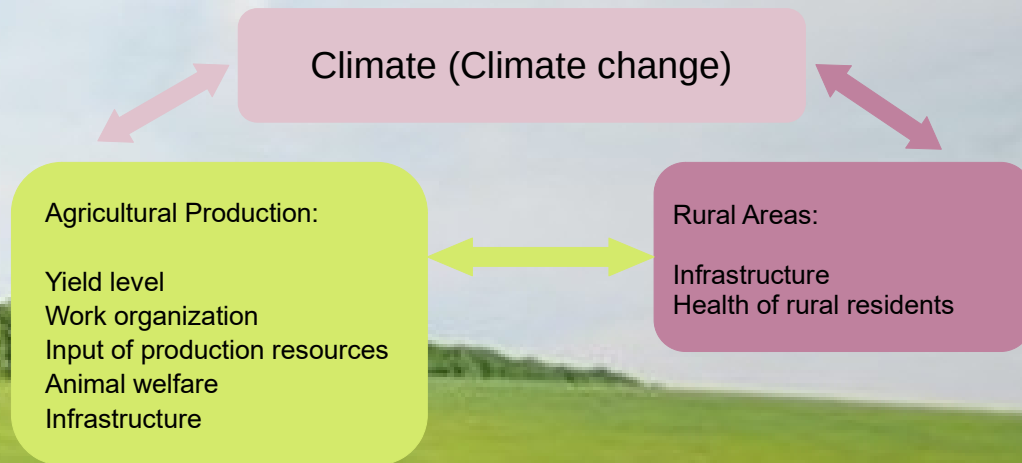


IMPACT OF CLIMATE CHANGE ON AGRICULTURE IN POLAND



IMPACT OF CLIMATE CHANGE ON AGRICULTURE

Agriculture has always been closely linked to climate. The productivity of agriculture depends on the climate. Inappropriate temperatures, precipitation, or wind strength can lead to poor yields or destroy maturing crops. Increasing weather anomalies, droughts, floods, or hurricanes directly affect agriculture. Climate change is associated with the intensification of extreme events and changes that trigger long-term consequences



Climate change

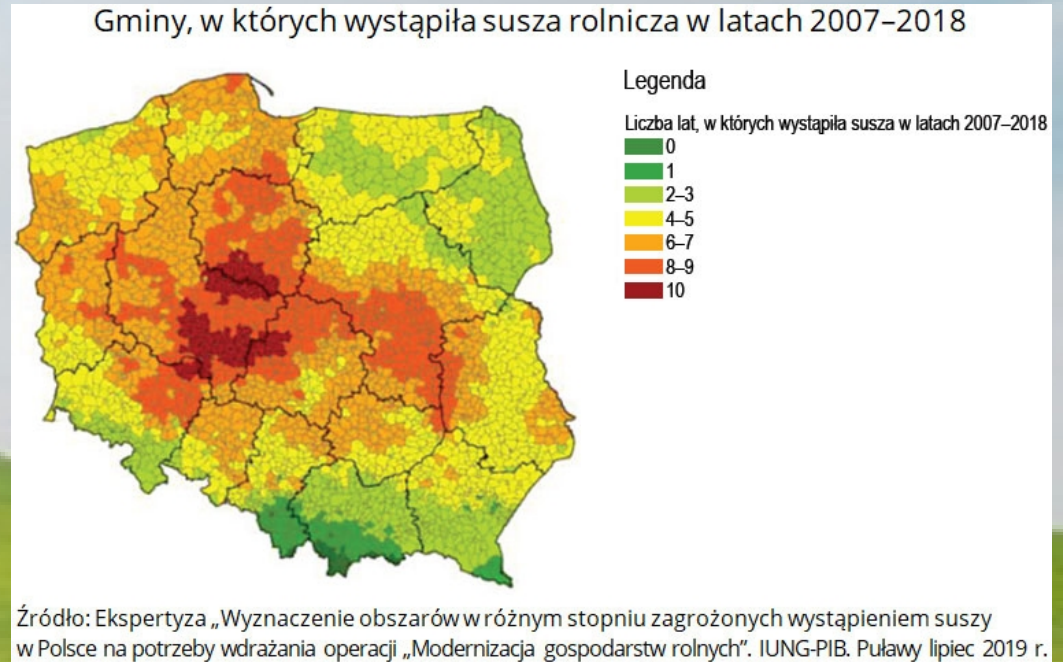
Variations in the amount and distribution of atmospheric precipitation (increased precipitation during the winter and early spring, and decreased during the spring and summer;

Increased terrestrial evaporation;

