WOOD ENERGY

A HOT TOPIC

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The Central Baltic INTERREG IV A Programme 2007–2013 is a cross-border co-operation programme under the European Territorial Co-operation objective. The programme has three priorities that contribute to the vision and objectives of the programme: a safe and healthy environment, an economically competitive and innovative region and attractive and dynamic societies.

The European Regional Development Fund (ERDF) aims to promote economic and social cohesion by correcting the main regional imbalances and participating in the development and conversion of regions, while ensuring synergy with assistance from other structural funds.


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INCREASING ROLE OF FOREST ENERGY

As a result of growing ambitions to combat climate change in line with the UN Framework Convention on Climate Change and reduce dependency on fuels bought from unstable regions, the demand for bioenergy is presently increasing around the world. In the Baltic region, the increased production of bioenergy is particularly pronounced both because of the high availability of wastewood from forest operations and forest-based industries, and, as there are various effective incentives in place, to cut the consumption of fossil fuels and other non-renewable energy resources. As the rate of development is high, there is a corresponding need for policy-makers to keep up with the development of environmental regulations, incentives and other regulating systems so that the overall development runs smoothly and turns out sustainable.

Opinion analyses tell it is crucial that increased use of forest-based bioenergy do not counteract the aim to preserve and improve living conditions for forest-dependent species (cf. the UN Convention for Biological Diversity), or jeopardise long-term productivity, or have an adverse impact on the quality of run-off waters. Knowledge and policy development on these matters have been going on for some decades, and all countries in the region have implemented various regulations and recommendations to secure sustainability. However, new methods and increased intensity strongly require further knowledge development and analyses.

At this stage, the use of incentives to counteract fossil fuels and/or promote renewable energy varies a lot between the Baltic countries. However, as our countries share a large common biofuel market, incentives in one country affect also the others.

Consequently, to facilitate a proper development, an increased regional exchange of knowledge and views on the issues related to bioenergy development is helpful. The European Union Project "Wood Energy and Cleantech" is therefore timely and has so far created a meeting-place for discussions about the potentialities for further market development, sustainability issues, including ash recycling.

The Swedish Forest Agency takes great interest in bioenergy development because we have a twofold responsibility: a) to aid the realization of a competitive contribution from Swedish forests to climate change mitigation, and b) to make sure this utilization, like all forestry activities, are conducted sustainably also from the perspective of environmental and social values.

This booklet tells about facts, conditions and policies with relevance for the bioenergy development in the three participating regions and also about some of the conclusions from the Project "Wood Energy and Cleantech" made so far.

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WOOD ENERGY AND CLEANTECH

Wood energy – a hot topic

Wood energy has been a traditional energy source. Even in modern times the biggest assortment from forest harvest was fuelwood for heating. In 1950s – 1990s the energy sources for heating changed to fuel oil, fossil gas, coal, and electricity. In a time of rising oil prices, global warming and sustainable solutions, there is an emerging interest in wood energy caused by:

- awareness and knowledge of pollution and global warming;
- price levels and reliable supply of oil and gas has not been satisfactory during the last years;
- regions with formulated strategies have formed stable rules for investments;
- highly efficient wood energy boilers, combined heating and power production (CHP) and new distribution systems.

Aim of Project

To increase knowledge and interest among forest owners and other stakeholder groups about bioenergy and sustainable development in the Baltic Sea region.

The Project represents three regions: Östergötland County in Sweden, Vidzeme Planning Region in Latvia and the South Estonian Region.

Tasks of Project

The Wood Energy Project promotes wood as an energy source and improves knowledge about wood energy, eco-friendly techniques and clean technologies. Knowledge regarding wood energy, clean technology (cleantech) and its applications are not sufficiently disseminated among the stakeholders of energy production in all regions of the Central Baltics. The industrial content of cleantech has developed and there is substantial interest in applying the new techniques. The transfer to a greener society must, to a great extent, be built on local and regional initiatives.

The Project develops regional action plans and strategies on how to raise the efficiency of wood energy. Case studies are carried out on investment calculations and procurement procedures in district heating. Furthermore, the Project aims to develop and introduce a flexible energy system combining wood with other materials, such as waste and straw. The Project will lead to a higher level of skill by transnational knowledge exchange in district heating as well as in forestry.

Project focus

A cross-sectoral and transnational approach where forestry, wood supply, energy production and energy distribution are investigated and analyzed.

Policies and planning

- analysis of strategies and planning tools;
- methods of public awareness raising;
- environmental aspects such as biodiversity, sustainability and resilience.

Market issues

- demand and supply in the value chain from forest to consumer;
- methods of business intelligence.

Competence demands

- operator skills;
- management skills;
- research skills.

Technological issues

- transregional technology study;
- analysis of regional differences and similarities.

System analysis

- study of the value chain from forest to consumer;
- investigation of optimal solution of different cases;
- investigation and analysis of environmental aspects;

- the balance of biodiversity and wood production is one important issue for the Project.

Working methods

- investigating the current situation in the regions;
- analysis and knowledge building;
- pilot projects and case studies.

Expected results

- cross-border structures and contacts between professionals with different skills;
- recommendations for strategies, planning and communication tools;
- case studies on investments and procurements;
- higher level of skills of the professionals;
- higher awareness on wood energy issues.

Target groups

- politicians on a regional level;
- administration in regions and municipalities;
- district heating operators;
- researchers;
- forest owners;
- general public.

Activities

- extension meetings for forest owners to increase their interest in bioenergy;
- organization and participation in bioenergy meetings with bioenergy contractors, environmentalists and other experts;
- collectining and exchanging bioenergy information with experts;
- study tours for target groups to Sweden, Latvia and Estonia.

Products and outputs

- Project web pages for each Project country and organisation;
- reports;
- extension materials for forest owners, guidelines and strategies for forest management;
- information booklet about the wood sector in the Project regions;
- Project newsletters;
- exhibition about the wood sector in the Project regions;
- movie about wood energy;
- various pilot projects in each Project country.¤

Forest energy production comprises several steps: planning and sustainable forest harvesting, fuel production, transporting and heat production. Recently the importance of ash recycling is expressly increasing.

AREA AND POPULATION

Administration

Östergötland County, comprising 13 municipalities, is one of the Sweden's 21 counties located in south-east of Sweden.

Vidzeme Planning Region was established in 2006. It lies in the north-eastern part of Latvia and includes the former district municipalities of Aluksne, Cesis, Gulbene, Madona, Valka and Valmiera. There are 25 local municipalities and one town –Valmiera.

South Estonia Region, bordering with Latvia, includes four counties – Põlva, Tartu, Valga and Võru.

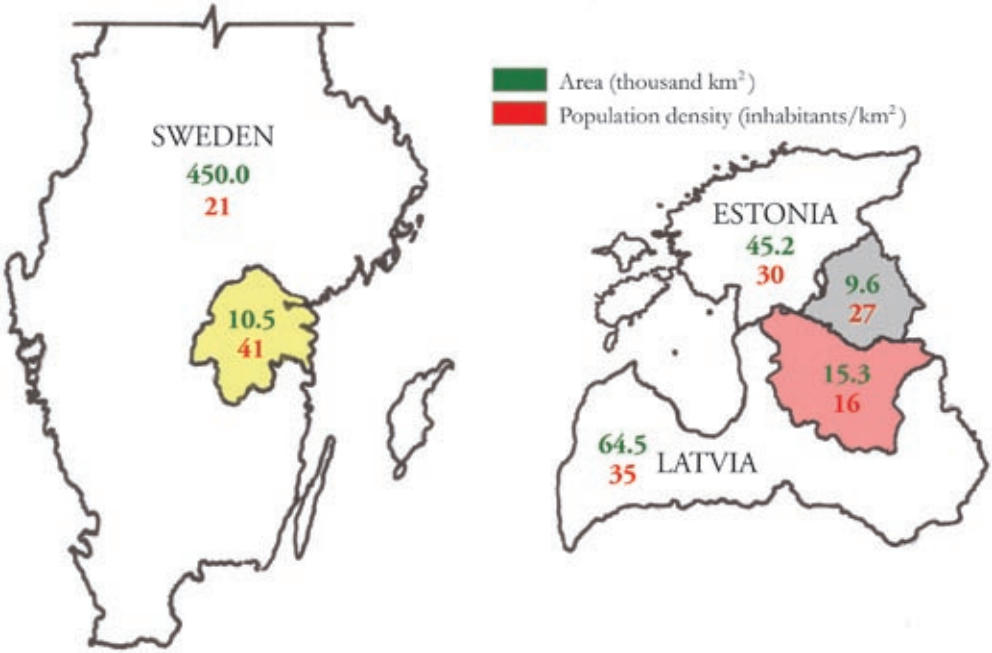
Territory

The Vidzeme Planning Region, covering 15,000km^2, is the biggest in the Project. The Östergötland County and the South Estonia Region make up about 10,000km^2 each. The Project regions in the Baltics account for about 1/5 of the territory of the respective country, while for Sweden it is slightly above 2 %.

