9 Wood energy markets, 2011-2012

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Highlights

- Wood energy constitutes the main source of renewable energy in the UNECE region.
- Wood energy markets continue to develop, with demand concentrated in the EU.
- Increasing rates of manufacturing of woody feedstock, and wood pellets in particular, may result in higher prices for raw materials in the near future.
- Prices for wood energy feedstocks exhibit annual and seasonal fluctuations. Greater price transparency in global markets is expected with the emergence and establishment of a global trading market in the APX-Endex and others.
- Forest-owner groups, manufacturing conglomerates and environmental non-government organizations have a variety of favourable and non-favourable views towards the use of wood for energy and towards public policy support for it.
- Wood pellets dominate international wood energy trade. Certification programmes for wood pellet quality and environmental stewardship have emerged and are expected to be widely adopted.
- Global forecasts for future wood energy use suggest a significant increase in consumption in the near future.
- Future wood energy consumption will be a function of renewable-energy mandates, production costs, public financial support, competing energy prices and public preferences, among other factors. Whether output of wood energy increases or remains at current levels, it will continue to be an important component of a diverse portfolio of renewable energy sources.
- Public policy support in the form of energy targets and financial assistance has aided the growth in wood energy demand in recent years. Tightening of public budgets in the next year and beyond is likely to reduce the access to support payments or preferential taxation for renewable energy.
- Public policy discussions continue over the environmental aspects associated with the use of wood for energy and, in particular, its greenhouse gas neutrality.
- Unknown public policy directions might create additional uncertainty for the development of new wood energy projects. Technological developments may ease transport and storage of wood for energy feedstock, improve energy conversion and enhance cost efficiency.

9.1 General energy market developments

To celebrate the 2012 International Year of Sustainable Energy for All, in this chapter we consider in some depth the sustainability of wood energy. To do so, we evaluate the traditional economic, environmental and social dimensions of the sustainability concept. We also address how public policy has influenced wood energy sustainability across the UNECE region.

Wood constitutes the region's principal source of renewable energy. And renewable energy targets are the major drivers of demand. Wood energy markets continue to develop globally and trade in wood pellets has become more established. The EU is the largest market for, and importer of, wood energy feedstock, while the US, Canada and the Russian Federation are the primary exporters.

The debate continues about the greenhouse gas (GHG) neutrality of wood energy focussed on issues related to the treatment of anthropogenic carbon emissions and indirect land uses. Different types of woody materials (e.g. co-products from manufacturing versus dedicated biomass crops) have varying levels of net GHG emissions. From a GHG-assessment perspective, the most favourable materials to generate energy are co-products from the manufacturing of solid-wood products. There is a market tendency to certify woody materials used for energy for quality and for being sourced from well-managed forests.

In the UNECE region, public views about wood energy are mixed. There is still a non-favourable view among a sector of the public about the use of wood to generate energy. Some environmental non-government organizations (NGOs) share these concerns. Forest-landowner groups tend to support wood energy in its various forms (e.g. direct combustion, liquid fuels). Forest-product manufacturers also express mixed opinions about the use of wood energy and, in particular, about the use of financial incentives to promote greater consumption. Globally, total investments in biomass energy projects (including wood) are ranked third, behind wind and solar energies.

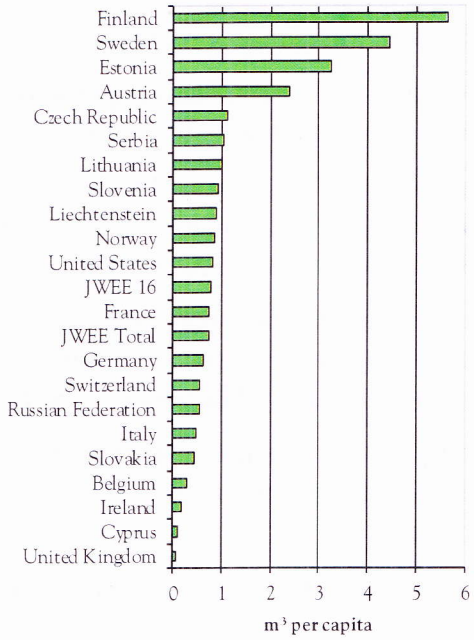
9.2 Economic considerations and sustainable wood energy

Wood energy remains the main source of renewable energy in the region. Based on data from the UNECE/FAO Joint Wood Energy Enquiry (JWEE 2009, 2011), it accounted for 3% of the total primary energy supply and 47% of the renewable energy supply (RES) in 2009 for those countries that responded to the enquiry. Average wood energy consumption per capita per year in the region shows that Finland, Sweden and Estonia have the highest per capita consumption, with over 3 m^3 of wood energy consumed in 2009 (graph 9.2.1).

Average per capita wood energy consumption for all countries that responded to the enquiry is estimated at 0.7 m^3 per year. Some of the lowest reported levels of consumption were found in Cyprus and the UK. Wood energy consumption in the region has not reduced forest inventory; rather, standing forest inventories have increased.

