

Renewable Energies for Agriculture: investments and diffusion



Regional Self-assessment – summary
AgroRES | Interreg Europe

Lubelskie Voivodeship

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REGIONAL SELF-ASSESSMENT – LUBELSKIE VOIVODESHIP

Regional socio-economic framework

The Lubelskie Voivodeship is located in the south-eastern part of Poland as a border region. At the end of 2020, its population was 2,095.3 thous. people (5.5% of the Polish population). The area of the Voivodship is 25,122 km², of which 70.4% is arable land. The region is one of the less developed regions in Poland, which is caused by the dominant share of agriculture in the structure of the economy and its low share in the creation of regional GDP. The value of GDP per capita in the region was the lowest in Poland and amounted to PLN 8,296,000. Euro.

The economy of the region belongs to the group of traditional economies due to the high share of agriculture and the low share of the service sector. A significant position of agriculture is connected with the demand for energy necessary to run farms: liquid fuels for driving vehicles and agricultural machines, electricity for powering machines and devices and not too high heat demand. The greatest heat consumption takes place in households. There is an increase in heat demand for drying, underdeveloped in Polish agriculture in relation to the actual needs.

Electricity production in the Lubelskie Voivodeship in 2019 amounted to 2,443.6 GWh, and the total production in the country amounted to 163,988.5 GWh. Electricity consumption in the region amounted to 6,117 GWh, and the total consumption in the country was 165,661 GWh. The greatest energy consumption took place in the industrial sector, both in Lublin, where it amounted to 6 117 GWh, which accounted for approx. 43.5% of total energy consumption, as well as in the whole of Poland. Agriculture is the sector of the least electricity needs.

Renewable energy development in the Lubelskie Voivodeship against the background of the country

Since 2005, there has been an increase in the installed capacity of devices generating electricity from RES in Poland, and individual technologies are not developing evenly. The development of wind energy was characterized by the greatest dynamics until 2016, when the act on investments in wind farms entered into force which, in fact, inhibited investments. In turn, since 2018, an increase in the capacity of photovoltaic installations has been observed, resulting from the implementation of support mechanisms for these technologies. This proves the close relationship between legal and financial regulations and the decisions of investors interested in generating energy from RES. The structure of obtaining primary energy from RES in Poland differs from the EU-28 due to the share of solid biomass (69.3% compared to 40.3% in the EU), which results from the availability of resources and energy conversion technologies. In 2020, renewable energy installations in Poland had a total capacity of 9,979 MW, including from wind farms - 6,347 MW in 2020 (63.6% of the total capacity), biomass 1,513 MW, hydropower 976 MW, solar 887 MW, biogas 256 MW.

The state of renewable energy technology in the Lubelskie voivodeship

Since 2016, an increase in electricity production has been observed in the Lubelskie Voivodeship, especially based on photovoltaic cells (Fig. 1). In 2020, wind farms accounted for 59.1% of the capacity (138.9 MW) of installations generating electricity from renewable energy sources, 32.6% (76.6 MW) photovoltaics, 6.6% (15.5 MW) biogas plants (including 8 agricultural biogas plants with a total capacity of 10.794 MW), solid biomass 1.1% (2.6 MW), small hydropower plants 0.8% (1.5 MW). In the region, as in Poland, the number of prosumer photovoltaic installations that meet the needs of households is growing rapidly.