Population

Population density has a direct impact on the demand for energy and the intensity of energy resources utilization. With its 41 inhabitants per km^2 the Östergötland County is a densely populated area. The population density there is almost twice as high as in other Project regions and the Sweden's average.

In the South Estonia Region the population density corresponds to the country's average, while 16 inhabitants per km^2 in the Vidzeme Planning Region is half as high as the average for Latvia.¤



Land area and population density in the Project countries and regions – Östergötland County (Sweden), Vidzeme Planning Region (Latvia) and South Estonia Region.

FOREST RESOURCES

Forest coverage

In Estonia, Latvia and also Sweden more than a half of land area is covered by forests. In Latvia, over the last 70 years the total forest area has doubled and the forest cover increase is expected to continue because of farmland afforestation and large areas of surplus lands.

The forest cover in the Östergötland County is 66 %, with this figure about 50 % in South Estonia and the Vidzeme Planning Region. The productive forest land is about 90 % of the entire forest area, and there is a great potential for the forest industry and energy sectors.

Growing stock

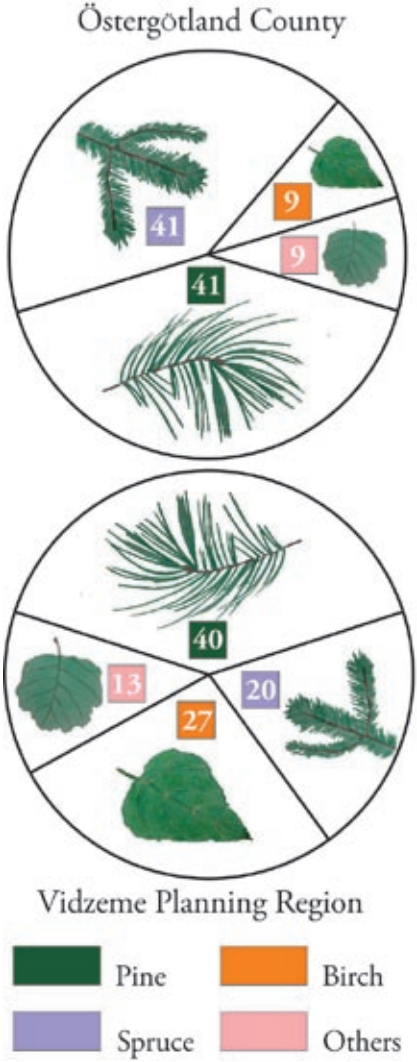
The growing stock in the Vidzeme Planning Region is about 149 million m^3, in the Östergötland County 112 million m^3, and 101 million m^3 in the South Estonia region.

Tree species

Coniferous forests make up 80 % of the forest area in Sweden and about 50 % in Estonia and Latvia. In the two Baltic countries birch accounts for about 25 % and grey alder, which has almost no industrial use, for about 9 % of all forests.

The distribution of dominant tree species in the Östergötland County is in line with the Sweden's average. The percentage of tree species is quite similar in the Vidzeme Planning Region and the South Estonia Region, with deciduous stands making up about 40 % of the total forest area.

In the Baltic countries the tree species composition in state-owned and other ownership forests differs. A considerable part of present-day private forests is a result of overgrowing of abandoned farmlands during the Soviet times. Thus, in private holdings of the Vidzeme Planning Region deciduous forests account for about 60 %, while in state forests this index is 27 % only. In the South



Percentage of dominant tree species in the Östergötland County of Sweden and the Vidzeme Planning Region of Latvia.

Estonia Region the difference between the proportion of deciduous and coniferous species in the given ownership categories is less sharp, 45 % and 52 %, respectively. Coniferous forests yield more timber and less energy wood than deciduous ones.¤

FOREST OWNERS

Structure

Sweden has long traditions in private ownership while in the Baltic countries during the Soviet rule, lasting for a half of century, there was no privately owned land. After these countries regained sovereignty in the early 1990s the former owners or their successors got their land properties returned.

In **Sweden,** 3 % of forests belong to the state and 14 % to state-owned companies, 50 % to private forest owners, 25 % to privately owned companies and 8 % to other private and public persons like municipalities and churches. In the **Östergötland County** 80 % of forests are privately owned and less than 9 % of woodlands belong to the state and state-owned companies.

In **Latvia**, the state owns about a half of forests, 47 % of forests belong to the private sector, 2 % to the municipalities, and 1 % to other owners. In the V**idzeme Planning Region** about 45 % of forests belong to the state.

In **Estonia,** the state owns 45 % of all woodlands, 43 % is under the private sector, 2 % belong to the municipalities, and in 2010 about 10 % of forests were still under privatization.

Private forest owners

There are about 329,000 forest owners in **Sweden**, including about 10,000 in the Östergötland County. In the Project region the total number of forest holdings is approximately 7,000 with the average size of a private holding up to 59ha. In Sweden the average size of a private forest holding is about 34ha.

In **Latvia**, the total number of forest owners is as high as 144,000 with the average size of a forest holding about 8ha. In the Vidzeme Planning Region there are about 39,000 private forest holdings and the average holding size is somewhat above 10ha.

In **Estonia**, the land register shows 148,000 cadastral units comprising forest. On the average each owner has two holdings and the average size of a privately owned forest holding is from 10 to 12ha. In the South Estonia Region there are 36,540 private forest holdings with the average size of holding 5.6ha.¤

Percentage of forest owners in the Project countries, number of private nonindustrial forest owners, and the average holding size in the Project regions

Project region	Östergötland	Vidzeme	South Estonia
Number of private forest holdings	10,284	35,980	36,540
Average forest holding size, ha	59	10	6
Forest owners, (%)			
Project country	**Sweden**	**Latvia**	**Estonia**
State and state-owned companies	17	50	36
Privately owned companies or private legal persons	25	8	9
Private persons (non-industrial owners)	50	39	35
Others	8	3	20

AVAILABILITY OF WOOD

Total removals

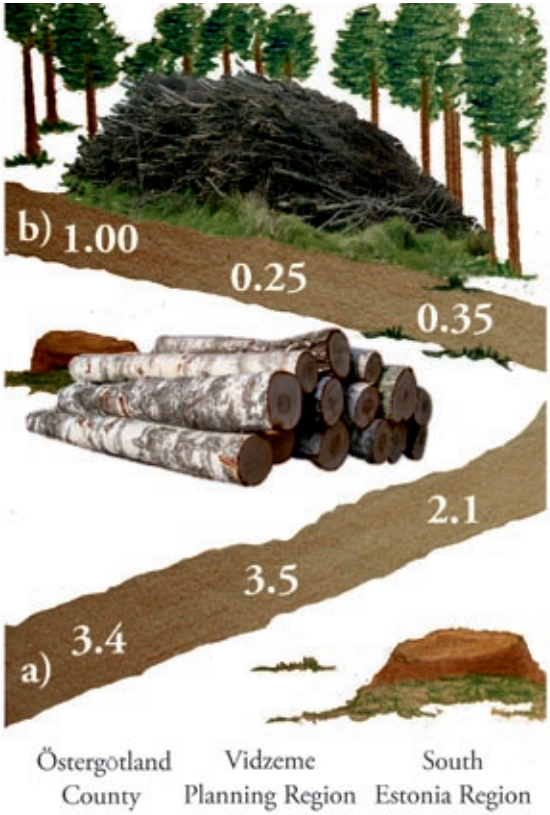
According to the statistics the gross average annual felling volume in the **Östergötland County** has for the last ten years been 3.4 million m^3.

In the **Vidzeme Planning Region** the same index is 3.5 million m^3, with about 52 % of it harvested in private forests. In Latvia, between 2007 and 2010, because of storms and the global economic crisis, the felling volume decreased, but it has already reached the previous level.

The amount of wood harvested in the **South Estonia Region** is continuously increasing since 2005, reaching 2.1 million m^3 in 2009.

Use of wood for energy

According to the 2008 data in the Östergötland County of Sweden the total consumption of woody biomass for energy was 1 million m^3. The same figures in 2009 for the Vidzeme Planning Region and South Estonia were about 250,000m^3 and 354,000m^3, respectively.



Total removals (a) and the amount of wood used for energy (b) in the Project regions, million m^3.

Potential for bioenergy

Woody biomass for energy is normally recovered in forest management activities, using for it mainly residues from final felling and thinnings. Biomass collection in Sweden was done in about 60 % of final-felled areas. This method is still seldom used in thinnings. Small-scale use of stumps is tested by a couple of companies. Still, there is a big potential for using stumpwood and small-size trees for energy, but the method of harvesting requires further development.

Although Estonia and Latvia export pulpwood and woody biomass for energy, a notable part of biomass is still used in one or another way. Contrary to the Baltic countries the Östergötland County consumes 35% more woody biomass than the potential growth.