GRAPH 9.2.1

Annual average wood energy consumption per capita in the UNECE region, 2009



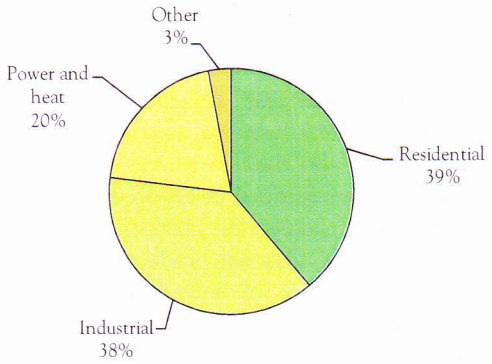
Source: UNECE/FAO Joint Wood Energy Enquiry (JWEE), 2011a.

Across sectors, the residential and wood-industry sectors are the two principal consumers of wood energy in the UNECE region, accounting for 39% and 38% of total consumption, respectively (graph 9.2.2). This is an important statistic as the majority of public policy instruments adopted in the region have primarily targeted power and heat energy generation. Total wood for energy consumption within the countries that responded to the 2009 Enquiry has been estimated at 595.7 million m^3.

Source: Vapo, 2012.

GRAPH 9.2.2

UNECE regional wood energy uses per sector



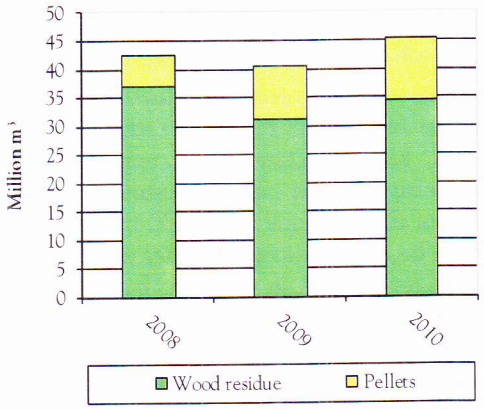
Source: UNECE/FAO Joint Wood Energy Enquiry, 2011a.

9.2.1 *Consumption and production - Europe subregion*

The EU is the world's largest market for wood energy, and imports of woody feedstock continue to grow. Between 2008 and 2010, wood pellet production in the EU increased by 20.5% and was estimated to meet about 81% of the EU demand for pellets (Cocchi, 2011). Estimated total production of wood energy feedstock (wood co-products, forest residues and wood pellets) in the EU shows that wood pellet manufacturing has grown every year, with exception of 2009 because of the economic crisis (graph 9.2.3).

GRAPH 9.2.3

Total production of wood co-products and wood pellets in the EU-27



Source: Eurostat, 2012.

Growth in the EU's wood energy consumption has been primarily driven by a demand for industrial pellets for co-firing, combined heat-and-power and district heating, and pellets for residential heating. Data from the 2009 Enquiry suggest that around 44% of all woody biomass used in Europe is for energy. Germany is the EU's largest producer of wood pellets and has a relatively well-developed consumer market. Production is approximately 2 million tonnes/year, while its production capacity was a little over 3 million tonnes/year in 2010. Sweden, Austria, France and Poland follow Germany in terms of capacity for wood pellet production, respectively (Cocchi, 2011). Wood energy met about 20% of the total energy demands of Sweden, Finland and Estonia and accounted for over half the renewable energy supply in the Nordic and Baltic States, as well as in Serbia and the Czech Republic.

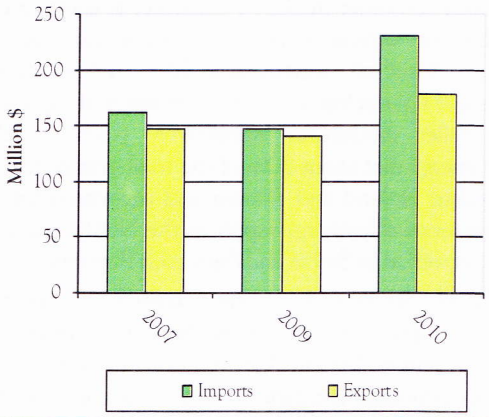
The EU seems to have the potential for continuous growth in capacity for the foreseeable future. For example, the Baltic region (Estonia, Latvia, Lithuania) is reported to have an estimated combined wood pellet capacity of 1.3 million tonnes per year. Some estimates suggest production capacity will continue to grow in the coming years to meet greater demand from Denmark and Sweden (Taberner, 2011). Nonetheless, sustained growth in production may be limited by the availability and price of raw materials.

While the EU region produces most of the residential pellets used for heating, a large proportion of industrial pellets are imported, resulting in a dynamic trading market. For instance, Austria continues to be a major manufacturer of pellets in the EU and keeps a wood pellet-installed production capacity-utilization rate of about 71%, while also importing considerable amounts of pellets (Cocchi, 2012). Graph 9.2.4 shows the total value of wood pellet imports and exports from Austria from 2007 to 2010, illustrating how dynamic wood energy markets have become in recent years, with an upward trend in both imports and exports. Nonetheless, 2009 showed a little slump in import and export markets because of the economic crisis.

Source: R. Hartkamp, 2012.

