



**National Hydrometeorological Service of the Republic of Kazakhstan
Scientific Research center**

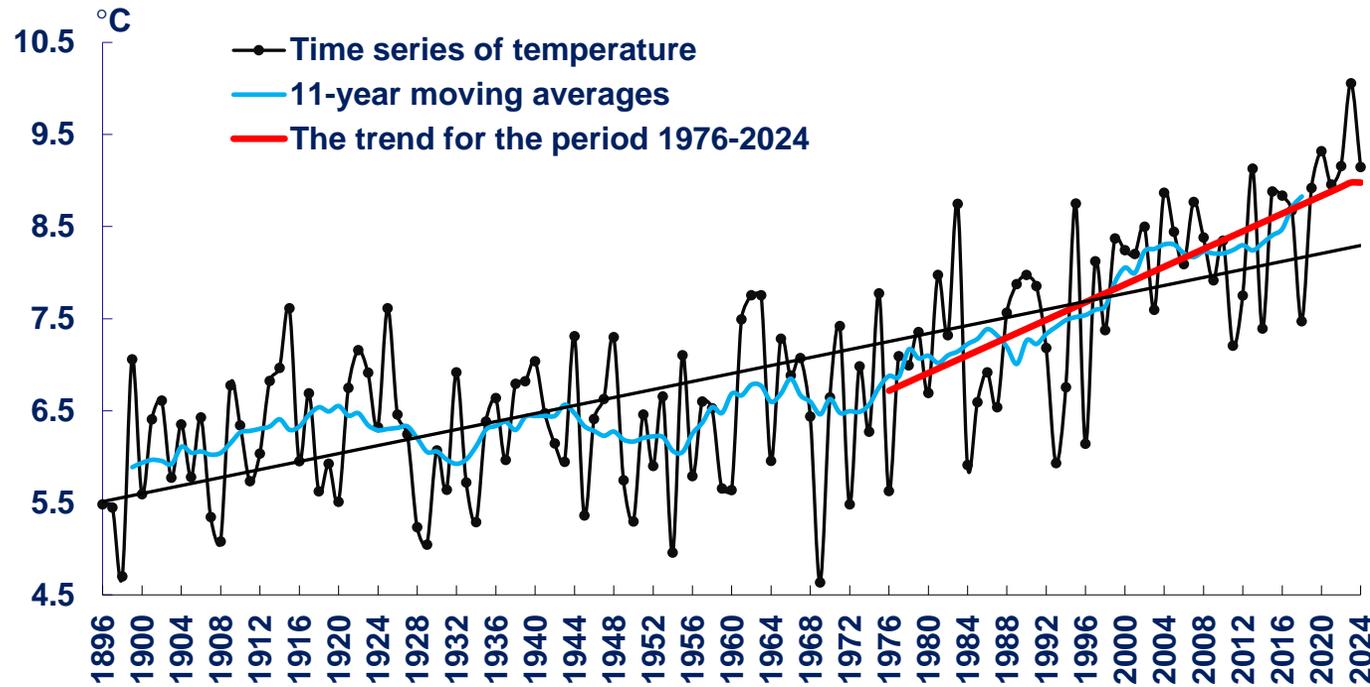
The current climate conditions and national outlook for JJAS 2025 in Kazakhstan

THE 3RD SESSION OF THE THIRD POLE CLIMATE FORUM

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Ms. Gulshat Aktayeva**

New Delhi, 2025

Kazakhstan's climate is warming faster than the global climate



Change in mean annual air temperature for the period 1894-2024, averaged over the long-row stations of the Republic of Kazakhstan

Trends in air temperature growth by season (1976-2024):

spring by **0,66 °C/10 year** summer by **0,25 °C/10 year**
 autumn by **0,28 °C/10 year** winter by **0,26 °C/10 year**

Temperature change in 1976-2024:

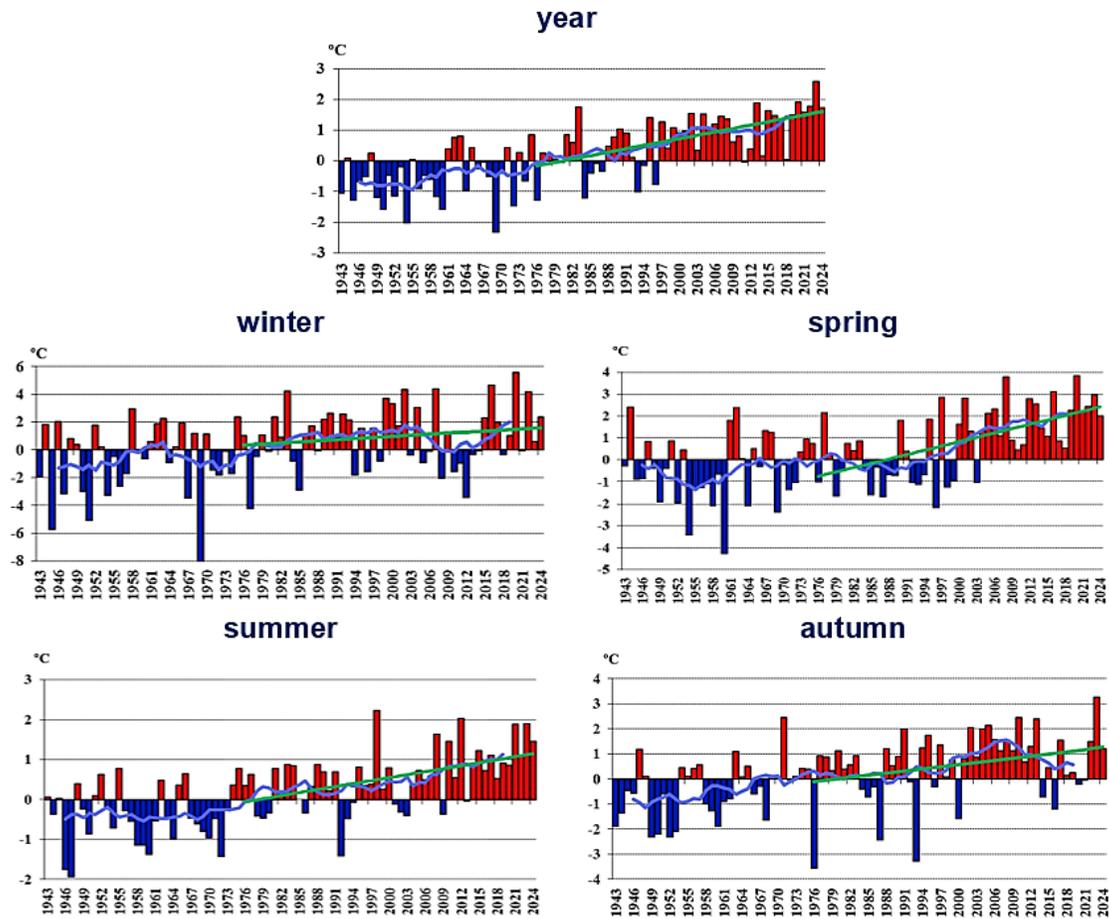
- Global scale: **0,19 °C every 10 years**
- Kazakhstan: **0,36 °C every 10 years**

10 warmest years

Year	Anomaly, °C 1961-1990	1991-202
2023	2,58	1,73
2020	1,92	1,07
2013	1,89	1,04
2022	1,78	0,92
1983	1,76	0,91
2024	1,72	0,87
2015	1,64	0,79
2021	1,58	0,73
2002	1,55	0,70
2004	1,53	0,68