In all three Project countries the forests are sustainably managed. During the last 5 years the Östergötland County utilizes only 70–75 % of the volume of annual growth; in the Vidzeme Planning Region and the South Estonia region this index is about 60 %. It means that in future a considerably higher amount of woody biomass can potentially be used for energy not only by more efficiently using the logging residues, but also by increasing within sustainability limits the total volume of removals.¤

HEATING

District heating

The given Project regions have **very different heating systems and installed capacity.** In the Östergötland County 10 large boiler plants and 3 central heating plants (CHP) can provide at least 2,787MW of thermal energy, while 120 boiler plants and 7CHP in the Vidzeme Planning Region produce about 332MW. In the South Estonia Region the number of boilers has decreased.

The energy produced by district heating companies has increased over the past years in the Östergötland County while in the South Estonia Planning Region and the Vidzeme Planning Region it has gradually decreased over the same period. The increase in Sweden is mainly because of the taxes imposed for CO_2 emissions and increasing number of customers.

Fuels

The fuels used in the district heating systems differ considerably from region to region. In the **Östergötland County** the main fuels are:

- woody biomass, 49 % (of which ~ 65 % are tops and other logging residues);
- waste from private households, 28 %;
- fossil and other fuels, 23 %.

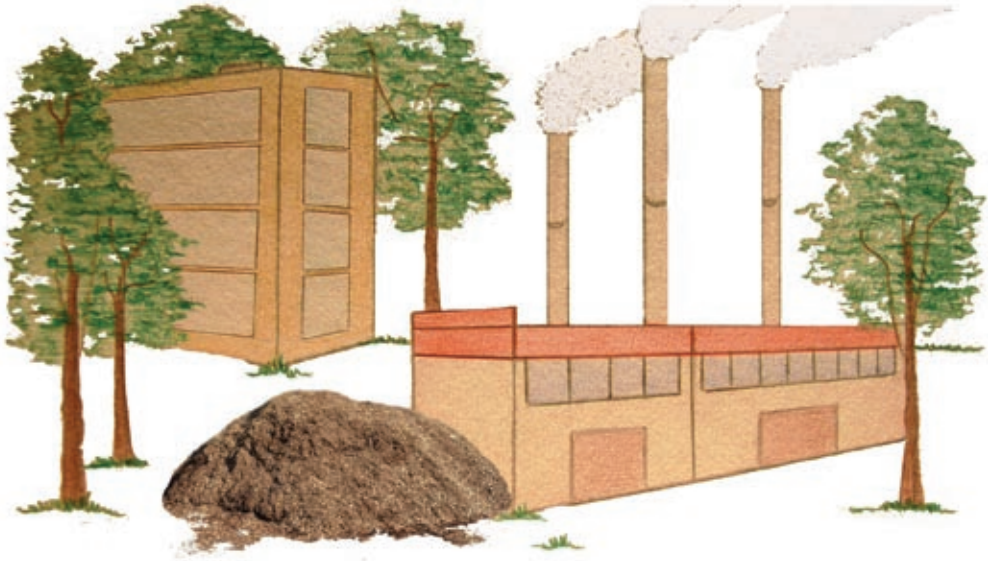
Dominant fuels in the **Vidzeme Planning Region** are:

- natural gas, 48 %;
- woody biomass, 48 %.

In the **South Estonia Region** nearly a half of fuels used are woody biomass followed by natural gas (26 %).

Household sector

In the district heating systems of the Project regions the wood pellets and briquettes are almost not used while in the household sector it is quite the reverse. In the Baltic countries firewood is the dominant energy resource in the household sector. The infrastructure for the collection and use of other types of woody biomass for energy in the household sector is still underdeveloped.¤

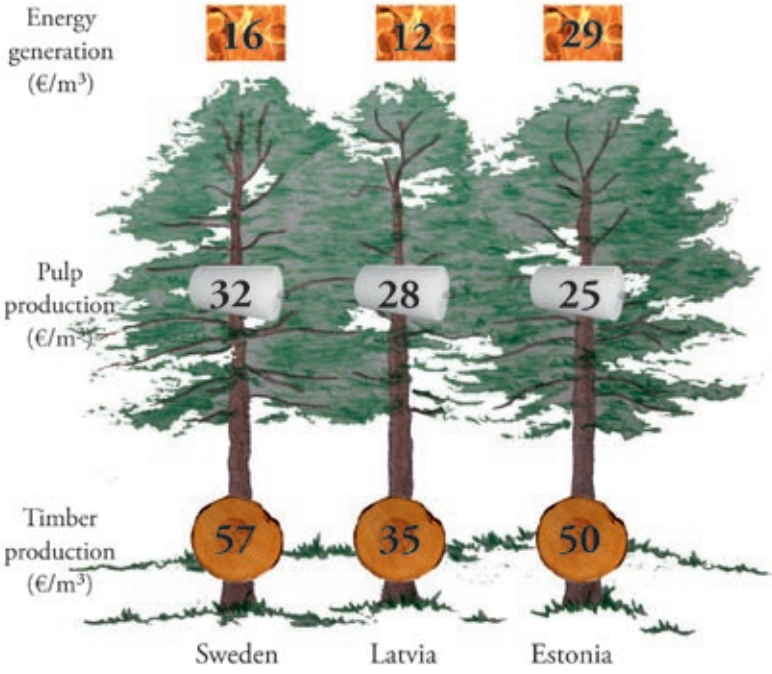


Wood chips make about a half of fuels used in CHP in the Project region.

PRICES

Woody biomass

In all three regions the raw material prices for producing pulp and timber products are much higher than for energy. In the South Estonia Region there was an exception in 2009–10, when the prices for woody biomass for energy were higher than for pulping. In Latvia and Estonia the price of wood for timber products is 35 €/m³ and 50 €/m³, respectively while in Sweden it is as high as 57 €/m³.



Raw material prices for producing timber products, pulp and energy in the Project regions (Source: Project report "Market Analyses of Wood Resources for District Heating in the Regions of Östergötland (Sweden), Vidzeme (Latvia), South Estonia, 2011").

A similar tendency is observed for the woody biomass used for pulp production. In Latvia and in Estonia the prices are 28 €/m³ and 25 €/m³, respectively, with 32 €/m³ in Sweden.

Concerning the biomass for energy, the 2010 prices in Estonia were higher than in Sweden and Latvia: 29 €/m³, 16 €/m³, and 12 €/m³, respectively. The reason for it was a booming demand for wood chips and pellets and a shortage of raw material needed for this sector of production.

Higher prices of wood for pulping and timber products stimulate the forest owners to sell their harvest for the said types of production rather than for energy (selling chipped wood for district heating), except for Estonia were it seems more profitable to use the woody biomass for producing fuel pellets rather than for pulping.

Commercial energy prices

In the South Estonia Region and the Vidzeme Planning Region the prices for natural gas are around 31 €/MWh and 40 €/MWh, respectively, with those of wood chips 13 €/MWh and 10 €/MWh, respectively.

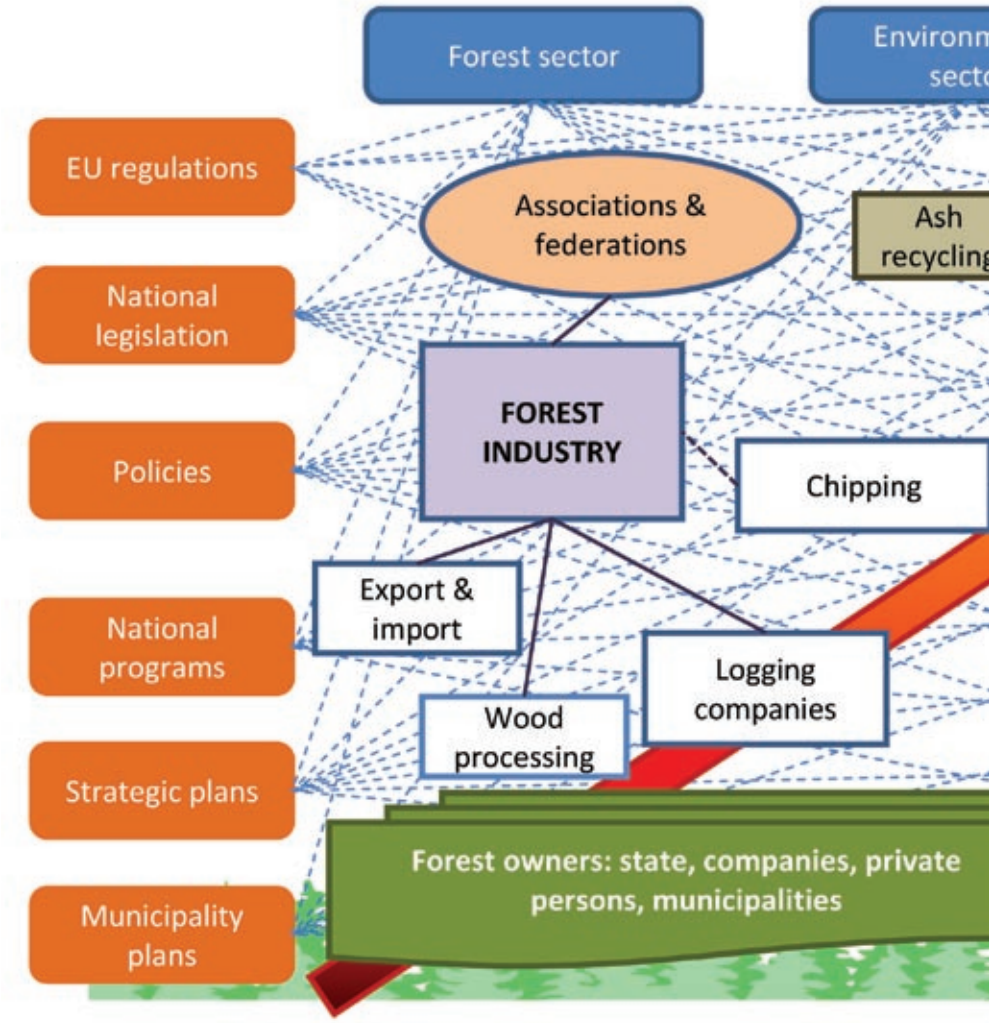
In the Östergötland County natural gas is not used for heating. The cost of energy produced from harvesting residues is around 18 to 19 €/MWh, and from recycled wood chips – about 10 €/MWh.¤