GRAPH 9.2.4

Austrian imports and exports of fuel wood, 2007-2010



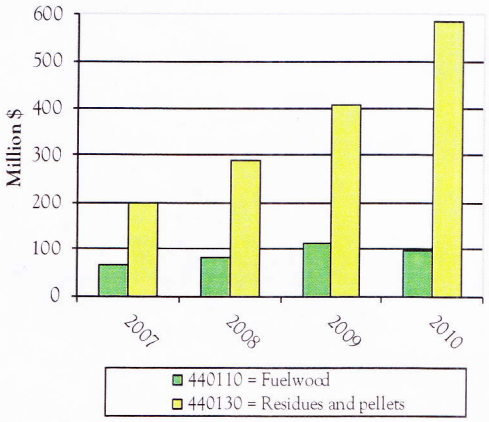
Notes: UN Comtrade Commodity code 4401includes fuel wood in logs, in billets, in twigs, in faggots or in similar forms; wood in chips or particles; sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms. Statistics for the year 2008 are not available.

Source: UN Comtrade, 2012.

Recent estimates suggest that the imbalance in the EU between demand and production has increased more than eightfold, from 262,000 tonnes in 2008 to 2.15 million tonnes in 2010 (Cocchi, 2011). While the import value of fuel wood has remained relatively flat since 2007, the value of imports of wood fuels(including pellets) has more than doubled from $199 million in 2007 to about $584 million in 2010 (graph 9.2.5).

GRAPH 9.2.5

Imports by EU-27 of fuel wood, pellets and woody residues, 2007-2010



Notes: UN Comtrade code 440110 includes fuel wood in logs, billets, twigs, faggots or similar forms. UN Comtrade code 440130 includes sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms.

Source: UN Comtrade, 2012.

9.2.2 Consumption and production - CIS subregion, Russian Federation

Wood pellet production continues to grow in the Russian Federation and reached a milestone of 1 million tonnes in 2012 for the first time. Exports have increased to approximately 850,000 tonnes/year, and domestic use to 150,000 tonnes/year (Glukhovskiy, 2012). The production, domestic use, and export of fuel chips and briquettes have also risen in recent years. Most of the wood pellets manufactured in the Russian Federation go to international markets. The domestic market represents only a fraction of national production but is growing steadily. On the basis of only data from the Russian Federal Agency of Forest Management, over 700,000 tonnes of annual production capacity is being built by "priority investment projects" in the Russian Federation.

Exports of Russian industrial pellets is dominated by large companies that produce industrial pellets for use in large power plants in Europe, mainly Sweden and Denmark. In 2011, the company VLK (formerly Vyborgskaya Celulosa) produced and exported over 220,000 tonnes of wood pellets, becoming the country's largest pellet producer. VLK is encountering difficulties with transporting raw materials, as well as with the operation of all production lines. The VLK plant has an estimated annual production capacity of 1 million tonnes.

Lesozavod 25 in the Arkhangelsk region exported over 100,000 tonnes and four other companies exported around 50,000 tonnes each. Some Swedish and Danish power plants have direct contracts with large Russian producers. The average price for pellets has risen to €115-€120 FOB. The pellets are shipped from the ports of St. Petersburg, Vyborg, Ust-luga, Petrozavodsk and Arkhangelsk. The transport and port handling of pellets in Russia is cumbersome and costly, as much of the material is still being transported in bags to the port.

There have been ongoing structural changes within the Russian Federation's bioenergy sector. For example, there has been a clear trend towards increasing production capacity and capital investments. Production capacities of 60,000 tonnes to 80,000 tonnes a year per plant have become common. Another trend is the rising level of professionalism in preparing business plans and the procurement of high-quality machinery. In addition, many new woodworking companies are actively pursuing integrated pellet manufacturing as a part of their production operations. Anecdotal evidence suggests that small businesses are leaving the pellet manufacturing sector and moving to briquette production.

Pellets are mainly produced in areas closer to port facilities in the Northwest Federal District, such as the Arkhangelsk and Leningrad regions. However, production is also being installed in Siberia and the Far

East of the Russian Federation. A Japanese wood working company is building a plant with a production capacity of 250,000 tonnes a year in Khabarovsk. Foreign investment in the Russian pellet market can be expected to increase. The company Russian Wood Pellets is building four pellet plants with an annual production capacity of 70,000 tonnes each and has plans to build nine more. Considering the present growth of domestic and export demand, pellet production in the Russian Federation (and wood energy in general) can be expected to grow considerably in the coming years.

9.2.3 *Consumption and production - North America subregion*

9.2.3.1 *US market developments*

In 2011, wood energy consumption was virtually unchanged from 2010 at 2,095 PJ. An estimated 10% decrease in use for electric power was offset by an increase for other uses, evenly split between residential and industrial users. The 2011 wood energy level remains 30% below the 1985 high of 2,835 PJ and 12% lower than 2000. Wood energy is continuing to decline as a share of renewable energy consumption, falling from 35% in 2000 to 22% in 2012 (EIA, 2012a).

