Europe warms up at the faster rate as expected; implications for water management sector

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EUSDR Thematic Event on Climate Change & Water Management

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Global Water Partnership
Central and Eastern Europe

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State of Global Climate (2020)

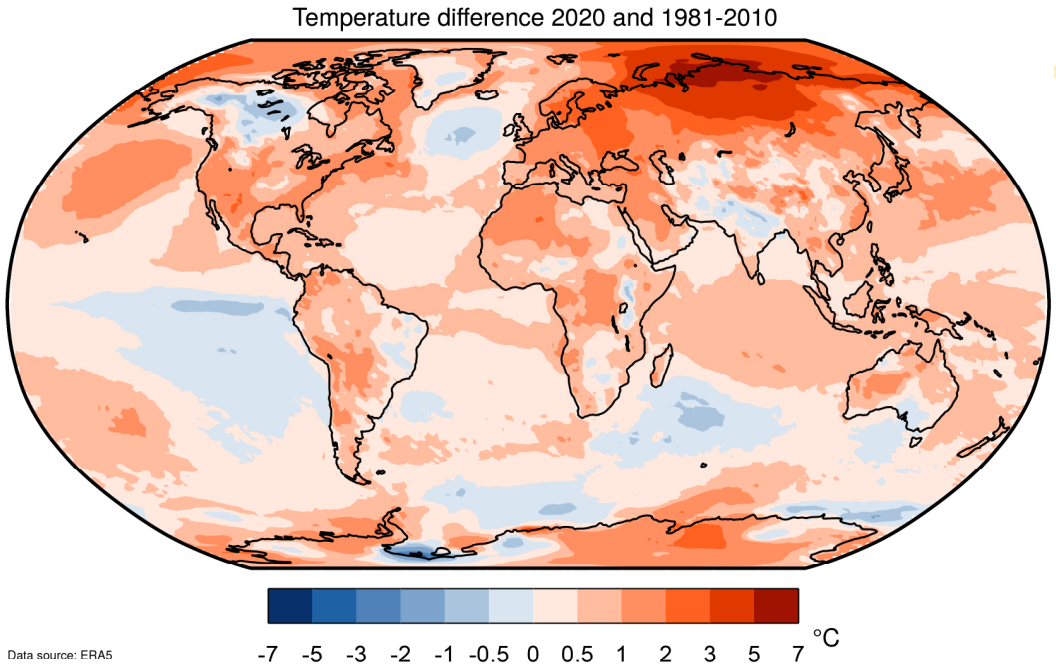
According to preliminary data from NASA, JMA, Berkeley and ERA5 (ECMWF), **2020** was **the warmest year at least since 1850 with a global temperature difference +0.60 ± 0.15 ° C** (compared to 1981-2010; tied with the previous warmest year 2016) and **+1.25 ° C** compared to the pre-industrial period (1850-1900).

The period of the last five years, 2015 - 2019, ended with a temp. diff. +1.1 to +1.2 ° C compared to the pre-industrial period.

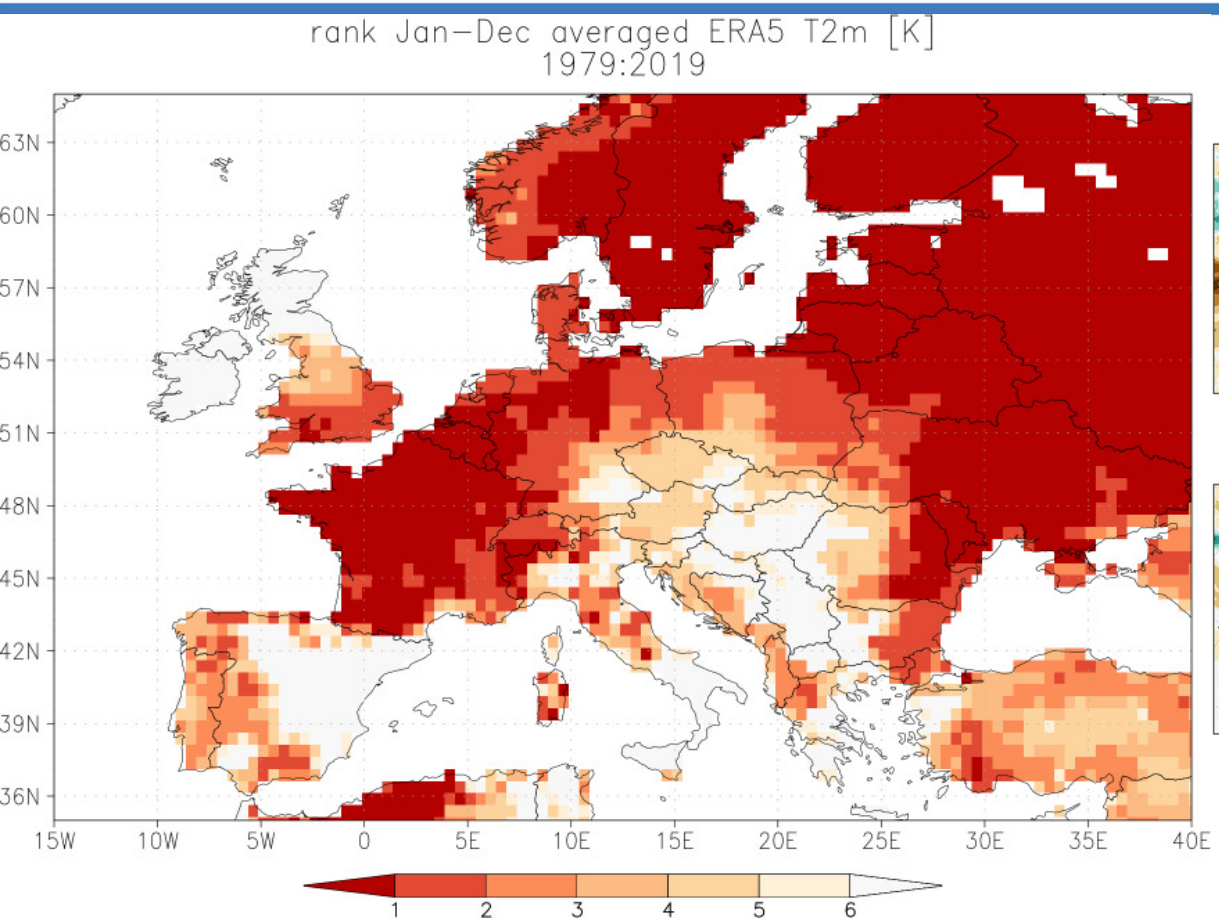
The last decade (2011-2020) is the warmest decade since 1850, and it is about 0.25 ° C warmer than the 2001-2010 decade.

