WP 3.3.2

Identification of Need for Demo Projects In POLAND

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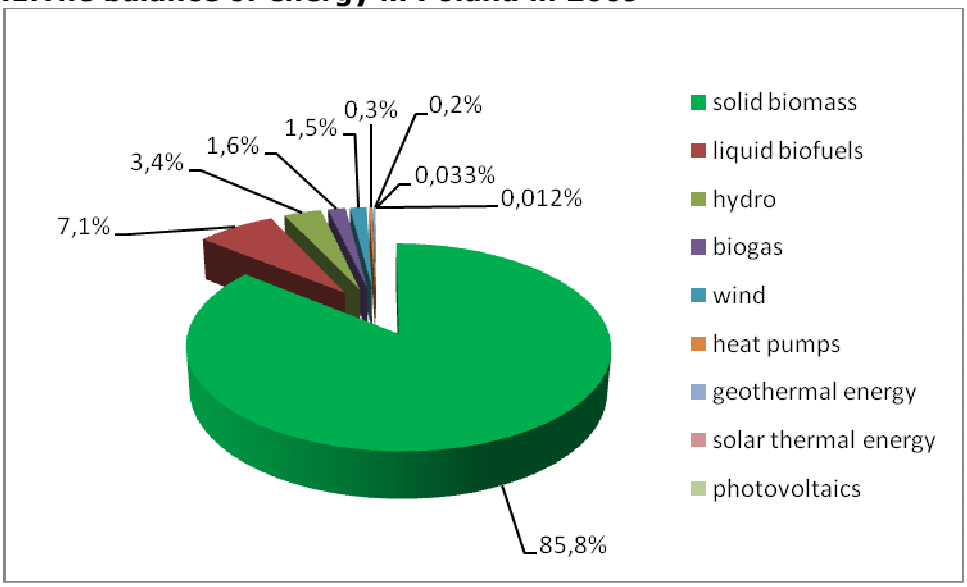
06.05.2011

1. Reviewing data available for the Task

In Poland there is no data base containing in-depth information about the biomass potential in the whole country that would be sufficiently detailed for this study.
Below some aggregated available data are presented.

The balance of energy in Poland in 2009 is presented below.

Figure 1.1.The balance of energy in Poland in 2009

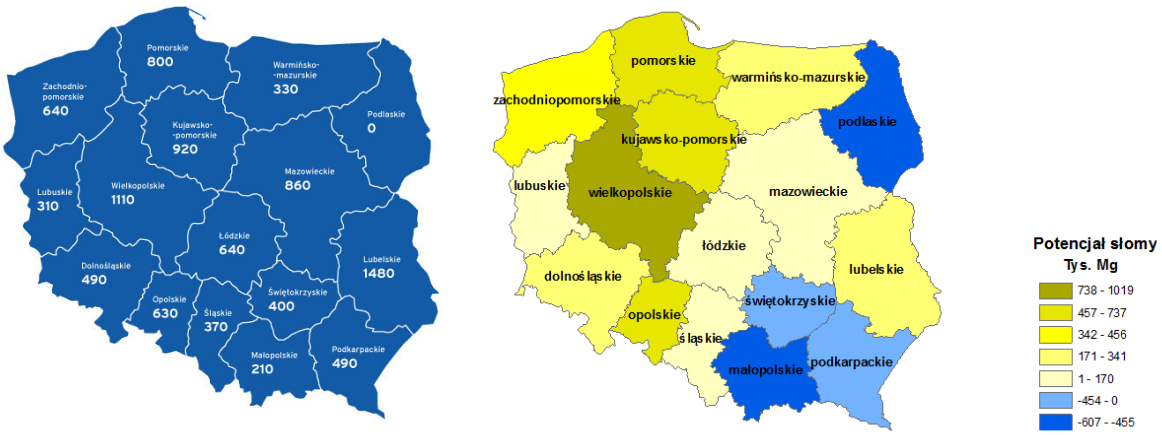


Source: Own calculations based on GUS data, "Energy from renewable sources in 2009".

Surplus of straw shown on the map below show that Małopolska region has the one of the smallest potential of this kind. This does not mean that this is the case in all counties of the region. These data are from 2008. In 2002 the surplus amounted to 77 thousand tons only (A. Cone, Gradziuk P., 2002).

Other sources give a negative value for the potential of straw in the region of Malopolska, which is from the viewpoint of the local development of RES use highly unfavorable (see map on left).

Fig. 1.2. Potential of straw (potencjał słomy) acc. to GUS (source Vattenfall) In 2008 (on the left) and potential of straw according to „National Action Plan"



Source: Vattelfall, Jaworska R., Biomass market in Poland – Strengths and weaknesses. www.bioenergiadlaregiony.pl

The availability of potential data required for the Task is rather limited and the term, financing and key objective of the project do not allow for the completion of the missing detailed potential analyses in the framework of the Project.