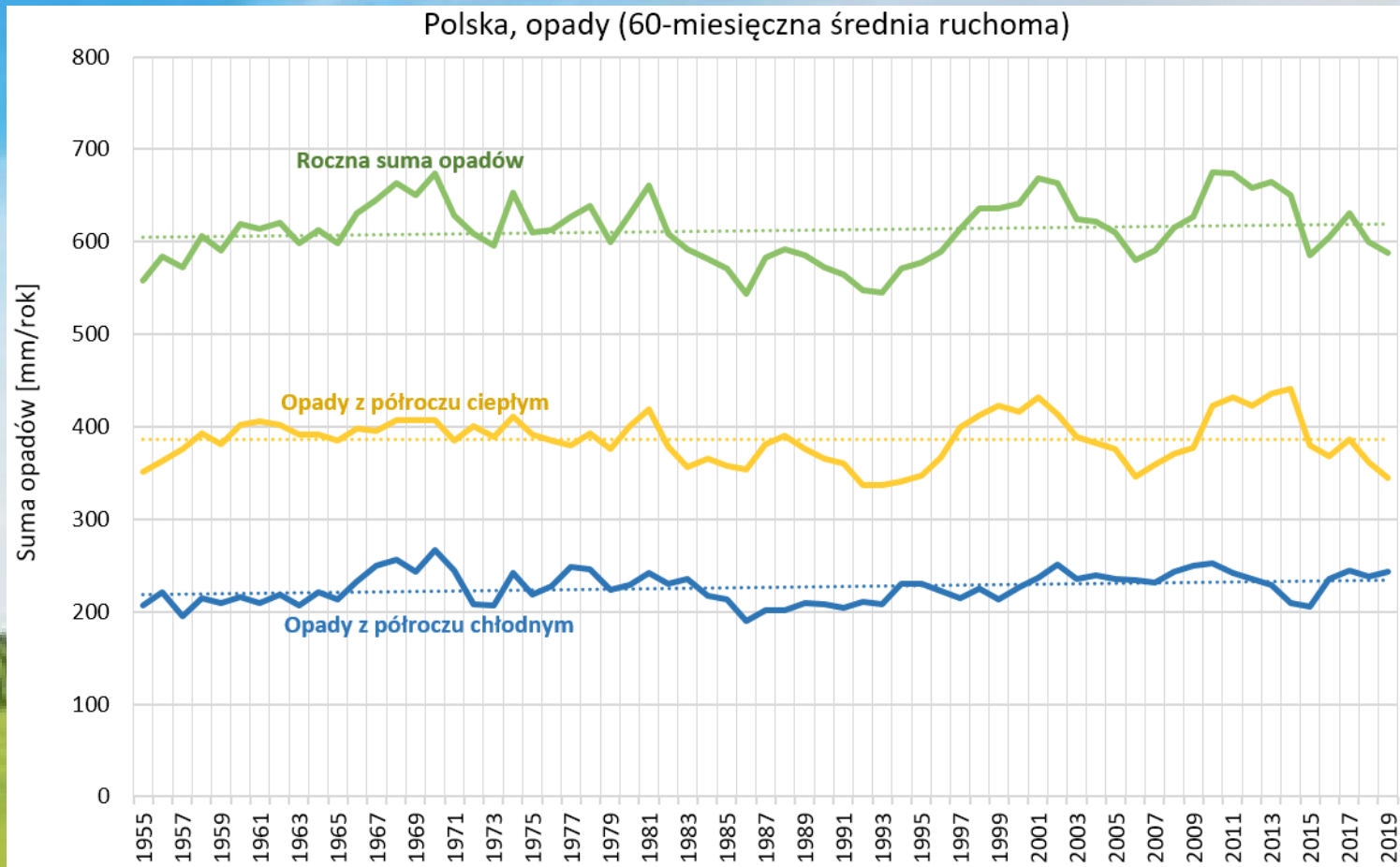
Growing water deficit (negative water balance);

Drought;

Torrential rainfall.

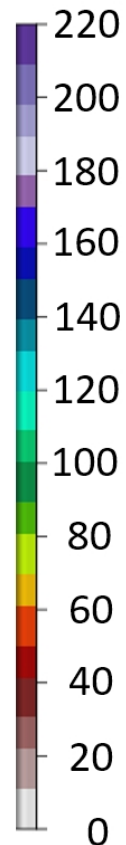
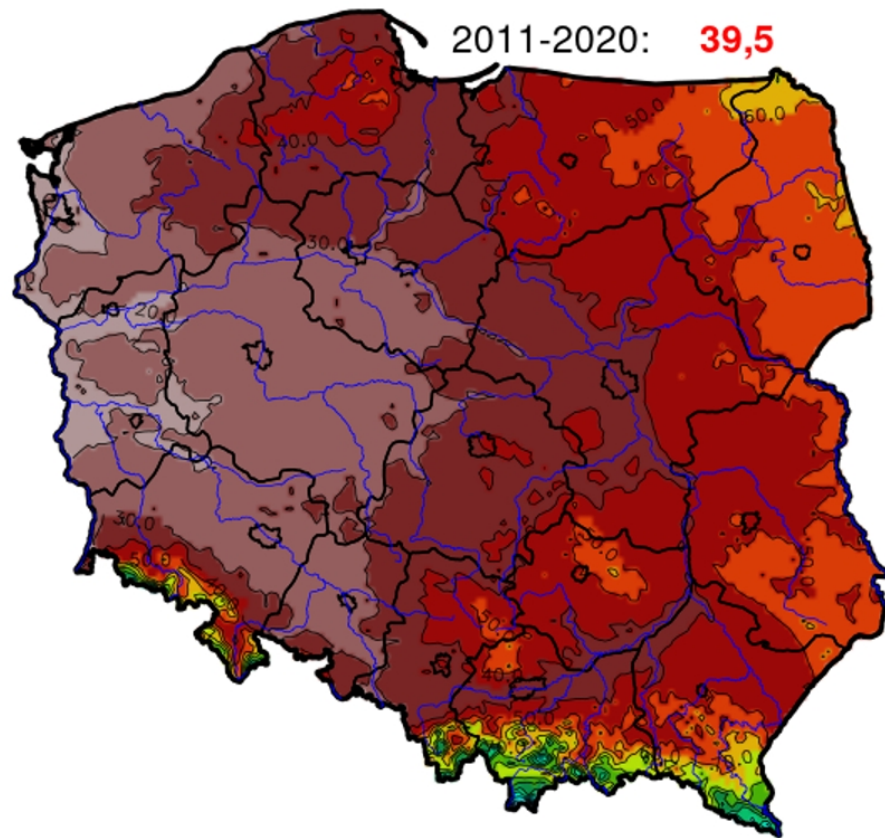
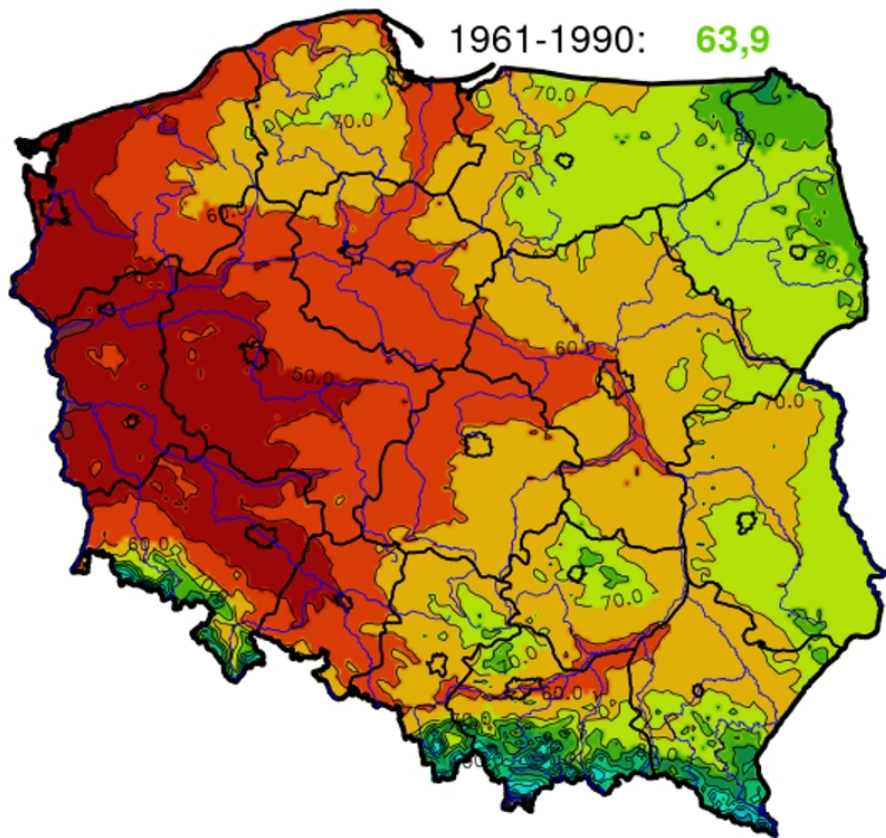