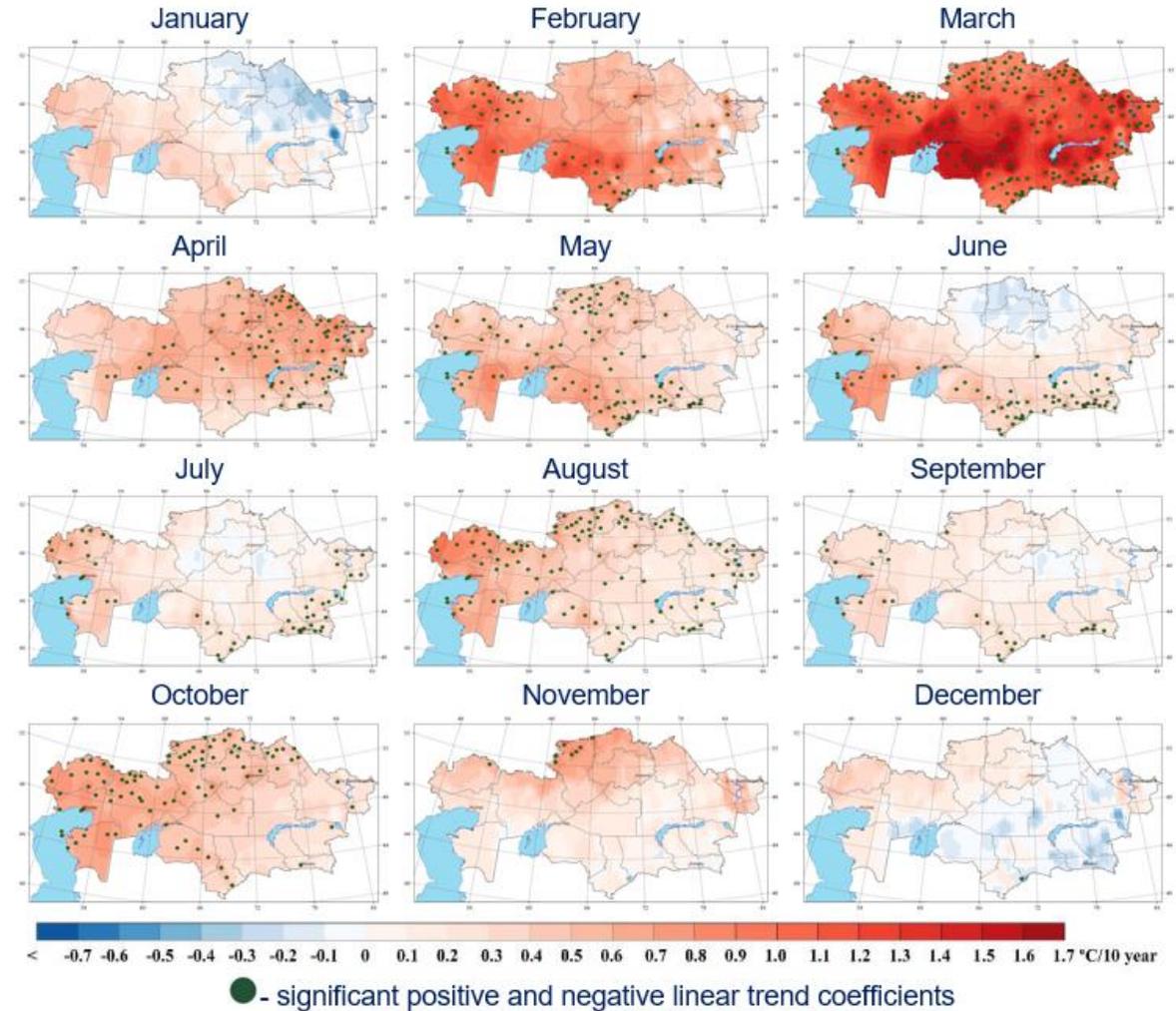


Climate change is heterogeneous across seasons, by territory and over time

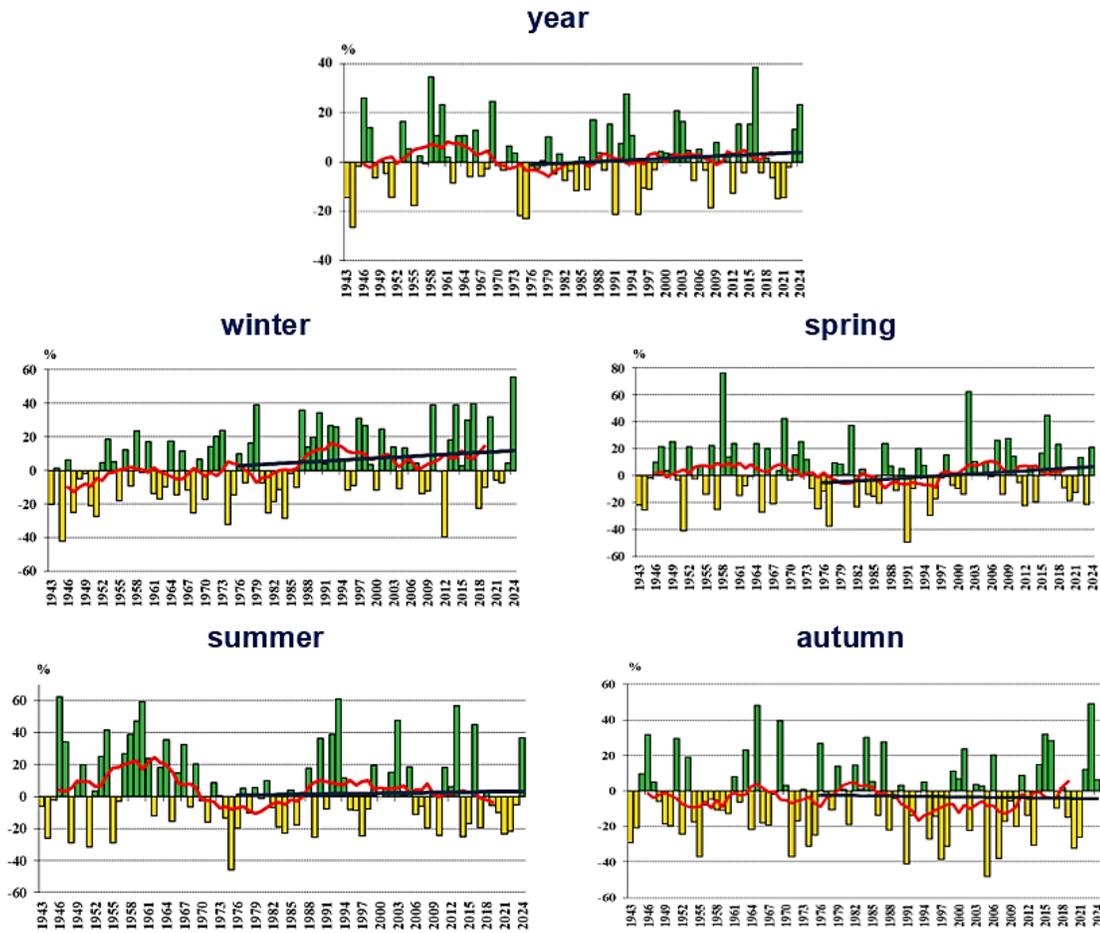


Time series of anomalies of annual and seasonal air temperatures (°C) averaged over the territory of Kazakhstan for the period 1941-2024. The anomalies are calculated relative to the base period of 1961-1990.