Heat supply constitutes one of the most important sectors in the Polish energy economy, as approx. 50% of primary energy is utilised for heat production. Simultaneously, a space heating and domestic warm water constitute approx. 80% of energy consumption in housing sector. Heat production and distribution play an important role in energy balances of the cities.
Because of most of the Poland live now in cities (61% of total population), where in order to meet the heat demand by biomass would lead to huge logistical problems (bringing biomass from distant sources, traffic congestion etc.).
As a result the Polish project partner decided to focus on biomass – derived heat in rural areas, where still almost 40% of people live and where biomass can be use locally at low cost, low transportation losses, at the same time creating local jobs and providing additional income.

2. Identifying the surveyed sector

Poland is a medium size country (approx. 313 000 km^2 and 39 mil. inhabitants), having substantial resources of primary energy (mostly solid fuels: hard coal and lignite), while other resources are rather small as in case of natural gas or minimal in case of crude oil. Also, wood and other RES are at present of small significance in the energy balance of the country. Poland does not have uranium ore and nuclear power plants. Furthermore, water and wind energy resources are also limited. In this situation biomass becomes a major renewable energy source. Very often it is assumed that the biomass resources are bigger than they are in reality. Therefore, many experts see the need to use biomass for energy purposes in a more focused way. The very recent study within 4biomass project showed that the primary use of biomass should be for heating purposes.
In fact, Poland is a rather cold country: part of Poland has continental climate (north eastern part), while north and north-west are closer to maritime climate. This results-in rather wide range of medium temperature (from -16°C to -24°C) in the heating season, which usually lasts from the middle of October to May (approx. 210 days ±10%). Average temperature in the heating season equals approx. 0°C, and a number of degree-days ranges from 3 450 at the seaside to over 4 000 in the mountains.
Approx. 70% of heat demands in towns is covered through DH networks supplied from CHP and heat only boilers (HOB). However, in rural areas and small towns heat demand is covered mainly by local (often - individual) heat sources.
Therefore, the sector we address is the sector of heating in rural areas.

It is necessary to stress that DH system is in fact a heat carrier distribution system, because heat can be produced in different heat sources - using different technologies and fuels. Thus DH sub-sector is strongly connected with other energy sub-sectors like: power, gas, coal, oil as well as local energy resources such as solar energy, excess and waste heat from industry, refuses utilization etc. Domination of solid fuels in Polish energy balance has an essential meaning for substantial development of DH systems (since 1953) [ref. DISTRICT HEATING SECTOR NATIONAL REPORT – POLAND. URE 2009]

3. Selecting the region to be surveyed

Considering the above arguments, the survey will be performed for a selected semi-rural area in the province of Malopolska.
This area covers communes: Jerzmanowice and Przeginia located near Krakow, where the biomass that can be considered is post-harvest straw.

Technical biofuel potential is estimated to 684, 6 PJ per year, based mostly on solid biomass (407,5 PJ) (Gradziuk i in. 2003)

In Malopolska there is a large variation in demand for heat and energy potential of solid biofuels. On the basis of calculation (Trojanowska 2006) was found that the annual heat demand in the rural areas around the voivodship is 60 PJ. This range varies from 1.3 PJ in the Miechowski county to more than 5.7 PJ in the Krakow country.

This indicator is calculated by multiplying the installed capacity in particular districts, and the average duration of the heating season. For comparative purposes, this demand was related to the surface, obtaining appropriate value from 2TJ/km^2 in the Miechowski county to 7.9TJ/km^2 in the Oswiecim county, with the average for the region of 3.8TJ/km^2 and variability of this rate coefficient equal to 0.7 (Trojanowska 2006). Differentiation of heat demand and the energy potential of solid biofuels in the Malopolska region were diagnosed using fuzzy classification. Three-class classification was considered the best. This classification covered19counties of the voivodship (except cities), and the variables were:

- separate individual heat demand(PC),
- indicator describing the possibilities of satisfying this demand by combustion of local resources, waste wood from the forests, the timber industry and orchards(PD),
- indicator describing the possibilities of satisfying this demand by combustion of willow (PW),
- indicator describing the possibilities of satisfying this demand by combustion of straw (PS)

In the case of planting of 20% set-aside of its plantations (PW) and straw (PS), calculated as the ratio of the energy potential of biofuels to heat demand in Table 3.1 summarized for each class averages of the indicators analyzed.