Climate change



Climate change

Średnia liczba dni z pokrywą śnieżną



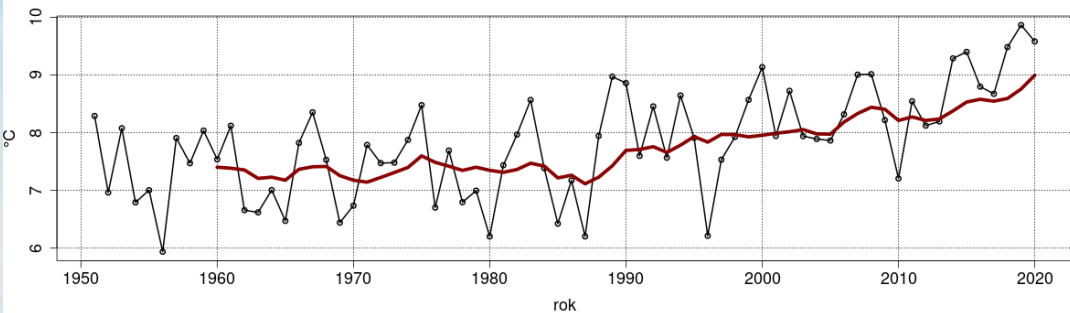
Climate change

Temperature rise;

Drought;

Changes in thermal conditions.

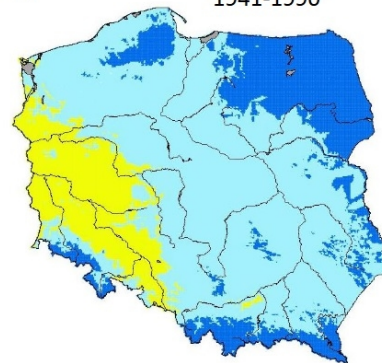
Średnia roczna temperatura powietrza + 10. letnia średnia ruchoma



Zmiany warunków termicznych w Polsce

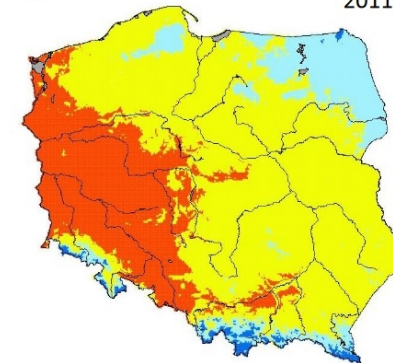
A).

1941-1990



B).

