficiency through market coupling. For example, APX-ENDEX already provides this market coupling in Europe (Belgium, France, Germany, Netherlands, Scandinavia, UK), resulting in optimal electricity flows by economising energy not produced or consumed. Market efficiency can additionally be optimised through trading, when one company with excess amount of wood pellets, sells them in regional markets at competitive prices, resulting in less wood shipped from abroad and more regional trade.

"We urge policy makers to set clear ground rules and certification schemes for wood to be used in energy… be it residential pellets, industrial pellets or wood chips."

Paul Groes - APX-ENDEX

Environmental risks

The use of wood for energy may have significant impacts on forests, ranging from nutrient depletion, biodiversity and net GHG emissions. Manufacturing of wood energy feedstock and corresponding impacts are a matter of scale, with bigger pellet manufacturing projects requiring more wood which often result in standing trees being targeted for raw materials. Examples include large pellet manufacturers in Canada, which, according to Greenpeace, procure up to 80% of their raw material from roundwood. It is thus recommended that wood energy should be collected from the cascading process using only by-products from local industries. Wood energy assessment must take into account the depletion of carbon from soils and the large footprint associated with transportation. Studies have estimated that up to 40% of the energy content of pellets shipped from western

"Assumptions in the forest bioenergy sector, such as carbon neutrality and waste-based energy, are often misleading and wrong. Bioenergy is part of the renewable energy portfolio, but it can only play a limited role."

Nicolas Mainville - Greenpeace Canada

Canada to Europe is consumed before reached the power plants. Moreover, assessments should fully account annual GHG emissions and full carbon payback time throughout the entire life cycle of products. In some cases, low-efficiency power plants can result in more GHG emissions from burning of biomass compared to coal, taking over a century before becoming carbon-neutral.

Cascaded use principle

Another part of the solution to climate change through the forestry sector is the greater use of wood-based products. Options include extending carbon retention in harvested wood products and non-renewable product substitution. Wood should be used for its highest value before being converted to energy, thus, observing the value and employment chains of wood. Wood may be used, reused and recycled several times but it can

"Use wood at the right time for the right process. Public policy at the moment is still trying to subvention a number of activities, such as industrial uses that do not maximize value and inefficient energy installations, without asking about efficiency criteria."

Ladislaus Döry - European Panel Federation

only be burned once. The woodworking industry is not against wood for energy if it is used in a highly-efficient system (e.g. combined heat and power), but suggests stopping subventions to industrial and low-efficiency installations that do not maximise use of woody materials. Generally, wood should be used for energy if sustainable forestry is guaranteed, demand for heating is reduced through enhanced efficiency in consumption, and only installations with highest efficiencies and lowest emissions should engage in energy generation. Based on their competence in the wood value-chain, the wood-based sector should be involved in the development of National Biomass Action Plans to maximise use of woody material.

Carbon Neutrality

The pulp and paper industry also supports the principle of a cascading use of natural resources. This sector has increased its share of biomass-based energy in mills from 49% in 2001 to 55% in 2010. This is particularly relevant since the industry belongs to the EU Emissions Trading Scheme (ETS) and is an important partner in reaching the EU2020 targets. Furthermore, the sector is increasingly submitted to policies, such as green public procurement policies, that require demonstrating the legality and sustainability of products offered in the market. It is desirable for all industries using wood to be equally committed to sustainability, including the wood energy

"If all of a sudden the 55% biomass-based energy produced by the paper industry was no longer carbon-neutral, the additional carbon price to be paid by the sector under ETS would range from 0.5 to 1.5 billion euros per year. It would be a huge impact on our industry and its competitiveness."

Bernard de Galembert - Confederation of European Paper Industries (CEPI)

industry. A predictable policy framework that includes renewable energy and efficiency thresholds, particularly beyond the 2020 targets, is critical for planning and investments. Yet, the short term carbon neutrality of wood energy has been questioned due to the time necessary for regeneration and regrowth of depleted forest resources (known as carbon debt). Should the biomass-based energy produced by the pulp and paper industry no longer be carbon neutral, there will be tremendous impacts on the industry´s competitiveness.

Health impacts

Besides GHGs, wood burning, especially in case of incomplete combustion, is an important source of air pollutants such as particulate matter (PM1, PM2.5, PM10, total suspended particles, elemental and black carbon) and heavy metals, non-methane volatile organic compounds, persistent organic compounds, and carbon monoxide. The main source of biomass emissions, based on categories used in national emission inventories, are non-industrial combustion plants of which residential plants (heating stoves, single house boilers, fireplaces, among others) are the most polluting. Health risks effects of pollutants from biomass combustion include premature death, lung damage, chronic bronchitis, allergies, asthma and lung cancer. There is growing evidence linking PM to cardiovascular diseases. PM is the most severe pollutant in terms of violation of World Health Organization (WHO) and EU standards for indoor and ambient air quality throughout the ECE region. Estimates between 2000 and 2010 in EU27, suggest wood burning emissions

"Governments in the ECE region will have to look closely into both climate and air pollution policies and state all commitments as a package. They will also have to look into impacts of wood burning on human health and the environment."

Krzysztof Olendrzynski - UNECE
Long-range Transboundary Air Pollution Convention

represented an average of 20 to 29% of all PM emissions with an increasing trend over the last decade. Policy action in the ECE region is already taking place with the revision of the Gothenburg Protocol to the Convention on Long-range Transboundary Air Pollution adding PM to the list of pollutants. By 2020, the EU as a whole aims to reduce emissions of volatile organic compounds and PM 2.5 by 28% and 22% respectively. The United States provisionally indicated that it is aiming for similar levels of reduction targets.