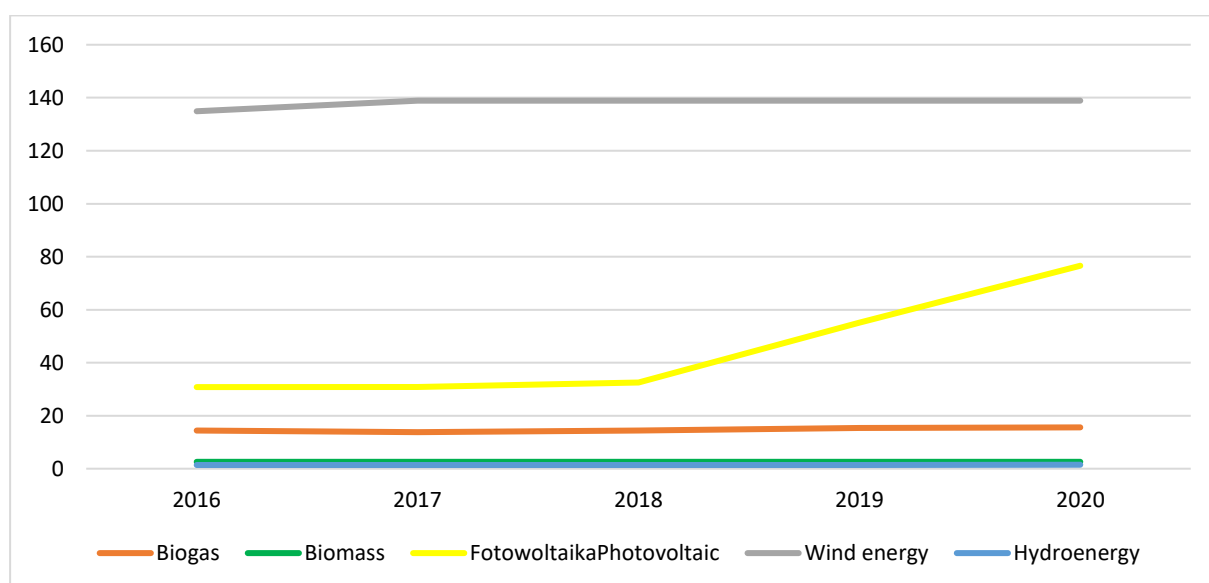


Figure 1. Installed capacity with a breakdown by energy source in 2016-2020 in the Lubelskie region [MW] (excluding prosumer installations)

Table 1. Installed capacity of electricity from renewable sources in the Lublin region and Poland (as of December 31, 2020)

	Number of installations	Installed power [MW]	Installed power [MW]		Share of Lubelskie region [%]
			Lubelskie region	Poland	
Wind energy	12	138,9	6 347,1	2,19	
Photovoltaics	130	76,6	887,4	8,63	
Biogas	17	15,5	255,7	6,06	
Agriculture	8	10,794	124,7	8,66	
Biomass	1	2,6	1 343,1	0,19	
Hydroenergy	23	1,5	976,0	0,15	
Total	183	235,1	9 934,0	2,37	

In 2019, operation of the RES installations allowed to generate electricity at the level of 25,354 GWh in Poland, including 568 GWh in the Lubelskie Voivodeship (Fig. 2). Taking into account the voivodeship's demand for electricity, it can be concluded that RES allow for meeting less than 10% of the region's needs.

