

REGIONAL ENERGY PROFILE

Region: Mazovian Voivodeship (Mazovia
Region)
English version

by
Mazovia Energy Agency (MAE)



PANEL 2050 – Partnership for New Energy Leadership 2050
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CENTRAL EASTERN EUROPEAN
SUSTAINABLE ENERGY NETWORK

Table of Content

1. Methodology	3
2. General introduction of the region	4
3. Basic demographic data and figures	6
4. Regional economy and economic trends	8
5. National and local energy strategies	10
6. Energy Production	12
6.1. Conventional energy production capacities.....	12
6.2. Renewable energy production	13
6.3. Transmission and distributions	13
6.4. Jobs in the energy sector.....	15
7. Final energy consumption	16
7.1. Households.....	16
7.2. Service Sector	17
7.3. Industry.....	17
7.4. Transport	17
7.5. Summary.....	19
7.5.1. Final energy indicators	19
7.5.2. Final energy consumption by fuel	20
7.5.3. Primary energy equivalent	20
7.5.4. Regional CO ₂ -emissions associated with energy consumption.....	21
8. Renewable energy sources – status and potential	22
8.1. General information	22
8.2. Available natural resources in the region	23
8.2.1. Biomass.....	23
8.2.2. Hydro power (incl. tide and wave power).....	24
8.2.3. Solar power	24
8.2.4. Wind power	25
8.2.5. Geothermal energy.....	26
8.2.6. Waste.....	27
8.2.7. Restriction through protected areas.....	27
9. Energy efficiency – status and potential	28
10. SWOT analysis	29
11. Annex: List of sources /bibliography /List of relevant stakeholders/institutions in the region....	31

1. Methodology

The PANEL 2050 project has the aim to create durable and replicable sustainable energy networks at local (municipality/community) level, where relevant local stakeholders collaborate for the creation of a local energy visions, strategies and action plans. The aim of these networks is to contribute to and actively work for the transition towards low carbon communities in 2050.

The PANEL 2050 partnership will provide support for the creation of first successful local energy networks in the CEE countries. In the course of the project, organisations from 10 CEE countries will collaborate on creating regional energy strategies and action plans.

The present Regional Energy Profile was prepared in order to get a better understanding of the energy-related status quo in the Mazovia Voivodeship (Mazovia Region), analysing strengths and challenges with regard to the transition towards a low carbon community.

This energy profile constitutes the groundwork for the preparation of a Regional Energy Roadmap and related Action Plans and will be essential for the communication with regional stakeholders.

2. General introduction of the region

Mazovian Voivodeship NUTS2

Geography and policy:

Mazovian Voivodeship is the largest of the sixteen Polish voivodeships (regions). It is located in the central and eastern part of Poland. It is bordered by six other voivodeships: Warmian-Masurian to the north, Podlaskie to the north-east, Lublin to the south-east, Świętokrzyskie to the south, Łódź to the south-west, and Kuyavian-Pomeranian to the north-west.



Source: Wikipedia

[https://pl.wikipedia.org/wiki/Wojew%C3%B3dztwo_mazowieckie#/media/File:Masovian_in_Poland_\(%2Brivers\).svg](https://pl.wikipedia.org/wiki/Wojew%C3%B3dztwo_mazowieckie#/media/File:Masovian_in_Poland_(%2Brivers).svg)

Present water sources - unsatisfactory quality of surface water with underground water source around 12% of national resources. Quaternary water is dominant among them, thermal water is also used. Mazovian Voivodeship is characterized by geothermal water area with temperature of 25-135°C occurring at the depth of 3100 meters. Estimated average solar radiation – 950 kWh/m²/year. Estimated wind potential - terrain topography and arrangement of main valleys and rivers in the Mazovia Region affect the influx of wind from the west and the east. Wind from other direction adapt to the valleys of latitudinal course. However, north and south winds are weakened mostly, by 20-40%. In spring - domination of northern sector (NW, N), in summer and autumn - domination of south-east (SE) winds. Fossil fuels in Mazovia - these are energy sources deposits (brown coal, two counties: kozienicki and radomski). There are surveys performed in order to discover crude oil and natural gas in this region. According to the expert opinion made in the Polish Geological Institute, as well as numerous oil companies, eastern and northern Mazovia has been included in zones of high probability for accumulation of natural shale gas.

The first industrial power plant in Mazovia was built in 1883 by Briggs brothers, investors from the United Kingdom. The biggest power plant in Poland EC Siekierki in Warsaw was put into operation in 1961. Another big power plants are: EC Żerań in Warsaw in 1954 and Kozienice and Ostrołęka in 1972. In 2014 started in Iłża with 27 turbines and installed capacity 54 MW. The huge milestone was after accession of Poland to the European Union in 2004, which helped to promote renewable energy and energy efficiency schemes. Afterwards European funding opportunities for energy sector developed. One of the next steps (2001) to increase knowledge about sustainable energy and Mazovia potentials was “Strategy of development Mazovian Voivodeship till 2020”.

In Poland the governmental institution responsible for energy sector is Ministry of Energy. It is regulating energy law, setting objectives and deciding on the energy mix. The other important entity is URE – Office of Energy Regulations that is responsible for energy market model. One of its main tasks are the promotion of competition between energy suppliers, setting security frames for Polish energy sector. At present on the political level, there is a big pressure to increase Energy Efficiency. On the local level all communes are to prepare Energy Plans, assisted by Plans of Low Carbon Economy (as an option). All public entities are obligated by Law of Energy Efficiency to optimize use of energy and energy monitoring is becoming more needed. In 2009 MAE was established to coordinate energy sector in the region aiming at participation in sustainable energy planning and contribution to local development policies.

Mazovian Voivodeship is one of the largest electricity consumers in Poland, at the same time producing too little in reference to the needs, and mostly from coal. Now many cities in Mazovia face huge problem of air pollution and smog. Challenges for the region is mostly reduction of contamination and investments in sustainable energy. Huge support for this goal is RPO – Regional Operational Program, which is to support with EU money Low-Carbon Economy. The next energy challenge is to take care of safety of energy sector. It is important to distribute energy effectively – with decentralized energy systems. Different energy sources should be integrated with an unlimited access to the grid. The latter, however, is in a rather state of repair and needs restoration and further investments.

3. Basic demographic data and figures

Regional demographic indicators:

Population of region	5 348 000	cap
Area of region	35 558	km ²
Population density	150 400	cap/km ²
Number of individual municipalities	314	mun.

