



BIOENERGY RURAL POLAND

"What are the obstacles and opportunities for Dutch companies in the bioenergy sector in rural Poland?"



Topics

- **Introduction to the subject**
 - What is Bioenergy?
 - Why Bioenergy?
 - Polish energy market
 - Bioenergy legislation
 - Support systems
 - Development Costs
- **Obstacles**
- **Opportunities**
- **Recommendations**

What is bioenergy?

"Renewable energy is energy produced from a source that is not permanently depleted."

"Bioenergy is renewable energy made available from materials derived from biological sources."

- Biomass
- Biogas
 - Biomethane
 - Bioliquids

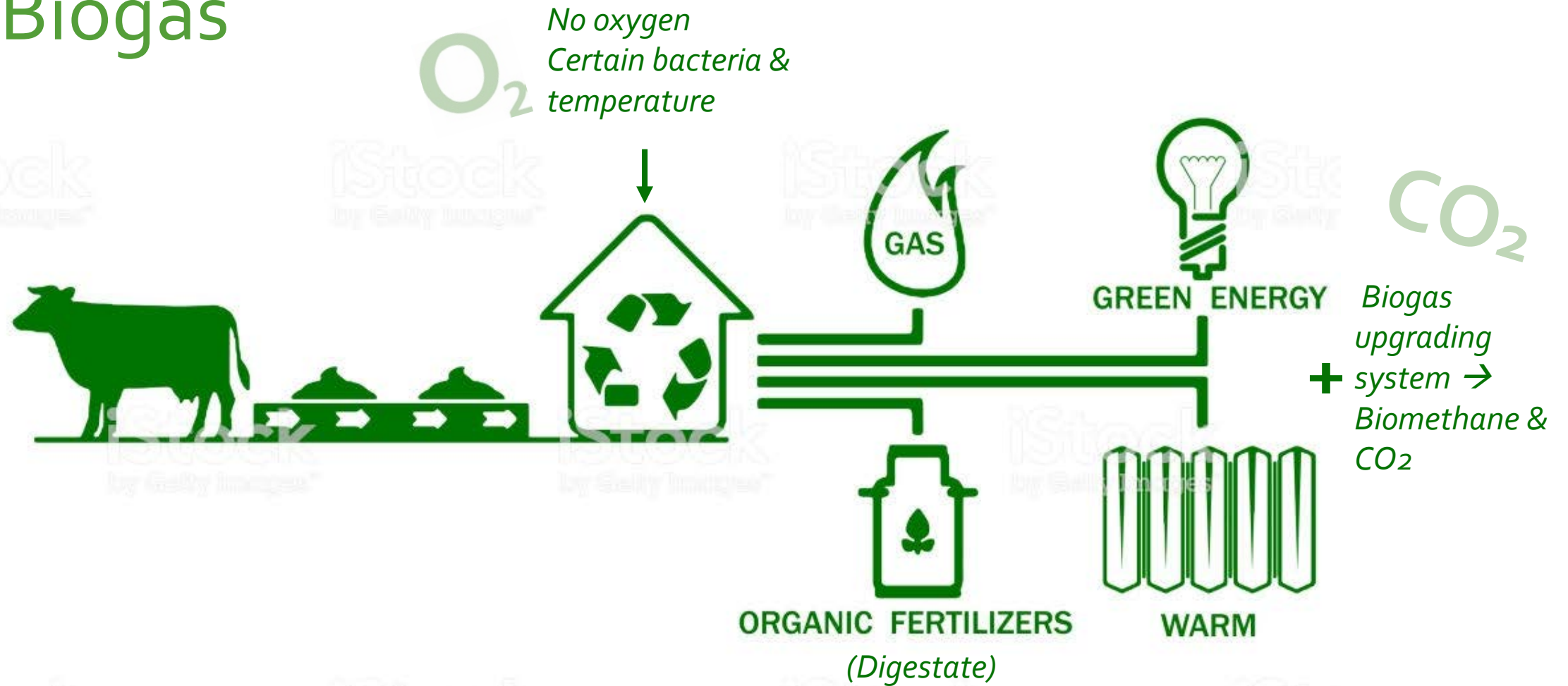
Biomass

Heat, Electricity or Biofuel through:

- Thermal conversion
- Direct firing
- Co-firing
- Pyrolysis
- Gasification
- Aerobic decomposition