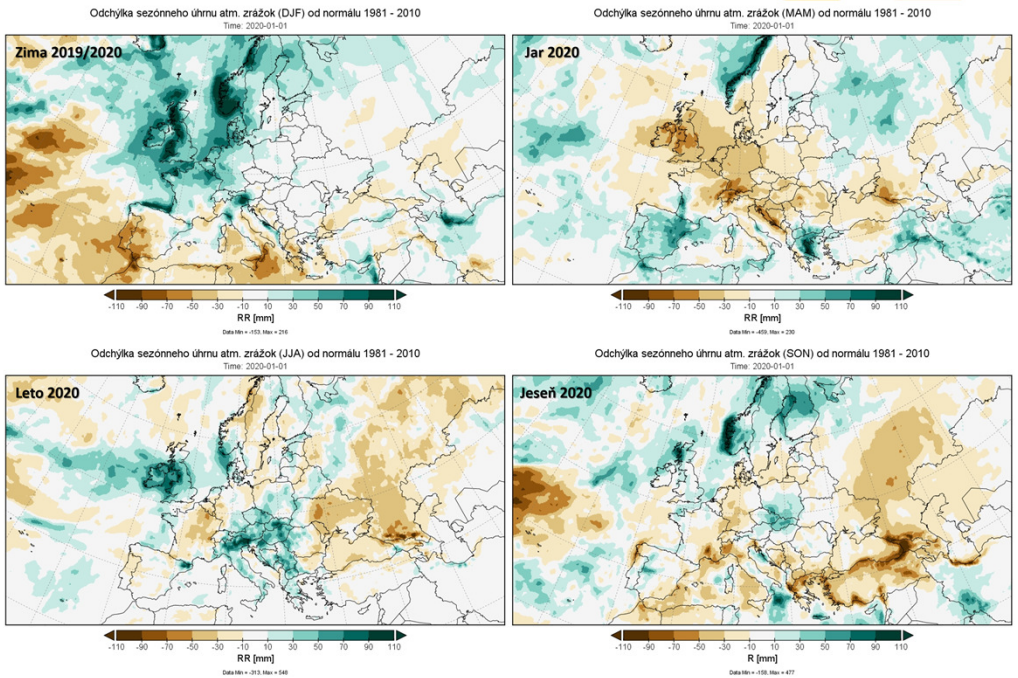
Europe saw its warmest year on record **at 1.6°C above the 1981-2010 reference period**, and 0.4°C above 2019, the previous warmest year (according to Copernicus).

The largest annual temperature deviation from the 1981-2010 average was concentrated over the Arctic and northern Siberia, reaching to over 6°C above average

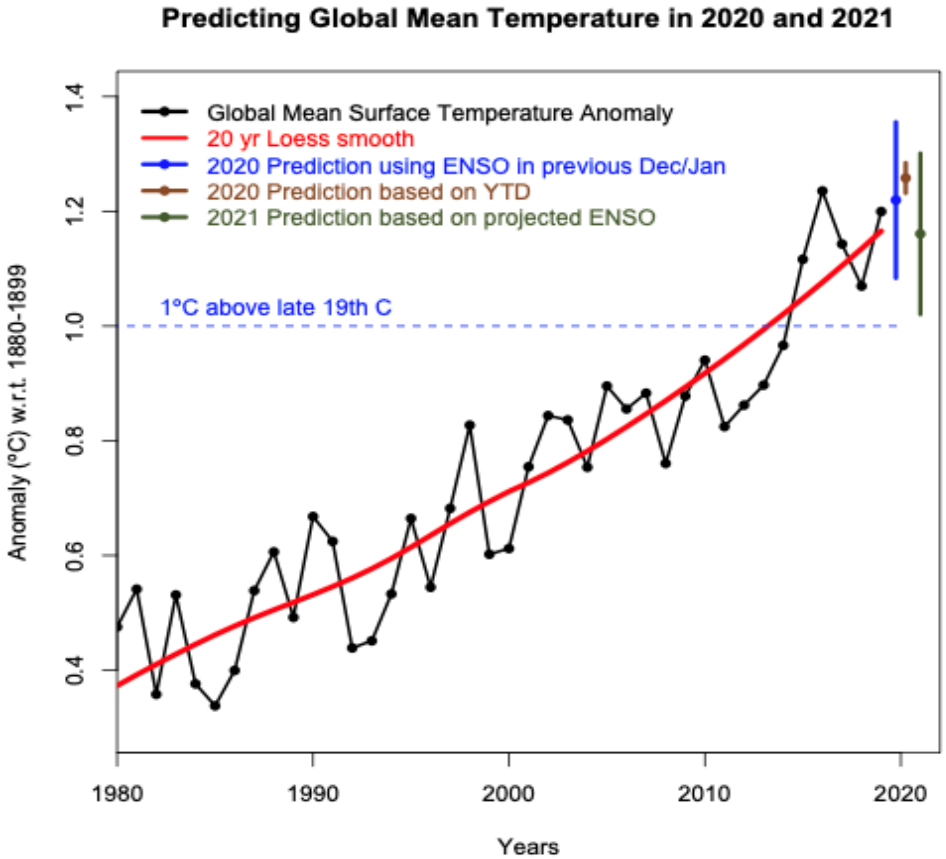


State of European Climate (2020)





Predictions for 2021



It was the sixth year in a row, when the global temperature was at least +1.0 ° C higher than the pre-industrial value and the third year (since 2014) when it was higher than 1.2 ° C.