Data from 2015

Basic demographic data

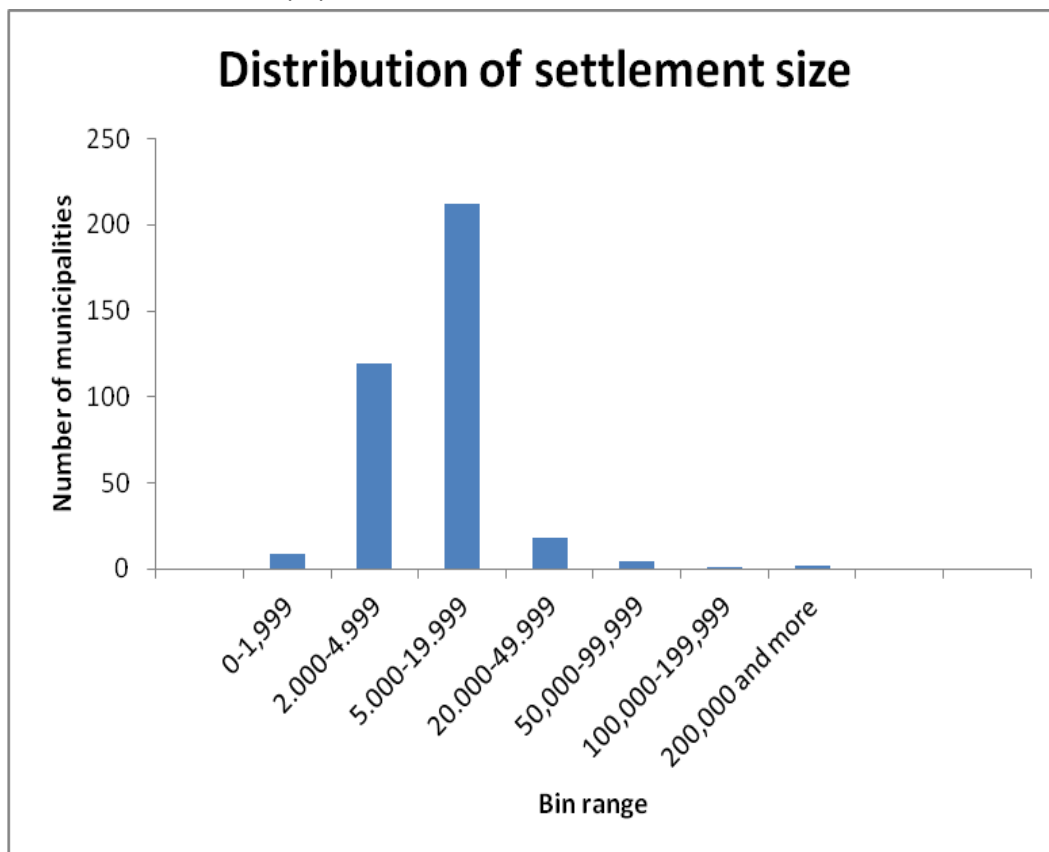
From 2005 to 2015 number of population increased 3.7%. Population in 2005 was calculated as 5 150 000, in 2015 reached 5 340 800. Age distribution in 2015: pre-working age 18,6% of total population, working age 61,4% of total population, post-working age 20% of total population. In year 2005: pre-working age 19,7% of total population, working age 63,5% of total population, post-working age 16,8% of total population.

Socio-economic development of past 3-5 years

Unemployment rate	8,3	%
Average annual income per capita (gross)	13215	EUR
difference from the EU average (34.500 EUR gross annual earning)	38,3	%
Share of employees in		
agriculture	0,17	%
industry	12,09	%
services	87,74	%
Share of population with tertiary education	44,33	%

Unemployment rate is in an EU margin rate. Average annual income per capita (gross) is well below European Union average. Main sector of employment in Mazovian Voivodeship is service sector with almost 90% share.

The spatial distribution of the population, level of urbanisation



4. Regional economy and economic trends

Regional economic indicators:

GDP, total	87 511, 7	million EUR
GDP per capita	16 435,5	EUR/cap
HDI	0,834	

Data from 2014/HDI - 2013

GDP per economic sectors:		
Agriculture	2,34	% of total GDP
Industry	16	%
Services	81,66	%

Data from 2015

Regional economy

Residents of Mazovian Voivodeship have very good life perspectives if compared to the status of persons from other regions in Poland. It is confirmed by figures indicating the lowest unemployment rate and relatively high level of income. The area is characteristic of high diversity of business activity, considerable financial outlays for development of science, high education level of population, high activity of residents and varied professional qualifications. Those factors affect the advantage of the Mazovian Voivodeship over other voivodeships in the country. Mazovia is one of the most economically developed regions in Poland. The region is the fastest developing region in reference to developed regions in European Union as a result of the highest participation in GDP generation of the country (21.9% in 2009) and high pace of growth of the economy. GDP per 1 resident in reference to the average GDP of EU-27 reached 97% in 2009. In 2010 GDP per 1 resident reached the value of around 60 359 PLN which was 161% of the national average. Warsaw drives the economy of Mazovia. Its GDP in 2009 for the country reached 13.4%, regional - 61%. GDP per one resident in 2011 in Warsaw was three times higher than the national average and four times higher than the least developed subregions of the voivodeship. A considerable growth in GDP from 152 079 million PLN in 2000 to 315 826 mln PLN in 2010 can be observed in the Mazovian Voivodeship. This is doubled. The growth is particularly related to the development of Warsaw which is the seat of numerous international companies which generates growth of GDP.

number of operating entrepreneurs (SMEs, large and individual)	602388	
→ share of SMEs	No data	% of total number of operating businesses
number of operating nonprofit organisations	21000	
Amount of EU funds (2007-13)	1,8 bn	EUR

Warsaw drives the economy of Mazovia but constantly increasing role of a western Warsaw subregions is noticable. GDP growth within the metropolitan area is based on trade/services, storage and logistics. Service sector plays also dominant role in the city of Warsaw.

Mazovian Voivodeship has one of the lowest unemployment rate region in the country. Unemployment rate is lower in urban areas than in rural areas. For total amount of 2 406 734 employed persons: 13% work in agriculture, forestry and fishing, industry 13,3%, main sector is services with more than 70% of working people.

5. National and local energy strategies

List of relevant and most influencing strategies / roadmaps / measures to local energy situation or development

Region	Brief description of current ...	legal requirement OR voluntary initiative	National/ regional/ local level	Original title + link (if possible)	English title + brief description	Organisation in charge	Type (EE, EPB, RES, etc....)
Central	Mazovia voivodeship is the largest electricity consumer, but it still produces too little electricity with regard to the needs. Moreover, electricity is produced in vast majority out of coal. Concentration of transmission high voltage lines (focused on the territory of Warsaw) is accompanied by slower development of transmission lines in the north and east part of the region. Problems with distribution systems concern 40% of rural areas, which require immediate modernization of 35-40- year old networks, to provide security of supply to end-point users.		regional	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	The Regional Council	
Central	Directive 2012/27/EU on EE 1) The energy efficiency obligation (white certificates); 2) Priority Programme: Smart Energy Networks (ISE); 3) Operational Programme Infrastructure and Environment 2014-2020 (Priority Investment 4.IV.) - Development and implementation of smart distribution systems at low and medium voltage levels; 4) information and education campaigns; 5) Energy efficiency improvement, Part 4 - Energy-saving investments in small and medium-sized enterprises; 6) Operational Programme Infrastructure and Environment 2014-2020 (Priority Investment 4.II.) - Promoting energy efficiency and use of renewable energy sources in enterprises; 7) Regional Operational Programmes for 2014-2020.	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.		EE
Central	Directive 2010/31/EU on energy performance of buildings 1) The Fund Thermo-modernization; 2) Green Investment Scheme. Part 1 - Energy management in public buildings; 3) Operational Programme Infrastructure and Environment 2014-2020 (Priority Investment 4.III.) - Support for energy efficiency, intelligent power management and utilization renewable energy sources in public infrastructures, including in public buildings and in the housing sector; 4) Energy efficiency improvement, Part 3 - Subsidies for loans for the construction of energy-efficient homes; 5) Operational Programme PL04 - "Saving energy and promoting renewable energy sources" within the framework of the EEA Financial Mechanism 2009-2014 (area No. 5 - energy efficiency and the area No. 6 - renewable energy); 6) Green Investment Scheme. Part 5 - Energy management in buildings selected public finance sector entities; 7) Energy efficiency improvement. Part 2 - LEMUR - Energy-efficient Buildings Public Service; 8) Operational Programme Infrastructure and Environment (OPIE) 2007-2013 (Measure 9.3) - Thermal modernization of public utility; 9) Efficient use of energy. Part 6 - OWL Energy-efficient street lighting; 10) Regional Operational Programmes for 2014-2020.	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.		EPB
Central	National Energy Efficiency Action Plan (10 August 2011) This document contains a description of the planned measures to improve energy efficiency, outlining the actions aimed at improving energy efficiency in various sectors of the economy, necessary for the implementation of the national target for efficient energy management in 2016. And the measures to achieve the overall objective of energy efficiency understood, as achieving a 20% savings in primary energy consumption in the European Union by 2020.	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.		EE
Central	The National Action Plan for energy from renewable sources by 2020 within the framework of the Energy Law of 1997.	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.		RES
Central	The National Action Plan aimed at increasing the number of buildings with low energy consumption within the Framework of the Act of 29 August 2014. The energy performance of buildings (Dz. U. item. 1200 and from 2015. Pos. 151). The Act transposes into national law some of the provisions of the Directive of the European Parliament and of the Council 2010/31 / EU of 19 May 2010. On the energy performance of buildings (Acts. Office. EU L 153, 18.06.2010, p. 13). The national plan includes a definition of a building with low energy consumption reflects the existing conditions and achievable, economically feasible measures to improve the energy performance of buildings. Moreover, it represents the actions of government taken to promoting buildings with low energy consumption, including the design, construction and reconstruction of buildings in a way that ensures their energy efficiency and increasing the acquisition of energy from renewable sources in new and existing buildings, and also sets out a timetable achieve its goals.	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.		EPB