Wood pellet manufacturing is the most dynamic wood energy sector in the US because of increases in capacity and production of industrial pellets for export to the EU. US export capacity has increased from less than 100,000 tonnes in 2008 to almost 2 million tonnes in 2011. It is projected that by 2015 the capacity for exports could increase to more than 6 million tonnes in order to capitalize on increased demand from the EU. Pellet production for the local market and use for US residential heating is stalled and perhaps declining, with current production capacity estimated at about 5 million tonnes (Spelter, 2012). Where natural gas is available to consumers, the incentive to use pellets is low. Where only fuel oil or propane are available, pellets are a less expensive option for heating.

The 2012 Annual Energy Outlook forecasts the possibility of a 57% increase in wood energy use by 2030, up from a 37% increase projected in 2011 (EIA, 2012b). The reason for the higher projection is entirely due to a greater projected increase in wood use for electric power with most of the increase in demand allocated to co-firing with fossil fuels. About 60% of the increase is expected in electric power production, with the remaining increase in industrial uses (EIA, 2012b). The outlook for production of ethanol from cellulosic feedstocks has been reduced significantly. Last year's forecast for 2022 of 13-16 billion litres was reduced to about 4 billion litres, which would fall far short of the 61 billion litre renewable fuel target for 2022 under the US Energy Independence and Security Act of 2007 (US Public Law 110-140).

Source: University of Missouri and Assassi Productions, 2012.

The Pellet Fuels Institute has been created as a North American trade association to promote energy independence through the efficient use of densified biomass fuel. On 8 November 2011, the Institute announced the launch of the PFI Standards Program, a third-party accreditation programme providing specifications for residential and commercial-grade fuel. The American Lumber Standard Committee will serve as the programme's accreditation body, responsible for implementation and enforcement, as well as helping with enrolment (PFI, 2011).

9.2.3.2 *Canadian market developments*

Canada's forest sector has been affected by the combined effects of a declining market for pulp and paper products and a weak housing market in the US, both of which have reduced demand for Canadian wood products. As a result, roundwood and fuelwood removals from Canadian forests dropped by over 40% between 2007 and 2009, from 198 million m^3 to 118 million m^3 (UNECE/FAO, 2009). The Canadian forest industry has explored wood energy production as a solution to the recent decline in wood-product manufacturing.

New technologies could create new markets to use wood that might otherwise be damaged by pests or fire. For instance, wood available as a result of insect outbreak such as the mountain pine beetle, or wildfires, or measures to minimize the risk of such events can be used by the industry to generate wood energy (Stennes and McBeath, 2006). Prominent among energy initiatives is the Biopathways Project, led by the Forest Products Association of Canada (FPAC) with input from industry (FPInnovations), government (Natural Resources Canada), and academia (FPAC, 2011).

The project considered standalone wood-to-energy options, as well as biorefining solutions that can deliver combinations of heat, electricity, liquid fuel, and chemicals,

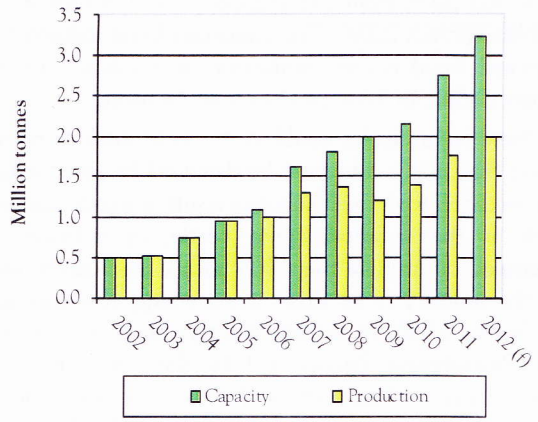
and compared them to traditional forest products. Development of advanced forest-based biorefineries, building on the substantial foundation provided by existing biorefineries, including pulp and paper mills, has been underway for years, although commercial implementation of many of these technologies in their full complexity remains elusive (Sims et al., 2010).

Canada has 39 cogeneration plants in pulp and paper mills and sawmills, with an estimated capacity of 1,349 megawatts energy output (MW_e) and 5,331 megawatts thermal output (MW_t) (CANBIO, 2012). Owing to the slowdown in the forest sector, there are now 20 fewer cogeneration facilities than in 2005. Additionally, there are 16 independent biomass-to-electricity plants (465 MW_e), and eight community-based wood-to-heat plants with a capacity of more than 10 MW_t. Production of heat and power from wood in Canada represented about 2% of primary energy supply in 2009, down from about 4% in 2007, in line with the decline in the forest sector (UNECE/FAO, 2009).

At the beginning of 2012, Canada had 39 operational wood pellet plants with a capacity of 3.2 million tonnes. Capacity has grown significantly in recent years, although the actual production is only utilizing about 50% of capacity (graph 9.2.6) (CANBIO, 2012). This lag may be associated with three factors: the slowdown in the primary wood products industry in Canada, which has reduced availability of raw materials such as sawdust; the expansion of pellet capacity in the US and other countries that compete with Canada to supply pellets to the EU; and the overall economic downturn.