According to NASA and the Met Office reports, 2021 should not be as warm as 2020 (mainly due to the cooling effect of La Niña in the first half of the Year).

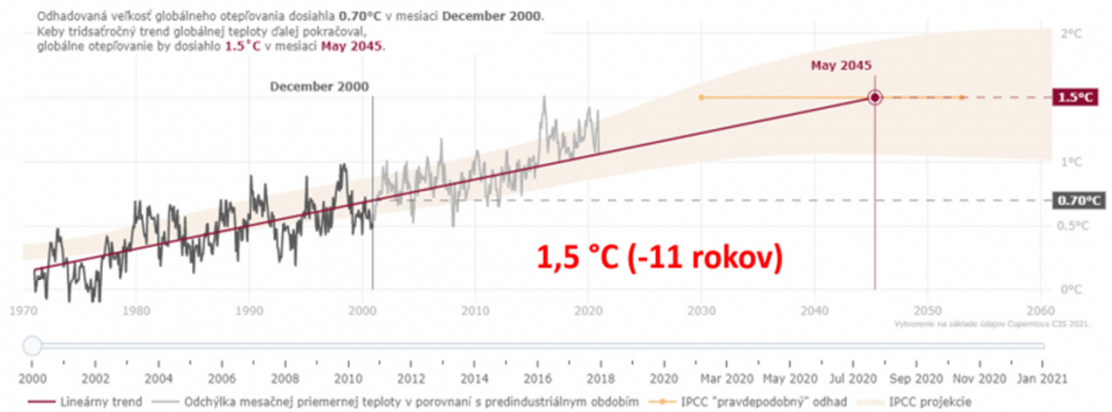
All ocean areas, up to a depth of 2,000 meters, have also shown rapid warming over the last 70 years.

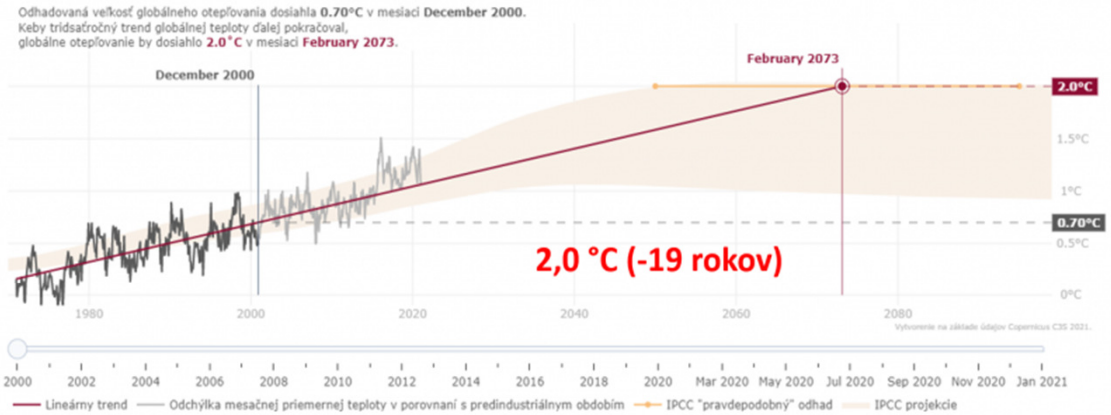
Many continental areas in the northern hemisphere show warming of more than 2.0 ° C (1880-2018).

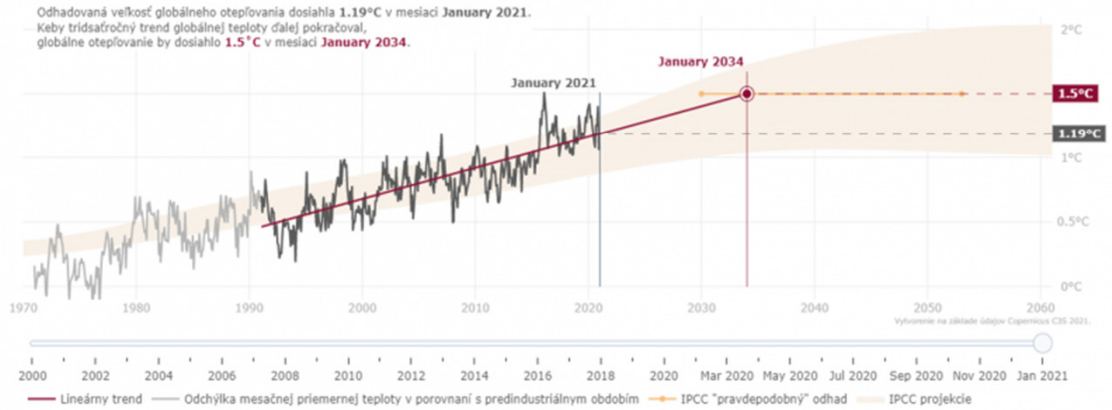
The polar regions in the northern hemisphere (Arctic + Greenland) have been warming 2- to 3-fold faster than the rest of the planet since the middle of the 20th century.

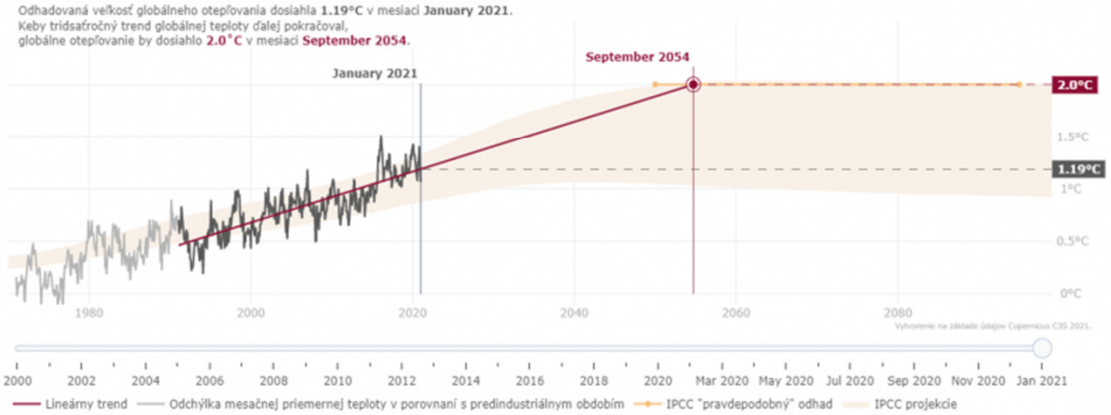
Global temperature databases (NASA, NOAA, JMA, CRU, ECMWF-ERA) are time-consistent in estimating temperature rise.