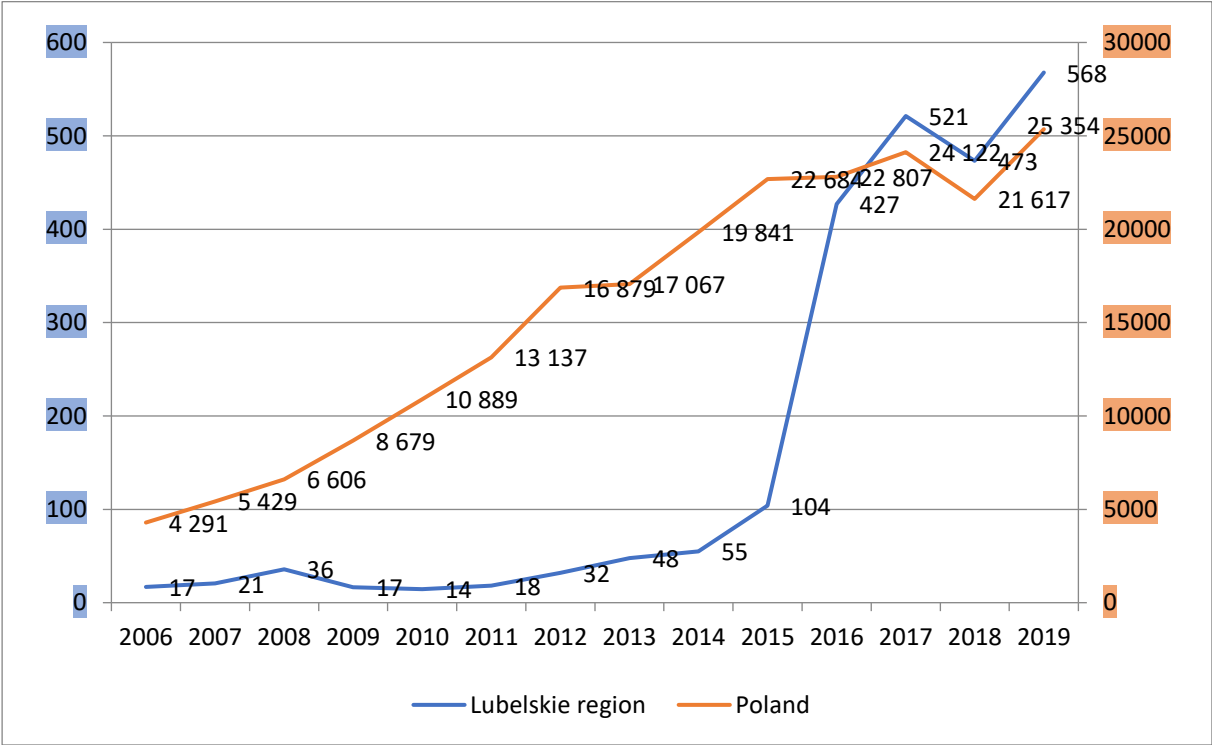


Figure 2. The volume of electricity production from RES in 2019 [GWh]

The Lubelskie Voivodeship has the highest insolation in the country, so the energy potential from this source is the highest here, and yet in 2020 photovoltaics accounted for only 8.6% of the installed capacity in Poland. A typically agricultural region, which is the Lubelskie Voivodeship, does not use biomass sources at the disposal of rural areas, neither in thermal processes nor in agricultural biogas plants. The region is not a national leader in any of the RES. There are no real data on the production of heat from renewable energy sources, especially as wood is commonly used for heating, straw-fired boilers are also in operation, as well as a significant number of solar collectors.

Production of alternative / renewable fuels

Two companies are involved in the production of liquid biofuels in the region: bioethanol (12 million liters / year) and methyl esters (12.6 million liters / year), which is 1.21% and 0.8% of national production, respectively. The region is typically agricultural, has a large amount of raw materials used for the production of biofuels, which proves that the region's resource potential is not fully used. Production is limited to primary agricultural raw materials and their conversion to biofuels takes place outside the region.

The region produces solid alternative fuels: waste fuels (RDF) in two companies located close to the Chełm cement plant, where RDF is burned. The second group of alternative fuels are granules (pellets, briquettes) made of wood waste and straw. The region has not developed a cultivation of targeted energy crops, which were indicated as an important source of biomass for the agro-energy sector.

The use of energy produced from RES for the purposes of agri-food processing

Most of the RES installations in the Lubelskie Voivodeship generates electricity (photovoltaics, wind and hydropower plants, biogas plants). The electricity is fed into the power grid, it is not directly used for the needs of agri-food processing. Heat from biogas plants is used in some agricultural aims: for heating greenhouses, fruit and vegetable drying, pellets making. The location of other biogas plants at a great distance from other facilities and housing estates limits or prevents rational heat management due to high transmission costs. It is worth proposing solutions for the use of heat from biogas plants, the excess of which is observed especially in summer. This time coincides with the heat demand of agriculture for drying rape seeds, cereals, legumes, corn.