2011-2020



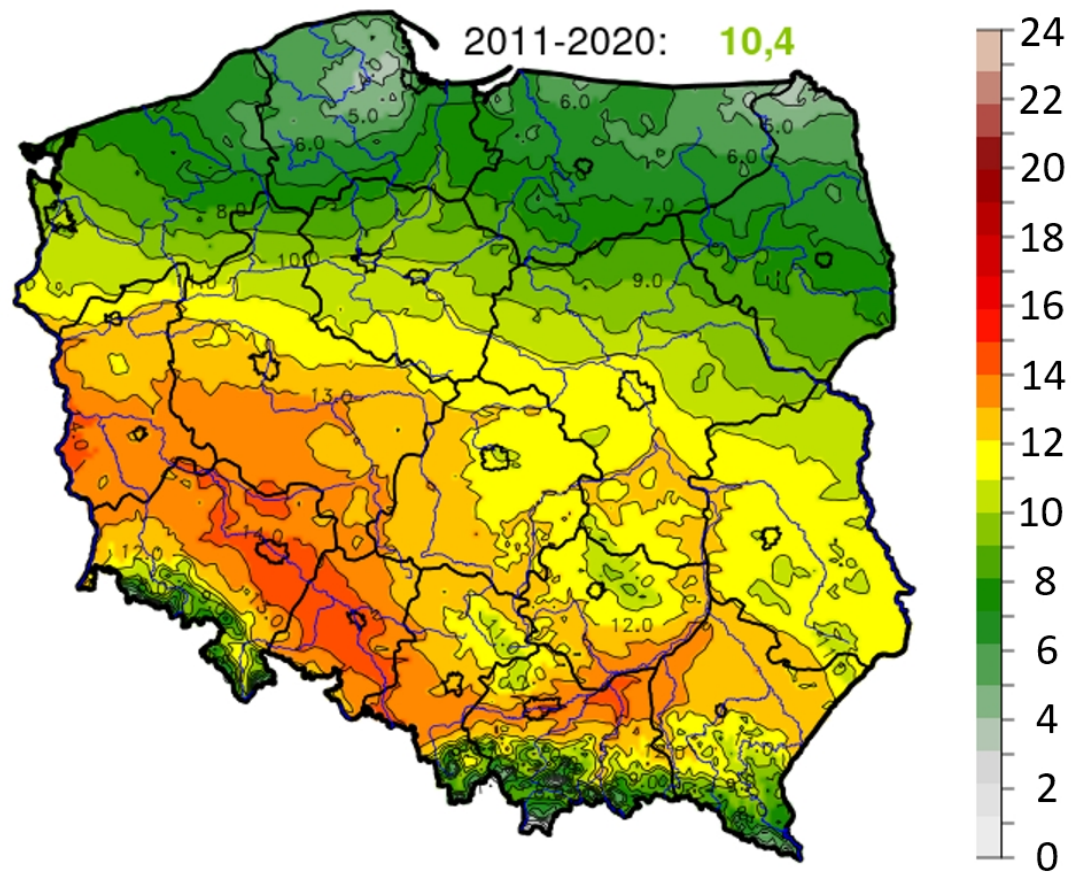
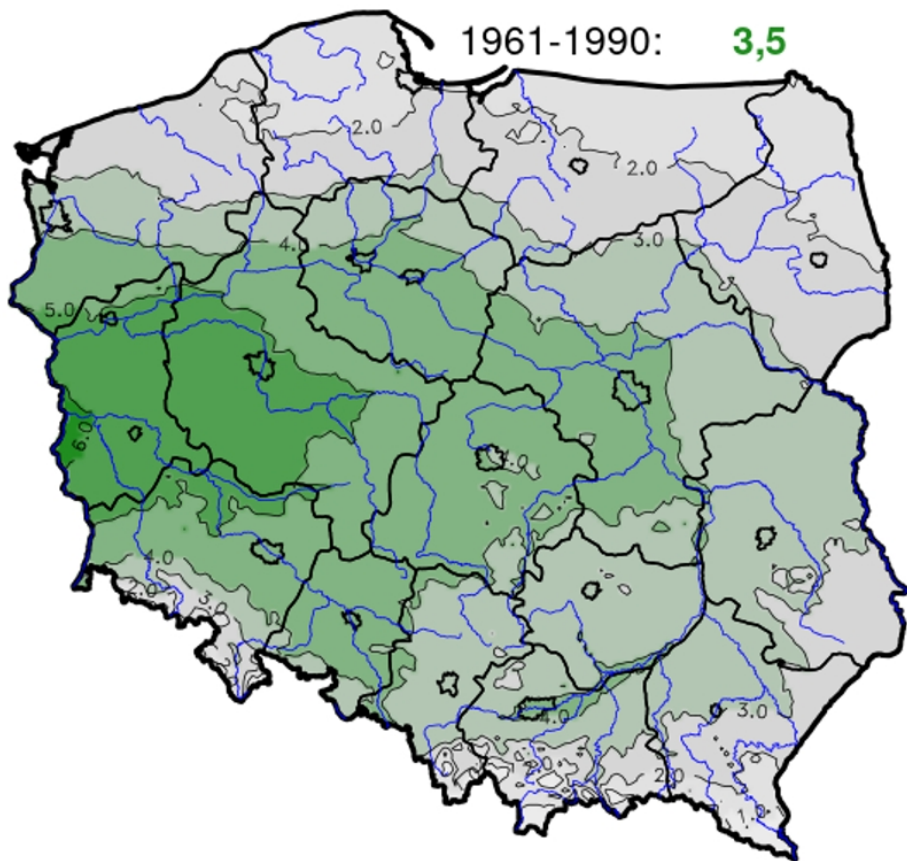
7,0 8,0 9,0 st.C

Obecnie jest jeszcze cieplej niż zakładał trend 0,3 °C na 10 lat !