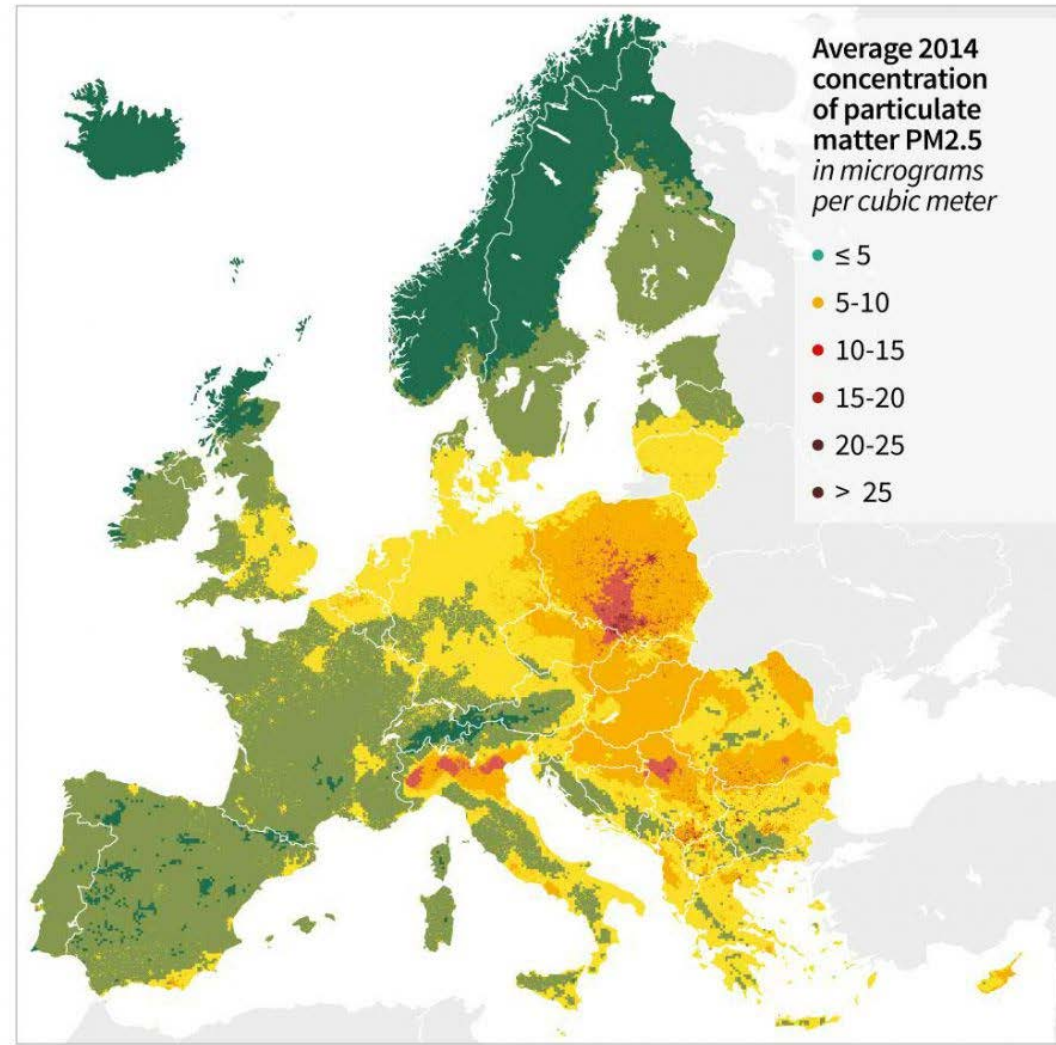


Biogas



Why Bioenergy?