Central	<p>ACT of 20 February 2015. Renewable energy with the amendment of the Act of 22 June 2016.</p> <p>The Act defines:</p> <ol style="list-style-type: none"> 1) the terms and conditions of business in the making: <ol style="list-style-type: none"> a) electricity from renewable energy sources, b) agricultural biogas <ul style="list-style-type: none"> - Installations renewable energy source, c) bioliquid; 2) mechanisms and instruments to support the production of: <ol style="list-style-type: none"> a) electricity from renewable energy sources, b) agricultural biogas, c) heat <ul style="list-style-type: none"> - Installations renewable energy source; 3) rules for issuing guarantees of origin of electricity produced from renewable energy installations renewable energy source; 4) rules for the implementation of the national action plan for renewable energy; 5) the conditions and procedure for certification of installers microinstallations, small installations and installation of renewable energy sources with a total installed capacity of heat is not greater than 600 kW, and the accreditation of training providers; 6) the principles of international cooperation in the field of renewable energy and joint investment projects. 	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	RES
Central	<p>ACT of 20 May 2016. Energy Efficiency (Dz. U. of 20 May 2016, item 831).</p> <p>The Act defines:</p> <ol style="list-style-type: none"> 1) national target for efficient energy management; 2) the tasks of the public sector in energy efficiency; 3) rules to obtain and redeem certificates of energy efficiency; 4) rules for drawing up the audit energy efficiency and obtain permission Auditor energy efficiency. 	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	EE
Central	<p>The Act of 10 April 1997. Energy Law (Dz. U. 2006. No. 89, item. 625 with changes).</p> <p>Energy Law regulates the energy sector, but also contains special provisions applicable to renewable energy sources, including:</p> <ul style="list-style-type: none"> • specific rules related to connecting to the network and transmission of energy electricity generated by using renewable energy companies; • rules for the sale of electricity generated by the company energy using renewable energy sources; • issuing and circulation of certificates of origin issued for energy from renewable energy sources. 	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	RES
Central	<p>Polish Energy Policy until 2030</p> <p>The main directions of Polish energy policy are:</p> <ul style="list-style-type: none"> • Improving energy efficiency, • Increased security of fuel and energy, • Diversification of electricity generation structure by introducing nuclear energy, • Development of renewable energy sources, including biofuels, • Development of competitive fuel and energy markets, • Reducing the impact of energy on the environment. 	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	EE + RES
Central	<p>ACT of 21 November 2008. on thermal and repair (Dz. U. of 18 December 2008).</p> <p>2010-06-07 d. Dz.U.2010.76.493 art. 1</p> <p>2011-01-01 d. Dz.U.2009.157.1241 art. 79</p> <p>2011-07-01 d. Dz.U.2011.106.622 art. 88</p> <p>The Act defines the principles funding in the Thermo-modernization of the cost of thermal modernization and renovation.</p>	legal requirement	national	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	EE + EPB
Central	<p>The Operational Programme Infrastructure and Environment 2014-2020. Action 1.3 Promoting energy efficiency in buildings / 1.3.1 Promoting energy efficiency in public buildings</p>	voluntary initiative	regional	Region Centralny	Central Region area includes the Mazowieckie voivodeship and Łódzkie voivodeship.	EPB
Central	<p>The Regional Operational Programme 2014-2020 MAZOWIECKIE. Action 4.1. Renewable sources of energy. The infrastructure for the production and distribution of energy from renewable sources</p>	voluntary initiative	regional			The Regional Council
Central	<p>The Regional Operational Programme 2014-2020 MAZOWIECKIE. Action 4.2. Energy efficiency. Retrofitting of public buildings</p>	voluntary initiative	regional			The Regional Council
Central	<p>Plans for Low-Carbon Economy aim to support the implementation of the climate and energy package in 2020.</p>	voluntary initiative	regional			
Central	<p>Plans for the Supply of Heat, Electricity and Gaseous Fuels for the Municipalities within the framework of the Energy Law of 1997.</p>	legal requirement	national			

6. Energy Production

6.1. Conventional energy production capacities

Name & Location (city, town)	Owner	Year of commissioning (refurbishment)	Type of plant & fuel	Capacity in MW	Annual energy production in MWh	Annual CO ₂ -emissions in t	Utilization rate (qualitative assessment)
Siekierki Power Plant (Warsaw)	Public	1961	Thermal and electricity Coal	622 MWe 2068 MWt			Constantly used
Żerań Power Plant (Warsaw)	Public	1954	Thermal and electricity Coal	386 MWe 1580 MWt			Constantly used
Kozienice Power Plant (Świerże Górne)	Public	1972	Thermal and electricity Coal	2905 MWe 6812, 6 MWt	11825000 MWh	10 mln T	Constantly used
Ostrołęka Power plant (Ostrołęka)	Public	Works A: 1956 Works B: 1972	Thermal and electricity Coal	Works A: 93,5 MWe 456,1 MWt Works B: 681 MWe			Constantly used

In Poland the most significant suppliers of energy play fossil fuels energy systems. In the structure of fuel supply for power plants, CHPs and heating plants, coal (hard coal and lignite – almost 90 % participation in fuel charge) play the most important role, lower is natural gas and heating oil. According to the opinion expressed in the project of Development Strategy for the Mazovian voivodeship the total electric power of electricity sources in the Mazovian voivodeship is insufficient in relation to the forecast needs for 2020-2030. Furthermore, most of the power plants in the system are over the age of 30 and they should be replaced by modern, high-efficient and low carbon energy sources.