Climate change accelerates

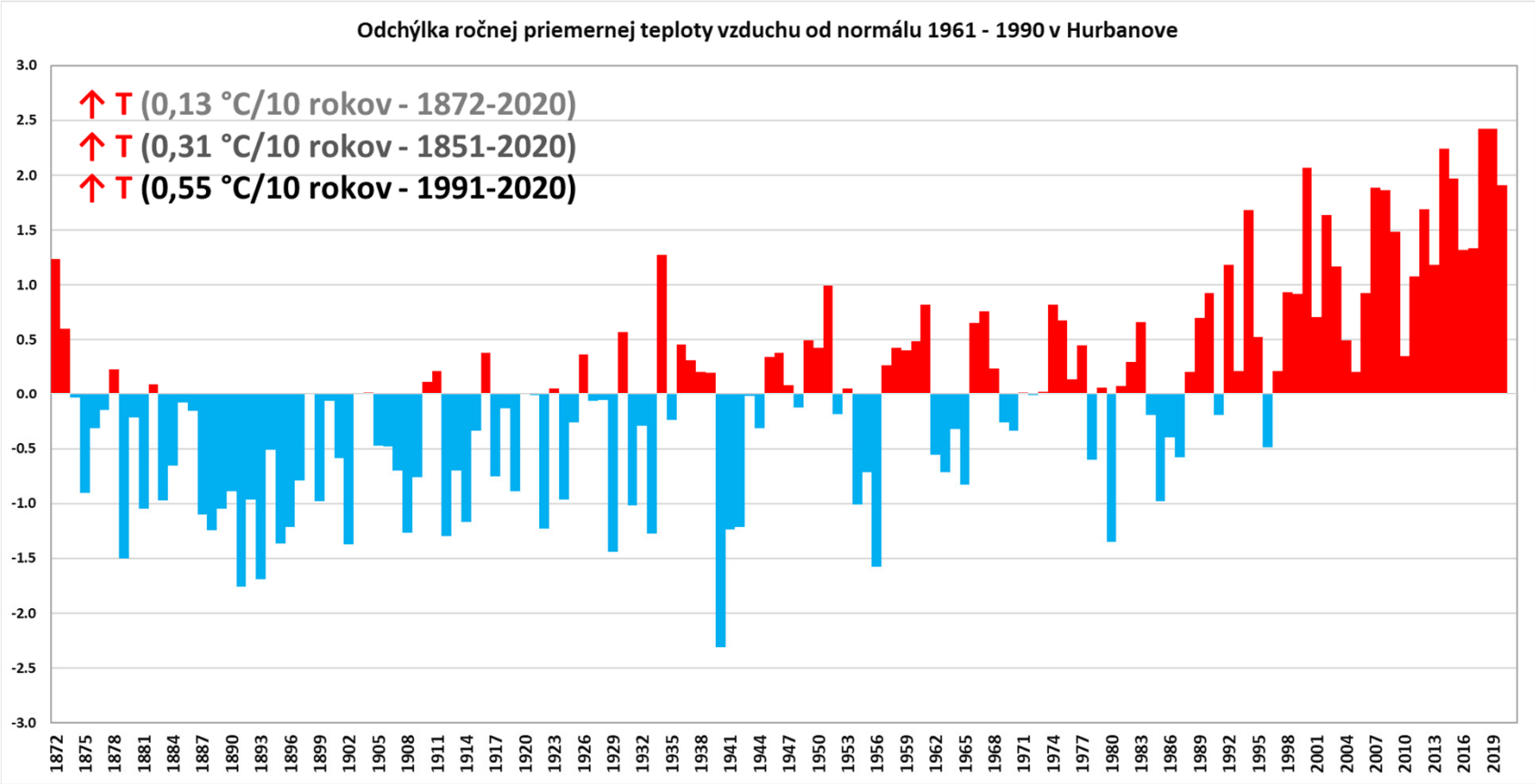




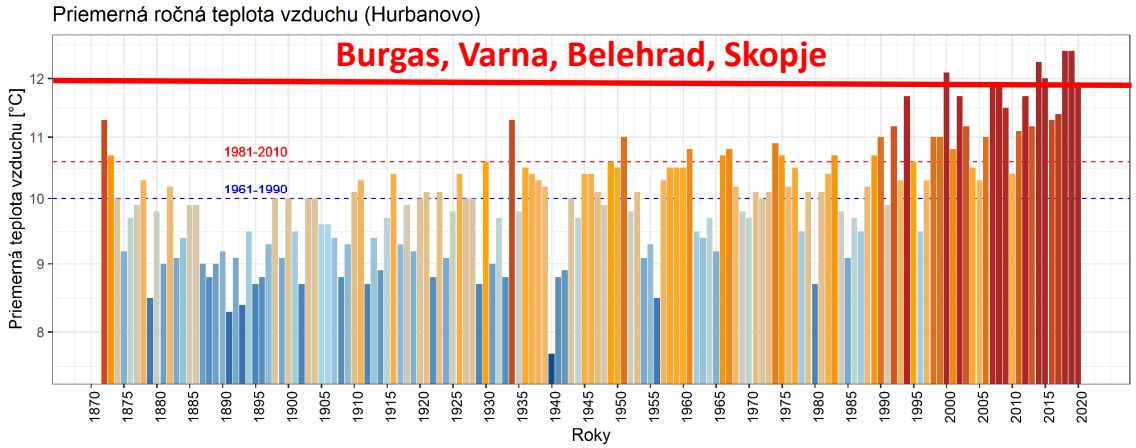


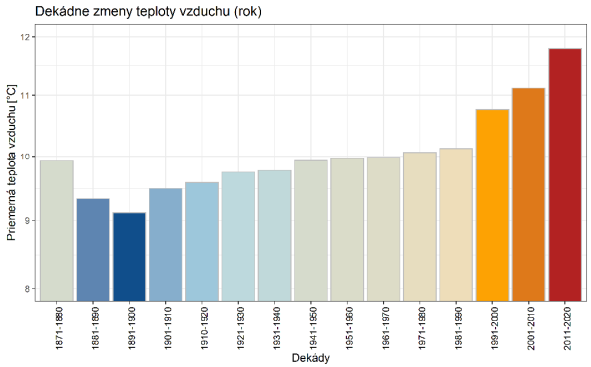


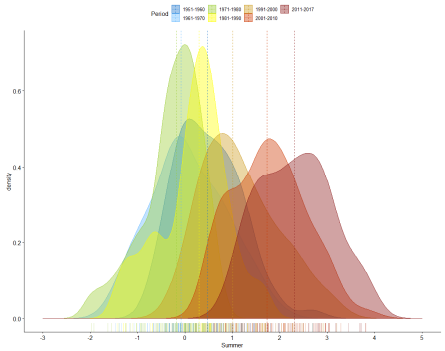
Climate change accelerates



Climate change signal in Slovakia







Since 1881, the annual mean air temperature has increased **by almost 2.0 ° C**, with the fastest rise in temperature in the summer months, when the average air temperature rose by more than 2.3 ° C.

Since 1901, the annual total precipitation has decreased on average in Slovakia by **25 mm** (5.6 %;
in the southern regions this decrease is even more pronounced, more than 10%).

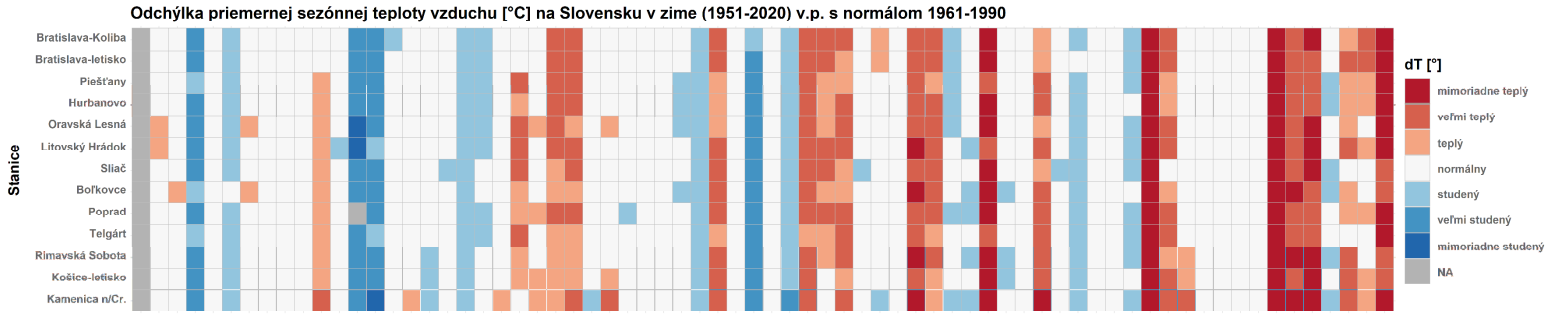