GRAPH 9.2.6

Capacity and production of wood pellets in Canada, 2002-2012



Notes: f = forecast.

Source: Wood Pellet Association of Canada 2012; CANBIO 2012.

None of Canada's wood energy or wood pellet plants use purpose-grown wood because of the higher cost of roundwood compared with co-products from sawmilling. A few new projects have successfully competed for wood supply from the forest, including Atikokan Renewable Fuels in Ontario, but are not yet in commercial operation (CANBIO, 2012; CKTG, 2012).

Canadian provinces use wood energy in varying ways, reflecting the different opportunities presented by the provincial forest economy. For example, British Columbia has the majority of combined heat and power plants using wood (more than half), a reflection of its large and relatively healthy forest sector, despite the fact that Ontario provides the strongest producer incentive (a feed-in tariff) for wood-to-electricity, and has the largest individual wood-to-electricity plant in the country (Moore et. al., 2012). By contrast, Quebec has the most community-based wood-to-heat capacity in the country. About 9% of Quebec's electricity is generated from biomass, compared with 1.5% in Ontario (CANBIO, 2012).

Domestic use of pellets in Canada is limited by the lack of low-cost feedstock (to support additional production) and the lack of a bulk delivery system for pellets (which would increase consumer uptake). At the same time, the price of natural gas has been in decline since 2008 after several years of tight supply and rising prices (NEB, 2012). The change in gas pricing has affected both residential and industrial biomass-to-heat projects, making them less attractive.

9.2.4 *Trade within the UNECE region and beyond*

Wood pellets dominate international trade in wood energy. About two-thirds of all those produced worldwide are fired in power plants in the EU. The main exporters are Canada, the US, the Russian Federation and the Baltic States. In coming years Australia, Mozambique, South Africa, and several South American countries are expected to become pellet exporters (Cocchi, 2011). Belgium, Denmark, the Netherlands, Sweden and the UK are the main importers of industrial pellets. The Netherlands serves as an import hub for northern Europe (CANBIO, 2012).

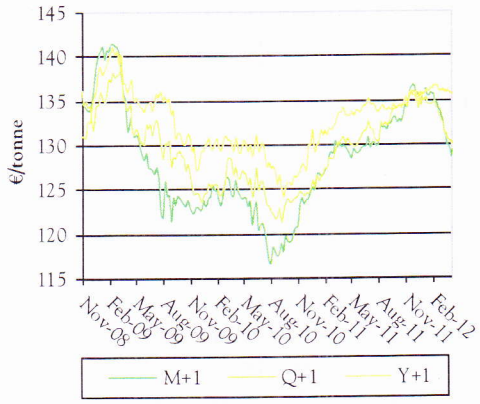
Global trade in all solid biomass fuels (excluding charcoal) totalled 18 million tonnes (300 PJ) in 2010. Wood energy accounted for over 90% of this trade (273PJ) corresponding to pellets (120 PJ), wood waste (77PJ), and fuelwood (76 PJ) (REN21, 2012). Canadian and US industrial wood pellet production is largely driven by demand from the EU, which has set a target to meet at least 20% of its total primary energy supply from renewable energy by 2020 (IEA Bioenergy Task 39 2012). More than 90% of Canadian wood pellets are exported, of which 90 % are destined for Europe. In the US, about 80% of pellets were used domestically, with the remaining 20% exported, almost entirely to the EU (Cocchi, 2011).

Countries throughout the world are becoming more involved in pellet consumption and production: in South America, Argentina, Brazil and Chile; in Asia, China, Japan, India and the Republic of Korea; and New Zealand. Investments in new production capacity are based on expected growth in the global trade of pellets and local demand. Demand from the EU is forecast to reach between 20-50 million tonnes by 2020 under the assumption that public policies will continue to support biomass to replace coal, carbon emission allowances for biomass, and other financial supports (e.g. tax credits for efficient pellet stoves). Additionally, demand from Asian countries, primarily Japan, China and the Republic of Korea may reach 5-10 million tonnes by 2020 (Cocchi, 2011). However, as new markets emerge and existing ones continue to grow, competition for raw materials may increase production costs and limit their expansion.

Recent market trends for industrial wood pellet future market prices as reported by APX-ENDEX (based on delivery CIF Rotterdam, Net Caloric Value of 17 MJ/kg and with no more than 10% water content) show considerable fluctuation in contract prices (graph 9.2.7). M+1 represents price traded per tonne for the upcoming month, Q+1 is next quarter price, and Y+1 captures prices for the upcoming-year (e.g. for 2012 it represents trading prices for 2013). In 2012, prices dropped below €130/tonne in April, except for Y+1 contracts, which have remained at levels above €135 per tonne.

GRAPH 9.2.7

Industrial wood pellet prices, 2008-2012



Notes: Prices given in Euros per tonne based on delivery CIF Rotterdam and Net Caloric Value of 17 MJ/kg (with water content less than 10%).

Source: APX-ENDEX, 2012.

