

RES (Renewable Energy Sources) in Poland

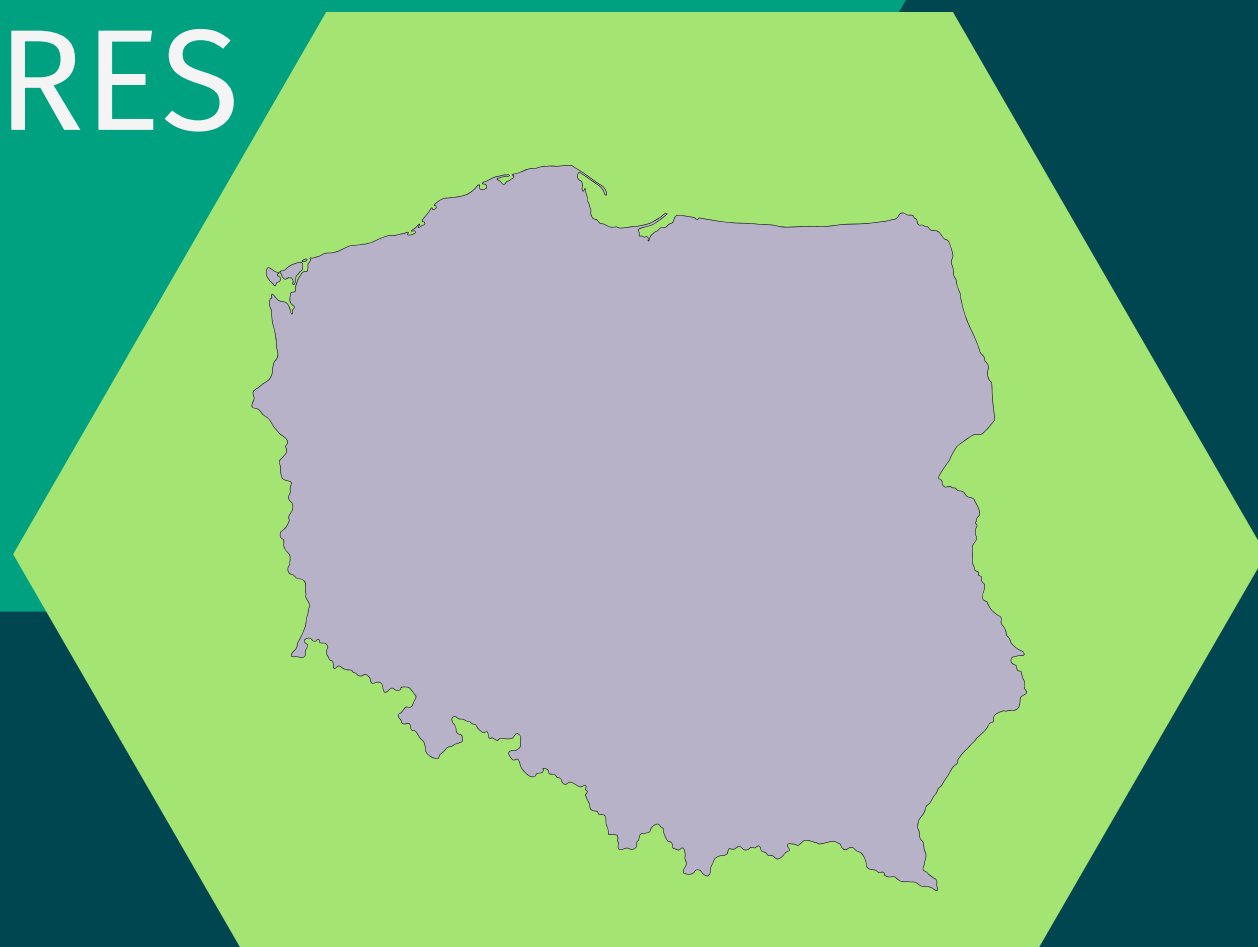


Types of RES

- Hydro power plants, where the gravitational energy of water is used (e.g. electricity in rivers),
- Photovoltaic power plants, where solar radiation is used,
- Geothermal power plants, where the heat energy of the Earth is used,
- Wind power plants, where wind power is used,
- Biomass where biofuel is used (e.g. of plant origin).



Geographical
conditions
and natural resources
of the country to
obtain RES



The sun's energy is a huge source of energy.
In our area, approx. 1.0 kW/sq m reaches the Earth.