Table 3.1. The average values of indicators characterizing the energy demand of rural consumers in Malopolska Region and the possibility of satisfying it by burning the local resources of biomass; according to Trojanowska 2003

Class	PC, TJ/km^2	PD, %	PW, %	PS, %
S1	2,7	4,7	16,6	18,2
S2	4,8	5,8	5,8	6,4
S3	3,0	13,4	7,1	7,8

where:
PC – specific heat demand per unit,
PD – the ratio of the energy potential of waste wood from forests, orchards, timber industry to the heat demand,
PW – the ratio of the energy potential of willow energy crops to the heat demand

PS - the ratio of the energy potential of straw to the heat demand

Districts lying in the northern part of the Malopolska Voivodship are included to the class S1.
This area, which is characterized by a low heat demand, has the most favorable conditions for the construction of small or medium scale installations for generating energy from solid biofuels, especially from the combustion of straw and willow

The authors have done their own calculations, which are presented in section 4.2 of this paper. Results can be compared with the research outlined above.

Selecting this area presents particular challenge. The expected result is of special important for the planning of biomass-based heating in rural and semi-rural areas in Poland.

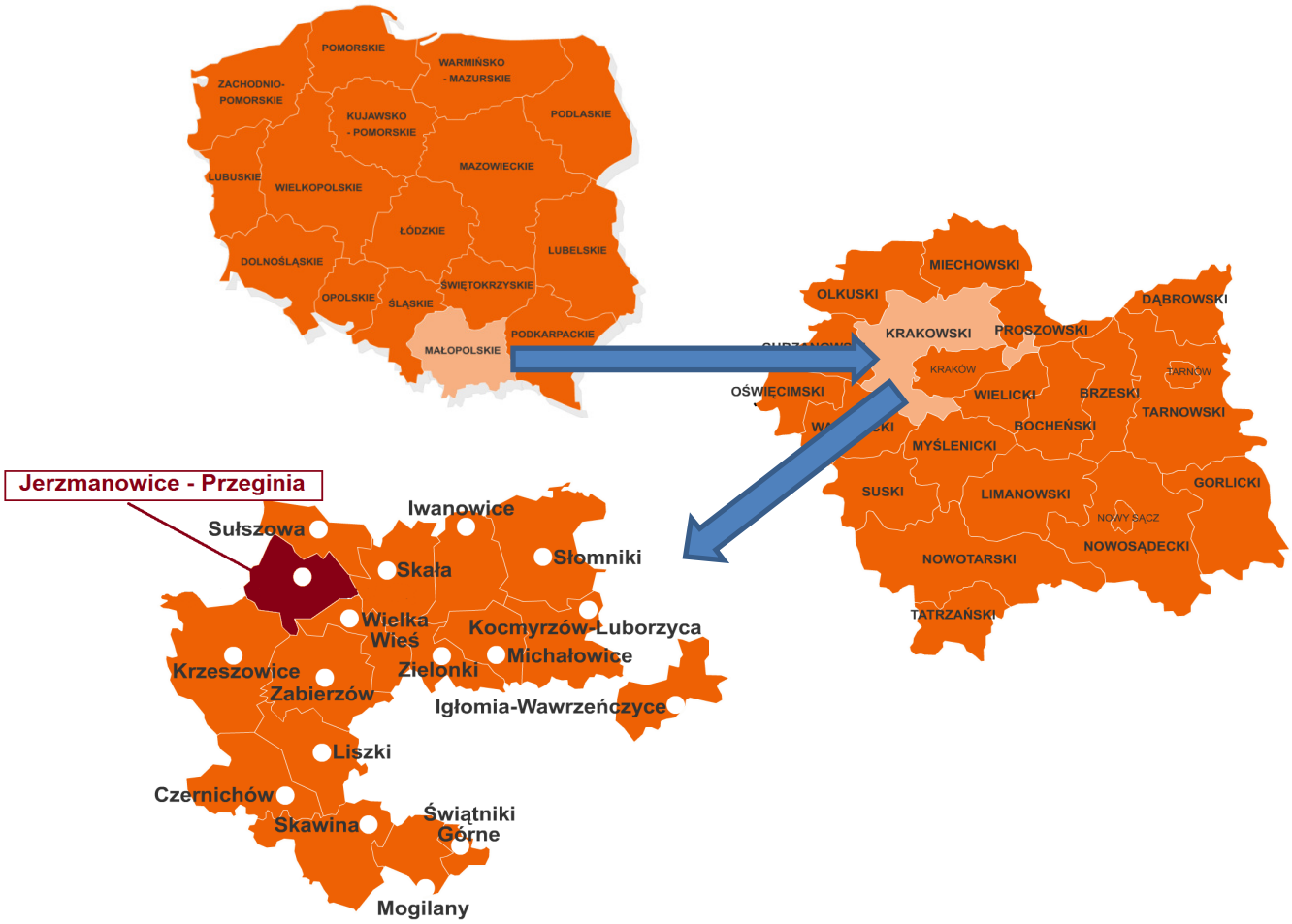


Fig. 3.1. Jerzmanowice community
Source: own elaboration by http://www.mapapolski.com.pl/

On the figure below aerial photo of Jerzmanowice-Przeginia community is presented. Fragmentation of fields can be observed.