6.2. Renewable energy production

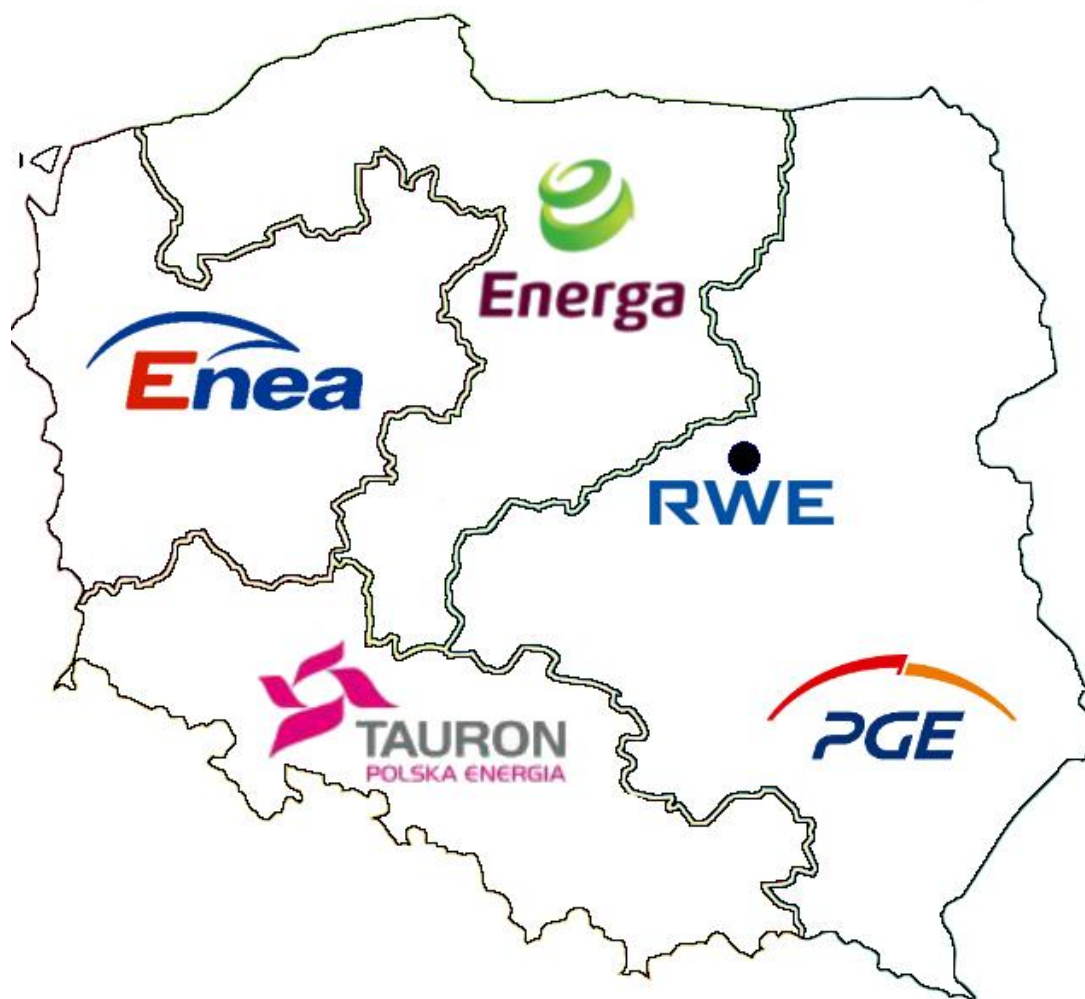
Energy production capacities

Name & Location (city, town)	Owner	Year of commis- sioning (refur- bishment)	Type of plant & fuel	Capacity in MW	Annual energy production in MWh	Annual CO ₂ - emissions in t	Utilization rate (qualitative assessment)
Dębe	Public	1957-1963	Hydro	21,18 MW	91 MWh	0	Constantly used
Korytnica	Public	2015	Wind	82,5 MW		0	Constantly used
Iłża	Public	2014	Wind	54 MW		0	Constantly used
Żuromin	Public	2012	Wind	60 MW		0	Constantly used

The area of the Mazovian voivodeship lies in the area of favorable conditions for the development of wind energy. Unfortunately, the enacted law on the location of wind farms (2016) slow down and even stopped the development of this industry. As for hydro power still Wisła (the largest river in Mazovian voivodeship and in Poland) energy potential is not fully utilized. Solar energy installations are increasingly used. Unfortunately meteorological conditions in Poland are characterized by very uneven distribution of solar radiation in the annual cycle and that causes lower annual energy production.

6.3. Transmission and distributions

In Poland the electric system is divided into subsystems: **manufacturing** (power station), **transmission network** (line and substations :750 kV, 400 kV, 220 kV) – the transport network is nationwide network and is managed by the Transmission System Operator (TSO) – Polish Power Grid Company and **distribution network** (line and power stations: high (110kV), medium and low voltage) – distribution networks are regional networks and are managed by regional distribution system operators (THE LARGEST Polish operators: PGE, TAURON, RWE (now Innogy), ENERGA, ENEA).



Source: <http://dobryprad.pl/dostawcy/prad/tradycyjni/energa>

The Mazovian voivodeship lays in the area of three operators :Energa, RWE (now Innogy), PGE. Due to the TPA (Third Party Access) end consumers can individually and freely choose the energy supplier who will offer the most favorable terms of sale while still using the power grid network company (TSO or DSO) with whom the customers have signed transmission or distribution contracts.

In the Mazovian voivodeship no natural gas mines are connected to the transmission and distribution pipeline system. This means that the entire supply of natural gas in Mazovia comes from the gas transmission system, fed by imported gas, or by gas from domestic production –located in different part of Poland. The winter season is protected from PMG (underground gas storage), which is also located outside Mazovia.

Currently, the infrastructure of the national gas system consists of:

- a) Gas pipelines: transmission and transit of high pressure - above 1.6 MPa; distribution: high pressure <0.5 - 1.6 MPa>, medium pressure <0.01 - 0.5 MPa>, low pressure - below <10 kPa.
- B) Gas compressors
- C) Reduction and measurement stations
- D) Underground gas storage (PMG)

The national natural gas transmission system consists of two separate systems: high methane gas, nitrogen gas. Mazovia has only a high methane gas system

About 50% of Poland's citizens buy heat from district heating companies. The remaining heat demand is satisfied from individual sources or small local sources. The largest heating network in

Poland is located in Warsaw. It has about 1 650 km long, which accounts for 8.5% of all heating networks in Poland. Warsaw also has the largest share of heat demand in the district heating system by 76%. Network heat production is based primarily on hard coal. Due to technical and economic constraints (lack of heat transfer capability over long distances), heat markets are local and often include one city area. In such local markets there are usually at most several large sources of system heat and only one district heating network operator. Heating services are provided to final customers usually on the basis of contracts with a local network operator who buys heat from generators connected to its network or generates them at their own source.

Mazovian voivodeship has a large demand on energy and the regional production is enough to cover this. There are no large production on which the rest of the country's energy supply might depend.

6.4. Jobs in the energy sector

In the fuel and energy sector, approximately 300,000 people are employed in Poland. 125 thousand in the coal and mining sector, almost 150 thousand. It deals with supply of electricity and gas. Earnings in the energy sector are clearly higher than in the Polish economy. The median salary is 4100 PLN which makes it one of the best paid industries.

In the region the coal and lignite mining is not undertaken but it plays a very important role in the country. That is the main that in Mazovian voivodeship coal and lignite still play the main role in energy sector.

7. Final energy consumption

7.1. Households

Regional final energy consumption of household sector	22662,52	GWh in a year
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Heat consumption

Total heat energy consumption of households sector (heating and hot water consumption)	9733,72	GWh in a year
Average heat energy consumption per household	4446,9	kWh/hh

The average time when the existing buildings were built is the years 1945-1988 (almost 50 % in the urban areas and more than 60% in the rural areas). The renovation of the buildings is becoming more popular in Mazovian voivodeship. There is a lot of new projects to encourage that but it is still not effective.

Electricity

Electricity consumption of households	4550,3	GWh in a year
Average electricity consumption per household	2078,8	kWh/hh

Gas consumption

Gas consumption	8378,5	GWh in a year
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The Mazovian Voivodeship consumes almost 20% of the natural gas consumption in Poland. In the case of recipients the durability of natural gas supplies is very important now, compared to customers from other voivodeships. It results from about 2 times higher consumption of gas in Mazovia than in other voivodeships..