Średnia temperatura w latach 1941-1990 (A) oraz prognozowana na lata 2011-2020 (B) (Źródło: Górski, Kozyra 2011)

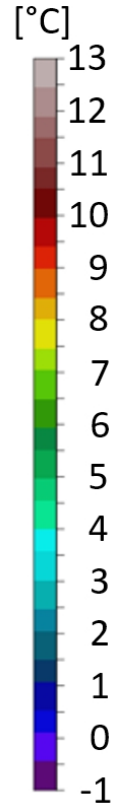
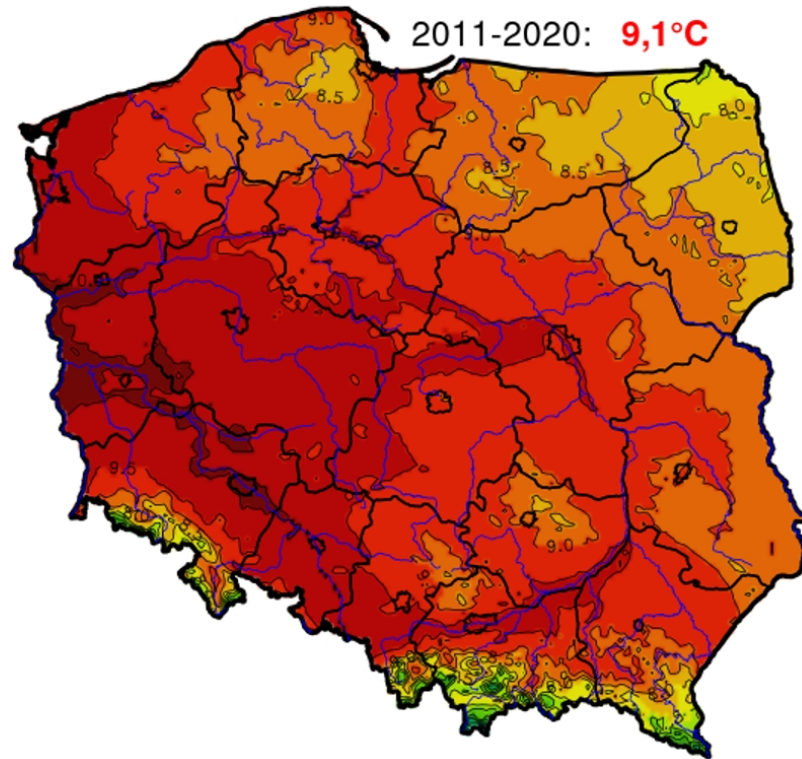
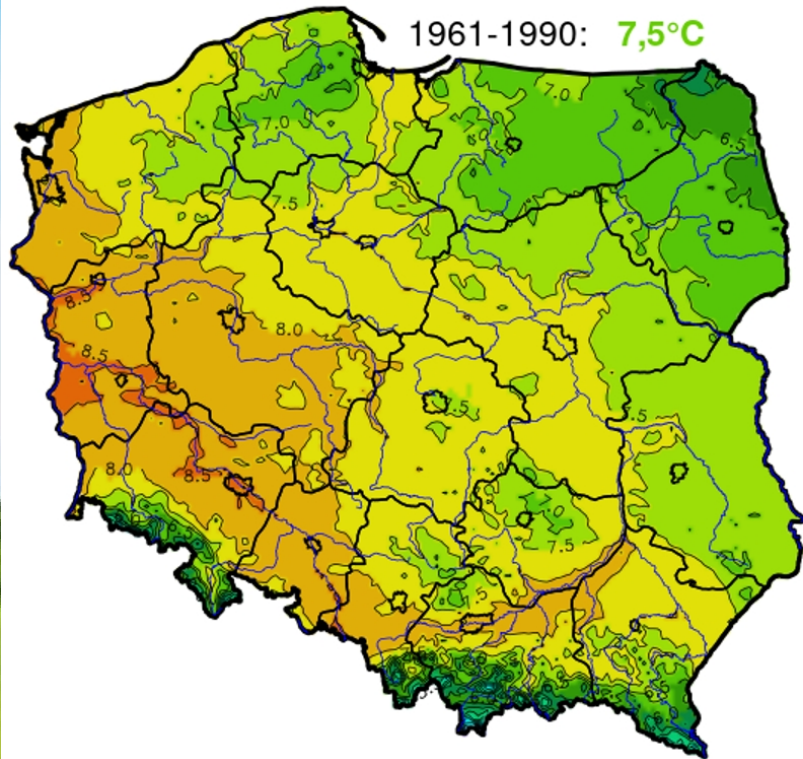
Climate change