Source: DigitalGlobe2010, OVI Nokia Maps

Figure 3.2. Aerial photo ofJerzmanowice-Przeginia community

Source: gminyturystyczne.pl

Figure 3.3. Selected pictures of Jerzmanowice-Przeginia community

Namely, the official data show that in the whole Malopolska region there is no biomass surplus that could be used for energy purposes – even, there is a deficit of straw because is also use for bedding the cattle and hens. However, a previous close in-field inspection

performed by the Krakow Institute for Sustainable Energy has shown that contrary to the aggregated data, there exist a potential for biomass heating in smaller regions or even at the individual farms. This untapped potential, which can be quite significant, needs: information, awareness raising and demonstration and this is the goal of this proposal.
Successful demonstration may (will) constitute a significant prerequisite for the decision making concerning the support policies at regional and national level, as it will help to overcome one of the main barriers in a cost and environment efficient use of biomass in Poland.

4. Identifying areas for demo projects

4.1. Surveying the demand side

For the commune Jerzmanowice-Przeginia single-family houses are typical. Houses in range of 120-150 m2 are heated individually by the owners of boilers using coal or gas boilers. In the central part of the municipality buildings are located for which one can apply a combined source of supply. Objects are shown in Figure 4.1.

Source: OVI Nokia Maps 2011

Figure 4.1. Centre of the Jerzmanowice commune

Objects:
1 – Primary, secondary school and kindergarten (place of boiler construction)
2 - Complex of commercial buildings
3 – Fire-station

Heat demand for typical one-family households is 250 GJ/individual agricultural holding

Number of households in Jerzmanowice-Przeginia commune:

One family households – ca. 2500
Households with an agricultural plot holder - 409.
Households with an user of an individual agricultural holding- 1265.
Gas customers – 2081 households
Heating dwellings with gas – 872 households
Heating dwellings with coal and/or biomass - 1628

Average total demand for public buildings in the centre of Jerzmanowice:
Object 1 –2068 GJ/year
Object 2 – 1780 GJ/year
Object 3 – n.a.

4.2. Surveying facilities using biomass in the region

Due to the abovementioned barrier there exist practically no biomass heating facilities in the Malopolska region, while the potential can be quite significant. In fact, this observation applies largely to the country as a whole.
Despite the existence of the possibilities of using locally produced straw, nearly all heating demand is covered by coal. It is interesting to observe that in many places there exists a possibility of using gas for heating. However, this is very rare in rural areas because using coal is much cheaper. In some areas where people own forests they use wood as fuel, but that is either done in low efficiency boilers or for cooking purposes only.

4.3. Surveying biomass sources available in the examined region to be used for energy causes

The preliminary basic data have been collected by KISE and presently are being integrated in the project framework by AGH-UST.

Table 4.1. Land area by agricultural holding type and area groups of agricultural land in 2009

agricultural lands	ha	4847
arable land, grand total	ha	4610
sown arable land	ha	2765
arable land, fallow land	ha	1654
arable land, set aside lands	ha	192
forests and forest land total	ha	620
public forest land, grand total	ha	185
private forest land, grand total	ha	435

Source: Central Statistical Office, 2011

As presented in the table above, the grand total arable land in the Commune of Jerzmanowice-Przeginia is 461 015 are. Fallow land constitutes almost **35%** of that area. The main reason for that situation is the fact that the agricultural activity is not profitable enough. However, would some financial incentives occur, the farmers would be ready to invest in biomass production for energy purposes.

Table 4.2. Sown area by agricultural holding type

Total	are	276 456
winter wheat	are	57 856
spring wheat	are	1 526
Rye	are	22 223
winter barley	are	3 280
spring barley	are	19 181
Oats	are	18 468
winter triticale	are	2 808
spring triticale	are	687

winter mixed cereals	are	2 001
spring mixed cereals	are	12 108
maize for grain	are	21
maize for green forage	are	152
pulses, edible	are	71
Potatoes	are	40 118
fodder root crops	are	3 628
field vegetables	are	1 887
Strawberries	are	239

Table 4.3. Lower Heating Value (LHV) of selected biomass dependent on moisture content

Type of biomass	Moisture content [%]	LHV in the fresh state [MJ/kg]	LHV in the dry state [MJ/kg]
Wheat straw	15-20	12,9-14,1	17,3
Barley straw	15-22	12,0-13,9	16,1
Rape straw	30-40	10,3-12,5	15,0
Maize straw	45-60	5,3-8,2	16,8
Wood dust	3,8-6,4	15,2-19,1	15,2-20,1
Sawdust	39,1-47,3	5,3	19,3
Willow chips	40-55	8,7-11,6	16,5
Pellets	3,6-12	16,5-17,3	17,8-19,6
Straw briquettes	9,7	15,2	17,1
Wood briquettes	3,8-14,1	15,2-19,7	16,9-20,4