European air quality

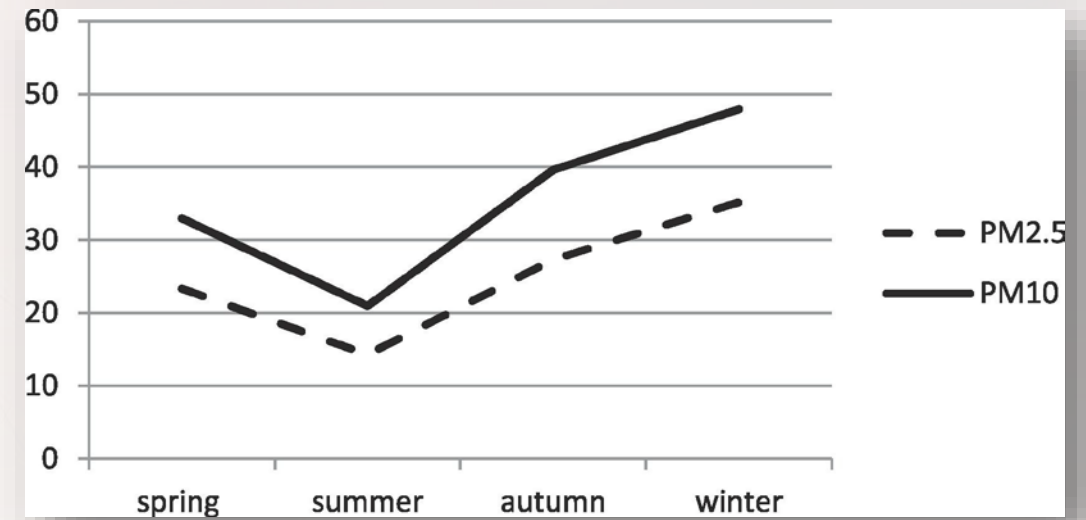


Source: EEA

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Air Pollution

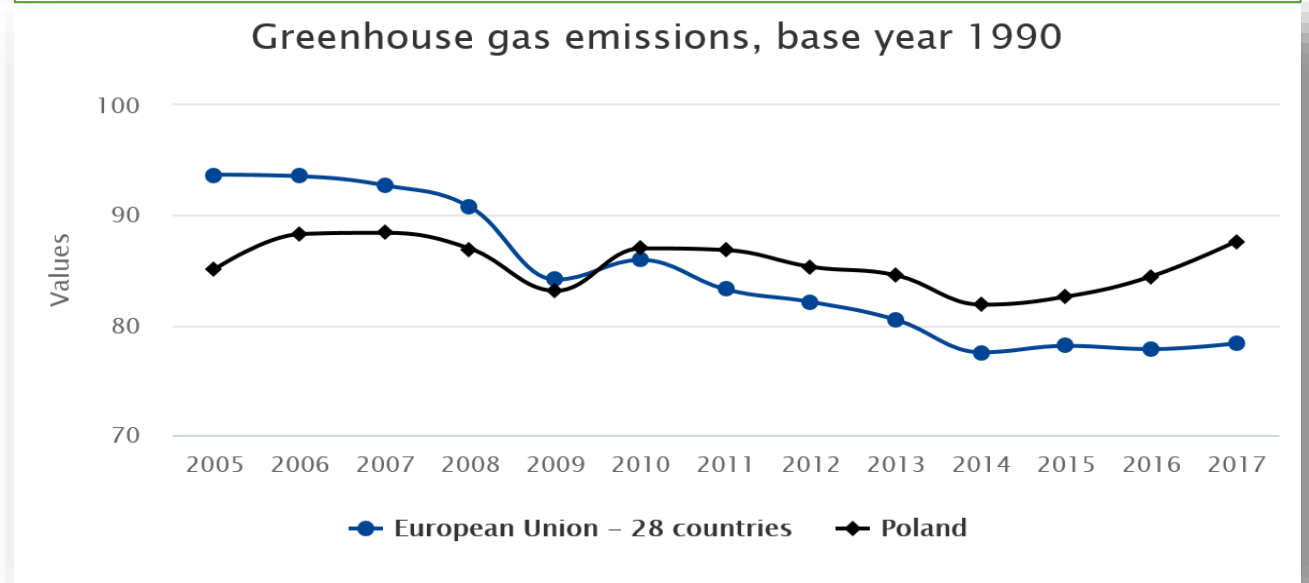
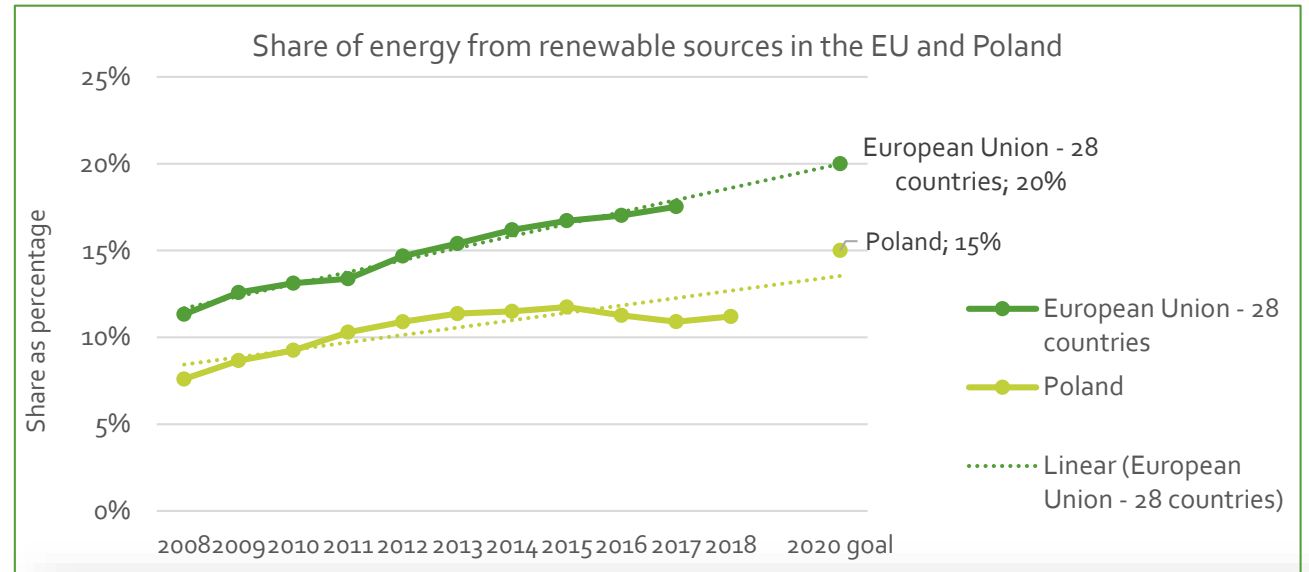
- Poland and Bulgaria worst in Europe
- 6 out of 10 worst polluted cities in Europe
- 45,000 premature deaths a year
- Main cause: energy and household sectors
- 78% of households burn coal
- Households use 31% of energy