Średnia liczba dni upalnych z $T_{\max} \geq 30^{\circ}\text{C}$



Climate change

Średnia roczna temperatura powietrza w Polsce

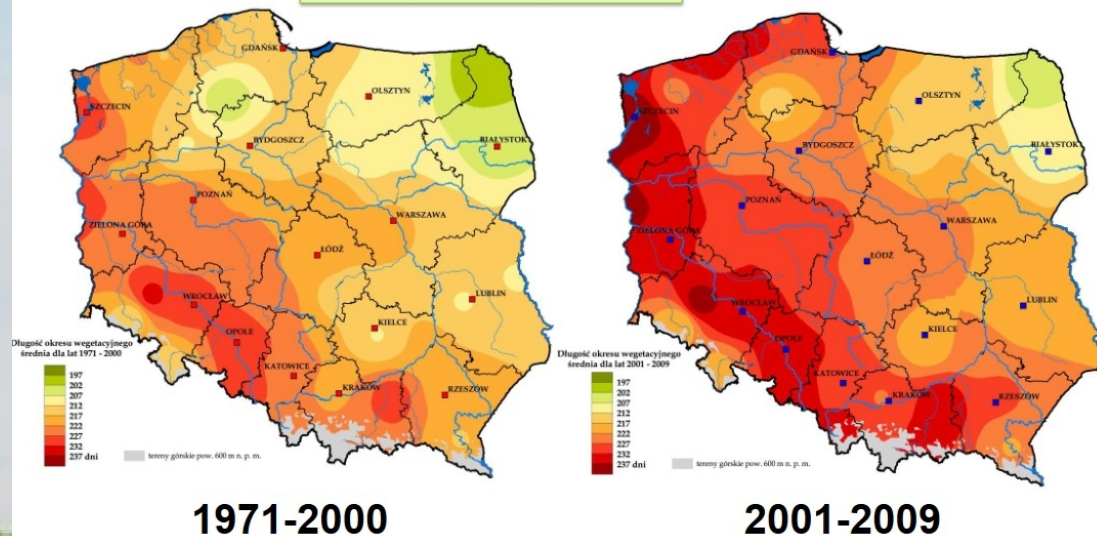


Climate change

Extension of the growing season (according to the analysis of several climate scenarios, by 2030, the growing season in central Poland is projected to be extended by 14 days compared to the years 1971–2000, and by 27 days by the year 2050).

Zmiany długości okresu wegetacyjnego

8 dni dłuższy okres wegetacji



Źródło: Nieróbca i in. 2013

Climate change

Extreme weather phenomena:

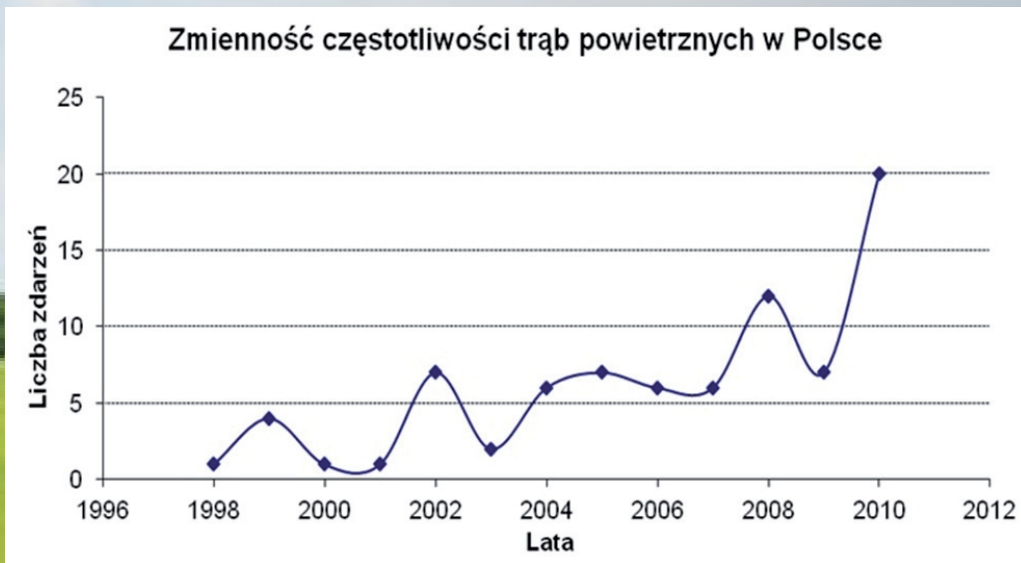
Hurricane-force winds;

Tornadoes;

Hailstorms;

Torrential rain;

Thunderstorms.



Consequences of climate change for agriculture in Poland

The consequences of climate change can be both positive and negative, causing hindrances in production processes, losses, increased production risks, crop damage, reduced yields, and others.

Climate change consequences:

Negative consequences:

- Reduced water availability in temperate and semi-arid regions.
- Loss of carbon in soil.
- Mineralization of organic carbon in soil.
- Deterioration of soil conditions due to water deficit.
- Thermal stress on plants and livestock caused by heatwaves.
- Crop damage.
- Limitation of the possibility to cultivate certain agricultural crops.
- Change in the range of occurrence of new pests and diseases requiring increased use of pesticides.

Positive consequences:

- Extended growing season.
- Opportunity to introduce new varieties and species of crops.
- Beneficial effect on plants from enriching the atmosphere with CO₂.
- Reduction in the occurrence of certain pests and diseases.

Consequences of climate change for agriculture in Poland

Changes in plant developmental stages: leaf development, flowering, fruit ripening, and activity of pollinating insects. For example, earlier flowering of plants may occur during periods of reduced pollinator activity, and earlier activity of crop pests may occur during periods when predators feeding on these pests have not yet returned from overwintering areas.



Appearance of new diseases, pests, and fungi previously not present in Poland due to too low temperatures, for example, new pests of corn - cereal leaf beetle and European corn borer, as well as cases of blue tongue disease (an infectious disease of ruminants).

Consequences of climate change for agriculture in Poland

Inadequate distribution of precipitation for agricultural needs.

Insufficient rainfall delays plant development and can even lead to their complete destruction.

Excessive rainfall reduces plant growth and during harvesting season, it hinders field work.

The necessity of irrigating cereal crops and pastures (significant increase in the costs of plant and animal production).