Source: *"An energetic analysis of selected plant biomass samples"*; I. Niedziolka, A. Zuchniarz; Agricultural University in Lublin; MOTROL, 2006, 8A, 232–237;

Table 4.4. Wheat straw and seed yields in tonnes per hectare and the ratio of seed yield to straw yield in the years 1997–2006

No. Household	1997			1998			1999			2000			2001		
	[t/ha]			[t/ha]			[t/ha]			[t/ha]			[t/ha]		
	straw	corn	straw/corn ratio	straw	corn	straw/corn ratio	straw	corn	straw/corn ratio	straw	corn	straw/corn ratio	straw	corn	straw/corn ratio
1	2,3	5	0,46	2,5	5,7	0,43	2,2	5,3	0,42	2,01	5,6	0,36	2,6	5,2	0,5
2	3,3	4,9	0,67	3,2	6,2	0,51	1,6	5,4	0,3*	1,28	6,6	0,19	2	5,7	0,35*
	2002			2003			2004			2005			2006		
	[t/ha]		straw/corn ratio	[t/ha]		straw/corn ratio	[t/ha]		straw/corn ratio	[t/ha]		straw/corn ratio	[t/ha]		straw/corn ratio
	straw	corn		straw	corn		straw	corn		straw	corn		straw	corn	
3	3	6,4	0,44	4	8,1	0,49	3,1	6,9	0,45	3,4	6,4	0,53	2,9	5,3	0,55
4	3,2	6,1	0,52	3	6,5	0,46	3,1	6,4	0,48	3,3	6,9	0,47	2,6	6	0,43
5	2,5	5,8	0,43	2,7	6,1	0,44	3,4	6	0,42	2,6	6,2	0,42	3	6,2	0,48

* harvested by CASE harvester
Source: "*Straw – Mass and Energy Potentials"*, W. Denisiuk, EkologZEC; Inżynieria Rolnicza 2(100)/2008

According to numerical data gathered in tables 4.1 – 4.4 the calculations of the existing potential have been made based on the following assumptions:

- 1500 ha is possible to cultivate for energy crops (willow), and cultivated cereals (1400 ha)
- yields in tonnes per hectare of willow 15 Mg / ha,
- yields in tonnes per hectare of straw 2.5 Mg / ha,
- Lower Heating Value of straw 14 GJ / t,
- Lower Heating Value of willow 16.5 GJ GJ / t.

Assuming the sustainable energy use and accounting above calculations, the total energy demand in the municipality of Jerzmanowice-Przeginia is 273 TJ, which leads to 108 GJ per household. Considering those conditions the local biomass resources like straw can cover ca. 15% and energy crops/willow 68% (assuming that 50% of fallow land will be planted with willow).

Assuming higher energy intensity in the municipality of Jerzmanowice-Przeginia, the amount of total energy consumption estimates 417 TJ, which leads to 166 GJ per household. Considering those conditions the local biomass resources like straw can cover ca. 10% and energy crops/willow 44,5% (assuming that 50% of fallow land will be planted with willow).

In this commune farmers are producing crops mainly (practically only) to satisfy their own needs for eg. cereals: wheat, barley, rye, oats and potatoes. During the site visits it was found that most of the farmers are over-plowing straw to fertilize their fields and/or as feed and bedding for their livestock. However, they may use some part of it for energy purposes eg. for heating their households or sell it to the external company, which will be responsible for providing "green heat" for their own premises or medium scale heating systems eg. in public buildings. According to information obtained during the site visits, the farmers have no proper equipment (agricultural machinery and devices) for collecting, baling and transportation of straw. This is one of the reasons that farmers are not interested in this kind of biomass use. This barrier could be overcome, if an external company would provide those services to the farmers.

5. Identifying obstacles and hindering factors in the surveyed region.

In this section several important barriers hindering the energy use of biomass are enumerated.

1) According to the tables below, the total sown arable land for agricultural holdings with land area over 1 ha is 2,62 thousand ha. The biggest fraction (88%) of this total is agricultural holding less than 5 ha. This is reflected in the table below, which shows that there are 2 681 agricultural holdings of overall number of 2 746 holdings located in the Community of Jerzmanowice-Przeginia. This constitutes to 98% of the total.
This fragmentation into small unit areas leads to logistic problems, eg. with collecting straw from many farmers - vendors of straw to a dedicated local company (an intermediary).