The decade 1991-2000, but also the period **2001-2010**, with the characteristics of air temperature, total precipitation, evaporation, snow cover, as well as other elements, approached the predicted climate conditions around **2030**, which were quantified in terms of climate change scenarios for our territory, the only exceptions are lower precipitation totals in the cold half of the year and in the winter in the 1991-2000 decade.

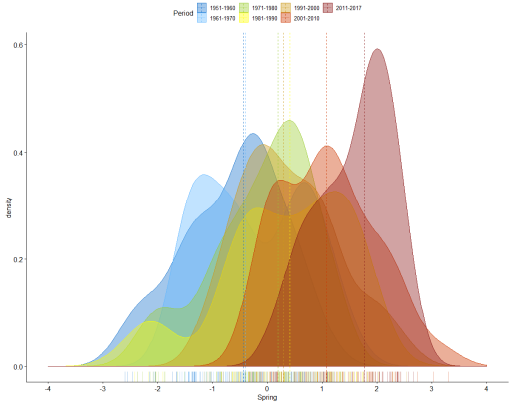
The number of **"warm" extremes of Tmax** increased significantly, especially after 1991, there was a rapid increase in the frequency of heat waves throughout Slovakia.

In the period 2001-2019, there are demonstrably more frequent **dry periods** (caused mainly by the growth of potential evapotranspiration).