WOOD ENERGY FRAMEWORK

Production of wood energy is relatively simple compared with the processes behind it like planning, implementing and promoting the use of wood for energy. **The arrow** in the diagram below represents the **process of producing wood energy**, including the actions taken and the actors and stakeholders involved. Availability of forest resources, forest owner decisions, and the policies of forest industry make the background for wood energy.

Top level decisions on wood energy rest with the forest, environmental, and energy sectors. Planning depends on the international, national and local legislation, policies, strategies, guidelines, and action plans of individual sectors. **All decisions are influenced by a variety of stakeholders.**

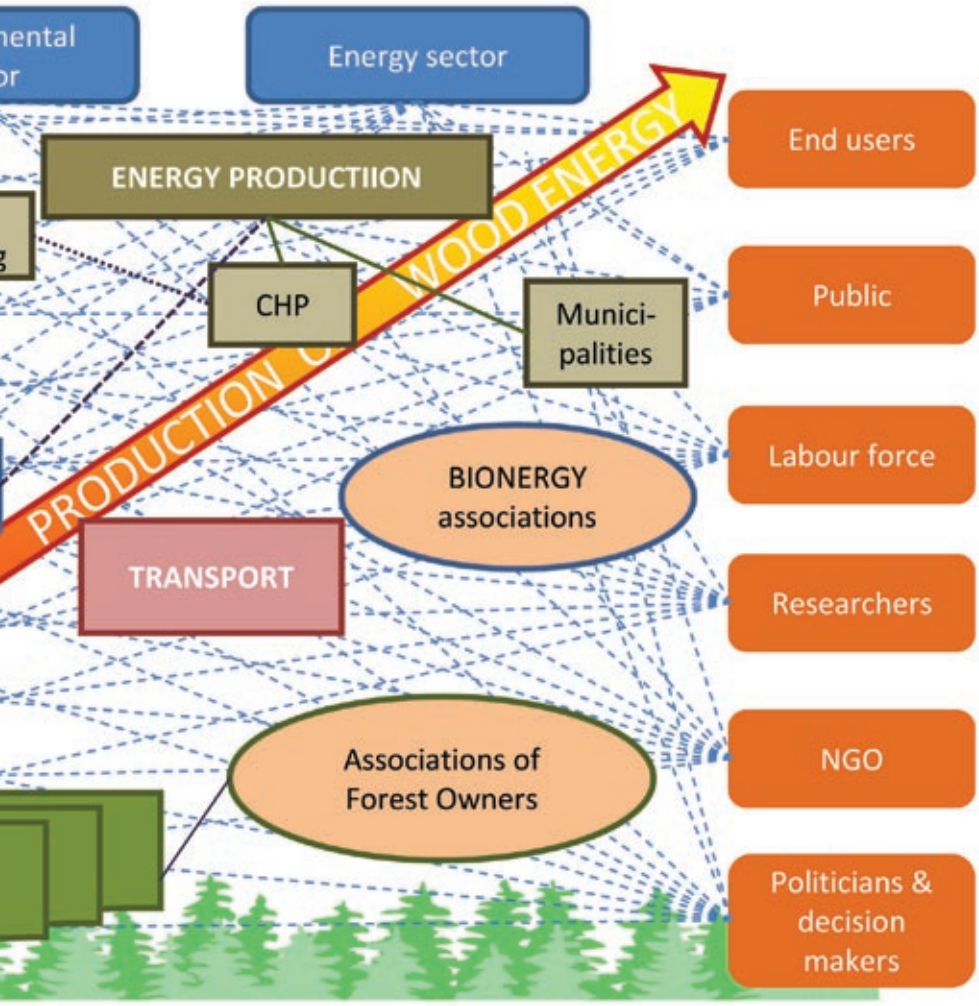
Moreover, the stakeholder groups are mixed and variable, and each stakeholder may simultaneously belong to a number of groups.



For example, a forest owner as a resource holder may at the same time be an end user of thermal energy, businessman, or a decision maker. Central heating plants (CHP), too, play different roles in energy production and planning.

Multiform direct and indirect links and networks exist among the actors of the whole system of wood energy, eventually determining its production and utilization. A **key to success** in using wood for energy is a well balanced **cooperation** between different mutually dependent actors and stakeholders.

However, collaboration among the sectors and stakeholder groups concerned is inadequate, with real round table discussions still missing in order to promote the use of wood energy and increase its role in the total energy balance compared to other renewable resources.¤



EUROPEAN UNION AND NATIONAL ENERGY PLANS

European energy policy

The **European Union White Paper** for future strategies and action plans in energy and environment sets out the goals to be reached especially for climate-affecting emissions, self-sufficiency of the EU countries in energy, and job creation. Since 2007, the EU has adopted a number of acts that are relevant to energy consumption and the ways of energy production in all member states. The priorities for the period till 2020 include the reduction of energy consumption, enforcing the internal market, infrastructure developments, improvements in technologies, consumer protection, and strengthening the external dimension of the energy policy.

In December 2008 the European Parliament adopted the Climate Change Package in order to achieve by 2020 the following **EU climate targets**:

- 20 % increase in energy efficiency (compared to projections);
- 20 % less greenhouse gas emissions (compared to 1990);
- 20 % share of renewables in the energy mix.

The new **Renewable Energy Directive**, effective since May 2009, lays down mandatory national targets to be achieved by EU-27 through promoting the use of renewable energy for generating electricity, heating and cooling, and transport to ensure that by 2020 the energy from renewable sources makes up at least 20 % of the total energy consumption. The agreement foresees also that renewable energy, such as biofuels, electricity and hydrogen produced from renewable materials, account for at least 10 % of the EU's total fuel consumption in all forms of transport.

EU member states have different binding targets for renewable energy

	Binding target (2020)	Current level (2008)
Sweden	49	44
Latvia	40	30
Estonia	25	19
EU	20	10

The **Treaty of Lisbon** (Dec., 2009) places energy at the heart of European activity. The policy aims are supported by market based tools (mainly taxes, subsidies and the CO_2 emission trading scheme), by novel energy technologies (especially technologies for energy efficiency and renewable or low-carbon energy), using for it the Community financial instruments.

European Commission/Energy – **http://ec.europa.eu/energy**
European Renewable Energy Council (EREC) – **www.erec.org**
Renewable Energy & Energy Efficiency Partner-ship (REEEP) – **www.reeep.org**

Sweden

In Sweden, national allocation plans are replaced by EU-wide allocations: emission reductions (within the EU Emissions Trading System) by 21 % by 2020 compared to 2005. The **Sweden's energy policy** and also that of climate changes are built on the same three pillars as the EU energy cooperation. Therefore, the policy aims to combine ecological sustainability, competitiveness, and security of supply. The policy goals to be reached by 2020 are:

- 50 % renewable energy;
- 10 % renewable energy in the transport sector;
- 20 % more efficient energy use;
- 40 % reduction in greenhouse gas emissions.

Regarding energy, Sweden is determined to take the biggest step forward compared

to any other advanced western economy by trying in 15 years to completely give up oil without building a new generation of nuclear power stations.

An Integrated Climate and Energy Policy of Sweden – **www.sweden.gov.se**

Estonia

The Long-term Development Programme for the Estonian Fuel and Energy Sector for a period till 2015 (2030) places high priority on the use of renewable local fuels. In electricity production Estonia has declared commitment to increase the use of renewable fuels up to 5.1 % by 2012 with the share of combined heat and power production from biomass as high as 20 % by 2020.

