Adaptation to climate change in practice

dr Adam Adamek

About me

Adam Adamek, Ph.D. graduated from the Faculty of Energy and Environmental Engineering at the Silesian University of Technology. He obtained Ph.D. degree in Environmental Engineering, Energy and Mining in 2019 at the Agriculture University in Cracow, degree from postgraduates studies at the AGH University of Science and Technology in specialization of Renewable sources of Energy and postgraduates studies at the SGH Warsaw School of Economics in specialization Effective IT management. He took part in the design of the largest modern power units in Poland Currently, manager of the research and development project "Model of 2.0 distributed Energy generation – self-balancing network areas" at TAURON Polska Energia.

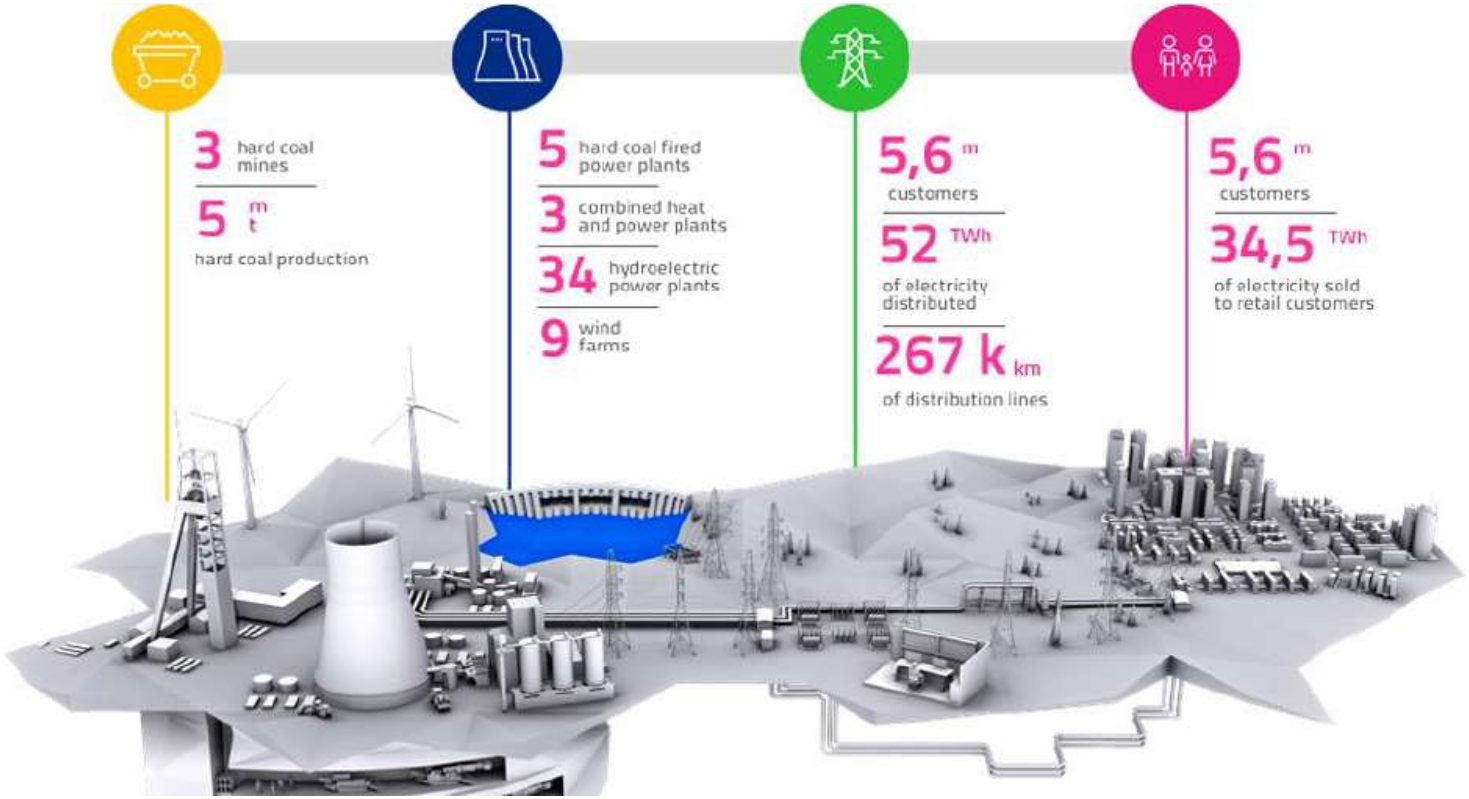
TAURON GROUP

One of the **largest business entities in Poland**, with over 18 bilion equity and approximately 25 thousand employees.