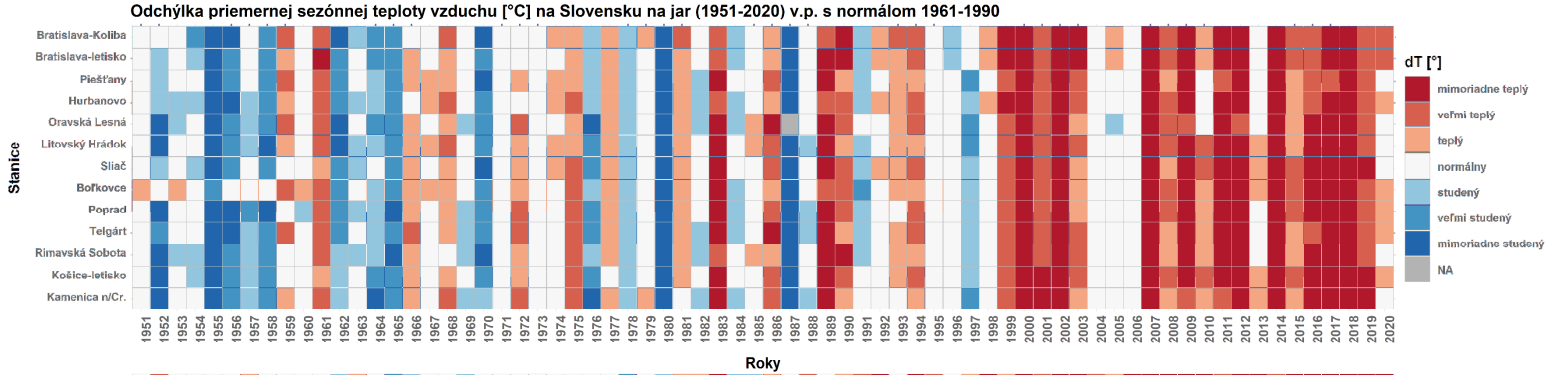
Climate change signal in Slovakia

WINTER

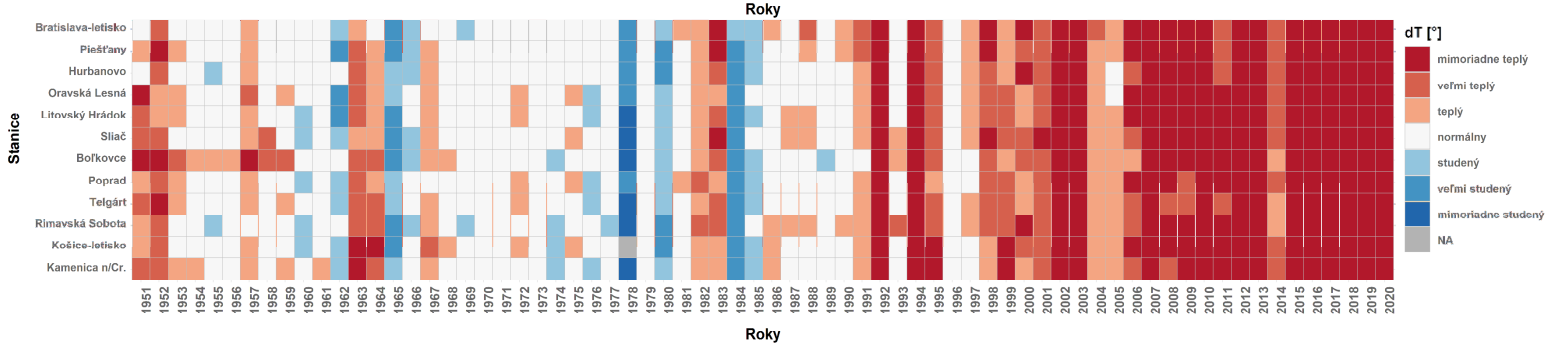


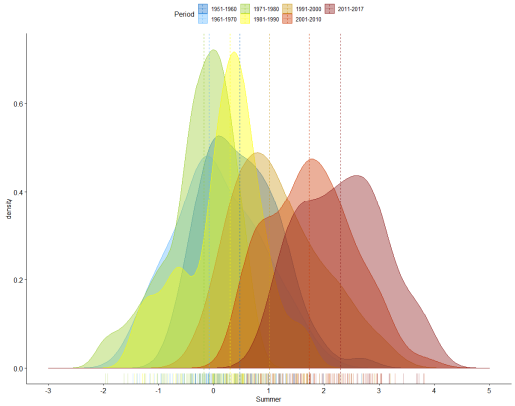


SPRING

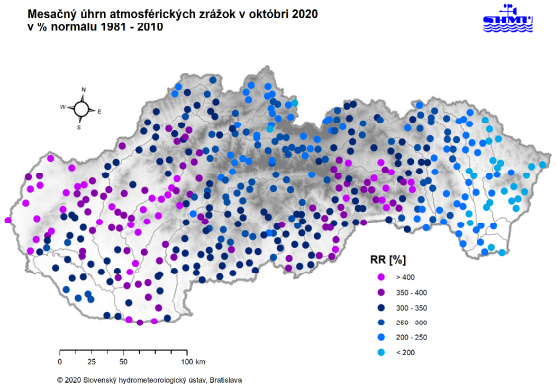


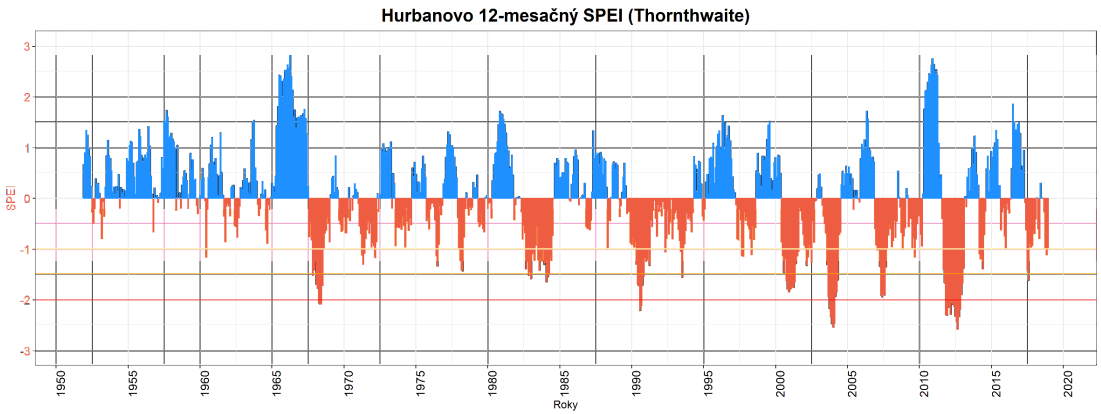
SUMMER





Climate change signal in Slovakia





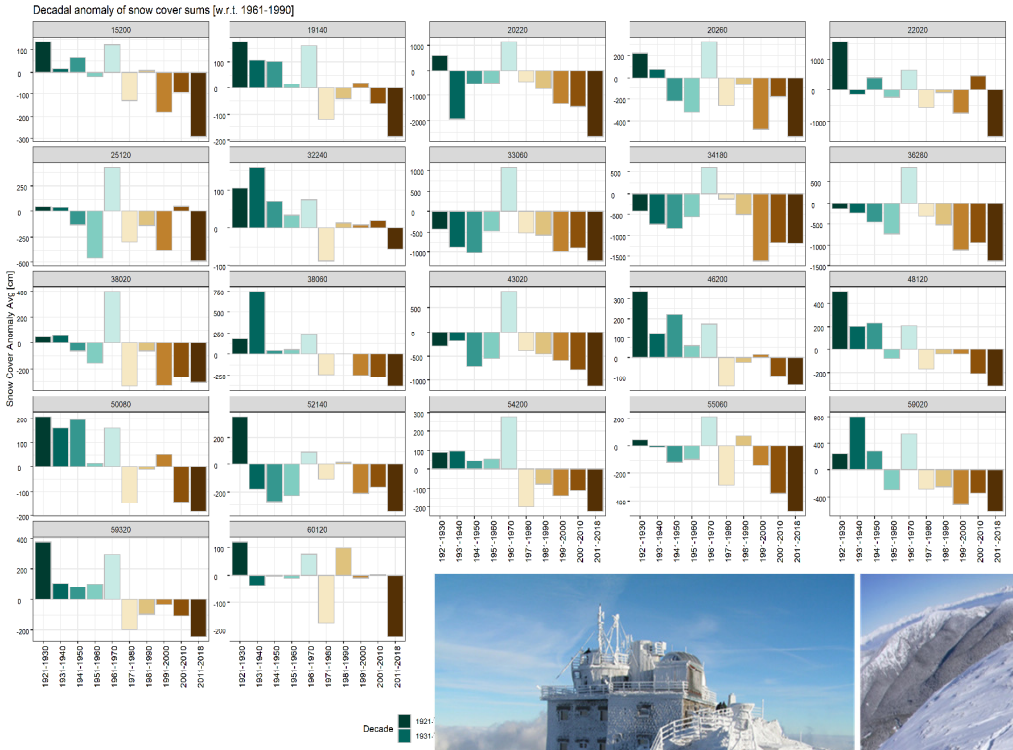
Torrential short-term rainfall appears to be more frequent and intense (by approximately 7-14% for every 1 ° C warming), and the extremes of daily and multi-day total precipitation are also highlighted. **Due to the higher temperature and humidity, stronger and more intense convection storms are expected**.

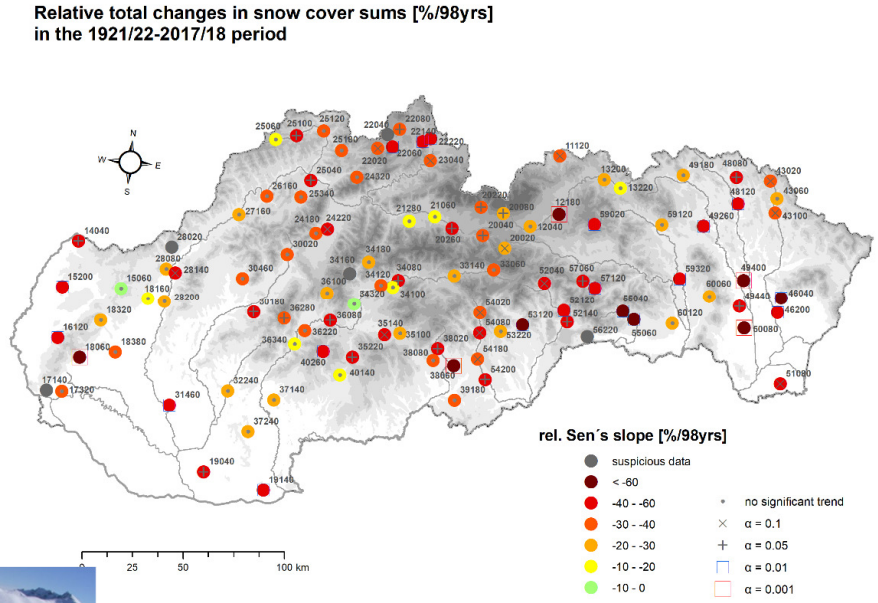