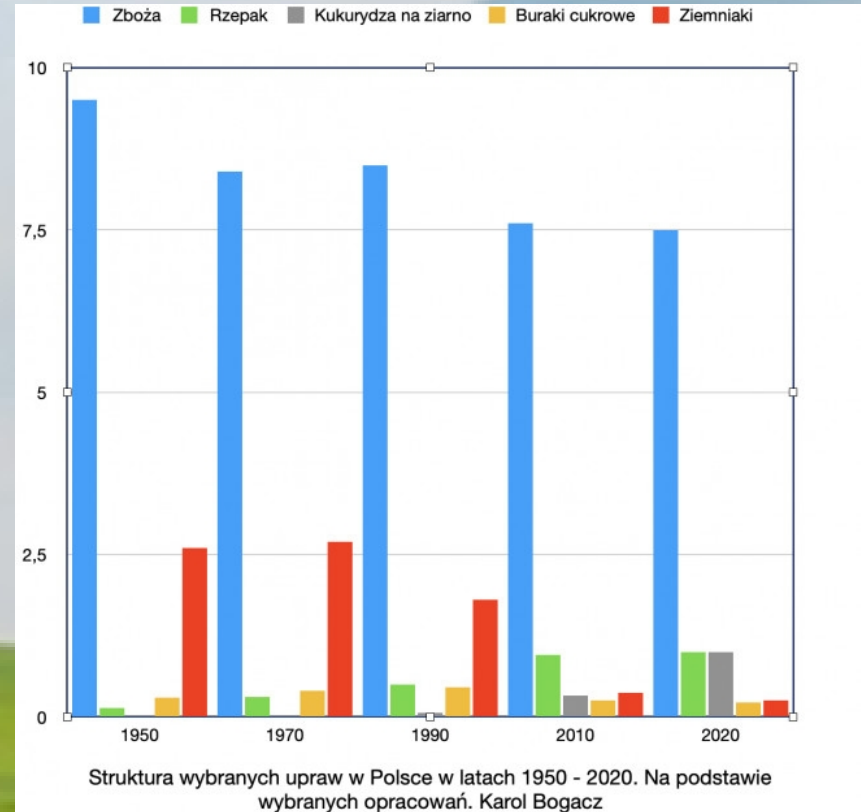
Increased surface water runoff during heavy rainfall increases the risk of water erosion.



Consequences of climate change for agriculture in Poland

The vegetative period in Poland has lengthened by approximately 20-30 days over the past 50 years. It is projected to extend by another 25-30 days by the middle of the current century. The extension of the vegetative period and the rise in temperature will cause changes in crops.

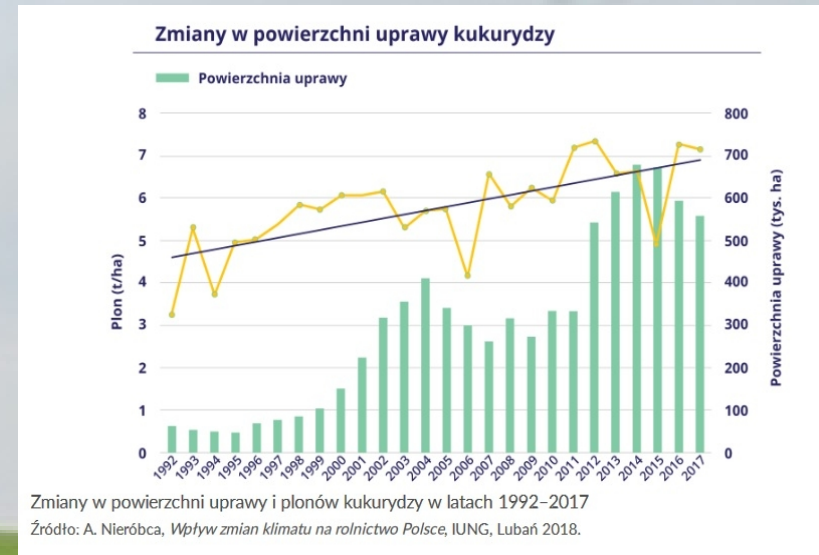
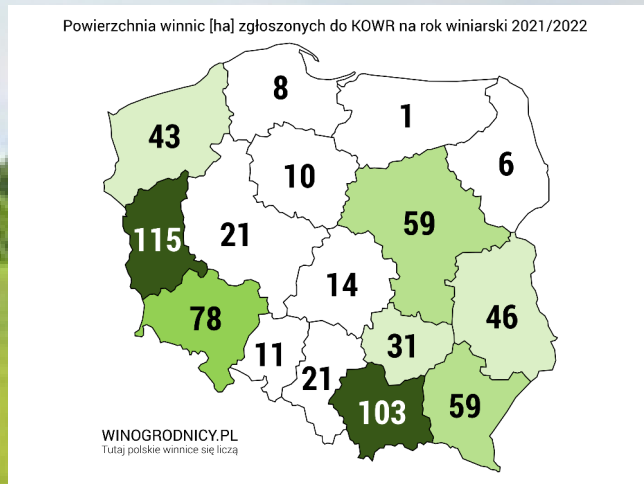
It is forecasted that potatoes will no longer be cultivated in Poland (as it will become too warm for them), and winter crops will also be at risk. The area of field crops and root crops will decrease. Average yields of winter grains may decrease by 10%, sugar beets by 15%, and potatoes by 70%.



Consequences of climate change for agriculture in Poland

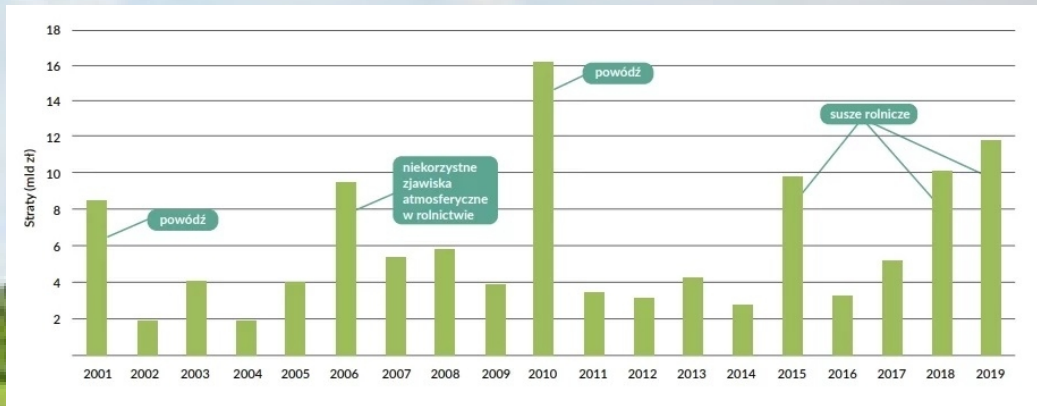
Only the cultivation of heat-loving plants will be highly productive. The area of maize cultivation will increase, and it will likely be grown for grain throughout Poland, with sorghum likely becoming more widespread. Maize's share in the overall crop structure in Poland will be 15-20%, but production outcomes will be unstable and dependent on the weather conditions in a given year..