Air temperature change, °C/10 year, 1976-2024

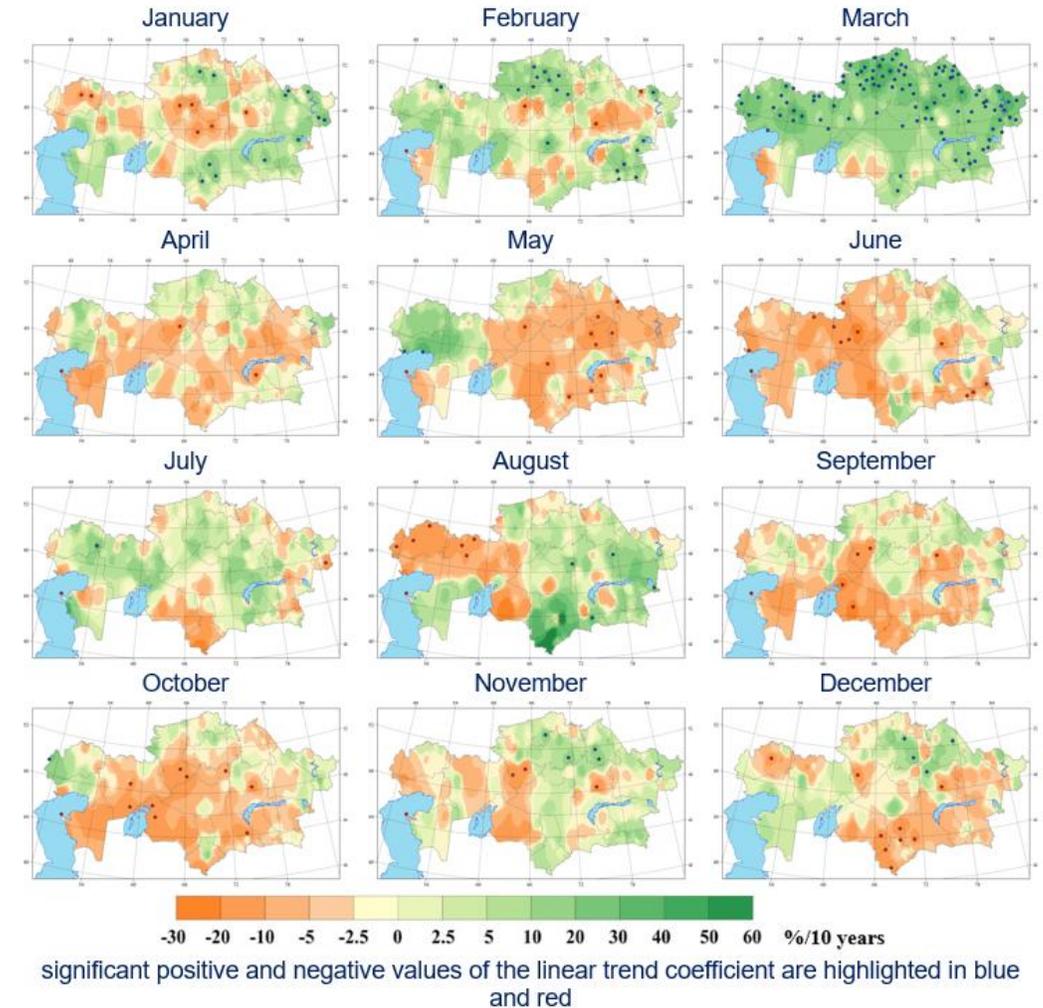


Climate change is heterogeneous across seasons, by territory and over time

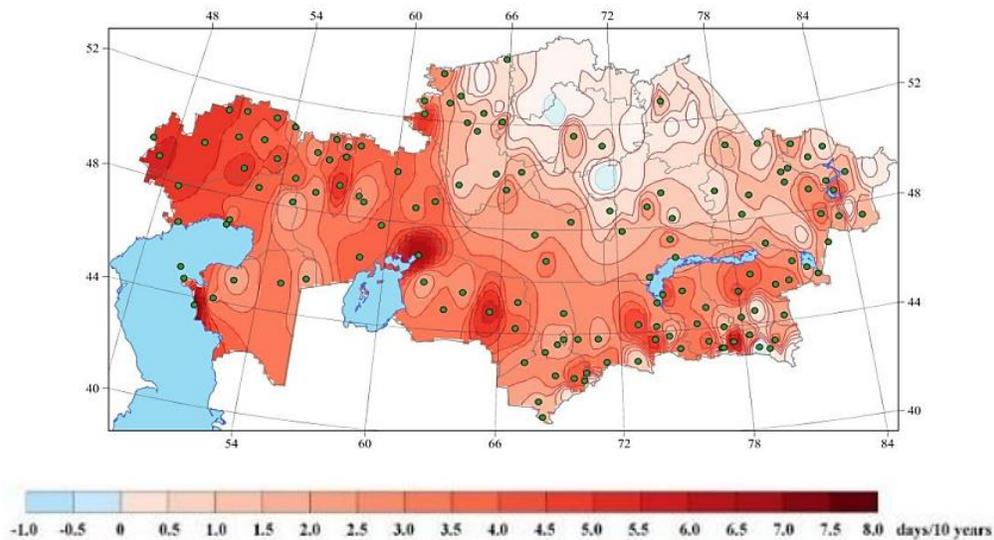


Time series of anomalies of annual and seasonal