Seasonal variability of PM concentrations in large urban zones in Poland

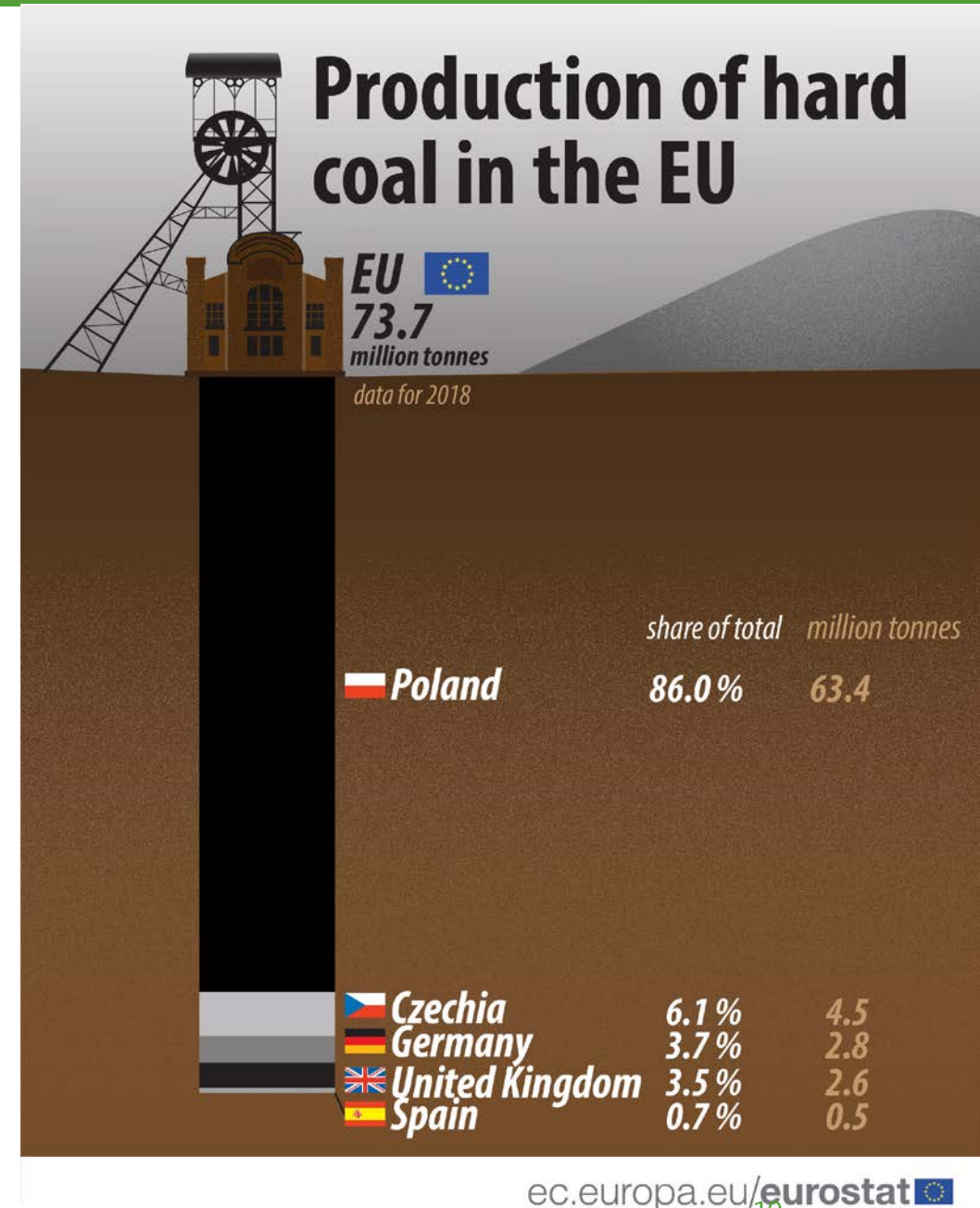
Climate goals

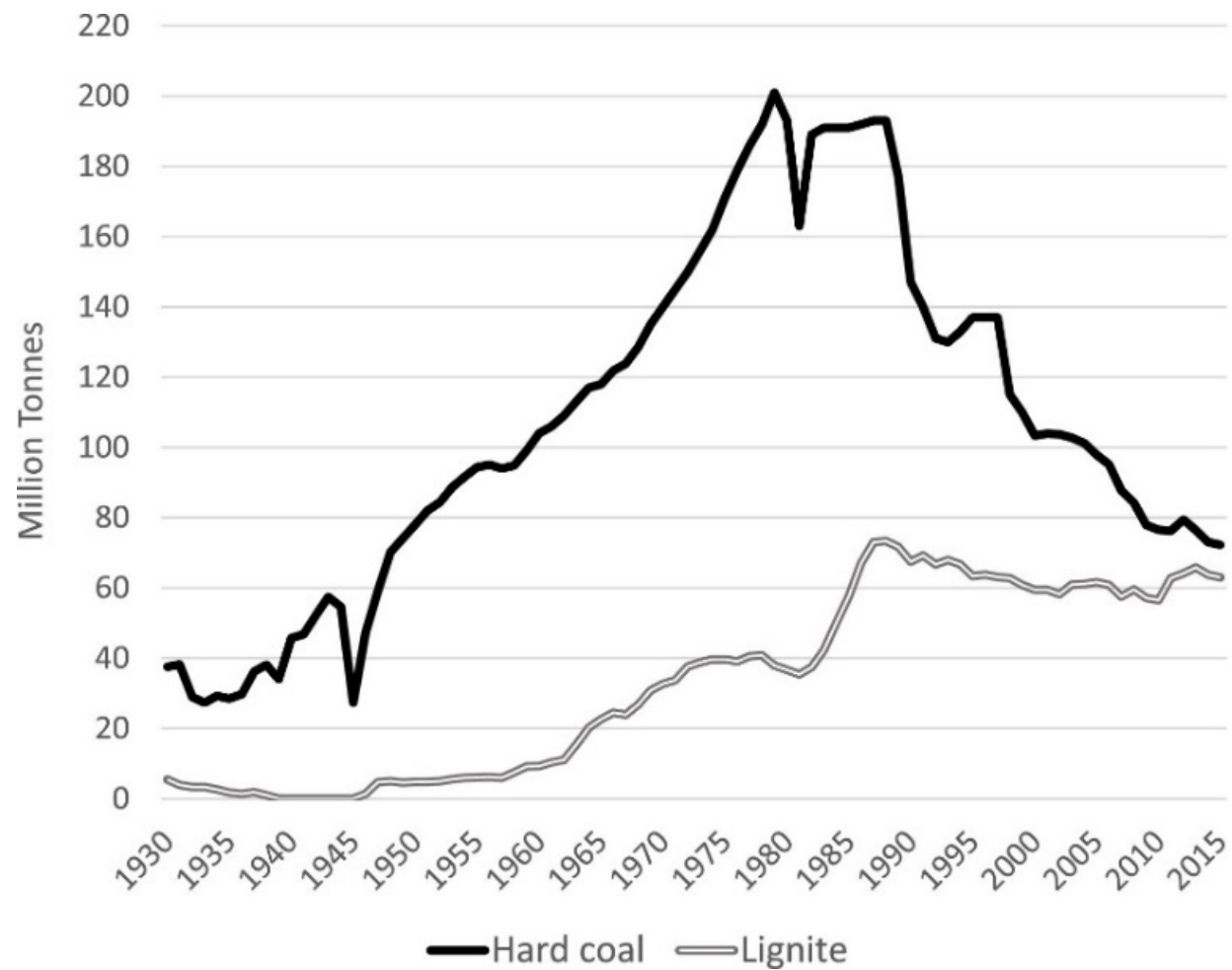
- Lisbon treaty: -40% greenhouse gases, 32% share renewable energy, (+energy efficiency, interconnection)
- 2020 Climate goals: EU 20% share, Poland 15% share
- Current share EU 17.5%, Poland 11.16%
- EU -16% greenhouse gases between 2005 and 2017.
- Poland greenhouse gas emissions rose with 3% between 2005 and 2017.