Many forecasts indicate that due to climate change, there will be changes in the boundaries of traditional wine production regions. Undoubtedly, climate change affects Polish winemaking. Climate warming presents a significant opportunity for the development of vineyards in Poland.



Consequences of climate change for agriculture in Poland

Climate change, especially temperature rise and changes in precipitation, have a very significant impact on agriculture, largely through extreme weather events - droughts and heatwaves, as well as heavy rainfall, leading to floods.



A particular type of atmospheric phenomenon posing a significant threat to agricultural crops is hail. Its occurrence is associated with storms and heavy rain. Considering the expected increase in the frequency and intensity of these events, we must also anticipate an increase in the frequency of hailstorms. Since hailstorms most commonly occur in May and June, this phenomenon represents a significant risk to agricultural crops.

Consequences of climate change for agriculture in Poland

One of the most dangerous consequences of climate change is the increase in frequency and intensity of extreme weather events. Climate change affects the expansion of the range of occurrence of hurricane-force winds. Therefore, they are increasingly occurring in Poland as well. For several years, there has been a systematic increase in the frequency of tornadoes in our country. While in the 1990s these phenomena occurred 1-2 times a year, in the early 21st century, their frequency increased to 7-20 times a year. Hurricane-force winds, especially tornadoes, cause enormous damage to crops and farm buildings.

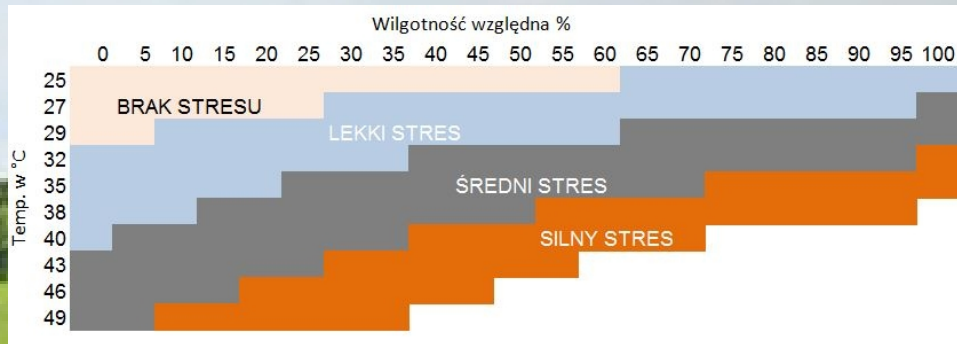


Consequences of climate change for agriculture in Poland

Climate change also poses challenges for livestock production. Two types of effects on animals can be distinguished: direct and indirect.

Direct factors are associated with the direct impact of temperature on animals. For example, changes in ambient temperature affect animal metabolism: slowed growth, decreased milk production, reduced conception rates, decreased appetite, and even increased mortality.

Rising temperatures also generate indirect effects. For instance, problems with access to water mean a decline in pasture quality and increased costs and availability of feed. Maintaining the appropriate temperature in buildings and associated expenses also falls under the category of indirect effects of climate change affecting livestock production.



Consequences of climate change for agriculture in Poland

Among all sectors of the economy, the agricultural sector is the most vulnerable to the impacts of climate change. Even a small change in climatic factors can render a specific type of production unable to be conducted in a particular area. Disruption of climatic factors will lead to destabilization of agricultural production and uncertainty in its outcomes. Therefore, climate change is considered one of the factors posing the greatest threat to food security worldwide.

Although Poland is considered to be less vulnerable to the negative impacts of climate change, our agriculture is already experiencing its adverse consequences, such as increased variability in yields.

Poland should actively engage in European Union efforts aimed at achieving climate neutrality by 2050 and encourage non-EU countries to undertake similar efforts. Gradual but steady reduction of greenhouse gas emissions is a fundamental condition for ensuring food security in the medium and long term.



Consequences of climate change for agriculture in Poland

Adaptive actions towards climate change in farms should focus on production systems aimed at protecting soil organic matter resources, rationalizing fertilization and irrigation, and ensuring animal welfare under heat stress conditions in livestock production. The food security of Poland will depend on whether these actions are undertaken and whether their scope is sufficient.

Adaptive actions

Introducing new species and varieties adapted to the emerging conditions, incorporating heat-loving crops and those more resistant to water shortages, diseases, and pests typical of warmer climates into agricultural production

Improving plant protection systems, modifying existing ones, and constructing new irrigation systems and rainwater harvesting systems. Regulating water relations through land reclamation measures (drainage, construction of irrigation-drainage ditches, building retention reservoirs, flood protection, planting vegetation on floodplains and unused agricultural land) and irrigation of crops.

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A landscape photograph featuring a vibrant green field in the foreground, a dense line of green trees in the middle ground, and a bright blue sky with scattered white clouds in the background. The text is centered over the sky.

**THANKS FOR YOUR
ATTENTION :D**