Another initiative to improve trade is the Minneapolis Biomass Exchange (MBioEX, 2012). MBioEX provides three main services: contract assistance, quality control services and export support (particularly from the US to the EU), with the aim of reducing risk and improving trading opportunities for both buyers and sellers of biomass. Its online platform provides listings of biomass sellers and buyers, including specific geo-referenced locations.

By June 2012, most buyers of imported wood pellets were fully contracted, with future negotiations focusing on 2013. A combination of higher future demand and tight supplies may encourage greater reliance on future and long-term contracts. There seems to be a seasonal trend of lower prices in summer months, coinciding with lower heat demand. The Argus report estimates bulk prices including cost, insurance and freight in 2013 to be in the range of €135 - €145 per tonne (Argus, 2012).

9.3 Environmental considerations of sustainable wood energy

9.3.1 Developments in Europe, the CIS and North America

Climate change mitigation through better management of forest carbon can include using wood energy. However, the absence of specific sustainability standards for wood energy has given rise to concern among various sector stakeholders. The development of ISO 13065 (Sustainability Criteria for Bioenergy, currently targeted for 2014) should help to create greater acceptance of bioenergy projects.

In 2009, the European Parliament issued a Renewable Energy Directive that included (a) establishing minimum GHG renewable-energy reduction values of 35% (rising to 50% on 1 January 2017 and to 60% from 1 January 2018 for biofuels and bioliquids produced in installations in which production started on or after 1 January 2017); (b) determining that raw material should not come from high biodiversity value areas, from the conversion of high-carbon stock areas, or from undrained peatland; and (c) calling for compliance with sustainability criteria for the production of biofuels (European Parliament, 2009).

Compliance can be proven via (a) EU-level recognition of voluntary schemes which address one or more of the sustainability criteria, (b) bilateral or multilateral agreements with third countries, and (c) Member States' national verification methods. The European Commission has also recommended that Member States should adopt sustainability schemes for solid and gaseous biomass (used for electricity, heating and cooling) that are consistent with those in the Renewable Energy Directive.

Member States were also asked to support schemes for electricity, heating and cooling installations that favour high-energy conversion efficiencies, such as cogeneration plants, as defined under the Cogeneration Directive (European Commission, 2010). An actual directive on

biomass sustainability criteria, replacing current recommendations, may be issued in the autumn of 2012.

In 2011, the US Environmental Protection Agency (USEPA) formed a Biogenic Carbon Emissions Panel to provide a review and recommendations to the accounting framework for biogenic CO_2 emissions from stationary sources (USEPA, 2011a). The Panel's main report suggested that to estimate the impact of biomass use, each case must be compared to an anticipated baseline scenario where biomass is not used for energy. The Panel acknowledges the difficulty and uncertainty in modelling anticipated baseline and biomass scenarios but sees this as the only way to estimate the additional emissions and sequestration changes in response to biomass feedstock use.

It pointed out that in evaluating wood energy it was important to capture market and landscape-level effects in evaluating scenarios including market-driven shifts in planting, management, harvest, displacement of existing users and land-use changes. Its main report recommends that USEPA should consider "…developing default BAFs (bioenergy accounting factors) by feedstock category and region. … facility-specific BAFs would be calculated to reflect the incremental carbon cycle and net emissions effects of a facility's use of a biogenic feedstock. With default BAFs, biogenic emissions from a facility would be based on the weighted combination of default BAFs relevant to a facility's feedstock consumption and location" (USEPA, 2011b).

In addition to the main draft report, there was one dissenting opinion included in the report to the full Panel. The argument went that should an Intergovernmental Panel on Climate Change (IPPC)-accounting approach be considered where determining carbon neutrality would depend on the qualification (for wood) that the forest stock be constant or expanding (USEPA, 2011b).

Also in the US, the Massachusetts Executive Office of Energy and Environmental Affairs (2012) has released draft Renewable Portfolio Standard regulations. These indicate how different types of wood feedstocks may be certified to have certain carbon-recovery performance that would offset their emissions over time after harvest and use in production of energy. The proposed final regulations identify three types of wood biomass feedstock – forest thinnings, forest residues (logging residues) and non-forest residue – and how their carbon recovery profile (in the case of thinnings) or avoided carbon decay profiles (in the case of residues) over time can be used to meet feedstock performance requirements. Restrictions on forest biomass supply include retention of logging residue on harvest sites, which differs by soil quality, and a limitation on overall removal of logging residue and thinnings for fuel as a fraction of conventional timber harvest. For an energy plant to obtain 0.5 to 1.0 renewable energy credit per unit of energy, its mix of wood feedstocks each year must have a carbon recovery of at least 50% within 20 years. An energy plant must also meet energy efficiency requirements to receive renewable energy credits per unit of energy ranging from 0.5 to 1.0.

9.3.2 *Private-sector certification for environmental stewardship*

In the EU, several private-sector environmental standards have emerged in recent years. The APEX-ENDEX (2011) states that all wood pellet contracts traded on the exchange are certified for sustainability with either the Green Gold Label (GGL, 2012) certification scheme, the Laborelec (2012)-SGS Solid Biomass Sustainability Scheme, or the Drax Power Limited Biomass Sustainability Implementation Process (2011).