General information

Household electricity price	0,14	EUR/kWh (incl. taxes)
Household natural gas price	2,8	EUR/kWh (incl. taxes)
Household price: other energy sources – specify: Ecoterm Plus fuel oil	0,06	EUR/kWh (incl. taxes)
Energy expenditure by household	15,75	% of income

Percentage of energy poor according to the relative definition of LIHC in Mazovia region in 2013 – 13-18%

Percentage of energy poor according to the absolute definition of "13% of income" in Poland in 2013-27-33%

Estimate of the trend in final energy consumption in the household sector using values from -5- to +5 where (-5 is a strong reduction, 0 means neither growth nor reduction, +5 strong growth):

+2 – growth of final energy consumption in the household sector

7.2. Service Sector

Regional final energy consumption of service sector	21 444	GWh
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Trade is the main sub-sector driving energy consumption. The service sector in Mazovia region provides approximately 64 % of the regional GDP

Estimate of the trend in final energy consumption in the service sector using values from -5- to +5 where (-5 is a strong reduction, 0 means neither growth nor reduction, +5 strong growth):

+2 – growth of final energy consumption in the service sector

7.3. Industry

Total energy consumption of the industrial sector	8669	GWh
Industry natural gas price	2,8	EUR/kWh (incl. taxes)

The industry sector in Mazovia region provides approximately 16 % of the regional GDP

7.4. Transport

Regional final energy consumption of transport sector	28314 (without freight transport)	GWh
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In 2013 at the end of the year in Mazovia Voivodship the length of public roads with the hard surface was 35375.2 km (1.0% more than in the end of last year).. Urban roads accounted for 19.7%, and rural roads accounted for 80.3% of all public roads with hard surface. The total number of motor vehicles and tractors registered in the Mazovia voivodship in 2015 amounted to 3170400. This group was dominated by passenger cars, which constituted about 75% of the total number of motor vehicles and tractors. Most passenger cars had gasoline engines, although the share of these vehicles decreased from 55.1% in 2012 to 54.2% in 2013 for diesel vehicles (up from 25.4% in 2012 to 26 , 6% in 2013). The share of passenger cars in LPG decreased from 18.7% to 18.5% in 2013.

Passenger transport

Motorisation rate - number of passenger cars	3170400	
Regional energy consumption of passenger transport in the region	27478	GWh

Use of alternative fuels

Ministry of Energy September 20, 2016 has submitted to the public consultation the Electromobility Development Plan in Poland, announcing the electrical revolution. This document identifies the benefits of electric vehicle distribution and shows how great potential is for this. The government plans that in Polish streets will drive one million electric cars by 2025. The idea will be popularized in several stages. The first is the testing of electric vehicles under real conditions in some cities. The next step will be the exchange of public administration vehicles and the construction of a charging station. There will also be changes to the tax system that will benefit electric vehicle users and vehicle emissions. The final stage is the implementation of the intelligent metering system and the installation of electricity storage, as well as the adjustment of tariffs.

Estimate of the trend in final energy consumption in the transport sector using values from -5- to +5 where (-5 is a strong reduction, 0 means neither growth nor reduction, +5 strong growth):

-1 – reduction of final energy consumption in the transport sector

7.5. Summary

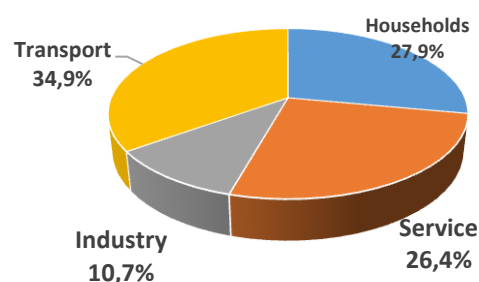
7.5.1. Final energy indicators

General indicators for the region

Total final energy consumption	81089,52	GWh
Final energy consumption per capita	15162,588	kWh/cap
Electricity consumption per capita	0,56	kWh/cap
Heat consumption per capita	1,5	kWh/cap
% of total country consumption	30	%

Final energy consumption per sector

Year: 2015			%
Households	22662,52	GWh	27,9
Service sector	21444	GWh	26,4
Industry	8669	GWh	10,7
Transport	28314	GWh	34,9



Estimate of the trend in final energy consumption using values from -5- to +5 (where -5 is a strong reduction, 0 means neither growth nor reduction, +5 strong growth):

+2 growth of final energy consumption

7.5.2. Final energy consumption by fuel

Total final energy consumption by fuel

Year: 2015

Coal and lignite	11856000	tones
Renewables and waste*	1872,1	GWh
Natural gas	31133	GWh
Oil, petroleum and products	965000	tones
Electricity	24327	GWh

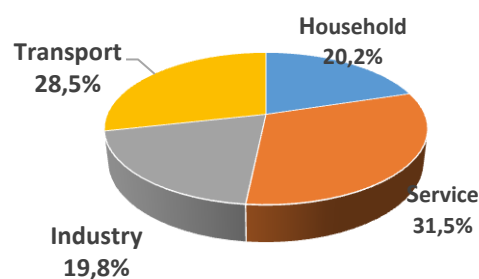
*Hydro, wind, solar, tide/wave, biomass and waste, geothermal

7.5.3. Primary energy equivalent

Total Primary Energy Consumption	109276,14	GWh
Primary energy consumption per capita	20433,086	kWh/cap
Energy intensity	1,2487032	TPES/GDP

Primary energy equivalent by sector

Year: 2015			%
Households	22082,84	GWh	20,2
Service sector	34375,4	GWh	31,5
Industry	21672,5	GWh	19,8
Transport	31145,40	GWh	28,5
Sum	109276,1	GWh	100,0



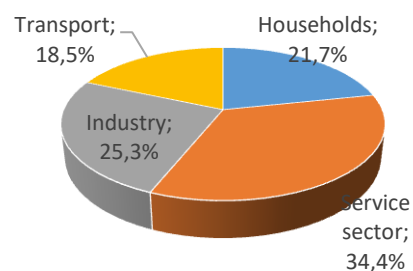
Dependency on fuel imports: very high / high / **average** / low / very low
 Gas needs to be imported internationally (Russia).

7.5.4. Regional CO₂-emissions associated with energy consumption

Total CO ₂ -emission associated with energy sector	40,78	Mio t
CO ₂ -emissions per capita	7,625	t/cap
CO ₂ -emissions per GDP	466,00	t/€ GDP

Energy-related CO₂-emissions by sector

Year: 2015			%
Households	8864171	t CO ₂	21,7
Service sector	14038887	t CO ₂	34,4
Industry	10324779	t CO ₂	25,3
Transport	7553043	t CO ₂	18,5
Sum	40780880	t CO₂	100,0



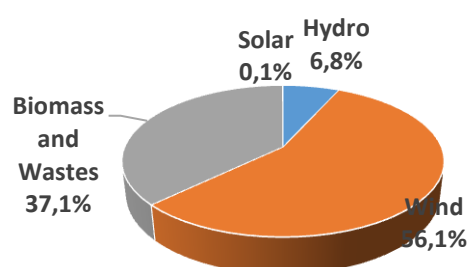
8. Renewable energy sources – status and potential

8.1. General information

Renewable Energy Targets:		
2020 RES share in gross final energy consumption	20	%
Current RES share (2015)	8	%

Share of final energy consumption produced by renewable fuels

Year: 2009			%
Hydro	126,4	GWh	6,8
Wind	1050	GWh	56,1
Biomass, biofuels and renewable wastes	694	GWh	37,1
Solar	0,936	GWh	0,1
Geothermal	0	GWh	0,0
Tide, Wave, Ocean	0	GWh	0,0
Sum	1872	GWh	100,0



Share of total electric demand covered by renewable fuels

Year: 2009		
Hydro	126,4	GWh
Wind	1050	GWh
Biomass, biofuels and renewable wastes	No data	GWh
Solar	No data	GWh
Geothermal	0	GWh
Tide, Wave, Ocean	0	GWh

In Mazovia region there is a new trend of electric vehicles. The new regional programmes and laws are going to encourage this trend. Unfortunately this process is still starting.

RES is covering approximately 8 % of total energy production.

There are many programmes which goal is to support RES development which are called Regional operating programmes.

The top 5 regulatory barriers slowing down current and future RES-development.

1. Lack of political support – new laws that makes it difficult for eg. Wind power to develop
2. Lack of interest of society
3. Dilemma: how to save Polish mining under the "rule" of the EU's energy and climate policy is more important
4. It is believed that RES provides less energy than conventional sources and it is not as reliable.

5. Financial not enough new investments

Those barriers should be addressed as national ones that cause regional problems.