The 2005 Estonian National Strategy on Sustainable Development – **Sustainable Estonia 21**, is a strategy for developing the Estonian state and society till 2030. It is based on the 1995 Estonian Sustainable Development Act, which establishes first of all the principles for sustainable use of natural environment and natural resources and serves as the basis for:

- Energy development plan till 2020;
- Development plan for the use of biomass and bioenergy, 2007–2013;
- Energy efficiency program for 2007–2013;
- Renewable energy action plan till 2020;
- Estonian electricity developments plan till 2018.

Latvia

The **Energy Policy** of Latvia is formulated in the 1997 National Energy Program for a period till 2020. It gives priority to the rational use of energy resources, the development of renewables, the energy diversification and restructuring the energy sector.

The **Energy Development Conception** for 2007–2013 defines the Latvia's national energy policy, the objectives and actions to be taken, and specifies the course of long-term development. The major activities address the improvement of energy efficiency in district heating systems and buildings, and the production of energy from renewable energy sources. Guidelines for the Energy Sector Development 2007–2016 set out a number of benchmarks to be achieved in the field of energy efficiency, such as higher energy intensity, increase of cogeneration potential, reduction of energy consumption in different sectors, boiler house energy efficiency increase.

The **2010 Sustainable Development Strategy** of Latvia for a period till 2030 states that the share of renewable resources (RES) in energy production should reach 42 % by 2020 and 60–65 % by 2030. In this respect wood as the RES has the highest potential. Therefore, it is necessary to change the policy of using wood for energy and stimulate complete utilization of all available wood fuels mainly to meet the local demands for energy.¤

Sustainable Estonia 21 – **www.valitsus.ee**
Sustainable development strategy of Latvia 2030 **www.latvija2030.lv**
Energy in Central and Eastern Europe (CEE) – **www.enercee.net**

LEGAL FRAMEWORK

Forest sector

Forest sector development in the Project countries is based on the national **Forest Policy** (FP) – a document defining the overall goals of forestry and the state's role in achieving them. In Sweden the FP is reviewed once in five years, and the most recent proposals for policy changes were submitted to the Parliament in 2008. Estonia reconsidered its FP long term commitments in 2007, with the short term objectives for ten years approved in 2002.

In all Project countries the **forest legislation** is revised to adjust it to the FP changes. A variety of statutory acts on the protection of environment and national heritage are intended to ensure sustainable forest management.

Energy sector

In 2009 the Swedish Parliament adopted an integrated energy and climate policy. In Estonia, long term plans for the energy sector were settled in 2004, while the Latvia's Energy Policy is formulated in its 1997 National Energy Programme.

In the Project countries the energy policy statements form the basis of pertaining statutory acts and regulations. In recent years Latvia has made essential amendments in the legislation related to forest management and the energy sector.¤

Major statutory acts on wood energy in the Project countries

Country	Legislation concerning renewable energy	Legislation of Forest & Environmental sector
Estonia	• Electricity Market Act – 2003 • District Heating Act – 2003 • Energy Efficiency of Equipment – 2004	• Forest Policy –1997 • Forest Act – 2007 • Nature Conservation Act –2004 (2008)*
Latvia	• Energy Law –1998 (2011) • Electricity Market Law – 2005 (2011) • Regulations Regarding the Production of Electricity Using Renewable Energy Resources and the Procedures for the Determination of the Price – 2010	• Forest Policy – 1998 • Forest Law – 2000 (2012) • Environmental Protection Law – 2006 (2011)
Sweden	• The Swedish Electricity Act – 1997 (2011) • Act on Taxation of Energy – 1994 (2011) • Act on Electrical Certificates – 2003 (2011) • District Heating Act – 2008 (2011)	• Forestry policy – 1993 • Forestry Act – 2004 (2010) • The Swedish Environmental Code – 1999 (2011) • The Heritage Conservation Act – 1988 (2011)

* year of last important amendments is given in brackets

POTENTIAL ENERGY RESOURCES

Principles for estimation

The exploitable volume of energy wood depends on the amount of wood potentially and actually available (following the sustainability criteria), and that technically (infrastructure) and/or economically available (owner's decision). In most cases the estimates are based on the characteristics of harvestable stands ripe for thinnings or cleanings. In Sweden special software is developed to calculate the yield of logging residues in forest operations. While no unambiguous estimation methods exist, expert opinions on the available amount of energy wood differ.

Sweden

In Sweden, mainly spruce dominated stands of no high biological, social or cultural values, and rot-affected spruce plantations on one-time farmlands are most suitable for collecting logging residues. Normally, residues are not collected on the sites prone to ground damages or having fine fraction soils, on wetland forests, high elevation sites, stands close to water catchment and recreation areas, and next to urban centres.

According to the estimates of Swedish experts the annual volume of residues would generate about 20–25TWh, small-size trees 10–12TWh and stumps, 10–12TWh. For the Östergötland County these indices are 0.67TWh, 0.40TWh and 0.32TWh, respectively. In 2006 – 2009, logging residues were annually extracted from about 90,000ha of Swedish forest land and increased to 150,000ha in 2010.

Experts consider that the harvest volume of logging residues in the Östergötland County may be increased to a maximum of 1.75TWh per year in input energy.

Latvia

Based on the harvest volume of 10 million m^3 in 2007, the LSFRI "Silava" experts have calculated that the potential volume of logging residues is 4.1 million m^3, the available volume 3.5, and technically available 2.6 million m^3 (63 % of the potential volume). From each 100 m^3 of timber it is possible to recover about 25 m^{3loose} of energy wood. In average it is about 80 m^{3loose} of energy wood (including firewood) per ha.

Experts of the Latvian Biomass Association "LATbio" have estimated that at the current annual harvest of 9 to 12 million m^3, the potential amount of energy wood to be recovered is 6 to 9 million m^3 per year, and about 0.5 to 2 million m^3 from non-used agricultural lands and roadsides. Together with the waste from wood processing it is possible to produce about 30TWh of energy, which is nearly twice as high as the actual consumption of thermal and electric energy. Moreover, the above volume of wastewood for energy uses won't affect sustainable forest management since the residues are collected only from fertile sites in commercial forests, excluding high value or protected areas. Logging residues can potentially be collected on about 66 % of the total forest area.

Estonia

Experts of the State Forest Management Centre of Estonia consider that today the country could use for energy production about 5 million m^3 of fuelwood and logging residues, with the actual production of fuelwood and different kinds of wastewood 3.0 million m^3 today. The average size of cutting area is about 1.3ha and the amount of logging residues about 150 m^{3loose}.

Out of the total amount of available wood fuels today the share of traditional fuelwood is 64 % and that of logging residues – 36 %.¤

FROM RESEARCH TO PRACTICE

In the Project region a number of organisations are involved in research on the use of wood for energy. The entities concerned with forestry focus mainly on the availability of wood energy resources, sustainable methods and technologies for harvesting, stockpiling, and chipping energy wood, including the related chain of custody, while those of technologies and engineering deal with the efficiency of heat supply systems and technical solutions.

Forest research in Latvia and Estonia

In the 1980s the **Latvian State Forest Research Institute "Silava"** conducted noteworthy research on the utilization of logging residues. In the early 1990s, with the changes in the political system and forest management practices new research projects were launched and trials established for producing energy wood in short rotation plantations of forest crops. Studies on the utilization of logging residues from harvester-felled sites were started in 2004 in cooperation with the Forestry Research Institute of Sweden (SFRI) *Skogforsk*. The economic aspects of utilizing logging residues analyzed in the given project served as an impetus for the JSC *Latvijas valsts meži* (Latvia's State Forests) to start chipping the logging slash in 2006. At present the focus is on the cost reduction in producing biofuels and implementing a novel technology of stump extraction combined with site preparation for forest regeneration.

The **Institute of Forestry and Rural Engineering,** which is an academic unit of the Estonian University of Life Sciences, has since 1998 carried out several projects on bioenergy like the estimation and potential use of woody biomass resources from different types of forests, analysis of the development possibilities for energy wood, and recommendations for the National Programme for Utilizing Renewable Energy Resources and Peat.

In 2003, the **State Forest Management Centre of Estonia** (RMK) in co-operation with the AS *Eesti Energia* made an analysis of the bioenergy resources and technological potential for their utilization. Based on the results of ensuing research projects in 2006-07, deliveries of wood chips to the boiler plants of central heating systems from the forests managed by the said organisation were started in 2009.

Sweden - a step ahead

In Sweden, the developments regarding the use of forest fuels were initiated about 40 years ago, with the district heating systems starting to use wood fuels on a small scale around 1980. Now the most topical issue for the **SFRI "Skogforsk"** is a four-year programme "Efficient Forest Fuel Supply Systems", which is a broad collaborative project with the Swedish Energy Agency, the forestry, power engineering, and transport sectors. The major goal is to increase the use of forest biomass for energy by raising efficiency, reducing costs and increasing the quality of wood fuels. Within the current cost level it is possible to double the production of primary forest fuels. The project outputs include novel technology, design of efficient chain of custody, and in-depth knowledge of the operational environment with forest fuels.