Core business includes **coal mining, generation, distribution and supply of electricity and heat.**

TAURON supplies approximately **50 TWH of electricity** to over **5,5 milion customers per year**, which makes it **the largest distributor of electricity in Poland.**

The holding controls approximately **30% of Polish hard coal resources**.



Agenda

- Why is adaptation an important issue?
- What is an adaptation to climate change?
- What is a mitigation of climate change?
- Theoretical issues
- Effects of climate change
- Practical examples of adaptation and mitigation
  - Urban Space
  - Transport
  - Energy sector
- Summary

THEORETICAL ISSUES

Why this is an important topic?

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The topic is increasingly appearing in strategic documents and in EU law.

Mandatory element of environmental impact assessment.

As expected, the subject will be strongly supported by EU funding in 2021-2030.

Knowledge of adaptation to climate change is needed in the work of a designer or government official

Climate change

Climate change

The Intergovernmental Panel on Climate Change (IPPC) defines climate change as "Climate change referring to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use”

Adaptation to climate change

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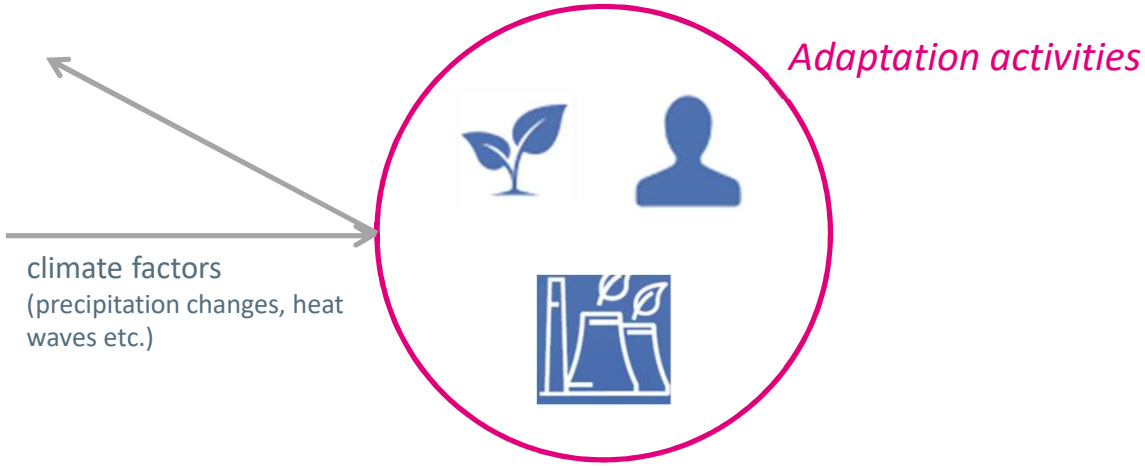
Adaptation

The Intergovernmental Panel on Climate Change (IPPC) defines adaptation as "any adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities".



Climate change mitigation

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Mitigation

The Intergovernmental Panel on Climate Change (IPPC) defines adaptation as "Climate change mitigation involves actions that reduce the rate of climate change. Climate change mitigation is achieved by limiting or preventing greenhouse gas emissions and by enhancing activities that remove these gases from the atmosphere.".