Table 5.1. Land area by agricultural holding type and area groups of agricultural land

Over 1 and less than 5 ha		
sown arable land	are	232 196
Over 5 and less than 10 ha		
sown arable land	are	25 010
Over 10 and less than 20 ha		
sown arable land	are	4 314
over 30 and less than 50 ha		
sown arable land	are	1 750
Total for land area over 1 ha		
sown arable land	Are	**263 270**

Table 5.2. Agricultural holdings/private farms

Total	2 746
up to 1 ha	895
over 1 and less than 2 ha	923
from 2 to less than 5 ha	863
from 5 to less than 7 ha	52
from 7 to less than 10 ha	8
from 10 to less than 15 ha	4
from 20 to less than 50 ha	0

2) Another hindering factor is the rather low quality of soil which is not conducive for agriculture production, including some energy crops requiring better soil quality. However, some plants could be successfully grown if proper species were selected. This requires a separate study that remains to be performed with agriculture specialists. Eg. from the Krakow Agriculture University, who already expressed interest.

3) As seen in the picture 4.1., the topological structure of the farms is not good for using large machinery. As the fields are mostly narrow strips of land that can be cultivated only using small agricultural machinery and devices. Moreover, the morphology (slopes) is another adverse factors in this respect.

It should be pointed out that such structure of agriculture holdings is typical for the whole region of Malopolska.

This notwithstanding the research performed by KISE has shown that there exists a potential for energy use of biomass in small/medium scale units as described in the last section (recommendation).

6. Motivations and incentives available in the surveyed target area

Practically there is no motivation at present for farmers to convert from coal to biomass for heating. The reasons are the following:

A. environmental awareness, as far as global threats are concerned, among farmers is very low
B. there is no information about the modern technologies of using biomass for heating
C. farmers usually do not have financial resources to invest in new dedicated biomass boiler (heating system)
D. there are no financial support schemes that would enable the farmers to use their own biomass for heating their premises
E. demonstration is lacking

the present project will address those barriers with the emphasis on the last one.

7. Conclusion and Recommendations

Conclusion
The main conclusion is that, despite of what the aggregated data imply, there are reasonable possibilities of using biomass for heating by individual farmers and some public buildings (municipal administration, schools etc.). this potential can be untapped if the above-mentioned barriers are overcome. The crucial point is demonstration.

Recommendations
Undertaking the following action is recommended:

Ad. 6 A *(environmental awareness, as far as global threats are concerned, among farmers is very low)* a meeting of inhabitants with academics from KISE and AGH-UST should be organised together with the local administration. During that meeting researcher will make awareness presentation showing in particular the ”unwanted truth”

Ad. 6B *(there is no information about the modern technologies of using biomass for heating)* during that meeting information about modern biomass boilers will be given (showing a film and, if possible also showing a real model of a boiler that will be brought by a boiler producer

Ad. 6C&*D (C: farmers usually do not have financial resources to invest in new dedicated biomass boiler (heating system), D: there are no financial support schemes that would enable the farmers to use their own biomass for heating their premises*
If meantime some potential (planned) support possibilities are identified the relevant information will be given, possibly by a representative of Bank for Environmental Protection. If not, the focus will be put on the immediate profits that investment would bring such as elimination of spending money on coal and using instead the no cost fuel – straw.

Ad. 6E *demonstration is lacking*
According to the findings done by KISE, one can assumed that one or two candidates may agree to embark on the demonstrations investment. Those are candidate who do have sufficient own resources and/or credit capacity. KISE has already investigated a possibility of investment project at administration building in Jerzmanowice and necessary data have been collected including the heat demand, existing infrastructure etc.

Construction of the local structure of production of biomass fuels and their consumption on-site for space and domestic water heating is possible for implementation in the community Jerzmanowice - Przeginia.

8. Rferences

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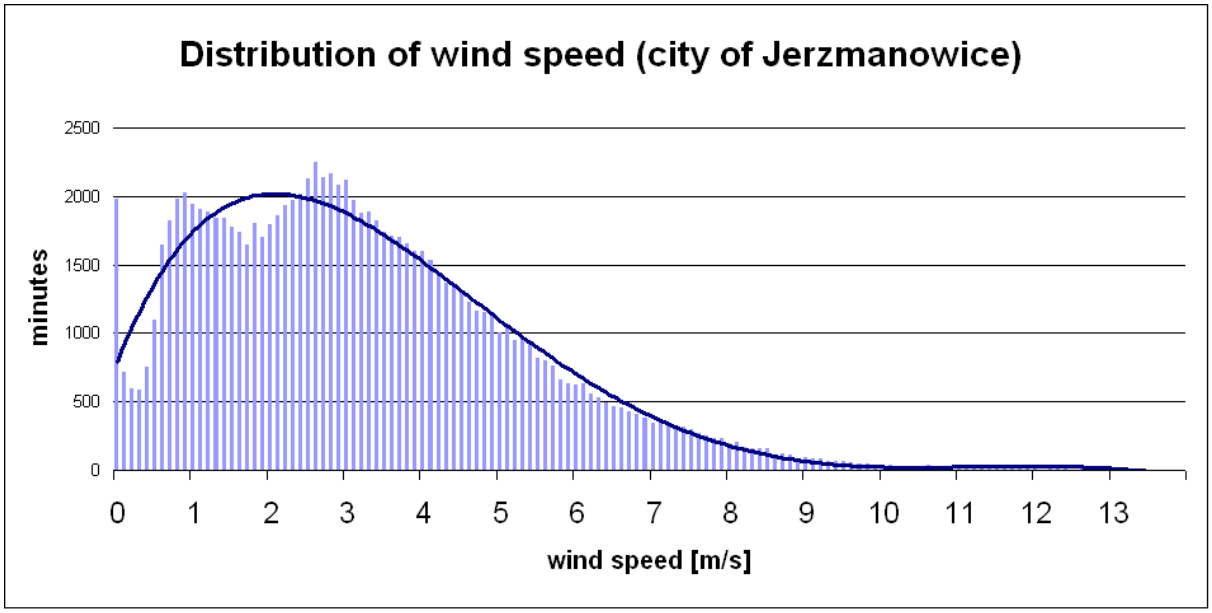