Analysis of strategic documents

European context

The shaping of the national energy policy is influenced by the EU climate and energy policy, in particular the pursuit of climate neutrality by 2050. In 2020, the European Council approved the EU target of reducing net greenhouse gas emissions by 2030 by at least 55% in relation to the level of 1990. The Paris Agreement stipulates that the increase in global mean temperature will be kept below 2°C above pre-industrial levels. On the other hand, the "Clean Energy for All Europeans" regulatory package indicates how to operationalize the EU's 2030 climate and energy goals. The European Green Deal aims to achieve climate neutrality by 2050. Poland negotiated a national derogation due to the difficult starting point of the Polish transformation and its socio-economic aspects. EU strategic documents are reflected in the provisions contained in directives: 2018/2002, 2009/28 / EC, 2018/2001, 2019/944 and others.

National documents

The directions of the Polish energy policy were set in 2010 for the Polish Energy Policy until 2030. The Strategy for Responsible Development, adopted in 2017, updated the country's energy development strategy. The National Action Plan for Poland's energy efficiency 2017, defined national targets for 2020. The current Polish Energy Policy until 2040 (PEP2040), approved by the Council of Ministers in 2021, is a vision of Poland's development in the field of energy transformation. Another strategic document at the national level is the National Energy and Climate Plan for 2021-2030. In turn, the National Program for the Development of a Low-Emission Economy indicates the possibilities of achieving economic, social and environmental benefits resulting from measures to reduce emissions in the time horizon up to 2050.

The implementation of the goals set out in strategic documents is ensured by a properly constructed legal system, consisting of acts and regulations resulting from them. The most important ones include: the Act of April 10, 1997, the Energy Law (Journal of Laws of 2021, item 716); Act of February 20, 2015 on renewable energy sources (Journal of Laws of 2021, item 610); the Act of May 20, 2016 on energy efficiency (Journal of Laws 2016, item 831) and many others.

Regional documents

First directions of RES development in the Lubelskie Voivodship were outlined in the document of 2006 "Provincial program for the development of alternative energy sources for the Lubelskie Voivodeship", containing an analysis of the conditions for the development of individual renewable energy sources in the region, in terms of their potential, possibilities and limitations. Biomass was considered the most promising RES, which resulted from the availability of raw materials. Establishment of enterprises processing biomass into fuels of various forms, including biogas, was assumed. Solar energy was indicated as the second important RES. Interestingly, it has been written that wind energy has little potential in the region and its development will be limited to small energy. The analysis contained in this self-assessment report shows that the assumptions of the Program have not been implemented. The region is dominated by wind energy, and the potential of biomass has not been used.

More detailed studies were also prepared: "Preliminary analysis of the biomass potential that can be used for energy purposes in the Lubelskie Voivodeship", "Location conditions and the investment process of building agricultural biogas plants in the Lubelskie Voivodeship", "The condition and prospects for the development of hydropower in the Lubelskie Voivodeship" and others. Despite the analyzes of the state and correctly outlined directions of action, there were no significant changes provided for in these documents, and those that took place (e.g. construction of wind farms) were independent of the actions resulting from the strategy, nor were they inconsistent with them.

The Development Strategy of the Lubelskie Voivodeship for 2014-2020 (with a perspective until 2030) of 2013 included a new, multi-sectoral approach to regional policy, geographically oriented activities aimed at rational use of energy and increasing energy efficiency in various sectors of the economy. The current Development Strategy of the Lubelskie Voivodeship until 2030, adopted in 2021, assumes a territorially balanced development, focused on the use of local and regional potentials, strengthening regional specializations, supporting innovation and using the potential of science.