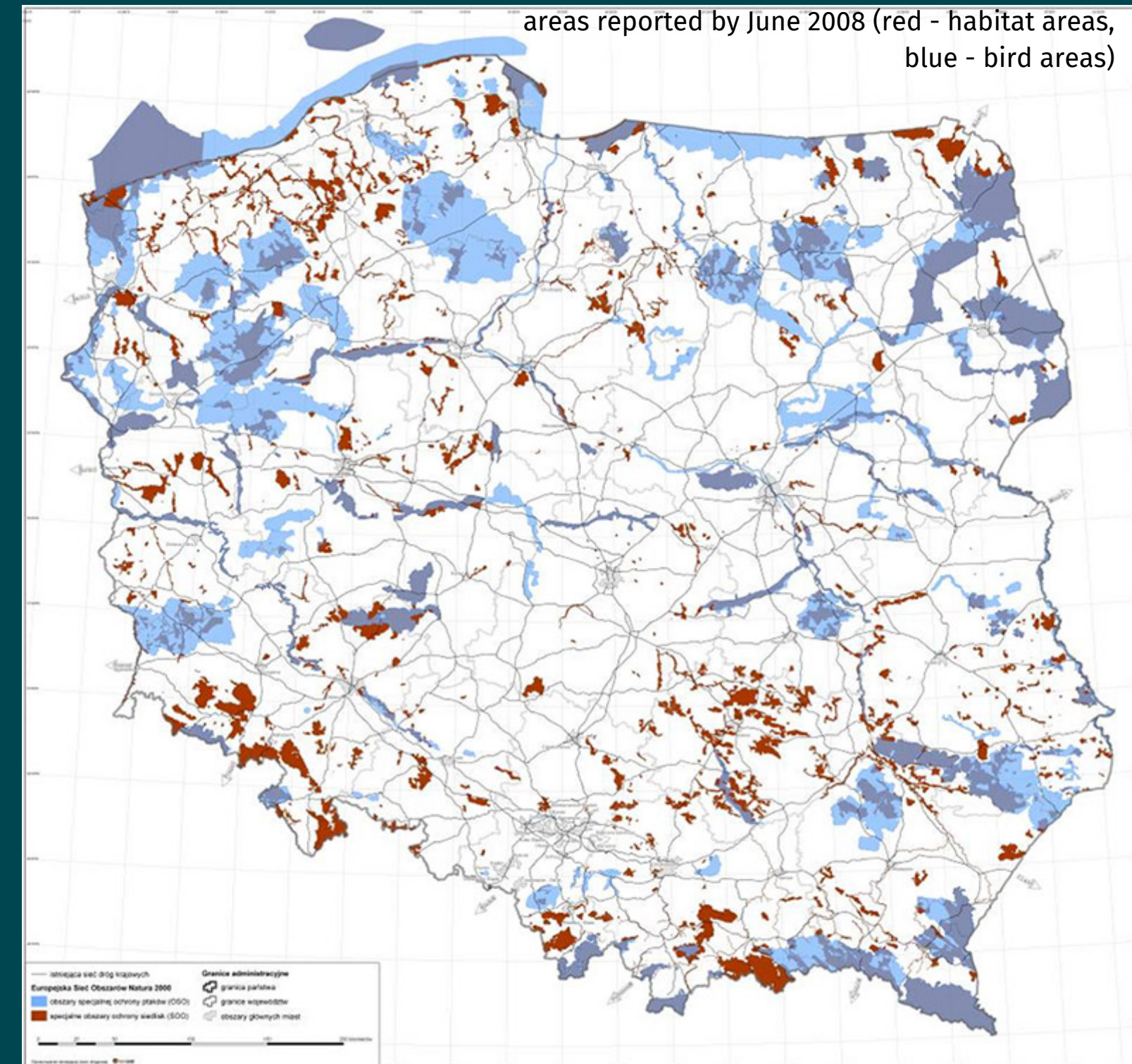
The range of solar irradiation in Poland
is about 900 - 1150 kW / sq m per year.



National and local social and economic conditions

- The basic technical problem of obtaining energy from renewable sources is the need to protect nature.
- The Polish government focuses on the most expensive RES technologies (i.e. those using biogas and biomass), which may result in slowing down the development of the sector.