Poland's energy sector

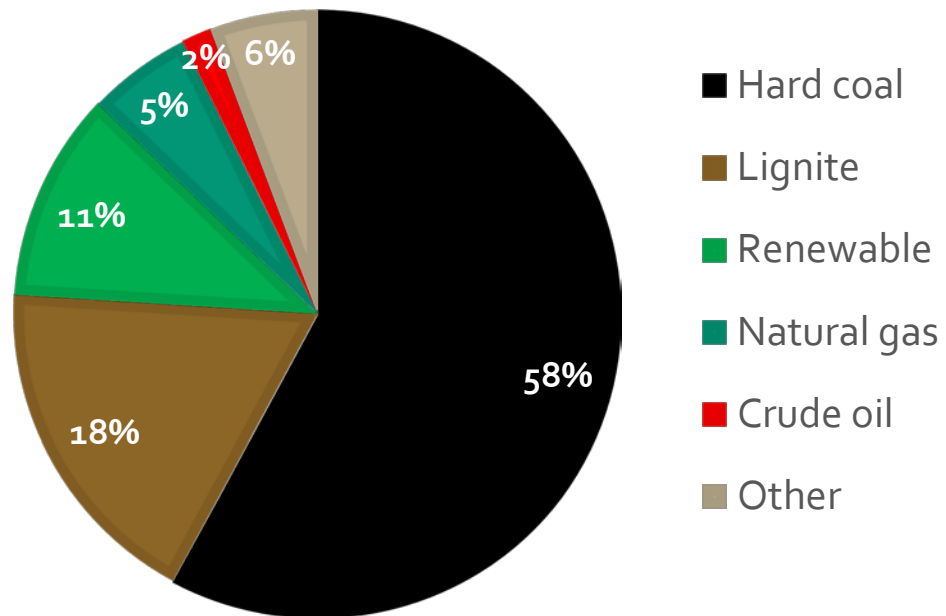
- Biggest coal and second-biggest lignite producer of Europe
- 90% of Poland's electricity
- 80% of mines unprofitable, a loss of 4.5 billion PLN in 2015





Hard coal and lignite production in Poland, 1930–2015

Energy Mix



- 5% of rural households access to piped natural gas
- 76% rural households coal as main energy source, 25% in urban areas.
- Introduction of nuclear energy

Energy consumption rural Poland

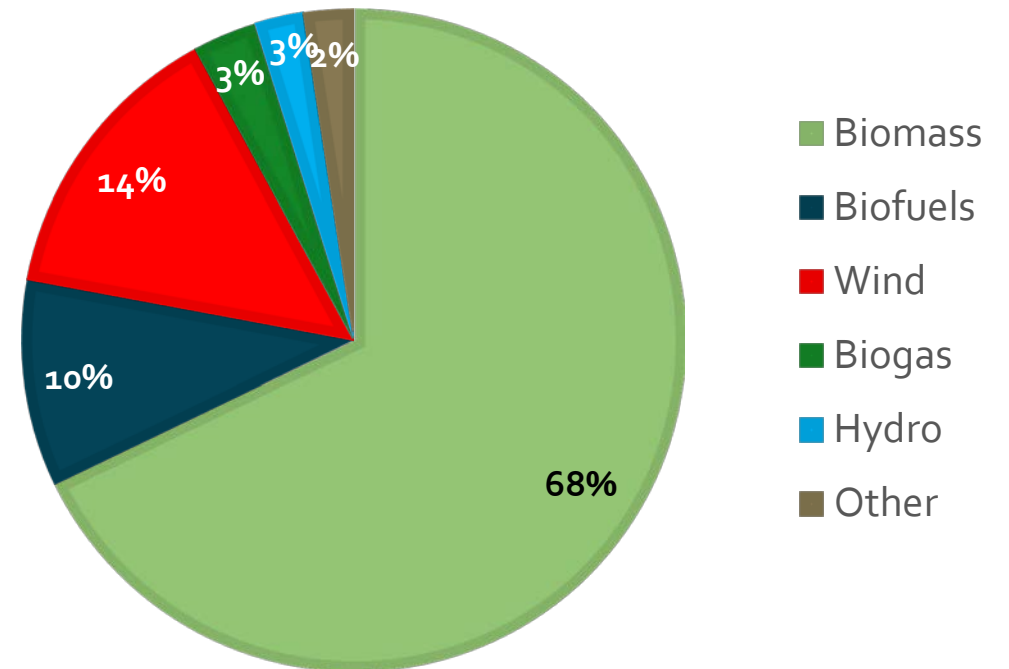
	Rural	Urban	% difference
Electricity	2407.3 kWh	1736.8 kWh	28%
Gas	10,344 kWh	5606 kWh	46%

- Share of energy consumption by households 25% in EU, 31% in Poland.
- More than 2/3 of household energy consumption for heating, another 15% heating of water.
- Big differences energy consumption rural and urban Poland.
- Difference of 24% between farm and non-farm rural households.

Renewable energy production

- PV: Peak high in 2018: 486 MW, doubled (partly due to auctions)
- Wind: Second-largest in EU in 2015. Regulations, restricted growth. Off-shore.
- Hydro: 761 plants with 994 MW. Little potential in Poland.

POLAND RENEWABLE ENERGY MIX (2017)