SWOT analysis

Strengths of RES:

- reduction of greenhouse gas emissions and air pollutants related to the reduction of the share of energy from fossil sources,
- meeting the EU requirements and national plans for increasing the share of renewable energy sources in the energy balance and reducing CO2 emissions,
- increasing energy security through the diversification and decentralization of energy sources,

- specific energy needs of rural areas that can be met by using local resources,
- use of local energy, land and labor resources.

Weakness of RES:

- frequent changes in law regulations,
- limited possibilities of connecting RES installations to local electricity, gas and heating networks,
- low social awareness,
- farmers' lack of interest in implementing renewable energy solutions,
- lack of coordination of RES implementation activities with local resources,
- farmers' lack of confidence in the stability of the financial conditions of RES-related activities,
- lack of specific actions by decision-makers towards the development of renewable energy in rural areas.

Opportunities of RES:

- increase in conventional energy prices,
- local market development,
- production of biomass processing equipment, including in local plants,
- new support measures and legal regulations favoring the development of renewable energy sources,
- gradual increase in social awareness,
- employment growth, especially in rural areas,
- development of RES-related clusters.

Threats of RES:

- lack of social acceptance for new technologies,
- activity of the energy lobby based on fossil sources,
- large fluctuations in the prices of agricultural raw materials.

Possibilities and mechanisms of financing activities in the field of renewable energy development in agriculture and rural areas

Due to the fact that the support programs for 2014-2020 are currently ending and the shape of new ones is not developed, it is difficult to indicate the mechanisms and amounts from which it will be possible to obtain funds for financing RES investments. Currently, the National Fund is collecting applications for renewable energy projects in the following programs: "My Electricity", "Clean Air", "Agroenergy", and soon "My Heat".

Conclusions

Analysis of the state of the economy of the province Lubelskie Voivodeship clearly indicates that the existing biomass potential is still significant and unused. There are also no measures to encourage farmers to produce agrobiomass, which is required by energy producers in combustion processes, and which is increasingly being imported to Poland. One can get the impression that rural areas are perceived at most as a place for the foundation of renewable

energy installations due to the space they have, and not as a source of energy resources and the place of their transformation into usable energy.

Based on the analysis, the following conclusions can be drawn:

- Lubelskie Voivodeship has good conditions for the development of renewable energy sources, especially based on biomass and processed into solid, liquid and gaseous fuels. Biomass resources from agriculture are of the greatest potential due to the economic and natural conditions for agri-food processing and forestry, together with the wood industry. When shaping the new eco-energy policy of the region, one can rely on the existing assessments and analyzes, taking into account new requirements and trends, such as generation II and III fuels or the use of raw materials listed in Annex 9 to the RED Directive;
- there is a great potential for the development of technologies using solar energy (large roof areas, land unsuitable for agricultural production): photovoltaics, solar collectors, including in production processes as opposed to only for household purposes. The agricultural character of the region may favor the development of drying based on solar energy;
- there is a gradual increase in the share of renewable energy sources in the region's energy mix, and its dominant element is wind energy, which was not taken into account in planning and strategic studies as an important source;
- dependence of investors' decisions on changes in legal regulations and the availability of support measures for RES investments is observed; these factors are stronger than the indicators related to the resources of a given RES. Therefore, the development of individual RES depends on the current legal regulations and support mechanisms dedicated to a given technology;
- socio-economic changes regarding the use of energy resources in rural areas are necessary. Rural areas and their inhabitants should be activated towards the implementation of renewable energy sources, especially by providing support funds, but also via consultancy, broadly informing about the availability of various subsidy mechanisms and the RES technologies themselves. The eco-energy awareness seems to be still low, but the methods of providing information so far are becoming more and more effective;
- on the basis of experiences in other European regions, it would be advisable to activate and support the development of bottom-up initiatives, local energy groups, clusters and civic energy communities.

Conclusions resulting from the work on the renewable energy development self-assessment document in the Lubelskie Voivodeship will be clarified after consultations with the local group of stakeholders participating in the work of the AgroRES project are held.