Estimate of the trend in renewable energy production using values from -5- to +5 (where -5 is a strong reduction, 0 means neither growth nor reduction, +5 strong growth):

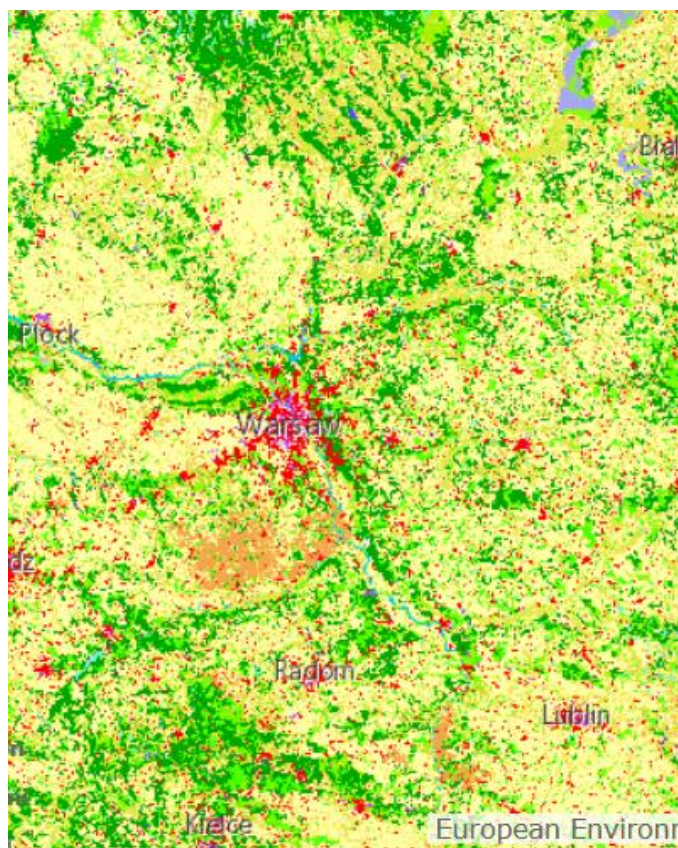
+2 growth of renewable energy production

8.2. Available natural resources in the region

8.2.1. Biomass

Forests in the Mazovian voivodship occupy an area of 810 thousand. ha, which constitutes about 23% of the structure of land distribution. The highest forest cover is characterized by county: Ostrołęka, Legionowo, Otwock, Przyuski and Szydłowiec (forest index of over 30%). Lowland forests occur in the poviats: Płońsk, Grójeckie, Sochaczew, Grodzisk, Pruszków and Zwoleń (less than 15%). The area of protective forests in the voivodship is 28.6% of the forest area. In 2010 from the forests was acquired 1 867.2 thousand.m³ merchantable timber, mainly from state forests. The main assortments were sawmill wood and paper wood. In recent years interest in the use of wood for energy purposes has increased again. In households - due to increasing prices of traditional fuels, in the power industry due to regulations.

In Mazovian Voivodeship there are 2.38 million ha of agricultural land (67.1% of the total area). The concept of development of agricultural land for the production of energy crops in Poland was not successful. At present, there is no emphasis on the production of plants for solid fuels.



Source: <http://land.copernicus.eu/pan-european/corine-land-cover/clc-2012/view>

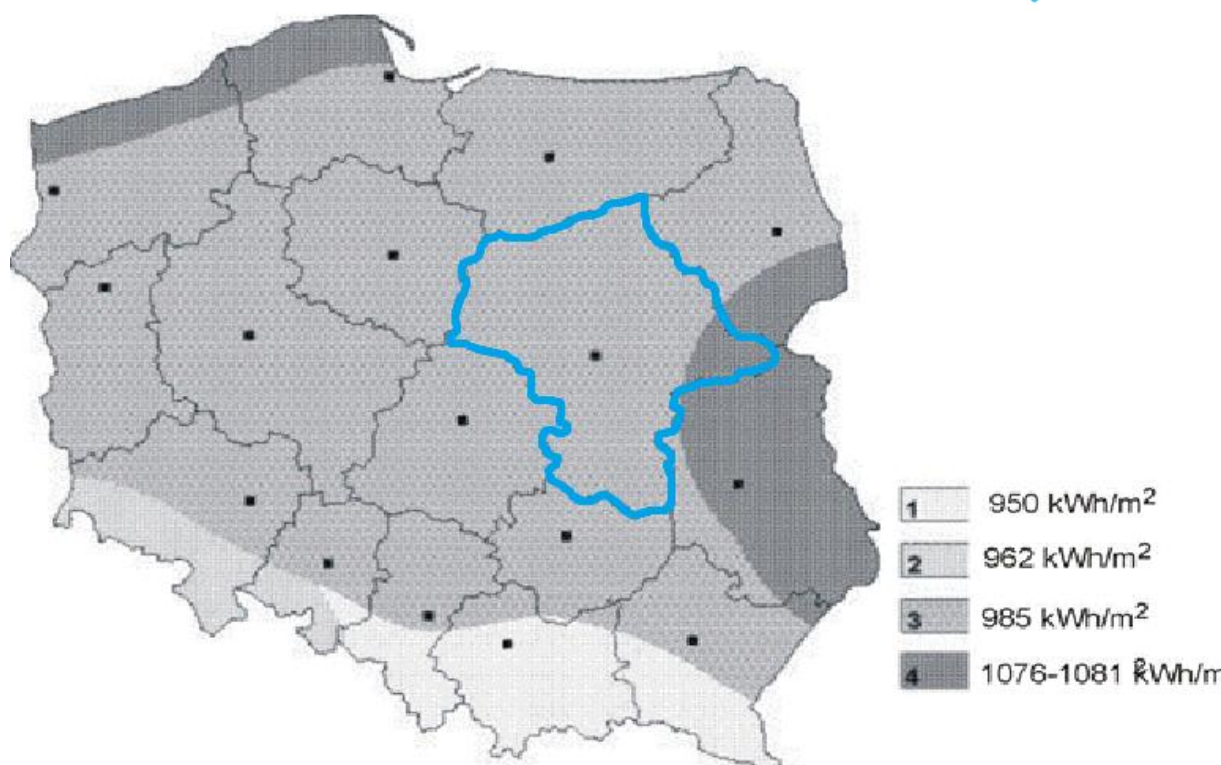
8.2.2. Hydro power (incl. tide and wave power)

The most favorable conditions for the construction of flow plants exist on the river Vistula. The rivers of Radom, Wkra, Prawny Law, Orzyc, Iłzanka and Liwiec enable the development of small hydropower plants. In many rivers (Wkra, Radomka) there are former water reservoirs suitable for energetic use (around 150). The energy potential of the Vistula River is still not used. Since the construction of large hydro power plants is associated with significant financial expenditures, the future development of small hydropower plants, which is characterized by relatively low investment expenditures, relatively short return period and ecological advantages can be foreseen in the future. According to the Energy Regulatory Authority data, there are 22 installations operating in the Mazovian Voivodeship with a total installed capacity of about 22 MW.