Adaptation and mitigation

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Adaptation - adapting human systems to the effects of climate change

Mitigation - reducing anthropogenic impact on the climate

EFFECTS OF CLIMATE CHANGE

Some of the effects of climate change

Temperature changes

- Heatwaves
- Frostwaves

Changes in rainfall intensity and wind speed

- Floods
- Droughts
- Windstorms

Climate change and urban area

water retention problems

bad air quality (smog)

urban heat island

health problems of residents

damage of city infrastructure

Climate change and transport

icing of roads

blocked roads

melting and cracking of road surfaces

Climate change and energy

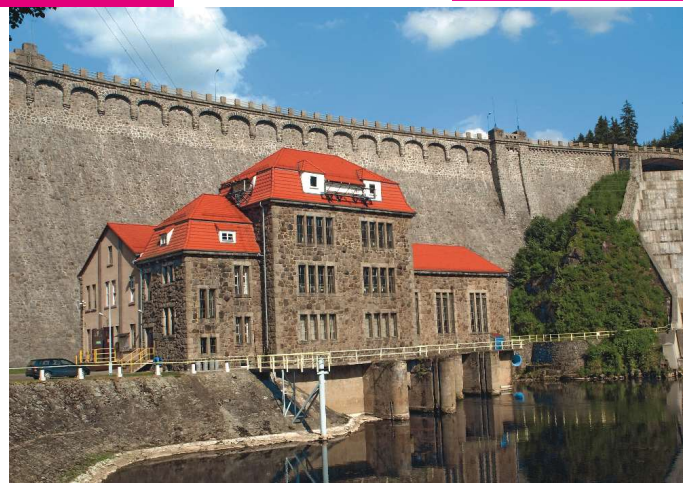
heating of water used for cooling power units

broken power lines

destruction of biomass crops

problems with the delivery of fuels and raw materials to the production site

device demage and decrease in productivity



EXAMPLES OF ADAPTATION AND MITIGATION ACTIVITIES IN URBAN AREA

Green roofs and green walls

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Internacional Congress Centre in Katowice
Source: http://www.portalsamorzadowy.pl;

Roof of the University of Warsaw Library
Source: http://www.panoramio.com

Green walls in the city centre in Katowice
Source: Wojciech Wardecki

Green roofs and walls

roofing or wall covering consisting of many layers of structure with a layer of soil on which planting is allowed.

Green roofs and green walls

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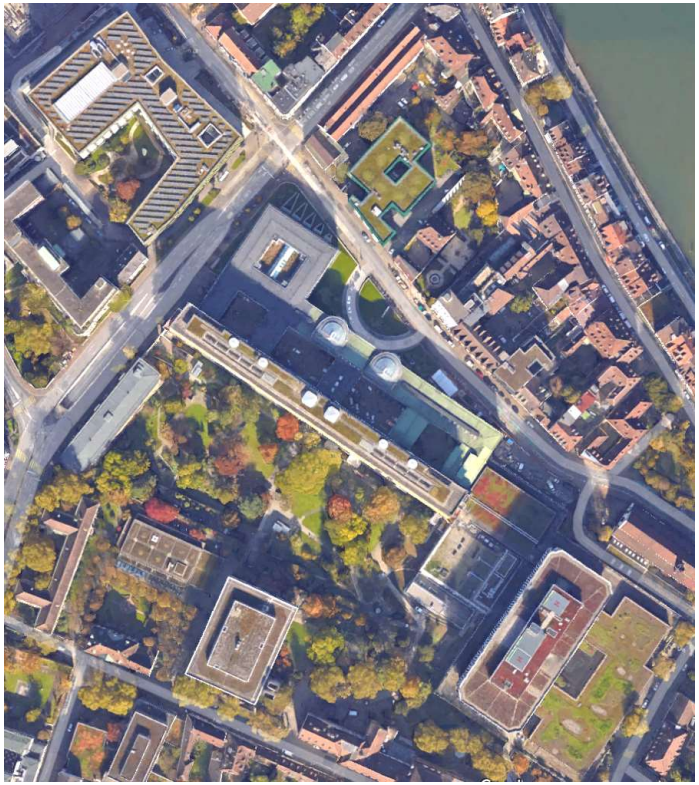
Some EU countries have enacted laws requiring new commercial buildings to have roofs at least partially covered with vegetation or solar panels.