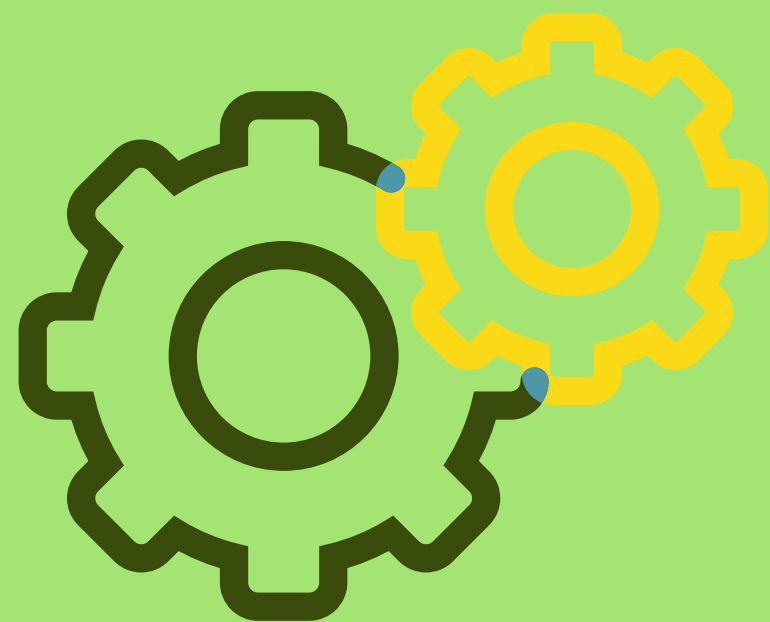
Fig. Natura 2000 network in Poland, including all areas reported by June 2008 (red - habitat areas, blue - bird areas)



- When it comes to the price of electricity, we are definitely below the European average.

Source: <https://ideologia.pl/odnawialne-zrodla-energii-oze-w-polsce/>

RES development



The development of RES is one of the priorities listed in the document Energy Policy of Poland until 2030. This document is a state strategy which is to prepare solutions to meet the challenges of the Polish energy sector and it was adopted by the Council of Ministers on November 10, 2009.

It provides for mechanisms to encourage the development of renewable energy sources (some of which have already been implemented), such as:

- Exemption of electricity generated from renewable energy sources from excise duty (already in force);
- certificates of origin and other mechanisms supporting companies generating energy from RES (already in force);
- tax mechanisms (some tax reliefs have already been introduced);
- support for RES projects from EU funds and environmental protection.

Technical and technological capabilities, RES sources used

The basic technical problem of obtaining energy from renewable sources is the need to protect nature. After all, moving away from "dirty" fossil fuels is aimed, among other things, at caring for the natural environment.

For this reason, the construction of wind, solar or water installations is often associated with serious restrictions.

Potential negative effects on the environment must be taken into account.



Technical and technological capabilities, RES sources used

- Power plants can seriously interfere with fauna and flora.
- Offshore wind farms affect fishing opportunities
- Production of energy from forest biomass poses a threat to forest management
- Improperly operated geothermal power plants can lead to soil depletion and salinization of surface waters.
- Potential location also poses problems. Areas intended for the construction of installations using renewable energy could equally well serve as a tourist base, transport route or farmland.

Source: <https://ideologia.pl/odnawialne-zrodla-energii-oze-w-polsce/>

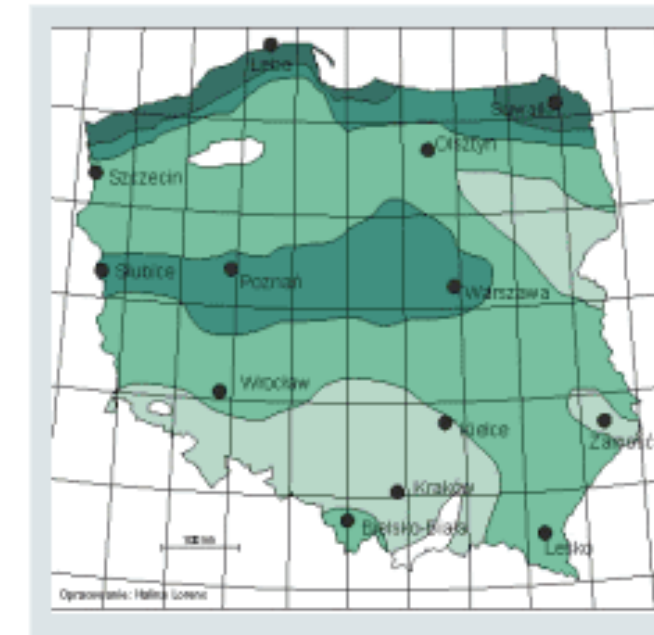
Technical potential of RES



01 Wind

- The Institute of Meteorology and Water Management reports that 30% of our country has good wind conditions, and 1-5% have very favorable conditions.