Important issues are also a review of the work environment and ergonomics, evaluation of training campaigns, includ-

ing different software programs: **FLIS** (a tool for simple machine cost calculations and analyses of entire forest fuel systems), **FlowOpt** (a tool for analysing wood flows, adapted for forest fuel logistics), and a special calculation tool to help the forest owner decide if it is feasible to extract forest fuels in logging operations. Wood energy calculations are available in **WECcalc** (http://woodenergy.sites.djangoeurope.com/).

International projects

For the last ten years the experts of Estonia, Latvia and Sweden have taken part in a number of international projects with the exchange of knowledge and know-how on a high level. Also the given project "Wood Energy and Cleantech" is one of the examples of ongoing successful cooperation. Most of the research and development projects have resulted in valuable findings, guidelines and recommendations for the use of energy wood, and in many cases we cannot identify one single author for them. The most important international projects and publications of the last decade with the participation of the Project partners are:

- Wood for Energy – a contribution to the development of sustainable forest management (WOOD-EN-MAN) – www.flec.kvl.dk;
- RecAsh – improving recycling of wood ash to forest land – www.recash.info;
- Bioenergy Promotion Project – www.bionergypromotion.com
- AFO – Activating private forest owners to increase forest fuel supply – ww.afo.eu.com
- The European Pathway Project – www.energy-pathways.org ¤

Main institutions involved in research on different aspects of wood energy

Estonia	Institute of Forestry and Rural Engineering of Estonia University of Life Sciences	www.emu.ee
	Energy Research Institute of Tallinn University of Technology	www.ttu.ee
	Tartu University	www.ut.ee
Latvia	Latvian State Forest Research Institute "Silava"	www.silava.lv
	Institute of Physical Energetics	www.innovation.lv
	The Laboratory of Faculty of Power and Electrical Engineering of Riga Technical University (RTU)	www.rtu.lv
	Institute of Energy Systems and Environment	www.videszinatne.lv
	Forest and Wood Products Research and Development Institute	www.e-koks.lv
Sweden	Swedish Forestry Research Institute "Skogforsk"	www.skogforsk.se
	Forestry Faculty of the Swedish University of Agricultural Sciences	www.slu.se
	Division of Energy Systems at Linköping University	www.iei.liu.se
	Department of Energy Technology of Royal Institute of Technology	www.energy.kth.se

ASSESSING CHAIN OF CUSTODY

Chain of custody

SWOT analyses for the Project regions are done to identify the strong and weak points from a perspective of wood for energy, covering four major components of the chain of custody:

- sustainable forest harvesting;
- wood fuel production from logging residues;
- boiler plants and the infrastructure of district heating systems;
- end consumers and end users.

Relevant differences exist among the functions of regional administration for the Project partners and the policy planning levels in each country. The Östergötland Region of Sweden is the most experienced among the Project partners.

Strengths

With the availability of relatively cheap raw material and short transportation distances, in all three Project regions there is a profound science-backed knowledge on the related issues of forestry, biofuel production and use. The costs of using wood resources for heat production are lower compared to those from other resources, and the utilization of wood fuels is profitable. Well developed technologies are available in all the chain-of-custody segments. The EU and national policies on every level support increasing use of bioenergy.

In Sweden there is a well-functioning infrastructure coupled by a developed system of logistics and a high level of cooperation in the whole chain of custody. On-going research on the ecology and forest fuel logistics, the Green Electricity Certificate, and a high level of physical planning in the cities, backed by the Environmental Code and municipal governance, are also important factors strengthening the use of wood for energy.

Weaknesses

In producing energy from woody biomass notable disadvantages are potential road damages and the occurring cases of removing biologically valuable deadwood from forest sites. There is an upper limit to the amount of wood fuels that can be extracted from sustainably managed forests. Some areas experience a shortage of energy wood resources and lack adequate infrastructure for transporting energy wood from the forest to the end user.

Collecting and processing the raw material for wood fuels require considerable workforce. Sustainable harvesting of energy wood is comparatively expensive. The demand for thermal energy in district heating systems is fairly stable in the regions with a few boiler plants and few district heating companies. Boiler conversion from fuels other than wood to wood chips is expensive or the respective combustion technologies are not efficient enough.

Lack of a regional authoritative platform for wood energy issues and wood energy projects in the municipal energy and climate documentation is fixed in Sweden. Latvia acknowledges a lack of sustainability-oriented national policy, responsibility for achieving the objectives for utilizing renewable energy resources, and energy efficiency. Estonia points to inadequate awareness on wood energy issues in forest management. Missing or incorrect regional statistics in some segments of the chain of custody is an important factor slowing down the use of wood for energy in the three Project countries.

Opportunities

Firstly, the EU and national policy guidelines and regulations support the use of wood for energy. The municipal energy planning, too, is making progress and the regional platform and regional statistics are expected to improve. Secondly, it is possible to increase the volume of harvesting residues used for energy wood and recover wood fuels from unused lands overgrowing by trees and

shrubs (road- and ditch sides, strips of land near the railway and under power lines). In all Project countries the stumps so far unutilized have a great potential for energy uses. Thirdly, continued increase of the efficiency of chain of custody and technological advances reduce the costs and make wood more competitive on the energy market.

There are also other trends which will facilitate the use of wood for energy, for example, introduction of standardized fuel qualities and small-scale CHP in the regions. Joint ventures among the district heating companies, the industries and the forest sector will also be important driving forces.

Threats

According to expert opinion at the moment the most important threats for the use wood energy are high extraction costs, the environmental objectives to be accounted for, and other fuels (int. al. household waste) already in the system. The use of wood fuels is more complicated compared to other fuels. The climate changes, too, have a negative impact like increased risk of forest soil damages by heavy machinery because of shorter and milder winters (the ground is softer over the year) and increased amount of pests. Technologies and policies for improving thermal insulation of buildings might slow down the expansion of district heating systems.

In the Baltics, because of poor cooperation among nonindustrial private forest owners and small producers, there are no guarantees for stable and regular supplies of energy wood. Many private forest owners do not see wood fuels as a source of income and are not very active in trading with fuelwood.

In the long term, an important threat is a growing demand for wood in other sectors of economy and in the neighbouring countries where the prices for wood fuels go up because of decreasing amount of domestic resources available for energy production.

Conclusions and suggestions

In September 2011, the Project held a SWOT analyses workshop for thermal energy producers, consumers and forestry specialists. A number of findings are relevant to all the Project partners and should be taken in consideration for future plans:

- to channel the developments in the desired direction, the municipalities where forests cover the largest part of their territories should promote cooperation with private forest owners to ensure sustainable development;
- every municipality should have its own energy plan for the future; the municipality should offer to private investors concession cooperation models to provide for heat production in the municipality;
- to help regulate prices, stock exchange yards for wood chips ought to be establish-ed in the areas where the concentration of local consumers is high;
- municipalities are advised to work out a joint information database on heat production and price rates;
- increase of the share of renewable energy in the total energy balance and energy efficiency are not only a responsibility of the state and individuals, but also a possibility for local municipalities to promote economic development and attract new labour force;
- the maximum use of RER should be ensured, as well as an efficient system of forest management and conservation;
- the curricula for basic education ought to provide general information on the eco-issues, environment, and green energy;
- longterm national, regional and municipal systems are necessary.
- analyses of long-term development scenarios ought to promote understanding how the situation with resource availability is expected to change with time. If biomass becomes more expensive, the solar and wind energy could be used instead. Some flexibility should also be envisaged.¤

TOP 5 PROBLEMS IN WOOD ENERGY PRODUCTION

Ash recycling

Increasing extraction of logging residues from felling sites in recent decades greatly depletes the nutrients and acid-buffering substances found in forest soils, potentially affecting tree growth and the content of chemicals in runoff waters. It implies that in the long run strongly depleted forest soils will require compensational fertilisation. Wood ash containing acid-buffering compounds and most of the missing nutrients is suitable for it. Recycling wood ash in this way will also increase the forest productivity.

The international handbook of the Swedish Forest Agency "**From Extraction of Forest Fuels to Ash Recycling**" contains information about practical aspects of producing wood ash for broadcast application to forest sites. To reach the recommended level of application, ash should be spread over a considerably larger area. Unfortunately, there is little interest in this business and the supply of suitable ash is limited. To reduce the costs of ash recycling, it is essential to envisage incentives for manufacturers and develop applicable technologies and supply systems.

Today in Estonia and Latvia gardeners or farmers use a small portion of ash produced by the local boiler plants. With increasing use of wood energy ash recycling will also become a topical issue for the Baltic countries.