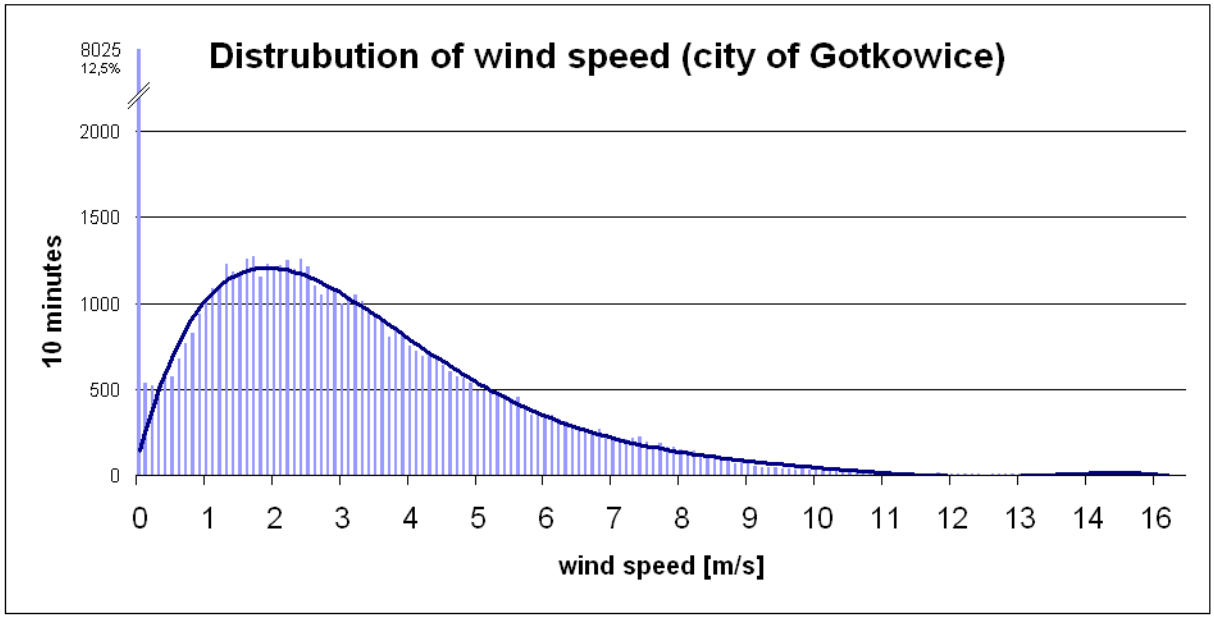

Figure 7.1. Distribution of wind speed in Jerzmanowice and Gotkowice

In course of the investigation conducted by KISE it has turned out that the analysed area has relatively good conditions for integrated small/medium scale energy systems biomass heating, solar (water heating) and wind support to direct water heating and charging batteries. The figure above shows the measured wind speeds. As it is seen those are sufficient for using small capacity turbines, especially vertical axis ones. In fact there are investors, who plan to build wind turbines of higher capacities (tens to few hundred kW) in order to make profit on Green Certificates.

Considering all the data gathered during personal interviews conducted with farmers in the community of Przeginia Jerzmanowice, and the current state of the retail fuel market for households Authors team believes that in the central part of the village recommended

solution would be construction of the Small District Heating. This installation could supply heat to a primary school, nursery school, fire station and commercial pavilion, as well as locals. This system can be powered with solar energy and wind turbine of small power (up to 10 kW).
The municipality also could - at a later stage - when the new storage of the biomass fuel for the DH will be erected - to encourage householders to install biomass boilers for heating. This proposal will be presented in detail in the next stage of the prefeasibility study.
Such a model will have a high replication potential in Poland in regions, where slight surplus of biomass is available. In regions with a very high biomass potential already all available biomass resources are contracted by power sector for co-firing in large scale CHP plants.