- Basel in Switzerland has the largest green roof area in the world in relation to the number of inhabitants. By updating the construction law, it was decided that all new and renovated roofs should be green
- In Copenhagen it was decided that since 2010 all newly built and modernized buildings with a flat roof should be planted



Basel
Source: https://www.google.pl/

Water retention

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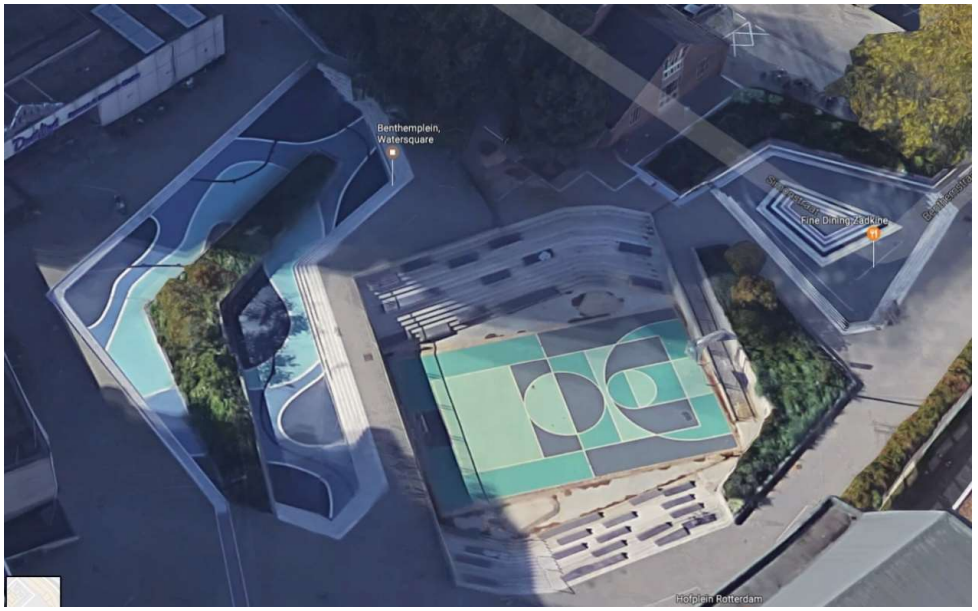
Rotterdam has become famous as a city managing waters. The city is highly resistant to natural disasters and unforeseen water shortages. A special officer for city adaptation is employed in Rotterdam.

Water Square - Rotterdam
Source: own data bank



Water Square - Rotterdam
Source: https://www.google.pl/

Others

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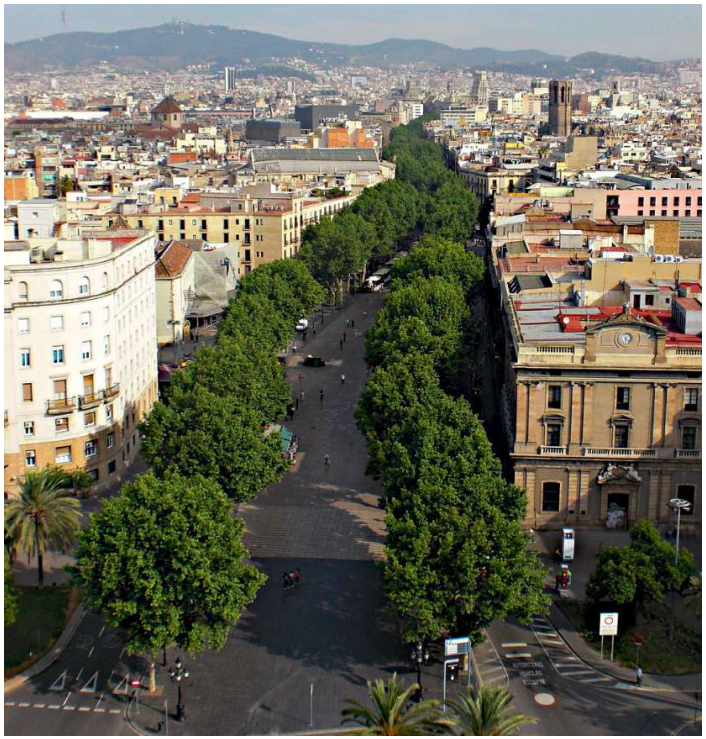
Sardynia, Iglesias (Itally)
Soruce: https://mulpix.com; @piazza.federica