- A barrier to the development of wind farms are the limitations of the area (natural, technological).
- Wind farms can be built on wasteland, land unsuitable for cultivation.
- Wind is an inexhaustible but unstable source of energy.



02 Biomass

- Possibility of primarily local use due to transport problems and costs.
- At present, Poland imports biomass, which negates the benefits related to the reduction of CO2 emissions.



- The theoretical potential (creation of plantations of energy crops) is conditioned only by the appropriate quality of the soil, with a good water ratio.
- The barrier to development is primarily the conflict with agricultural space and the natural function of forests.
- A stable source of energy.

Technical potential of RES



03 Sun

- The annual solar radiation density in Poland on a horizontal plane ranges from 950-1250 kWh/m².
- It is possible to obtain 1.3% of solar energy in the total energy demand.

- Meteorological conditions are characterized by a very uneven distribution of solar radiation in annual cycles. About 80% of the total annual amount of sunshine falls on 6 months of the spring-summer season, from the beginning of April to the end of September.
- An inexhaustible but unstable source of energy.



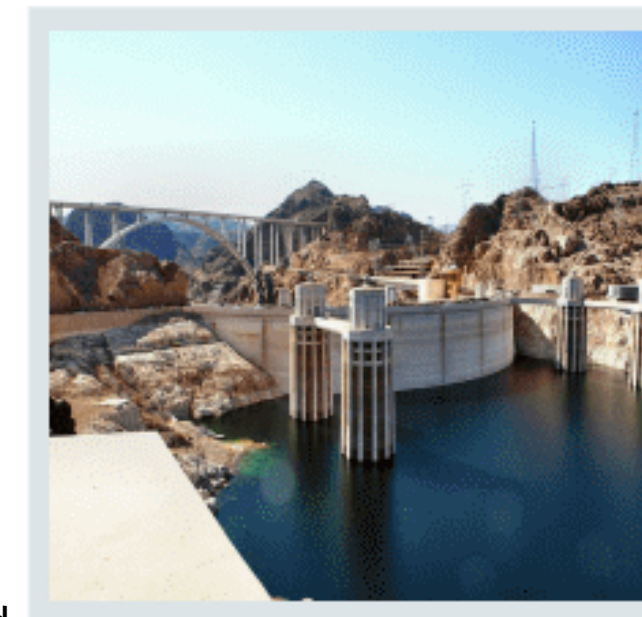
04 Water

- Due to the physical characteristics of the terrain (slopes and hydrological conditions), Poland's potential is limited to small hydropower plants (SHP).
- The disadvantage is the problem with connecting to the power grid and the threat to the ecosystem.



Advantages:

- Ability to quickly turn on/off to the power grid
- High energy efficiency
- Low operating costs
- Long life of the power plant
- A stable source of energy



Technical potential of RES



05 Geothermal

- Area of occurrence - the total reserves of thermal waters in Poland are estimated at about 6500 km³, and the water contained in them is characterized by a temperature of 25 to 120 °C, which predisposes it to be used for heating purposes, preparation of hot utility water as well as technological and therapeutic purposes.
- Water temperature - profitable in the case of very hot springs - above 300 °C; at lower temperatures (90-150 °C), binary power plants can be built, but their thermal efficiency is from 10 to 15%.
- Low operating costs, but high investment costs.



Political potential of RES

An unstable legal system certainly significantly hinders the implementation of new solutions, and RES should still be considered in such categories. These are the main problems that not only energy producers, but also investors and customers can face.

- Regulatory changes

Act of On February 20, 2015, on renewable energy sources, the first amendment was made in the same year. It has resulted in postponing by half a year the entry into force of the feed-in tariff system for owners of micro-installations with a capacity of up to 10 kW. There is also talk of another amendment to introduce, among other things, increasing the maximum capacity of RES micro-installations from 40 kW to 50 kW, including micro-installations owned by entrepreneurs in the prosumer settlement system in the form of discounts, or guaranteed tariffs for selected types of biogas plants or hydroelectric power plants with a capacity of up to 500 kW. Although these changes look positive on paper, in 2017 the production of energy from renewable sources will decrease for the first time in 13 years. The main reason is the fall in the price of green certificates, i.e. government subsidies for RES. Currently, their price oscillates around 10% of the value from a few years ago. This makes the production of green energy unprofitable. According to the data of the Energy Market Agency, in 2016 as many as 70% of wind farms ended the year with a loss, and the production of energy from biomass in the first quarter of 2017 decreased by 0.5 TWh.