The GGL system, which is inspected by an independent third party, provides certification for sustainable biomass covering production, processing, transport and final energy transformation. GGL-inspected woody biomass is certified by either (a) recognized forest programmes (Forest Stewardship Council/FSC, Programme for the Endorsement of Forest Certification/PEFC, Canadian Standards Association's Sustainable Forest Management, Sustainable Forest Initiative/SFI or Finnish Forest Certification System), (b) has approved pre-scope certificate of one of the endorsed forest management certification systems – with the intention of full certification, or (c) has been certified under GGL forest-management criteria.

The Laborelec-SGS verification procedure corroborates primary production to have PEFC, FSC or SFI certification, and allows for the traceability of biomass resources. It also estimates biomass accounting to meet a minimal 35% of threshold for GHG savings. Drax Power Limited has issued a set of sustainable biomass sourcing principles based on the developing regulatory and policy initiatives of the UK, EU and other markets (Drax Power Limited, 2011). The ENplus certificate combines quality and sustainability requirements.

By the end of 2011, ENplus-certified pellets were being produced in Austria, Belgium, Canada, Croatia, Czech Republic, France, Germany, Italy, Romania, Spain, and the United Kingdom (ENplus 2012). Over 90% of the pellet production of Germany and Austria is already ENplus certified. The ENplus certificate is given only to pellets that meet European Norm EN 14961-2 (quality standard). A certification system for wood briquettes for non-industrial use is currently being prepared based on European Norm EN 14961-3.

In the US, companies exporting woody biomass to the EU have sought certification from recognized standards. For example, Enviva (a company created in 2004 and

based on Maryland to supply wood pellets and other processed biomass to industrial customers) has certified its chain-of-custody to FSC, PEFC and SFI standards. It has also achieved verification of its operating facilities by the Laborelec-SGS Solid Biomass Sustainability scheme (Ryckmans, 2010; Enviva, 2012).

Canada has not yet developed formal standards for wood pellet production, which may also hinder trade over the medium to long term, as more European importers begin to demand products that meet environmental certification (ENplus, 2012).

Some of the European energy companies working with wood feedstock imported from the Russian Federation have developed biomass certification schemes for the sustainability of the wood resources, though few have independent verification of supply chains. However, most companies have not yet established any sustainability requirements and sometimes do not know where wood is being sourced. At present, Russian exporters to the EU need to comply only with quality requirements for industrial pellets.

9.4 Social considerations of sustainable wood energy

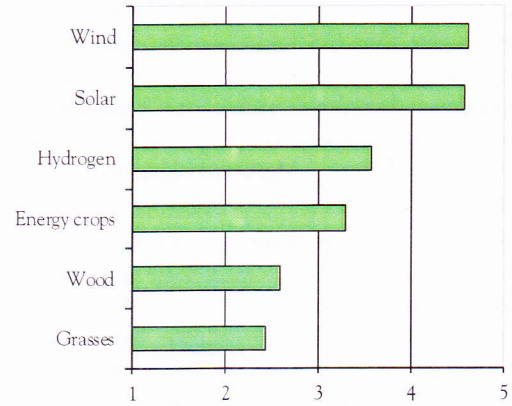
9.4.1 *Attitudes towards wood energy: public perceptions of wood energy*

Even though in the UNECE region wood energy is the main renewable energy source, there is little awareness of this among the public. In household surveys across the US, respondents quoted wind and solar energy as the two most important sources of renewable energy: wood energy ranked fifth just above grasses (graph 9.4.1) (Aguilar and Cai, 2010).

Source: F. Aguilar, 2012.

GRAPH 9.4.1

Average reported values of a survey of households in the US on the importance of selected sources in generating renewable energy



Notes: Reported on a 5-point Likert scale (1=strongly disagree; 3=neither agree nor disagree; 5= strongly agree).

Source: Aguilar and Cai, 2010.

Allocation of investments in wood and other renewable energies might be a reflection of the general public perception. New global investments in biomass and waste-to-energy projects, including woody biomass, were estimated to have reached $10.6 billion in 2011 (McCrone et al., 2012). However, this is about a 12% drop in investment compared with 2010. Investment in biomass and waste-to-energy projects was third among different sectors, after solar and wind. The decline in investment in biomass projects in recent years corresponds to primarily investments in the power and heat sector. Expected growth in demand for cellulosic biofuels, linked to public policy measures, may spur a resurgence of investment in biofuels for transport in the UNECE region and beyond.

9.4.2 *Attitudes towards wood energy: forest owners*

Forest owners, both public and private, are instrumental to the long-term sustainability of wood energy projects. On the supply side, the availability of wood is highly dependent on their willingness to harvest biomass for energy. The adoption of best management practices related to the removal of woody biomass is also an important component in wood energy, as it will be central to the sustainable supply of material from forests. On the demand side, in the UNECE region the residential sector is the largest consumer of wood energy (UNECE/FAO, 2011b).