Biogas production

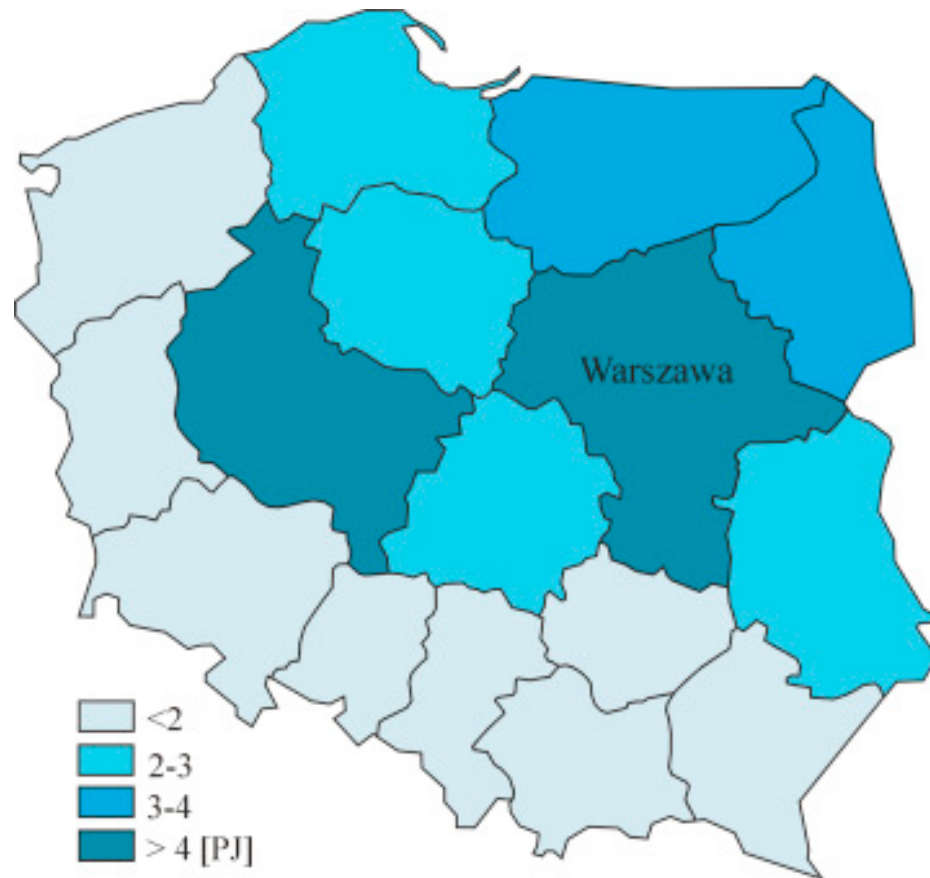
- 303 plants, 93 agricultural
- 240 MW, >100 MW agricultural
- Average capacity of 0.8 MW
- 0.6% of potential (39 PJ)

Item	Substrate	Biogas volume [million m ³]	Energy [PJ]
1.	Municipal waste	82	1.28
2.	Sewage sludge	20	0.32
3.	Animal droppings	1603	25.19
4.	Maize	42	0.66
5.	Maize from untilled/fallow land	509	8.00
6.	Grass	254	3.99
	<i>Total</i>	<i>2510</i>	<i>39.44</i>

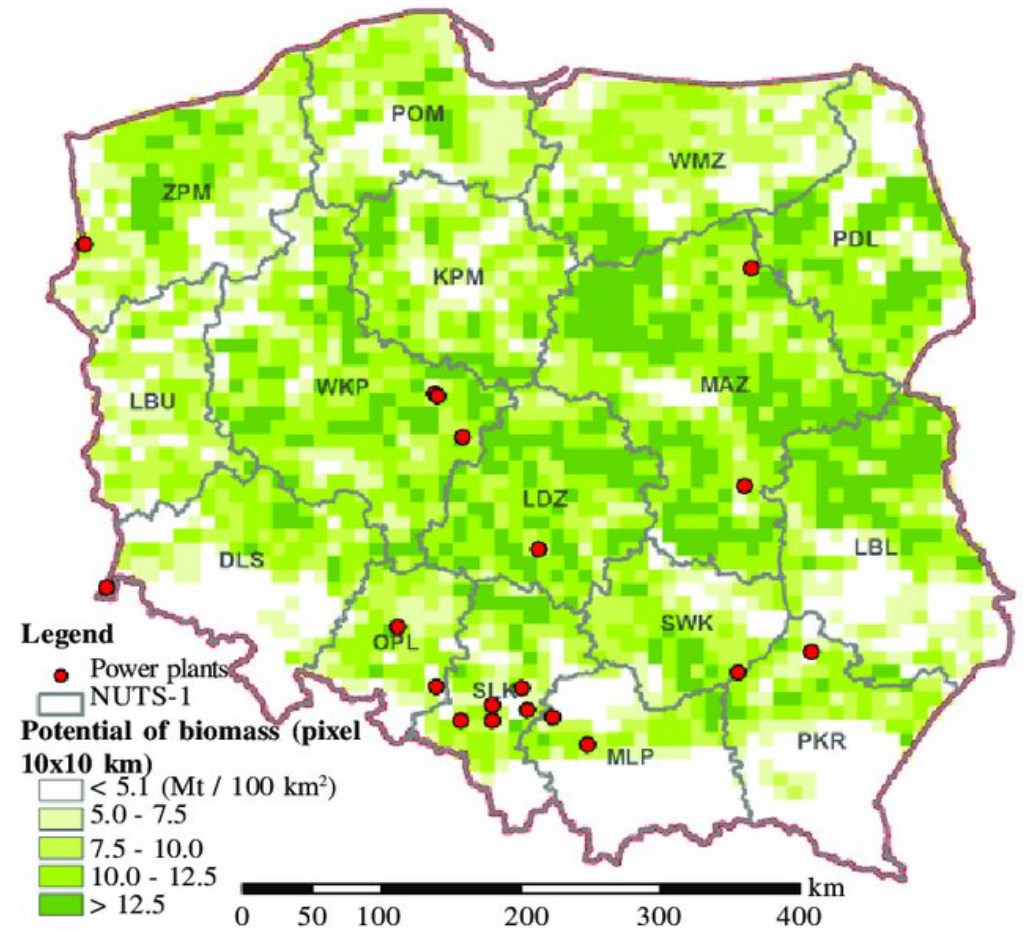
Energy from biomass

Biomass resource	Millions of tonnes available
Biowaste	6
Cereals straw	8
(waste) wood	9
Slurry	20
Manure	80

- 6th largest surface in the EU
- Potential: 895 PJ
- Current production: 298 PJ
- 10 million tonnes of straw surpluses could replace 9.16 million tonnes of coal
- Straw and energy crops most suitable for heating facilities.



