

Opportunities for Biomass Energy Programmes – Experiences & Lessons Learned by UNDP in Europe & the CIS

Final Report

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Contents

Contents	2
1 Introduction	4
1.1 Objective of this report.....	4
1.2 Overview of the UNDP-GEF biomass projects	5
1.3 Scope of this report	6
1.4 Acknowledgements	7
2 Biomass energy in Europe and the CIS	7
2.1 Biomass energy use and potential.....	7
2.2 Trends in biomass fuel prices and competing fuels in the region	11
2.4 Key market trends and support mechanisms.....	16
2.4.1 Policy drivers in the EU biomass energy market.....	17
2.4.2 Policy approaches in the EU	18
2.4.3 Key factors in creating biomass markets in areas it is already taking off	20
2.4.4 Viability of biomass as a competitive fuel source, and its future prospects.....	22
2.4.5 Creating Markets - key lessons from countries where biomass energy use is growing	25
3 Lessons learnt in creating markets	32
3.1 Lessons from market learning through technology demonstration	33
3.1.1 Technology learning.....	34
3.1.3 Institutional learning.....	40
3.2 Lessons from addressing market barriers	43
3.2.1 Addressing policy barriers.....	44
3.2.2 Financing sustainably	48
3.3 Lessons from market transformation	53
3.4 Creating sound project designs.....	57
4 Conclusions and Recommendations	66
4.1 Project level lessons	66
4.2 Lessons in market transformation.....	67

Annex 1: Summary of 5 UNDP–GEF biomass energy projects	68
Annex 2: Overview of key terms and issues in biomass energy	88
Annex 3: Bibliography and references	91

1 Introduction

UNDP-GEF is currently implementing 12 projects under GEF Operational Programme 6 which focus on the use of biomass from forest, agricultural or sawmill wastes through direct combustion in boilers, gasification or production of liquid biofuels. These projects share many of the same challenges in ensuring the adequacy of the fuel-supply or input flows as well as ensuring the commercial foundations of the energy outflows. The projects are located in three regions: Latin America and the Caribbean, Europe and the Commonwealth of Independent States (CIS), and the Asia and Pacific region.

Five UNDP-GEF biomass energy projects have been implemented in Europe and the CIS region. These projects are:

- ‘Integrated Approach to Wood Waste Combustion for Heat Production in Poland’;
- ‘Reducing Greenhouse Gas Emissions through the Use of Biomass Energy in Northwest Slovakia’;
- ‘Slovenia - Removing Barriers to the Increased Use of Biomass as an Energy Source’;
- ‘Biomass Energy for Heating and Hot Water Supply in Belarus’
- ‘Economic and Cost-effective use of Wood Waste for Municipal Heating Systems in Latvia’

For more detailed descriptions of the projects, see “Annex 1: Summary of 5 UNDP-GEF biomass energy projects”.

The projects in Poland, Slovakia, Slovenia and Belarus come to an end in 2006 or 2007, and the project in Latvia ended in July 2005.

1.1 Objective of this report

This Lessons Learned Report discusses the experiences and lessons from the five UNDP-GEF biomass energy projects in Europe and the CIS. The report focuses on lessons for biomass project development and implementation for market transformation in this region based on what can be learnt from the implementation of the current portfolio on UNDP-GEF biomass energy projects, and makes recommendations for the development and implementation of new biomass projects in the region and beyond. The principle target audience is UNDP project and programme officers throughout the region.

1.2 Overview of the UNDP–GEF biomass projects

The portfolio of UNDP-GEF biomass projects in Europe and the CIS focuses on the use of wood residues from wood processing and forestry in the provision of heat. A number of key characteristics of the projects are summarized in the table below:

Table 1: Summary data on the 5 UNDP-GEF projects

	Belarus	Latvia	Poland	Slovakia	Slovenia
Start date	September 2003	March 2001	June 2002	1999	October 2002
Expected end date	September 2007	March 2004	June 2005	2003	February 2005
Actual end date	Ongoing	July 2005	December 2006	December 2006	March 2007
Total project size (million USD)	8.94	4.5 ¹	2.7	8.3	11.8 (planned) 13.5 (realized)
GEF contribution (million USD)	3.37	0.75	0.95	0.97	4.3
Government co-funding (million USD)	2.2		1.5	SR 1,14 EU 1,14 KKA 0,7	2.5 (grants) 0.4 (in-kind)
Other co-funding		2.68 (Netherlands)		3.3 (loan - DEXIA banka Slovensko)	2.3 (soft loans – Environmental fund of the Republic of Slovenia)
Leveraged co-financing (million USD)	1.78 1.59 (in-kind)	0.5 (in kind)	Municipalities in-kind 0.075 Municipal assets 0.087	BIOMASA Ass. Members 1.0 (in kind)	Municipalities 0.5 Others 3.9
Project Management Unit location / type	Independent government agency linked to Ministry of Energy	NGO linked to Ministry of Environment	Independent NGO	Association of municipalities - NGO	Government agency in Ministry of Environment and Spatial Planning
Key aims / objectives	Strengthen institutional capacity, build track record for investments, Develop revolving fund, Overcome negative perceptions & provide investors with market information	Support & promote the use of biomass energy, Promote the development and implementation of an economic & commercially run municipal heating system, Assist in removing/reducing technical, legislative, institutional, economic information and financial barriers.	Create an example of an inter-municipal, and public-private partnership company to manage biomass energy resources at the local level, Increase the use of wood waste produced locally and sustainably as a fuel for space heating	Demonstration of a new way for alternative environmental friendly fuel, Reduction of greenhouse gas emissions, Substitution of fossil fuels by environmentally friendly fuel, Increase public awareness and interest	Support the development of an initial set of Biomass District Heating Projects, Removal of barriers to increase the energy use of woody biomass, Promotion of use of biomass as an energy source
Financing mechanisms (at project design)	Bioenergy revolving fund operated by state owned company	Public-private partnership, and small fund creation	Public-private partnership	None, beyond bilateral funding for demonstration projects	Revolving equity / loan fund, grants, public-private partnership

¹ For the Latvia project the realized financing (at the end of the project) was USD 794 000 (Ludza), USD 1 700 000 (Private), USD 240 000 (Dutch), USD 36 000 (Mncpl I), USD 863 200 (Credit), and USD 117 600 (Mncpl II)

1.3 Scope of this report

This report focuses on lessons learnt from the portfolio of UNDP-GEF projects described in section 1.2. It thus focuses on:

- Woody biomass from forest residues and the wood-processing industries (wood-chips, sawdust, bark, pellets, etc.)
- Principally heat provision with CHP in some cases
- Industrial heating, heating of municipal buildings, and district heating systems
- Small- to medium-scale heating systems (between a few 10s of kilowatts to about 10 megawatts thermal)

All biomass that can be used for energy generation comes either from farming (industry, forestry and agriculture) or natural vegetation. Because of their frequent low cost (sometimes zero or even negative if there are costs associated with disposal) biomass ‘waste’ is usually the first choice for use as biomass fuel. Formal harvesting of vegetation will almost always be more expensive than farm and forest residues, and informal collection is unlikely to provide a sufficiently reliable supply of fuel for power and heat generation in the formal sector and this is the case in the Europe and CIS region. The ‘wet’ bioconversion processes, digestion and fermentation, are currently not covered by any UNDP-GEF projects in the region. The key biomass energy paths are shown diagrammatically in Figure 1 below. The highlighted blocks are the subject of this paper.