Las Ramblas Barcelona (Spain)
Source https://www.wikipedia.org/

Others

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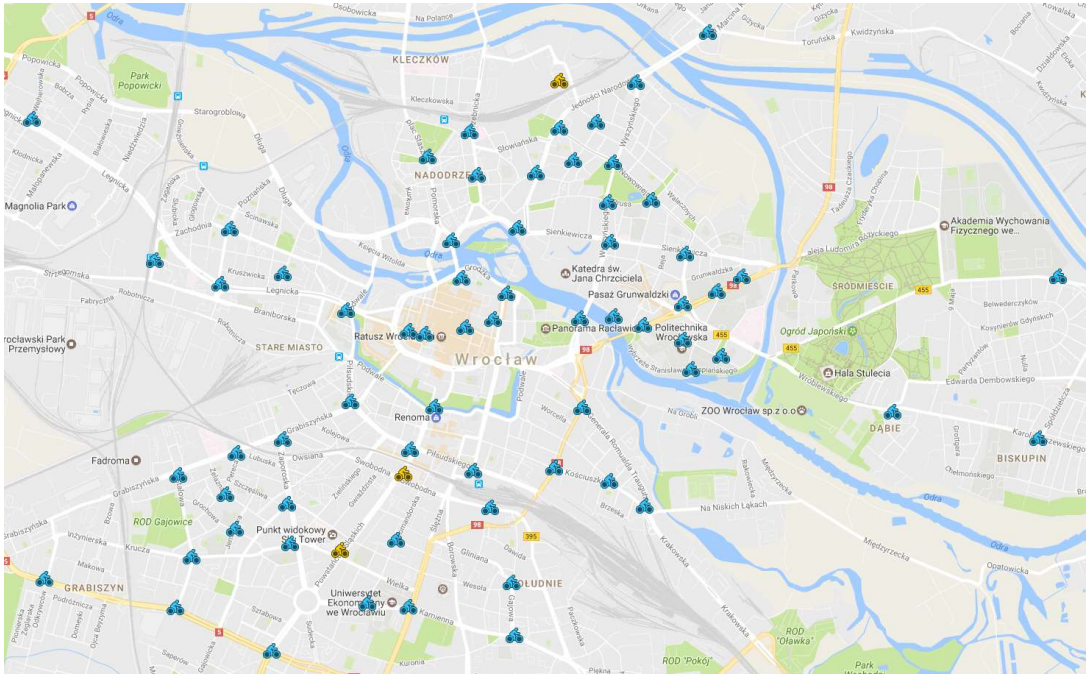
Rasing streets in Miami (USA)
Source: http://www.miamiherald.com