Guidelines for sustainable harvesting of forest fuels

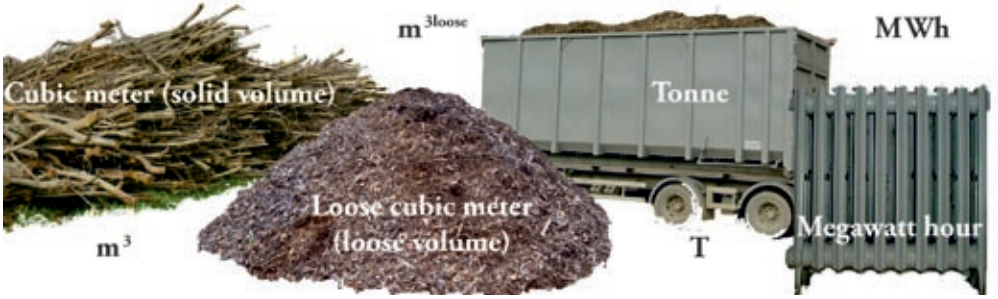
Biomass removal from woodlands in growing volumes may adversely affect forest biodiversity, soils, waters, and the long-term yield of forest stands. However, risks can be made acceptable by selecting suitable logging sites, careful planning, site-adapted management, conservation, and appropriate compensation measures for the operators involved.

In **final felling**, stockpiling and utilizing logging residues is not considered a significant threat to biodiversity compared with traditional removal of stemwood. The Swedish Forest Agency has worked out recommendations about the harvest of slash and stumps after logging. In clear-cuts extraction of logging residues should be limited to 80% of their gross quantity. In areas with patches of high biological value (endangered species, etc.) site-adapted methods and specific rules may be applied.

Stump extraction reduces ground bearing capacity and increases the risk of soil damage and compaction by forest machinery. Leaving intact for biodiversity huge stumps and high snags seems to be sufficient to provide habitat for the species to be preserved. Practicable rules for such practices have yet to be developed.

Stands of small-size trees are an important source of forest fuels. **Thinning or cleaning** of young stands is a must for creating high-yield crop stands. Pre-commercial thinnings involve considerable expenses, yet sufficient volumes of forest fuel may be recovered from overstocked young stands, achieving cost-efficiency and even generating a surplus. Discussions on thinning intensity and its impact on stand performance are still going on.

Compensation and precautionary measures can be applied and developed further to ensure that forest biofuels are utilized intensively enough without undesirable environmental impacts.



Technologies and efficiency

To improve extraction efficiency and reduce the costs, suitable technologies and harvesting methods of energy wood ought to be developed, taking into account also the silvicultural aspects like avoiding excessive damage to the remaining stand and taking care of forest soils and waters. Supporting greater utilization of forest fuels from small-size tree stands is of special importance. In Sweden novel methods for thinnings and cleanings are currently tested.

Measurement and calculation models

At present we have no reliable and useful methods of evaluating and measuring in specified units the energy wood in the whole chain of custody from forest to the end user. The boiler plants use MWh, the hauling operators talk in terms of tonnes, and wood merchants mainly use volumes, such as solid or loose cubic meter of chipwood. To avoid misunderstandings, there is a strong need for precise conversion rates between different measurement units like tonnes and megawatt hours, for instance. Wood energy market on the local and international level will only benefit from unified assortment standards and conversion coefficients.

Regarding raw material supplies, the wood energy producers cannot rely on state-own-ed and company forests alone. Still, in the Baltic states the wood energy market is of no interest for family forests owners due to a long period of cash flow in case the payment is based on the amount of heat produced. It takes a long way for the money to come back from the end users of wood fuels to the producers, contractors and forest owners. Another limiting factor is uncertainty about the real benefit (profit) the forest owner gets due to the long chain of custody and tricky measurement system.

Implementation and promoting

Wood energy production goes with intensive research, development of novel technologies, the related working methods, and software. No introduction of new knowledge and reducing the gap between science and practice is possible without informing, educating and training all stakeholder groups like forest owners, foresters, extension agents, contractors, decision makers etc. In Sweden, first awareness raising and educational campaigns on wood energy issues show positive results.

Even in a situation of plentiful energy wood resources and efficient working methods nothing would happen without appropriate tools and stimuli for translating policies in practical actions. In planning and implementing the use of wood energy it is necessary to strengthen cooperation among scientists, manufacturers, policy makers, forest owners, end users, and other stakeholder groups.¤

MOTIVE SYSTEM

Ministries

In Sweden, the Ministry of Enterprise, Energy and Communications is responsible for energy issues, including power supply, transmission, energy efficiency, renewable energy, wind power, certification, and the like. In Latvia, the same issues fall on the Ministry of Economics, but in Estonia – on the Ministry of Economic Affairs and Communications.

In Sweden, forestry is under the Ministry for Rural Affairs; in Latvia – under the Ministry of Agriculture; in Estonia – the Ministry of Environment.

Governmental organisations

The **Swedish Energy Agency** is a government entity for national energy policy issues. Concerned with various sectors of economy and supporting research & development, it strives to create conditions for effective, cost-efficient and sustainable energy supply and utilization. The **District Heating Board** established in 2008 is an independent unit acting as a mediator in negotiations between district heating companies and their customers regarding the terms and conditions for heat supply.

The Latvian Environmental Protection Fund, the State Enterprise *Vides Projekti* (Environmental Projects), and the State Regional Development Agency are the institutions subordinated to the **Ministry of Environmental Protection and Regional Development**; they take active part in supporting and developing the ideas of green energy.

In Estonia, main tasks of the **Foundation Environmental Investments Centre** (EIC) with the **Ministry of Finance** are to channel the returns from environment exploitation back into environment protection, carry out the environmental projects funded by the European Regional Development Fund, the European Social Fund and the Cohesion Fund, and administer the funds for environmental projects. Since 2010 it also acts as the authority implementing the Green Investment Scheme (selling the excess CO_2 quota and supervising the investments).

The **Environmental Inspectorate,** an administrative unit under the Ministry of Environment, coordinates and supervises the utilization of natural resources and environment protection.¤

Andres Talijärv
Deputy Secretary General
Estonian Ministry of Environment
www. envir.ee

Government role in supporting use of wood energy

In Estonia, most of the electrical energy is produced from oil shale. It is clear that in the near future the use of oil shale will continue, and the exploitation of renewable energy resources will grow rapidly, especially those of wood.

Until 2009, forests were mainly valued as a source of raw material for forest industries producing plywood, sawn wood, buildings, pulp and paper etc. Since 2009, more and bigger heat and power plants and combined heat and power plants (CHP) are using wood. The main driving factor is clearly the appreciation of oil and gas. It makes us look for alternative energy resources. Estonia has wood and peat, which are cheaper, and most importantly, more environment friendly, which implies also using production methods that emit less carbon dioxide.

The second important factor is renewable energy subsidy. The Renewable Energy Directive 2009/28/EC has advanced specific targets for renewable energy to the EU Member States, and by 2020 Estonia is expected to raise the share of renewable energy in the total energy consumption to 25%, with 2005 as the reference year. In order to promote the use of renewable energy sources, make the energy sector more efficient, and ensure the security of domestic supply and capacity, subsidies are set in § 59 of the Electricity Market Act. Subsidies are paid for electricity that is generated from renewable sources, from biomass in CHP mode, or in efficient CHP mode.

However, when talking about a high level of using wood energy, we have a long way to go as compared to our Scandinavian neighbours in particular. In 2009, the prices for woody biomass for energy production were higher than for pulp. Supply and demand are the main keywords for future prices. Estonia has huge resources of wood biomass: half of the territory of Estonia is covered by forests and we have lots of low-value agricultural lands partially becoming scrubland; so supply should be sufficient if there is demand. **The demand depends also on how much the state subsidizes the use of renewable resources.**

Government entities play an important role in increasing the proportion of renewable energy in Estonia. It means not only working out strategies, plans and different tools for policy implementation within each single organisation, but also good co-operation and common targets in long term planning and sustainable use of resources. It is important not only to set targets for certain period, but also evaluate them after this period and during it.

Estonia has gained valuable knowledge on wood energy issues from both local and international research projects. The international project "Wood Energy and Cleantech" is sure to have a positive impact on bioenergy development.¤

IMPORTANCE OF PRIVATE FOREST SECTOR

Organisations of private forest owners

In **Sweden**, four regional associations, uniting individual forest owner associations and producer cooperatives, own and manage about 50 % of private forests. The associations act mainly to represent their members' interests on the market, fetch a good price for wood resources, and provide services. The Federation of Swedish Family Forest Owners – **LRF Skogsägarna,** is the head organization.

The **Estonian Private Forest Union** (EPFU) is an umbrella organization for 30 local organizations with the forest owner associations covering about 10 % of privately owned forestlands.

In Latvia, 20 active local associations (with 20–50 members in each) represent the practical interests of private forest owners, and the first forest owner cooperative was established in 2012. The **Latvian Forest Owners Association** (LFOA) is an umbrella organisation acting for the associations and other private forest owners.