8.2.3. Solar power

Solar irradiation (on optimally inclined plane) per year	from 1000 to 1050	kWh/m ²
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Average annual insolation for Mazovian voivodeships range from 1400-1550 in the western part, and 1600-1650 in the east. Total solar radiation is 985 kWh / m² in the western part of the year and 1081 kWh / m² in the east. The general conditions of sunshine in the Mazovian voivodeship are good and therefore solar installations can be used throughout. The conditions of solar energy development are similar in the entire Mazovian Voivodeship. Large urban agglomerations are characterized by slightly worse conditions (due to increased levels of air pollution), while the use of solar energy is greater in them due to a much higher density of power and thermal energy demand. Most of the voivodeship's area is characterized by annual total radiation ranging from 1 000 - 1 050 kWh / m². Only in the western part of the voivodeship average annual radiation exceeds 1055 kWh / m². According to the data of the Energy Regulatory Office in the area of Mazovian voivodeship there are 26 installations with a total installed capacity of about 1.7 MW.



source: Stanisław Gołębiowski „Solar energetic in Poland” 2007

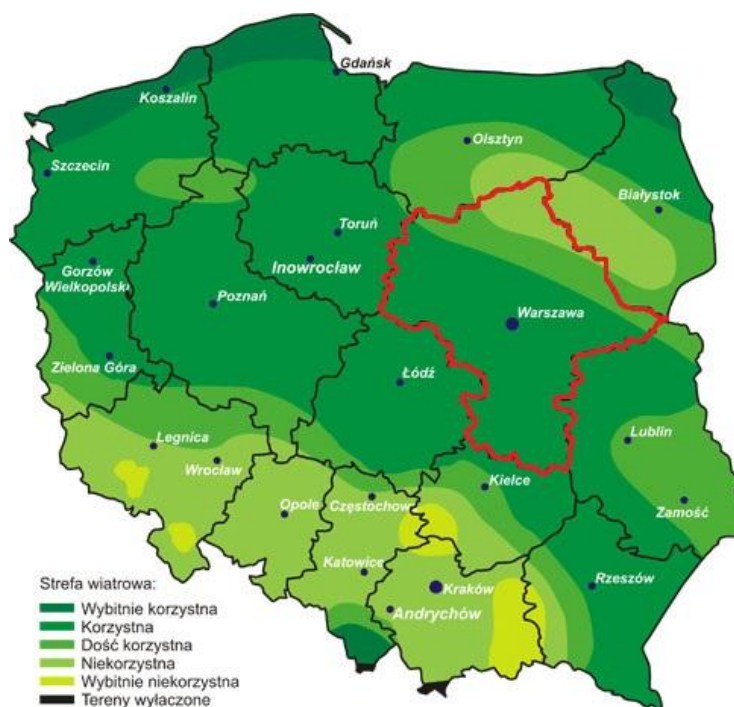
Administrative map of Poland, showing annual distribution of solar radiation (kWh/m² on horizontal surface)

Blue Line – Mazovian voivodeship

8.2.4. Wind power

Average wind velocity	4,5	m/s
Full load hours	1500-2500	h/a

In terms of airiness, Poland is characterized by great territorial variability. There are areas where wind energy can be successfully used and estimated at about 40% of the country's area, with a minimum profitability of 1000 kWh/m²/year at 30 m above the ground. The wind speed and frequency of repetition of certain speed values determines the amount of electricity produced per year and the profitability threshold is determined for an annual average wind speed of more than 4 m / s. Under such conditions, the annual capacity utilization of wind turbines is between 1500 and 2500 hours. This means that the maximum installed capacity is between 17 and 28%. The area of the Mazovian voivodeship lies in the area of favourable conditions and very favourable wind resources. It is estimated that half of the voivodeship is located in areas where it is possible to use the wind at 2000 hours per year and the potential at 1300 kWh / m² / year. Areas with the most favourable winds are the ones located in the western part of the voivodeship, including the districts of ciechanowski, garwoliński, grójecki, mława, płocki and płoński. According to the Energy Regulatory Authority data, in the Mazovian voivodeship there are 98 single or group wind turbine installations with a combined installed capacity of approximately 378 MW.



Source: <http://www.enis.pl/en/wind-energy.html>

Legend:

Wind zone depend on colour from the top

Very favourable

Favourable

Kind of favourable

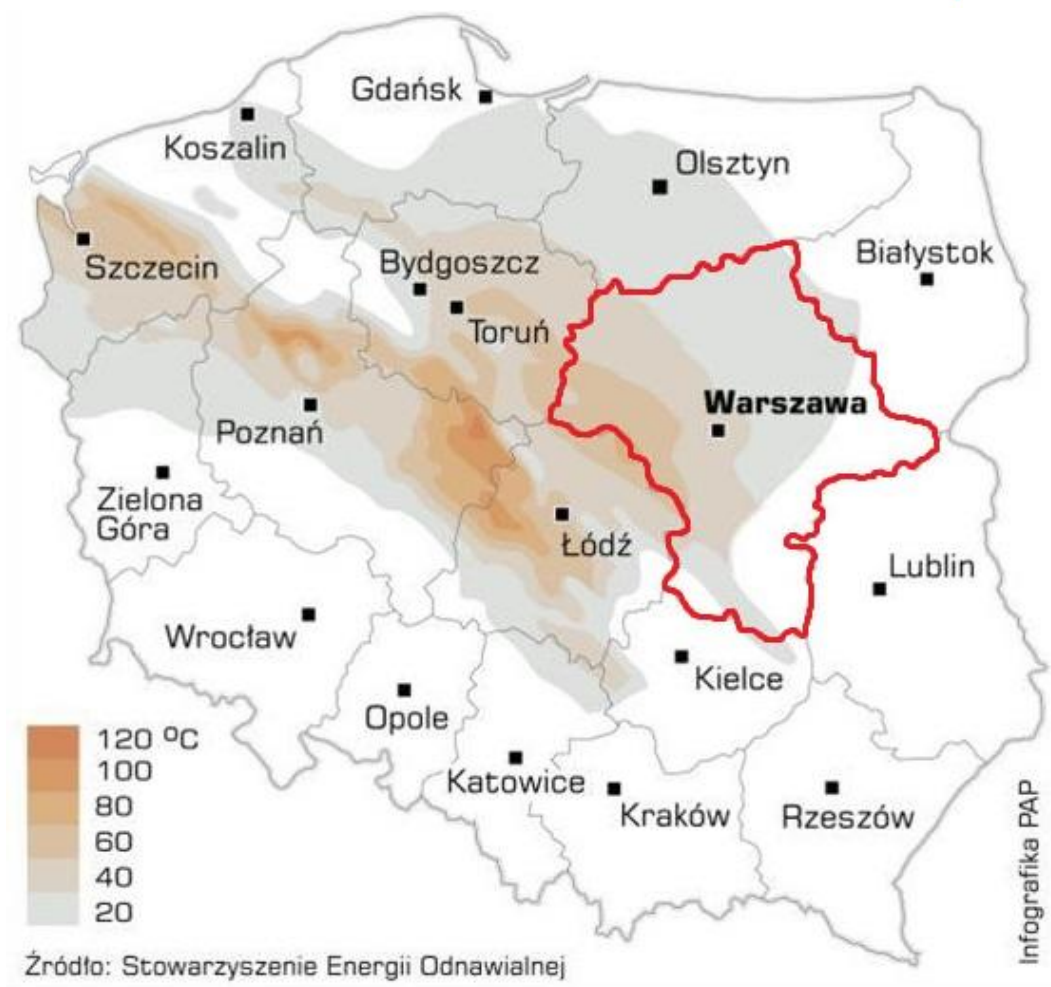
Unfavourable

Very unfavourable

Terrain off

8.2.5. Geothermal energy

The Mazowieckie voivodeship is located in the Polish Lowlands In the geological district of Grudziądz - Warsaw. The area is approximately 70 thousand. km² with geothermal waters of 25-135 degrees Celsius, occurring in Triassic, Cretaceous and Jurassic decks, with total resources of 3,100 km³. The heat resources are estimated at 168 000 t.p.u./km². This gives an average of 44 million m³ of geothermal water per km² of surface area. The most favorable conditions for the use of geothermal energy are found in counties : Gostynin, Płock, Żuromin, Płońsk, Sierpc, Sochaczew, Żyrardów.