Drifting cafe (Netherlands)
Source: own date bank

EXAMPLES OF ADAPTATION AND MITIGATION ACTIVITIES IN TRANSPORT

Bicycle sharing system

Bike rental
Źródło: https://nextbike.pl



Bike sharing system in Wrocław in 2017
Source: http://www.wroclaw.pl

E-mobility and car sharing

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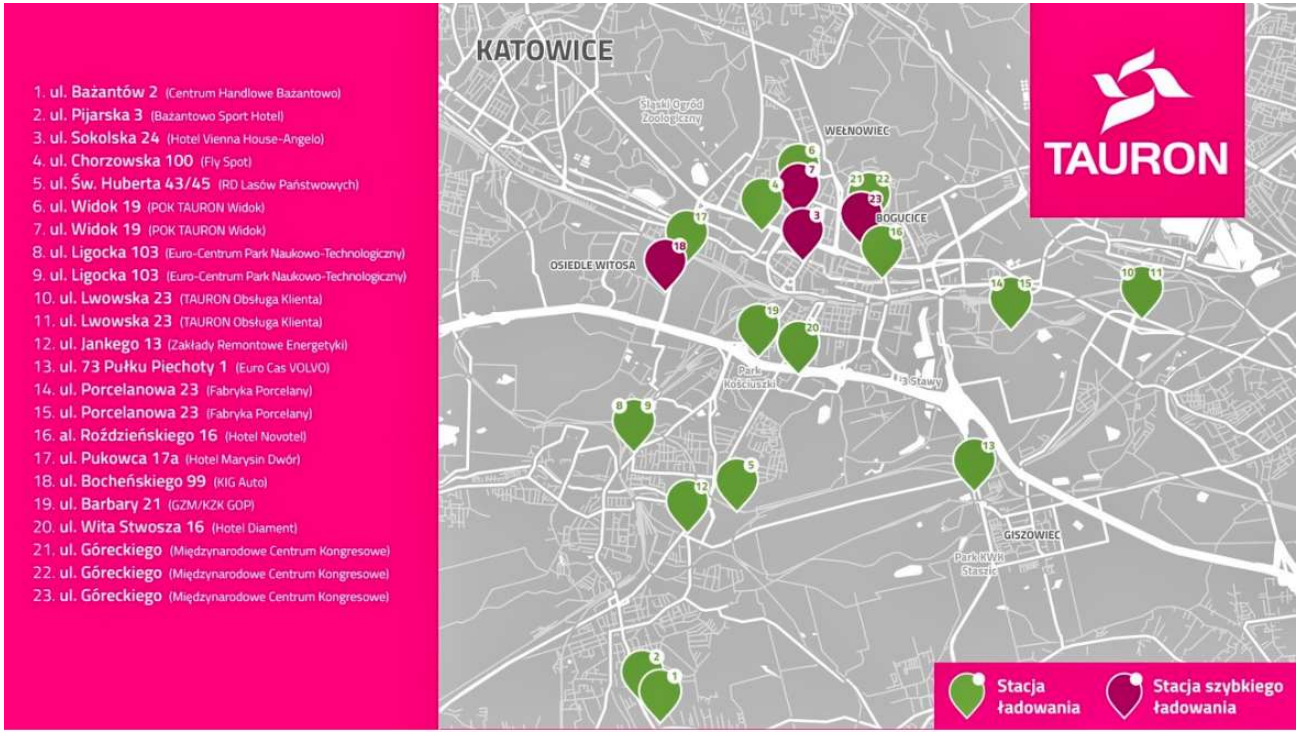
The car sharing system is an increasingly common solution in cities.

Typically, electric vehicles are used in this system



Green bus shelters

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Green bus shelter in Białystok (Poland)
Source: https://www.se.pl/bialystok/sa-juz-pierwsze-zielone-przystanki-w-bialymstoku-zdjecia-aa-VvMV-dazG-NiKc.html

Green bus shelter in Siemiatycze (Poland)
Source: http://www.bryla.pl/bryla/7,85301,24896603,zielone-przystanki-w-siemiatyczach-miasto-postawilo-je-w-2017.html

Public transport – green roofs

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Green roof on the bus
Source: https://blog.urbanscape-architecture.com/what-phyto-kinetic-stands-for

Green boat
Source: own data bank

EXAMPLES OF ADAPTATION AND MITIGATION ACTIVITIES IN ENERGY SECTOR

Megatrends in energy sector

Reducing emissions and reducing the environmental impact of investments

Development of Renewable Energy Sources

Growing social awareness

Improving energy efficiency

Development of energy storage technology

Improving energy efficiency

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Increasing energy efficiency helps reduce energy losses. The effect is a reduction in energy consumption, which is associated with smaller fuel consumption, and therefore lower emissions.

Thermomodernization at energy consumers
Source: http://gdaa.plt

Development of RES sources

The development of renewable energy has been implemented for years using wind and photovoltaic technologies. Renewable energy sources work depending on weather conditions, therefore it is important to combine them into systems ensuring greater work efficiency.

Source: https://grybow.pl/wp-content/uploads/2018/03/farma_fotowoltaika.jpg

Development of offshore wind farms

In recent years there has been a dynamic development of offshore technology (farms installed on the water). Like onshore farms, these are high power sources.