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- Problems with auctions

The energy auction system, and more precisely, the government's preferences in this matter, also raises a lot of controversy. The amended RES Act assumes that the funds allocated to support the production of energy from renewable sources will first go to those producers who declare energy production at the lowest price. The shortcomings of the system have been discussed for a long time: its discretion, non-transparency or unpredictability for investors.

The Polish Wind Energy Association also points out that the government focuses on the most expensive RES technologies (i.e. those using biogas and biomass), which may result in slowing down the development of the sector. Expensive technologies translate into higher prices, and these must be paid by the final recipient. Therefore, one can expect consumers to move away from green energy towards cheaper coal.

PWEA emphasizes that not a single wind power plant has been allowed by the government to participate in the auction system, which is discriminatory - consents have been issued, for example, for biomass and biogas installations. Also, the volume of proposed auctions is appallingly low.

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- Windmill Act - will we reach 15%

The act on investments may be the ball around the Polish energy sector in the field of wind farms, i.e. windmill act. It assumes that windmills can be placed at a distance from houses not less than 10 times the height of these installations. The same distance would be maintained when building new windmills at the borders of e.g. national parks, reserves, landscape parks, Natura 2000 areas. Existing windmills that do not meet the distance criterion could not be expanded. The Act also significantly increases investment costs, due to unfavorable interpretation of the regulations. Windmill owners will have to pay property tax on the value of the entire windmill, and not - as before - only from the mast and foundations. Experts estimate that this will increase the tax burden even fourfold.

Source: <https://ideologia.pl/odnawialne-zrodla-energii-oze-w-polsce/>



How much does green energy cost?

Financial conditions - costs and profits

Renewable energy prices are rapidly falling and are becoming more and more competitive with traditional coal energy. This is particularly clear when we also take into account external costs - environmental or health. In this approach, coal becomes even twice as expensive as wind or nuclear energy.

The European Wind Energy Association (EWEA) points out that renewables still have the potential to reduce costs, in contrast to the already mature coal energy technology. This is also reflected in other documents, e.g. in the report of the International Renewable Energy Agency (IRENA) from 2016. In its light, the cost of energy production from wind farms is already 25% lower than in the case of coal-fired power plants. This is largely due to the expenditure on the R&D sector. The authors of the report estimate that since 2010, the cost of wind turbines has fallen by 45%, and the cost of solar panels - by up to 80%.



Global determinants include both phenomena and processes that either occur globally or occur locally, have serious effects on a global scale or affect events and processes occurring on other continents. This category includes all risks of armed conflicts, trade wars, economic crises or ecological disasters.



The use of RES in agriculture

The use of energy from renewable sources on a farm allows for the replacement of non-renewable raw materials that are increasingly difficult to obtain in agriculture and more and more expensive, such as coal and coke for the generation of electricity, space heating and water.

RES in agriculture:

- solid biofuel boilers - biomass
- wind farms
- photovoltaic installations
- biogas plants
- heat pumps
- solar panels

National and local problems and challenges



The main directions of development in Poland should be wind energy and energy from biomass.

- To achieve this goal, however, significant investment expenditures are required, reaching up to USD 4.5 billion per year (so twice as much as today). IRENA estimates that Poland needs about 6,000 km of new transmission lines to ensure a stable functioning power grid, especially important in the context of less permanent renewables, such as wind and solar farms. However, these expenses will save up to \$2 billion in environmental and health costs.
- An additional problem is the need to carry out investments offshore as a place with the greatest wind force. Such a location nearly doubles the capital costs associated with the construction of wind farms.

National and local problems and challenges



The main directions of development in Poland should be wind energy and energy from biomass.

- The costs of investing in RES in Poland are exceptionally high, mainly due to competition from coal-fired energy. Therefore, an appropriate government support policy is necessary for the optimal development of the sector. If the current assumptions and guidelines are maintained, we can count on a mere 16% share of RES in the Polish energy sector in 2030. This is important because under Directive 2009/28/EC of the European Parliament and of the Council, Poland was obliged to achieve a minimum of 15% share of RES in the energy sector by 2020
- There may be serious penalties for failing to meet the target.

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