In all three Project countries organisations of private forest owners play an important role in **extension** among landowners as well as in the whole society. Energy issues are comparatively new topic for Baltics, but also in Sweden continuous research on energy issues provide knew knowledge all the while.¤

Arnis Muižnieks

Executive Director

Latvian Forest Owners Association

www.mezaipasnieki.lv

Cooperation – key to increase benefits from wood energy

In the Baltics and also Sweden family forest owners and nonindustrial private forest owners hold a significant part of resources. We cannot meet the growing demand for raw material in the industries sector without the private owners playing an active part on the timber market. Today, when the issue of green energy takes on a new meaning, the statistics show that the Baltic private forest owners in particular don't fully benefit from the sales of energy wood.

In the Nordic and also Baltic countries, because the average holding is fairly small, fragmentation and small-scale operations are typical for private forestry. In recent times, as a result of economic development the forest owners are less dependent on the income from forestry, which affects the total volume of timber harvest and, accordingly, supply. From an economic viewpoint the management of a single small holding may be expensive and sometimes unprofitable. One way how to intensify management and increase the profitability of private forestry is to support the forest owners in decision-making and offer them a practical help in organising activities, using services, and getting a fair price for their timber. It is one of the major tasks of private forest owners associations.

In Sweden, because of secure and continuous property rights to land, the forest owners have long long-standing traditions of joining in a variety of organisations. In the Baltics the property rights to land, including forest, were re-established in the early 1990s. The first attempts to draw on the Scandinavian experience in stimulating the cooperation of private forest owners failed to live up to expectations. In 2005, with the EU funds available, a number of smaller associations restarted the process of cooperation in the private sector of forestry. Even though the Latvian associations are small compared with the Swedish ones they are an important driving force in the municipalities where they act.

After studying the situation in the Nordic countries and evaluating the prior experience in uniting forest owners, the first private forest owner cooperative of Latvia was established in 2012. The role of local associations is gradually increasing, too. These activities help the private forest owners become reliable partners on the timber market.

In a situation of increasing significance of cogeneration stations and CHPs using energy wood, the state-owned forests alone cannot provide the required amount of wood. At the same time in the private sector a considerable share of resources remain unutilized, yet in planning energy production it is too complicated and risky to rely on them. Cooperation of private forest owners in selling their wood resources is a key factor for ensuring regular supplies of raw material to the wood energy industry, improve the management of private forests, and raise the income of landowners. Latvian Forest Owners Association will support this process by information and education campaigns, initiation of round-table discussions with different stakeholder groups, and putting the private owner interests over to the authorities.¤

INCREASING ROLE OF MUNICIPALITIES

Energy strategies and plans

As of the end of 2011, all 13 municipalities of **Östergötland County** have effective energy and climate plans. However, the Östergötland County has no regional strategy and planning document for energy wood.

In **Estonia**, 18 municipalities of 90 have their own energy action plans or strategies. Three out of six counties already have or are working on their energy strategies or plans. Also one regional energy strategy exists for a bigger territorial unit.

In **Latvia**, most of the municipalities are currently elaborating their development programmes while those already completed show a tendency towards energy efficiency and the use of renewable energy resources.¤

Gösta Gustavsson
Chairman of *Tekniska verken*
Linköpings municipality
www.tekniskaverken.se

Tekniska Verken is an energy company with a turnover over 6 billion SEK (0.65 billion EUR). The company is owned by the municipality of Linköping. *Tekniska Verken's* vision is to transform energy without being dependent on non-renewable fossil fuels such as coal and oil. Therefore, we base our production of electricity and heat on resources that would otherwise have been lost – wastewood or waste heat.

Forest biofuels, too, are an important component in the production. We also help the industries reduce the environmental impacts of their production. In one of the Linköping's largest industries we are now replacing several oil boilers with one biofuel boiler that supplies steam. The saving of carbon dioxide emissions will be approximately 1,700 tons per year as 700 cubic meters of oil are replaced with biofuels.¤

Biofuels are a way out of dependence on fossil fuels

The energy sector is an important player in order to reach the 20-20-20 goals. The district heating sector has in two decades reduced the Sweden's carbon dioxide emissions by as much as one fifth.

Muharrem Demirok
Leading councillor
Environment and Spatial Planning in the Municipality of Linköping
www.linkoping.se

Role of politicians – work the wishes of people into sustainable energy systems

Linköping is one of the European cities which has over the years developed a system based on low fuel prices, assuming that future belongs to motor transport. But times have changed. People today desire cities which are socially and environmentally more friendly and have attractive city centres. Our role as politicians is to combine the peoples´ wishes for more socially orientated cities with the need for new thinking as regards the energy systems of future.

Today there is hardly any politician who does not speak emphatically about the need for new energy systems and who promotes increasing use of biofuels in the transport sector. For a political representative it is necessary to present ideas and plans how this will become a reality. In this respect Linköping has realized that a new line of action for city development can be chosen only after a great deal of public involvement and discussions. In fact, public involvement is very important for all our planning work in the city, but we have one important suggestion regarding the proposed changes in energy systems - let this process take time.

In 2010, the Linköping City Council approved a new master plan for the city. The plan clearly defines a new direction for future city development. The council´s approval of the plan was preceded by several years of intensive planning work and public involvement. There is not usually a great demand for city planning documents, but in this case the master plan had to be reprinted and over 6,000 copies were handed out to the general public, authorities, societies and others.

An exhibition of the plan was arranged on the city square and the city councillors and planners were daily on duty there for three weeks. During this period 26,000 people passed through the exhibition area. We even visited the city district centres with a mobile exhibition in order to spread information about and discuss the master plan with the people who could not come to the city square. We also worked hard on a very distinct media strategy in order to stimulate a creative public debate on the master plan. No other plan in the city has been written about so much in the media. The result of our efforts was as expected – the proposed reduction of emissions in the city proved to gain acceptance by the public.

So, now we have a sound basis for energy policies in the city. We have listened to the voice of people and it is up to us to realize the peoples´ wishes.¤

BRIDGE BEETWEEN SCIENCE AND PRACTICE

The ESS-programme at Forestry Research Institute of Sweden *Skogforsk* has focused on efficient forest fuel supply systems since 2007 and is funded until 2015. The main goal is to improve technology, methodology and logistics in the forest fuel supply chain in order to reduce costs and fossil fuel input. Our research is done in close cooperation with forest companies, forest owner organisations as well as the energy producers. All these stakeholders take active part in the work, hosting studies, making machinery available and collecting long-time data.

Since 2007 use of forest fuels has increased by about 12 % per year with only a marginal increase in costs per ton. This, despite the fact that an increasing amount of fuel is collected further away from industry locations than before.

Furthermore we work with planning, prognosis and inventory problems in the fuel supply systems. If forest fuel recovery shall be a viable and profitable business it is of vital importance to have up-to-date and on-line information of where fuels are stored and in which quantities and qualities. When all this is set, forest fuel can be paid for what it's worth irrespective of if the seller is a big company or a farmer.

Henrik von Hofsten

Researcher

Forest Research Institute of Sweden *Skogforsk*

WE WILL NEVER BE OUT OF WORK

The project has so far had the function as a meeting place, an arena where professionals have been discussing many important issues and contributed to the present picture of forest fuels and district heating.

The participants have compiled knowledge about competence, market, planning, fuel supply and the present situation of district heating. This cross-sectoralal approach has provided an increased understanding of the whole value chain of forest fuels and district heating.

The coming activities will consist of practical cases in the fields of competence development, planning issues on a local level, sensitivity analysis of district heating facilities and information activities.

The now established cross-sectoral network will in the future focus on the collaboration between research and the industry, especially in establishing the concept of energy systems where you involve all factors affecting the value chain, develop the competence in the forest fuel sector, work with the motivation and technical support of end users of district heating.

Johan Palm

Project Manager

Wood Energy and Cleantech

USEFUL LINKS

Forest sector – governmental organsiations

- Estonia – www.rmk.ee
- Latvia – www.vmd.gov.lv
- Sweden – www.skogsstyrelsen.se

Legislation

- Estonia – www.legaltext.ee
- Latvia – www.likumi.lv
- Sweden – www.riksdagen.se
- the World Law Guide – www.lexadin.nl/wlg/

Statistics

- Estonia – www.stat.ee
- Latvia – www.csb.gov.lv
- Sweden – www.scb.se
- Eurostat – http://epp.eurostat.ec.europa.eu

Umbrella organisations of private forest owners

- Estonia – www.eramets.ee
- Latvia – www.mezaipasnieki.lv
- Sweden – www.lrf.se/Skogen/

Other

- Euroforest Portal – http://forestportal.efi.int/
- Swedish Energy Agency – www.energimyndigheten.se

FOR NOTES

1 m^{3loose} = 0,33–0,40 m^3

1 m^{3loose} = 0,8 MWh

1 Kw = 1 000 W

1 MWh = 1 000 000 W

1 GWh = 1 000 000 000 W

1 TWh = 1 000 000 000 000 W

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