Installations of this type implement the assumptions of the megatrend of RES development and emission reduction.

Source: https://pbs.twimg.com/media/ECEtGvfUYAEvgso.png

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Distributed energy - the effect of increasing public awareness

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In addition to the development of large RES, the number of domestic RES installations is growing dynamically.

This trend creates new challenges and at the same time creates new opportunities - attempts to connect these installations into larger systems.

Source: https://www.apricum-group.com/residential-energy-storage-business-models-growth-germany/

Source: http://polish.windturbinegeneratorsystem.com/sale-10086686-3kw-wind-solar-hybrid -off-grid-system-1500w-eolic-wind-generator-for-home.html

Microgrids - combining small RES into larger systems

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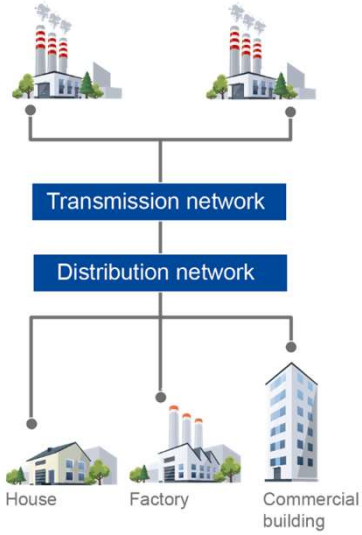
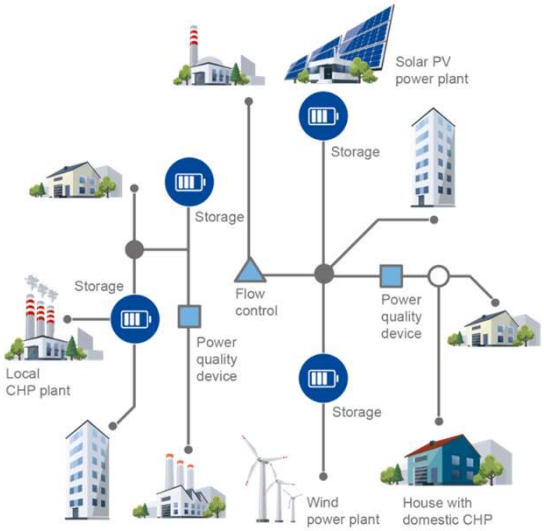


Megatrends



MICROGRIDS TODAY

Individually managed distributed energy sources

MICROGRIDS 2.0

Professional cooperation between distributed energy sources/energy islands and distribution grid