Higher demand for wood provides new income and employment opportunities, especially in rural areas. In addition, the availability of a market for small-diameter or

lower-quality trees gives an incentive to manage forests sustainably, potentially resulting in their better resilience. Private European forest owners express overall support for wood energy projects (Lantiainen, 2012). Several studies in the US have explored how willing family forest owners might be to harvest wood for energy. Surveys in multiple States suggest that US forest owners are supportive of wood energy projects to enhance national energy independence, but also that they expect remuneration at competitive market prices (Gruchy et al., 2011; Joshi and Mehmood, 2011; Markowski-Lindsay et al., Forthcoming).

Based on responses from over 1,800 forest owners, Daniel and Aguilar (2011) report there are, nonetheless, some expressions of concern over potential harmful impacts to forest soils and wildlife habitat of wood removals for energy. In Canada, forest owners perceive that the price for wood for energy may not be sufficient to make it an economically feasible activity.

9.4.3 *Attitudes towards wood energy: interest groups*

Positions about the use of wood energy vary greatly among different interest groups. For instance, the Sierra Club in the US in a guidance statement indicates it believes that biomass projects can be sustainable, but that many are not. "We are not confident that massive new biomass energy resources are available without risking soil and forest health, given the lack of commitment by governments and industry to preservation, restoration, and conservation of natural resources" (Sierra Club, n.d.).

The wood-products industry also has mixed views about the type of energy projects and use of woody feedstocks. The European Panel Federation supports the use of wood for energy when it is generated from co-products from the solid-product manufacturing industry, or residues from forest harvests, and used in high-efficiency systems such as combined heat and power (Döry, 2012).

But the Federation has a strong position against large wood energy projects and recommends stopping public subventions to energy-inefficient installations, as they can distort competition for raw materials. On the other hand, the European Pellet Council (Rakos, 2012) advocates greater use of wood energy as an incentive to increase current depressed prices for wood fibre, promote better forest management and reduce energy costs for households.

There have also been several initiatives in Canada to promote the sustainable use of wood for energy. Prominent Canadian environmental NGOs have identified wood energy as a credible renewable energy alternative for Canada (e.g. David Suzuki Foundation, 2012). The World Wildlife Fund (WWF) has worked with the Forest Products Association of Canada to review regulations and practices that could help better manage biomass harvesting for energy purposes (WWF Canada/FPAC, 2010). Greenpeace has asked, among other recommendations, that Canadian provincial governments focus wood energy on industrial co-products rather than relying directly on forests (Mainville, 2011).

9.5 Public policy and future developments

The public policy landscape affecting wood energy consumption is still dominated by regulatory policies, fiscal incentives and public financing. The UNECE region is leading the global trend in adopting policies to support renewable energy (REN21 2012). Nonetheless, an expected contraction in public spending for 2013 may potentially affect the current policy landscape, with less fiscal and financial support. In addition to public-spending considerations, the treatment of GHG emissions from different types of wood energy feedstocks (Section 9.3.1) may also influence new developments. As pointed out in the 2011 Forest Products Annual Market Report (UNECE/FAO, 2011) a lack of long-term policy certainty and stability may discourage current and future investments in wood energy.

If public support is to be restructured, some programmes may be phased out but general support for renewable energy is expected to continue. While recent years have seen a major focus on promoting greater wood energy production from the power and heat sector, policy support may shift to other sectors (Aguilar et al., 2011). The residential sector remains a potential target group given its large share of wood energy consumption and elasticity to respond to competing energy price changes, particularly in rural areas (UNECE/FAO 2011; Song et al., 2012).

Public policy will influence wood energy consumption in 2013 and beyond, as will the price of competing energies. Technological progress and public support have reduced extraction costs of other energy sources such as natural gas. In the US, in particular, prices for natural gas have consistently declined since 2008 when the annual average was at about \$270 per thousand m^3 to about \$150 per thousand m^3 in 2010 (U.S. Energy Information Administration 2012c). Low natural-gas prices may prove a major barrier to the greater use of wood energy.

The technology for harvesting, treating, storing and converting wood to energy will have to improve if wood energy is to remain price competitive. Improvements in cooking and heating stoves for use in the residential sector may motivate homeowners to adopt and use wood energy in larger quantities. This has already resulted in greater demand for residential quality wood pellets and firewood in the EU.

Torrefaction of woody biomass (a mild pyrolysis process that improves the fuel properties of wood) can also provide for more efficient gasification and energy conversion (Prins et al., 2006). Torrefaction permits higher co-firing percentages, and lowers handling, processing and transport costs thanks to higher energy density and lower degradation due to the hydrophobic nature of the processed material (Kleinschmidt 2011).

Torrefaction is being studied by several institutes and companies. Worldwide about 10 companies are making torrefied pellets. Arguably, the most productive and successful is "Topell" in the Netherlands (the company has won the first prize "WNF Cleantech Star" and is rated in the "Global CleanTech 100"). The plant was built as a test pilot for developing torrefaction technology. The result was a reactor with a capacity of 8-10 tonnes per hour. RWE (a strategic partner of the project) is building a production plant in the US. The price for torrefied pellets will likely be in line with its calorific value, at an estimated €170 per tonne FOB (Post van der Burg, 2012).

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