In particular, the intensities of **5 to 180 minutes of rain increase significantly**, which can be explained by the more frequent occurrence of short-term convection precipitation and, conversely, by the rarer occurrence of long-lasting (and more extensive) mostly stratiform precipitation.

Changes in temperature and precipitation conditions in winter are reflected in changes in snow conditions. **These are demonstrated both in the reduction of the number of days with snow cover and also in the decrease of the average height of snow cover**.

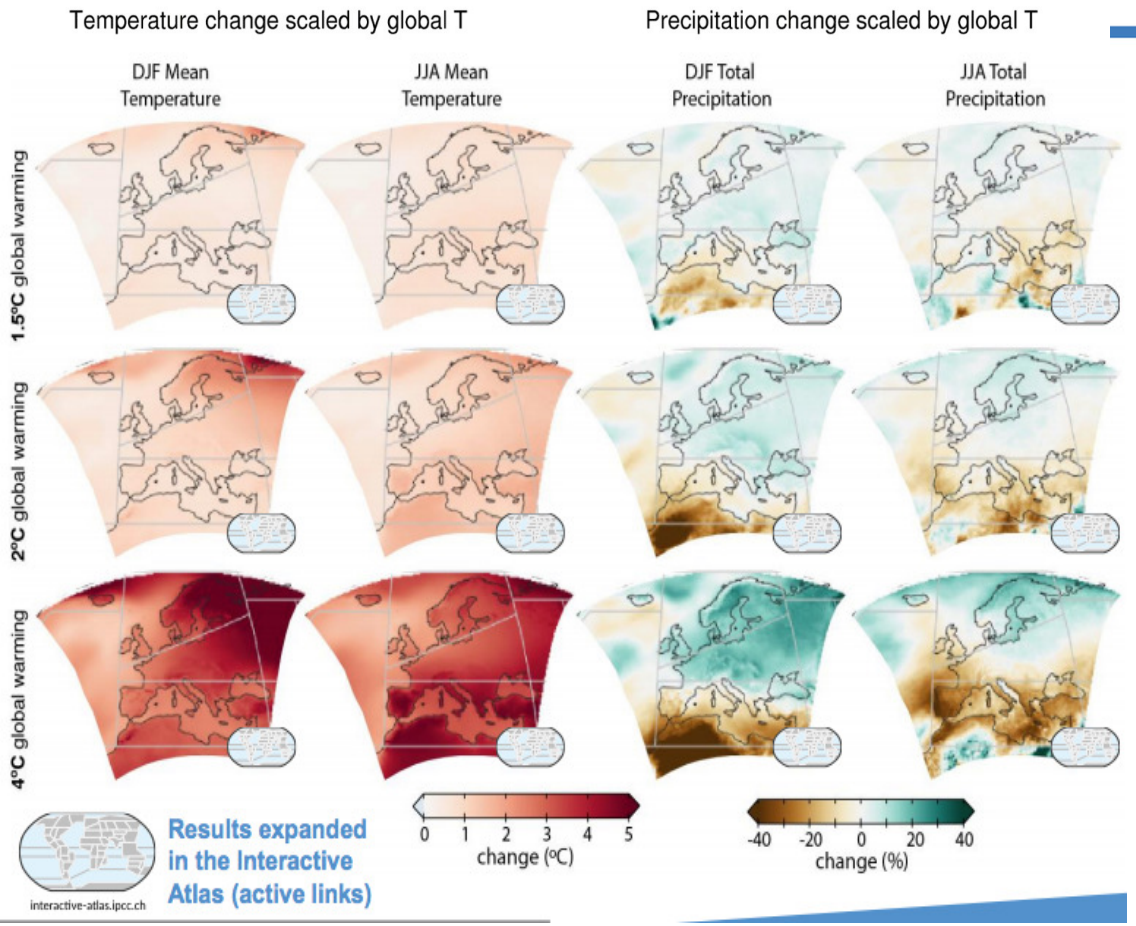
The occurrence of more extreme weather, more frequent droughts and extremely hot seasons already significantly affects all sectors of the Slovak national economy (with the necessary more frequent remediation of damages, compensation of insurance claims, etc.).