Microgrids - combining small RES into larger systems

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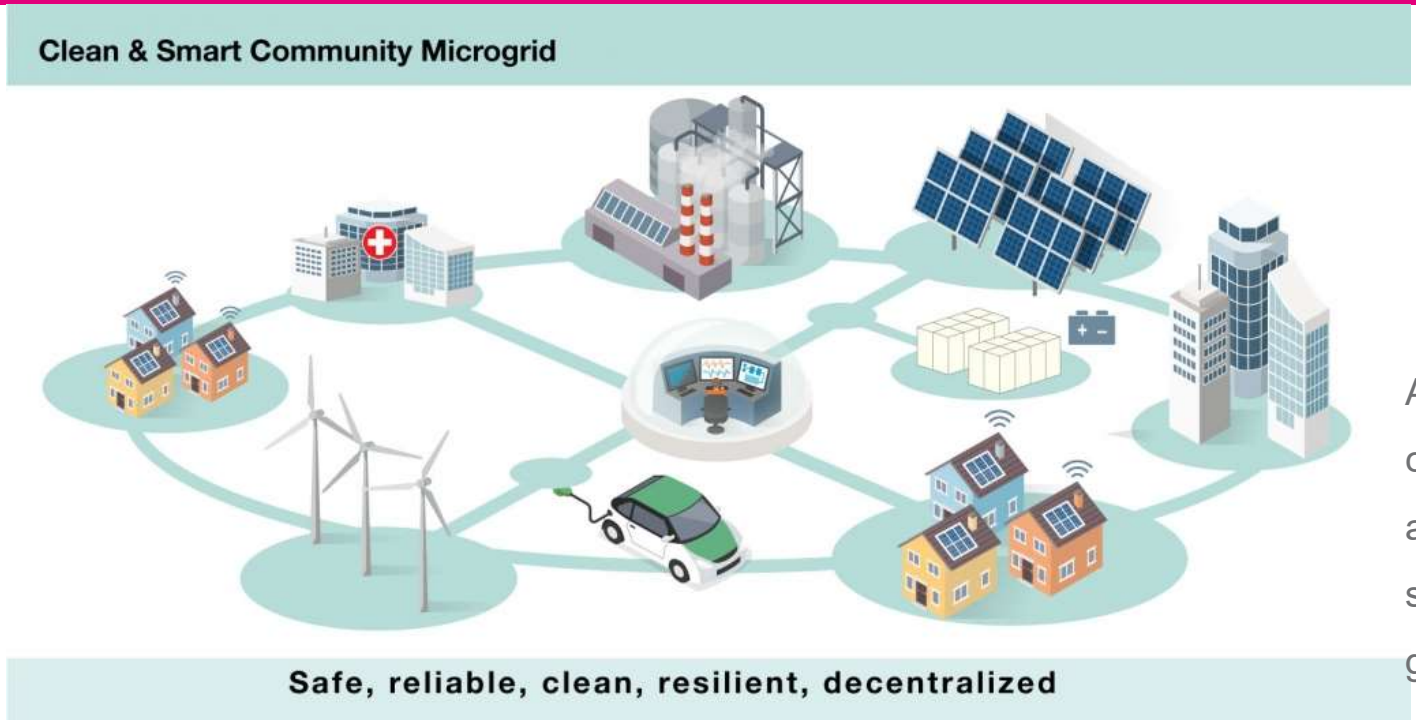
An microgrid is a physically separated area covering local energy sources (mainly RES) and consumers of energy produced from these sources. Energy storage and gas or oil generators are also built into the microgrids, which provide energy in situations of insufficient production of energy from renewable energy sources. All elements of the microgrid are connected by a power network, and the work of the installation is controlled by an IT system. The microgrid can be connected to the local electricity distribution network, but can also work completely independently (creating an energy island)

Microgrids - combining small RES into larger systems



Microgrid
Source: https://theclimatecenter.org/wp-content/uploads/2019/11/microgrid-1030x525.jpg

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Microgrids in TAURON

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analytical tools
for determination of profitability of the microgrids for different locations

operating pilot plant
combining elements of energy generation, transmission & storage

know-how and proven experience
in the field of construction and operation of microgrids

PILOT PLANT


Energy consumers


Active players
(prosumers, local entities)


Local energy sources
(PV ,wind turbine, gas engine)


Energy storage

Internal results:

Representative pilot plant together with a detailed documentation of operational and technical issues, ready to implement in other locations.

Microgrids in TAURON

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separation of a certain area of the energy network together with connected consumers, in order to make them independent of energy supplies from the external network

generation of electricity through locally available sources of electricity:

- Photovoltaic panels: 100 kW
- Wind turbines: 60 kW
- Gas engine: 40 kW
- Accumulation unit capacity: 250-300 kWh

application of advanced automation and control systems as well as an IT system managing plant operation

INSTEAD OF A SUMMARY - GREEN SMART CITY

Green Smart City

Care for the environment belongs to one of the megatrends that shape current development. Adaption (adapting human systems to the effects of climate change) and mitigation (reducing anthropogenic impact on the environment) activities are often innovative solutions. Their implementation gradually brings urban centers closer to the green smart city model

Smart city - a city that uses information and communication technologies to increase the interactivity and efficiency of urban infrastructure and its components, as well as to raise the awareness of residents. This part of the definition mainly highlights the role of broadly understood IT technologies. In addition, Green Smart City operates in a neutral way for the environment.

Green Smart City

Source: http://vincent.callebaut.org

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THANKS FOR YOUR ATTENTION

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