Biogas potential per voivodeship



Distribution of biomass potential

Employment

Polish renewable energy sector	Number of jobs
Liquid biofuel	31,400
Solid biomass	25,900
Wind energy	8,000
Biogas	2,300
Total	72,200

- Fourth largest employer in the renewable energy sector.
- Mining sector: 98,000 people in 2015. 388,000 in 1990.

The background of the slide features a close-up, low-angle shot of two flags flying against a cloudy sky. On the left is the European Union flag, with its blue field and twelve yellow stars. On the right is the French flag, with its vertical stripes of blue, white, and red. The flags are slightly out of focus, creating a sense of depth. The title 'Bioenergy legislation' is centered over the flags in a white, sans-serif font.

Bioenergy legislation

Polish legislation

- **The Energy Policy of Poland until 2040 (EPP2040):**

- provide energy security,
- ensuring the competitiveness of the economy,
- energy efficiency,
- a reduction of the environmental impact of the energy sector,
- optimum use of Poland's own energy resources

- **Act of Renewable Energy Sources (RES-Act):**

- principles for the implementation of the national action plan in the field of energy from renewable sources
- mechanisms and instruments supporting the production of: electricity from RES, agricultural biogas, and heat in renewable energy installations

RES-Act

- **Certification of Installers**

- *Installers of renewable energy plants need to have certain qualifications and training.*

- **Energy Auctions**

- **Prosumer Law**

- *Both a consumer and producer of energy, micro renewable energy installations.*

- **Blending quota**

- *Annual minimum percentages of biofuels as a total amount of liquid fuels.*
- *8% in 2019, 8.5% in 2020.*

Unstable? Changes in the basic support model for installations, replacements of green certificates for the auction system, changes for prosumer energy receivers and micro-installations.

European Union Legislation

- Definitions for bioenergy
- **Non obligatory:**
 - Guidelines on national support schemes
 - Sustainability criteria

The background of the slide features a stylized illustration. At the center is a brown money bag with a grey Euro symbol (€) on its front. The bag is surrounded by four large, light-green leaves that appear to be growing from a common base. Scattered around the leaves and the bag are four gold coins, each with a brown, striped border. The entire scene is set against a white background, which is framed by a thick green border at the top and bottom.

Support Systems

Types of support schemes



Support by the Polish Government

- 5th most biomass incentives (28) in the electricity sector in the EU.
- Incentive: “something that encourages a person to do something,”.
- Poland applies a combination of a feed-in tariff (FIT), a sliding feed-in premium (FIP) and a tendering system.
 - *FIP for specific installations under specific conditions, price unused electricity*
 - *FIT for small hydro and biogas installations, 90% reference price*
- Prosumers: exchange the surplus of energy produced by favorable conditions for gaps in energy production in the future, in 1:0.8 or 1:0.7 relation.
- Low-interest loans for certain installations with certain installation costs per MW.
- Tax exemption, consumption taxes

Auction system

- July 2016, switch from green certificate (quota) system.
- Ministry of Economy announce amount of renewable energy and reference prices.
- Categories: small (<1 MW) and large installations (>1 MW)
- Transition Tenders

Non-agricultural
biogas and
biomass

Hydro,
geothermal and
offshore wind

Agricultural
biogas

Onshore wind
and solar PV

Hybrid

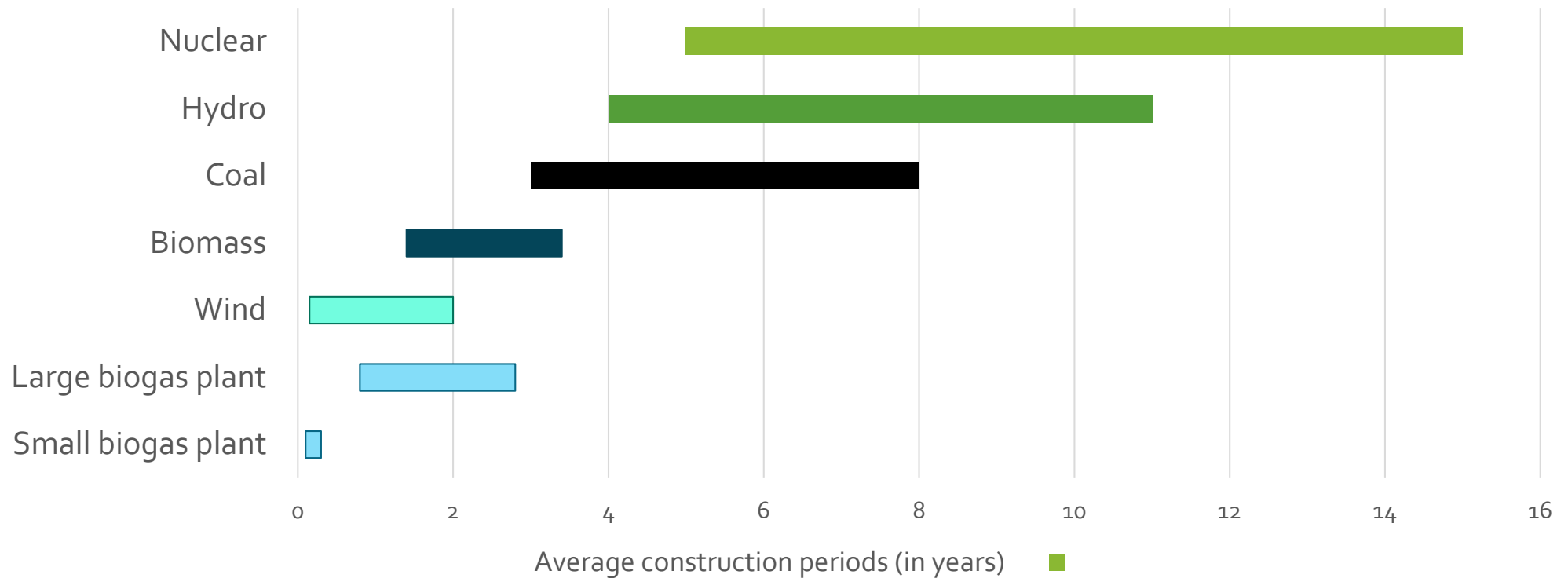
Other Support

- **Support by the EU:**
 - Cohesion funds -> Renewable energy
 - Research and development funding -> Horizon 2020 and FP5
- **Funds:**
 - Kyoto protocol -> National green investment scheme
 - Norway and EAA grants -> Individual projects