Climate change signal in Slovakia





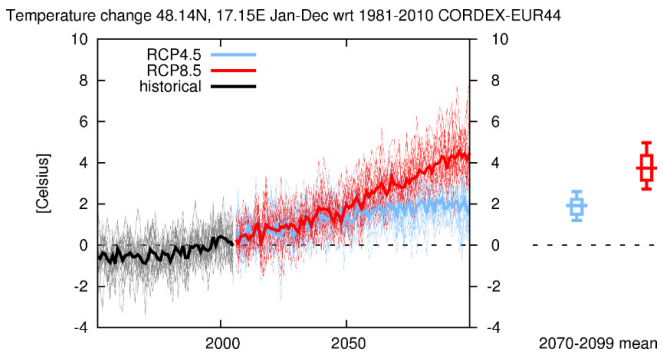
Climate change scenarios



According to the latest projections of climate models (CMIP6, which will be used in the forthcoming AR6. IPCC report), it can be expected that by the end of this century the regional rise in average annual temperature in Slovakia can reach **3.5 to 7.5 ° C compared to the present**. (compared to previous projections, there is a slight increase).

This will mean that the territory of Slovakia will climate "move" to the area of central Italy and the southern Balkans, in extremely warm years to the level of southern (continental) Turkey.

The climate in Slovakia will be significantly drier (more arid) even if the above scenarios come true, even in the northern regions of Slovakia.



Climate change impacts

TEMPERATURE

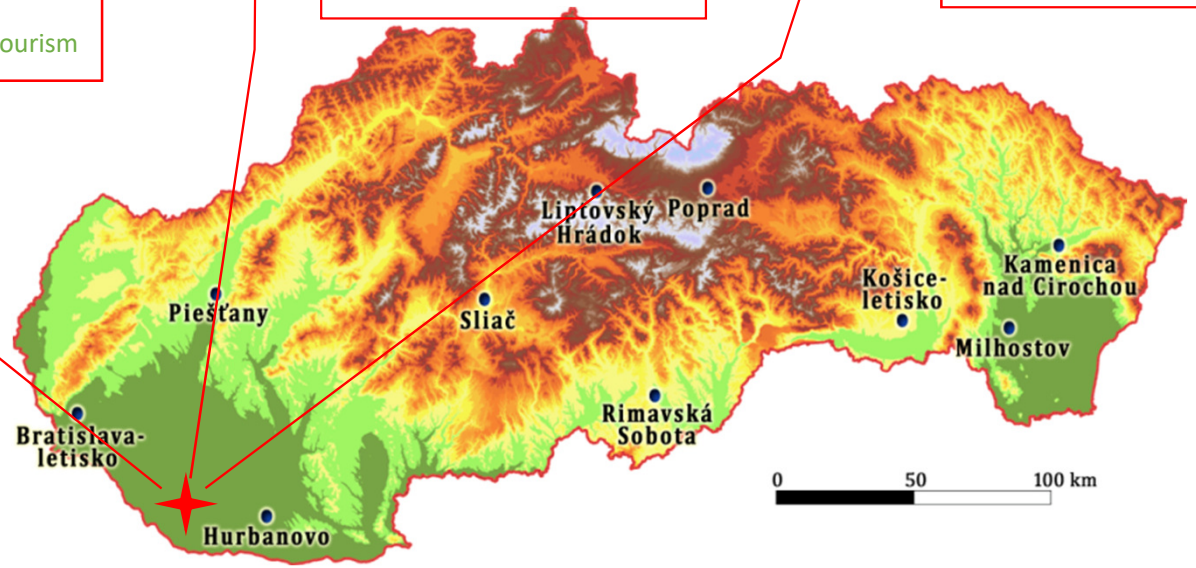
Increasing temperature stress, increasing over-mortality in the population, reducing energy demand, less availability of drinking water, eutrophication of stagnant waters, better conditions for more thermophilic plant species, improving the conditions of summer tourism

PRECIPITATION

Lack of utility and drinking water, reduction of soil production capacity, higher risk of fires, lack of food, reduction of electricity production, reducing the risk of spreading diseases, negative impacts on tourism

EXTREME WAETHER

Growth of insurance claims, increased risk of soil and crop damage, water contamination, increase in over-mortality, increased risk of disease spread, reduced food availability, negative impacts on tourism.



Thank you for your attention