Source: Association of Renewable Energy

8.2.6. Waste

Mazovian voivodeship is the largest voivodeship in the country, both in terms of area and number of inhabitants. The largest number of inhabitants results in the largest amount of municipal waste collected in the country. The inhabitants of Mazovia produce about 2 mln Mg (tonnes) of municipal waste annually. These are non-sorted waste. Unfortunately, only a small percentage of waste is disposed of using modern thermal methods. There is also no well-developed system for controlling selective waste collection, for example with glass, paper, plastic and other waste. Because the current system operates mainly on the basis of single-municipal landfills not related by a complex system. Moreover, in Mazovia there are still wild landfill sites and some waste is still burned in domestic ovens. In Mazovian voivodeship there are currently 20 installations using biogas from landfill sites with a combined capacity of 11.9 MW .

8.2.7. Restriction through protected areas

Environmentally protected areas, which are not available for REN facilities or restrict the overall potential: All national parks, landscapes, nature reserves, Natura 2000 areas

9. Energy efficiency – status and potential

The goals of the Energy Efficiency Directive are accepted by the government of Poland. The report on the implementation of the Energy Efficiency Directive (2012/27 / EU) states that the Energy Efficiency Directive: insufficiently implemented but nevertheless provides a framework for energy efficiency. Controversial legislation hampers ecological success, increases bureaucracy and increases energy costs, and that more coherent energy legislation is needed.

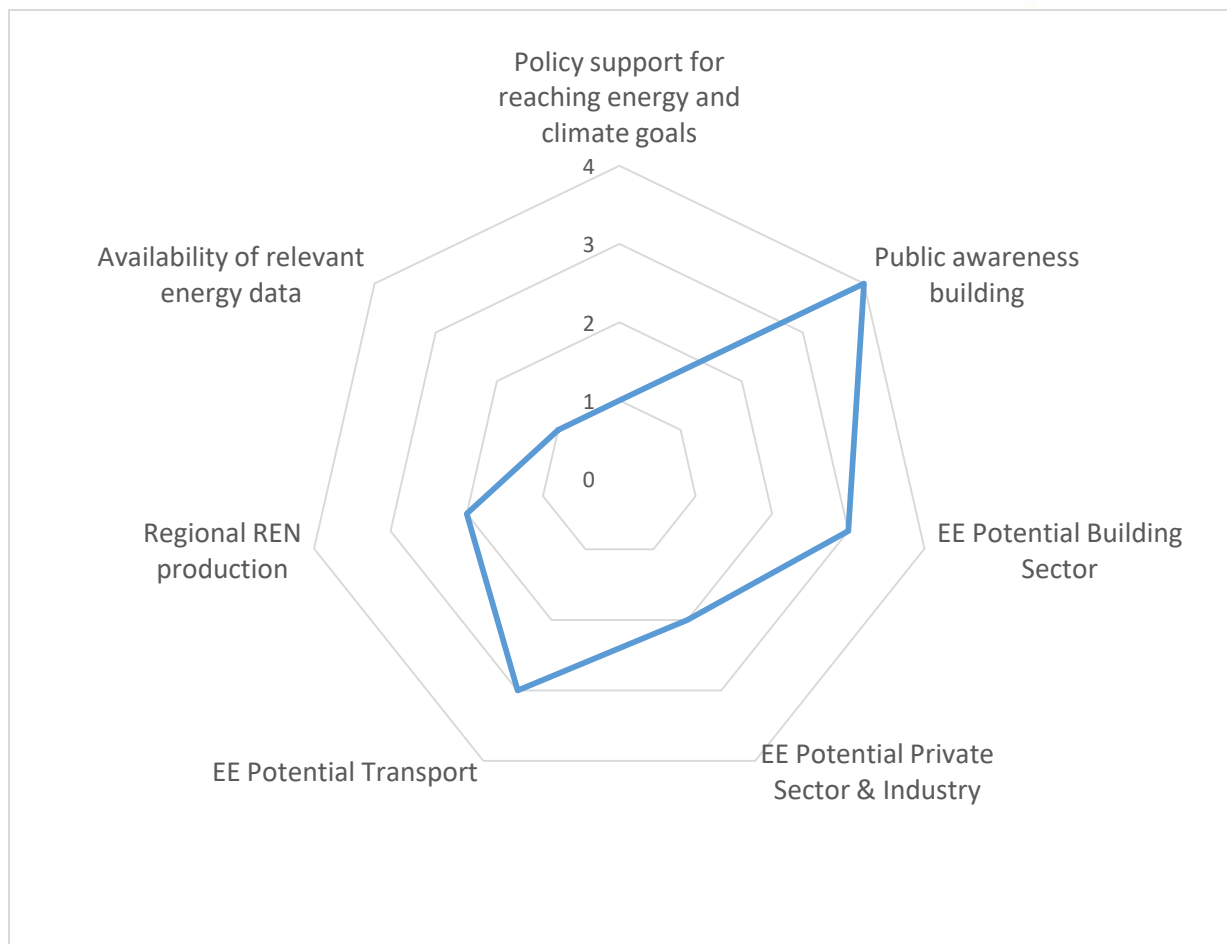
From January 2017, EP limit values for newly built buildings and certain U factors for external partitions of buildings have changed, in line with the provisions of the ordinance amending the Regulation on technical conditions to be met by buildings. The gradual introduction of the regulation is aimed at adapting all the participants of the construction market to the legal requirements in force. This solution aims to fulfill the provisions of art. 9 sec. 1 of the Energy Performance of Buildings Directive, which states that until 31 December 2020 all new buildings should be buildings with almost zero energy consumption. The modifications concern the permissible values of the EP index (this index determines the building's demand for non-renewable primary energy) and the heat transfer coefficient of the external partitions (ie external and internal walls, roofs, ceilings, windows, doors, etc.), which can not exceed the limits Provisions of the Regulation of the Minister of Infrastructure

There are a lot of awareness campaigns to highlight the potential. MAE started a new project in January called EMPOWER an interregional project aiming to reduce carbon output by dynamically monitoring energy efficiency in buildings

Estimate of the trend in energy efficiency development using values from -5- to +5 where (-5 is a strong reduction, 0 means neither growth nor reduction, +5 strong growth):
+1 growth

10. SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Big RES potential • A lot of new EU projects that includes low carbon economy politics • A lot of municipalities have already develop a Low carbon economy plans 	<ul style="list-style-type: none"> • Poor availability to regional energy data – there is data only on national level • Lack of investors • High costs of REN production when compared to conventional energy production sources
Opportunities	Threats
<ul style="list-style-type: none"> • To develop REN • To improve the EE in Household sector 	<ul style="list-style-type: none"> • Unpredictable of RES • No help from politicians



11. Annex: List of sources /bibliography /List of relevant stakeholders/institutions in the region

1. Agata Dziakowicz-Grudzień „Energy expenditure in household budgets in Poland - context of sustainable consumption”
2. Stanisław Gołębiowski „Solar energetic in Poland”
3. Sylwia Słupik „Restructuring employment in the energy sector in Poland”
4. Central Statistical Office „Statistical Yearbook of Poland 2016”
5. Central Statistical Office „Consumption of fuels and energy carriers in 2011”
6. Central Statistical Office ” Energy consumption in households in 2015”
7. Central Statistical Office „Residential buildings: National Population and Households 2011”
8. Institute for Development "Energy poverty in Poland"
9. Ministry of Economy "Strategy for Energy Security and the Environment, the prospect of 2020"
10. Polish Information and Foreign Investment Agency "Energy Sector in Poland"
11. PGNiG „Environmental report PGNiG Termika 2015”
12. PWC „The heat market in Poland”
13. The Energy Regulatory Office „Heat energy in numbers 2015”
14. The Energy Regulatory Office <https://www.ure.gov.pl/uremapoze/mapa.html>
15. Statistical Office in Warsaw „Statistical Yearbook of the Mazowieckie Voivodeship 2016”
16. Statistical Office in Warsaw „Statistical Newsletter of the Mazowieckie Voivodship”
17. Statistical Office in Warsaw „Households and families in Mazowieckie voivodeship. Demographic characteristics”
18. GeoRenewables, PGNiG, PGE, Innogy websites



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