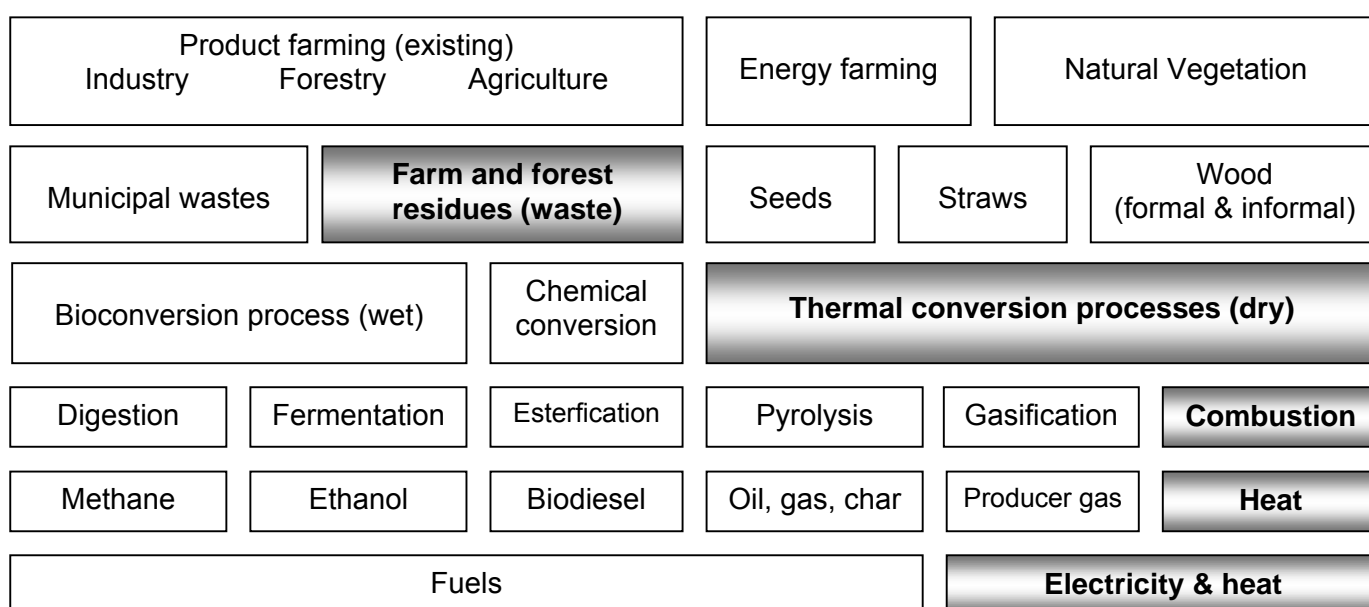


Figure 1: Key biomass energy paths highlighting the subject of this report

Biomass resources are seldom in exactly the right form, and available at precisely the right place and when needed for use in biomass energy systems and collection, processing (including processes such as drying, chipping, and pelletising / briquetting), transport, and storage are of

great importance to the success of a bioenergy system. These ‘fuel supply’ issues add to the fuel costs. Of equal importance to the questions of fuel supply are questions of the energy end-use since this represents the revenue stream, and is thus a key factor determining the overall financial feasibility of the project. Of importance is the form of energy required by the end users (mechanical (shaft power), thermal (heat, frequently in the form of hot water or steam), and/or electrical), the amount of energy required, and the demand profile (when it is required). The thermal conversion technology comes between fuel supply, and energy end-use demand, and the selection of the most appropriate thermal conversion technology for a particular location is strongly determined by the particular supply and demand characteristics.

1.4 Acknowledgements

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2 Biomass energy in Europe and the CIS

2.1 Biomass energy use and potential

In 2004, renewables accounted for 13.1% of the 11 059 Mtoe of world total primary energy supply. Combustible renewables and waste (97% of which is biomass, both commercial and non-commercial) represented 79.4% of total renewables, meaning that in 2004 biomass accounted for about 10% of world total primary energy supply or 1100 Mtoe (OECD/IEA 2007). Its largest contribution to energy consumption—on average between a third and a fifth—is found in developing countries. Compare that with 3 percent in industrialised countries (Hall and others, 1993; WEC, 1994b; IEA REWP, 1999). In non-OECD Europe and the Former USSR renewables contribute, according to IEA statistics for 2004, 10.6% and 3% of Total Primary Energy Supply

respectively (OECD/IEA 2007). Biomass contributes only 6% and 1% respectively of Total Primary Energy Supply in this region (biomass accounting for 14 Mtoe in 2004 for both regions together)².

Estimating the biomass energy potential for countries in which biomass is not historically a significant part of the energy mix is not straightforward. With the exception of the biomass resource-rich countries of Central and Eastern Europe and the CIS, the use of wood energy is greater in countries with large forest cover like Sweden, Finland and Austria where activity sectors linked to biomass are especially significant (wood for furniture and buildings). In European countries of larger sizes and with the largest populations like France, Germany and Spain, use of wood energy is especially localised in forestry regions (Wood Energy Barometer, 2005).

Based on this relationship, countries in Europe and the CIS with significant biomass potential (over 30% forest cover) include Slovenia, Estonia, Bosnia & Herzegovina, Latvia, Russian Federation, Belarus, Cyprus, Slovak Republic, Tajikistan, Croatia, Albania, Lithuania, Serbia & Montenegro, Czech Republic, Georgia, Bulgaria and Poland (see Table 2 below). Other indicators of biomass energy potential include forest production where, based on annual roundwood production the main countries of potential are the Russian Federation, Poland, Belarus, Czech Republic, Romania, Ukraine, Latvia, Slovak Republic, Lithuania, Estonia, Hungary, Croatia, and Slovenia. Based on estimates of biomass energy technical potential from the EBRD (2003), the main potential lies in the Russian Federation, Poland, Bulgaria, Romania, Ukraine, Kazakhstan, Belarus, Hungary, Czech Republic, Albania, Croatia and Uzbekistan. This estimation of technical potential includes energy from crop residues, and farm-based biogas systems that may be roughly estimated by consideration of farm sizes, numbers of animals, and agricultural productivity. A detailed analysis of these issues lies outside the scope of this report.

Wood energy industrial development is far from being homogeneous in the EU. Many countries are just beginning to exploit their potential, while others, like Finland and Sweden, have already developed a high-tech industrial sector (in particular with combined heat and power – CHP – systems) and have already largely tapped their potential. New EU members like Poland, the Czech

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