Local energy solutions

One possible solution for the negative consequences of biomass burning for energy can be found in technological innovation, as exemplified by Austria. In Upper Austria (Oberösterreich), thanks to a business model that builds on locally available forest resources, biomass heating provides 15% of total energy consumption, with over 40,000 biomass heating installations and about 40% of all municipalities use biomass as their main source for heating. Currently, there are 300 biomass district heating networks, which are mostly operated by farmers or forest owner co-operatives and about 50 projects are supplied

"We need new business models. Not everyone can or is willing to use biomass. In Upper Austria we have about 300 biomass district heating networks operated and owned by cooperatives of farmers that also own forests. This is a very local circle."

Christiane Egger - Upper Austria Energy Agency

by specialised biomass Energy Service Companies (ESCOs). The development of fully automated solutions to provide energy to domestic, commercial and public buildings through the use of different fuels (such as wood chips, wood pellets and log wood) and an array of technologies (such as stoves, semi-automatic log wood boilers, automatic wood pellet and wood chip boilers, district heating and CHP) was critical for this growth. Technological innovation driven by public policy is making it possible to drastically improve efficiency and to lower carbon and particulate matter emissions from biomass boilers. Targets by 2030 include reducing heat demand by 39% and reducing electricity demand by 0.5% per year, and cutting CO_2 emissions by 65%.

Policy Recommendations

The complexity of wood energy markets requires the adoption of comprehensive policy that addresses economic, environmental and social dimensions. The mobilisation and assortment of wood for material and energy uses expands beyond national and ECE regional boundaries which calls for the uniform adoption of rules and regulations for all types of wood. The wood energy market is dynamic and requires new investments in infrastructure, human resources and multiple other resources that can be deterred if there are no well-defined and stable policy objectives.

Policy Principles

Development and implementation of public policy tools should continuously ask for input from all stakeholders directly, indirectly or potentially affected by the growing use of wood for energy. Public policy affecting the wood energy sector should be:

a) uniform across all wood uses and market participants,
b) flexible to adapt to scientific progress and shifts in market dynamics,
c) clear in establishing incremental renewable energy targets that allow compliance by market participants,
d) attainable and with long-term steady objectives that foster technological advances, new investments and improvements in economic, environmental and social conditions.

Recommended Actions

Specific recommendations that emerged from the policy debate indicate that policymakers should:

- Prioritise local and regional procurement of wood for energy over exports and imports.
- Define clear targets beyond EU2020 and the role of wood energy in meeting expected demand and compliance with emission trading schemes
- Develop clear definitions of wood for energy along the supply-chain that reduce the risk of negative environmental impacts and unfair competition for fibre with other industries.
- Embrace the cascade principle for wood utilization, requiring efficient use of wood for material manufacturing and energy generation, only burning wood at the late part of its cycle once use has been maximised.
- Evaluate the environmental impacts of wood energy generation based on a comprehensive cross-sectorial analysis of various generation platforms (e.g. heat, electricity, transportation fuels).
- Identify and distinguish between various wood energy feedstock based on full Life Cycle Analysis. Support the use of wood energy generated only from the most efficient feedstock based on net energy generation and GHG emissions.
- Facilitate development of global carbon markets and their integration with bioenergy targets. Engage in a new energy tax reform with transparent and consistent carbon emission fees.
- Remove financial incentives for low-efficient uses of wood energy and revisit current subventions for wood energy that create ineffective market competition.
- Complement wood energy efforts, within renewable energy targets, with lower energy consumption and greater efficiency in conversion and consumption.
- Expand current sustainability certification tools across all wood uses using certifiable, credible and practical schemes.
- Support and expand the use of proper forest management methods for wood removal.
- Facilitate a network of wood-based businesses and include all wood industry participants in the development of national renewable energy plans.
- Limit and phase out the use of boilers and stoves with high-emission levels.
- Invest in new research to evaluate health effects of particulate matter and develop cleaner technologies.
- Commission coordinated research and development of innovative technology to reduce costs of collection, processing, transport, conversion, distribution and consumption of wood energy.
- Facilitate funds for training of human resources to sustainably harvest and mobilise wood in the ECE region.

More information
United Nations Economic Commission for Europe (UNECE)
Food and Agricultral Organization of the United Nations (FAO)
Forestry and Timber Section, Palais des Nations, CH-1211 Geneva 10, Switzerland.
Email: woodenergy.timber@unece.org
Website: http://www.unece.org/forests

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Credits
Lead Author: Francisco X. Aguilar, Assistant Professor, Department of Forestry, The School of Natural Resources, University of Missouri
Email: aguilarf@missouri.edu
Project Manager: David Ellul, Associate Economic Affairs Officer, UNECE/FAO
Layout: Christina Weimann, Carlo Schmid Fellow, UNECE/FAO

The UNECE/FAO Forestry and Timber Section would like to thank the French government (*Ministère de l'Écologie, du Développement durable et de l'Énergie* and *Ministère de l'Agriculture, de l'agroalimentaire et de la forêt*) for its support of the UNECE/FAO wood energy programme.

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
Ministère de l'Écologie, du Développement durable et de l'Énergie

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE L'AGRICULTURE DE L'AGROALIMENTAIRE ET DE LA FORÊT