A glowing lightbulb with a dollar sign inside, symbolizing development costs. The lightbulb is shown in a close-up, slightly angled view, with its base on the right and the bulbous part on the left. The interior of the bulb is illuminated with a warm, yellowish light, and a large, glowing dollar sign (\$) is visible inside. The text "Development Costs" is overlaid in the center of the image.

Development Costs

Development Periods



Construction costs

Type of a power plant	Total power [GW]	Capital expenditures [10 ⁹ EUR]		Duration of implementation [years]
		Per unit	Total	
Single nuclear unit	1.6	12	12	15
2 Coal-fired units with CCS	1.7	4	8	10
1000 Biogas plants of power rating 1.6 MW each	1.6	0.006	<u>6</u>	1

Comparison of capital expenditures between power plants in Poland

Production costs of electricity

- Large hydro power plants are not possible and energy capacities from small hydro power plants are limited.
- Nuclear energy capacities are also limited as these require large investments and there is an uncertainty on long-term uranium availability.

Power technology	Range production cost of electricity (EUR/MWh)	Referent value
Large Hydro plant	30-140	50
<u>Biogas</u>	<u>50-200</u>	<u>60</u>
Nuclear	45-80	65
On-shore wind	55-90	70
Small Hydro plant	55-160	70
Off-shore wind	65-120	75
Coal	80-110	90
<u>Solid biomass</u>	<u>80-200</u>	<u>95</u>
Solar PV	270-460	320

Obstacles

1. Support systems

- *FIT's and fixed auction prices hinder a competitive energy market, efficient production and investment decisions.*

2. Illogical categorization of baskets

3. Unsuccessful transition tenders

4. Legislative and administrative barriers:

- *"Difficult administrative and legal procedures, as well as financial barriers, large number of formal requirements in realization of biogas projects (too extensive documentation to prepare an application and the lack of trust of banks for biogas projects),".*

5. Unstable energy market

6. Biomethane legislation

Opportunities

1. Green Deal

- Just-Transition funds and Green Deal might provide opportunities to the sector.

2. Support for Prosumers

- Special support scheme and simplified administrative path

3. Available funds

- Cohesion, rural development, R&D, Norway and EEA and Kyoto Protocol

4. Biomass incentives

- 5th most in Europe, 28 incentives

5. High (untapped) biomass potential

6. High electricity prices

7. Growing trust of banks

Recommendations

- **Guidelines**

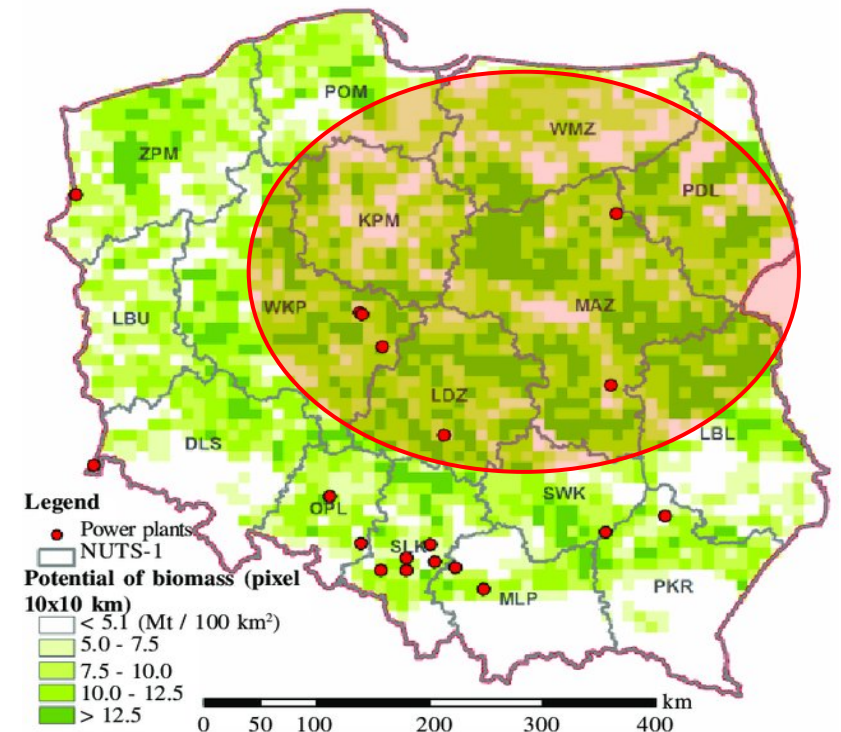
- Preparing clear guidelines for future bioenergy investors/operators with a detailed description of all the laws, costs and procedures needed for a successful bioenergy project

- **Location**

- Central-Eastern parts of Poland, surrounding Mazowieckie

- **Educational Campaigns**

- Seminars or training courses for involved administrative bodies, authorities, bank employees and biogas investors .
- Big information campaign for the entire country
- Optimize support systems and auction system



Other Recommendations

- **Compare prices**
 - Wholesale prices might keep rising
 - Auction system: fixed price for 15 years
 - Risks
- **Biomass resources**
 - Whether to use straw?
 - Surpluses might decrease due to droughts
- **Available funds**
 - R&D might benefit in the long-term
 - Norway& EEA on the short term.



Questions?