Annex 1

Aggregated data gathered during site visits among farmers with agricultural land holdings over 5 ha

Question	**Households**				
No	**1**	**2**	**3**	**4**	**5**
Land area	14 ha	6 ha	5,5 ha	5,46 ha	5 ha
agricultural holding type and area groups of agricultural land	**cereals - 10ha** (6 ha wheat; 1,5 ha barley; 1,8 ha oats; 1 ha lupine) **potatoes - 2ha**	**wheat - 5 ha; meadows - 1 ha; potatoes - 10 are;**	**cereals - 4,5 ha** (rye, wheat, barley); **potatoes - 0,5 ha**	**cereals - 3,8 ha** (wheat); **meadows - 1,2 ha potatoes - 0,3 are;**	**cereals, potatoes - 2,5 ha**
purpose of production	for sale	for own use	for own use	for sale/for own use	for own use
Plans	**planing** to enlarge the agricultural holding -> lease	**no plans** to enlarge the agricultural holding	**no plans** to enlarge the agricultural holding	**planing** to enlarge the agricultural holding -> lease	**no plans** to enlarge the agricultural holding
Straw management	remains on the field as fertilizer	remains on the field as fertilizer	some part collected, some part remains on the field as fertilizer	remains on the field as fertilizer	remains on the field as fertilizer
Sale of straw	depending on price	not interested	depending on price and costs of harvesting + storage + transport	depending on price and costs of harvesting + storage + transport	not for sale

Livestock	none	pigs - 4 head;hens - 6-7 head.	cattle: 4 head,hens: 12 head	hens - 60 head;rooster - 1 head	interim rearing of poultry and rabbits
Current heating source of the household	based on coal	based on coal	based on coal	based on coal	based on coal
Individual biomass heating system	Yes, but financial support needed	not interested	Yes, but financial support needed	Yes, but financial support needed	Yes, but financial support needed
Combined biomass and solar heating system	Yes, but financial support needed	not interested	Yes, but financial support needed	Yes, but financial support needed	not interested
Comments	Very interested in own biomass boiler	-	-	-	low quality of soil

Question	**Households**				
No	**6**	**7**	**8**	**9**	**10**
Land area	5 ha	8 ha	5 ha	4 ha	8 ha
agricultural	set aside lands	**cereals 1 ha**	2,5 ha - given	**cereals - 2,5**	part - set aside

holding type and area groups of agricultural land		(oats, rye); **meadows - 4 ha**	on lease 2,5 ha - set aside lands	**ha; potatoes 0,5 ha; meadows 1ha**	lands; part - given on lease
purpose of production	na	for own use	na	for sale/for own use	na
Plans	**no plans**	planing dismemberment	na	**no plans**	na
Straw management	na	remains on the field as fertilizer	na	remains on the field as fertilizer	na
Sale of straw	na	very reluctantly	na	no	na
Livestock	na	none	na	pigs - 6 head hens - 10 headducks - 30 head	na
Current heating source of the household	no data available	based on coal and wood from own forest	based on coal	based on coal and wood	based on gas
Individual	no data	Possibly, but	not interested	not interested	not interested

biomass heating system	available	financial support needed			
Combined biomass and solar heating system	no data available	Possibly, but financial support needed	not interested	not interested	not interested
Comments	not interested in cooperation	owning 3 ha of forest		wood from own forest	

Question	**Households**			
No	**11**	**12**	**13**	**14**
Land area	12 ha	10 ha	4 ha	7 ha
agricultural holding type and area groups of agricultural land	**cereals - 2,5 ha** (wheat, oats); **potatoes - 0,5 ha; meadows - 4 ha**	**cereals 5 ha** (mixed); **meadows - 5ha**	**cereals 3ha** (barley, wheat, oats)	barley - 3ha; wheat 3,5 ha; oats - 0,5 ha
purpose of production	for own use	for own use	NA	NA
Plans	**no plans** to enlarge the agricultural holding	**no plans** to enlarge the agricultural holding	**no plans** to enlarge the agricultural holding	**no plans** to enlarge the agricultural holding
Straw management	for bedding	for bedding	for bedding	remains on the field as fertilizer

Sale of straw	not interested	not interested	depending on price and costs of harvesting + storage + transport	very interested
Livestock	cattle - 11 head;horse - 1 head;hens - 25 head	cattle - 8 head		
Current heating source of the household	based on coal and wood	based on gas	based on coal	based on gas and coal
Individual biomass heating system	Yes, but financial support needed	brak surowca	not interested	Yes, but financial support needed
Combined biomass and solar heating system	brak zainteresowania	brak zainteresowania (eweltualnie tylko kolektory)	interested	Yes, but financial support needed
Comments	wood from own forest - 5 ha	all meadows collected for the cattle	forest - 1ha	very interested