precipitation sums (%), spatially averaged over the territory of Kazakhstan for the period 1941–2024. Anomalies are calculated relative to the baseline period 1961–1990.

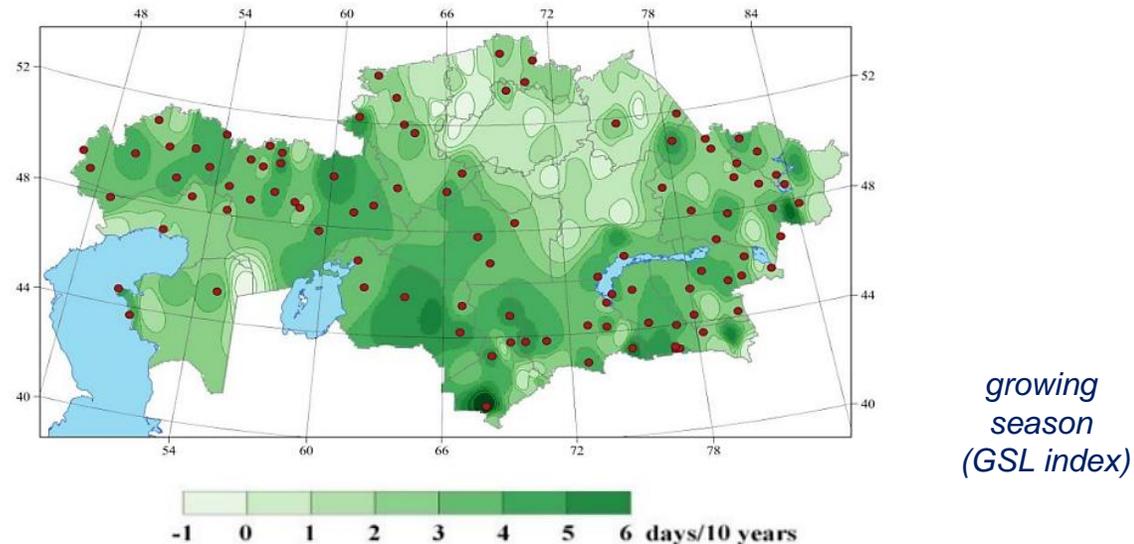
Change in precipitation, %/10 year, 1976-2024



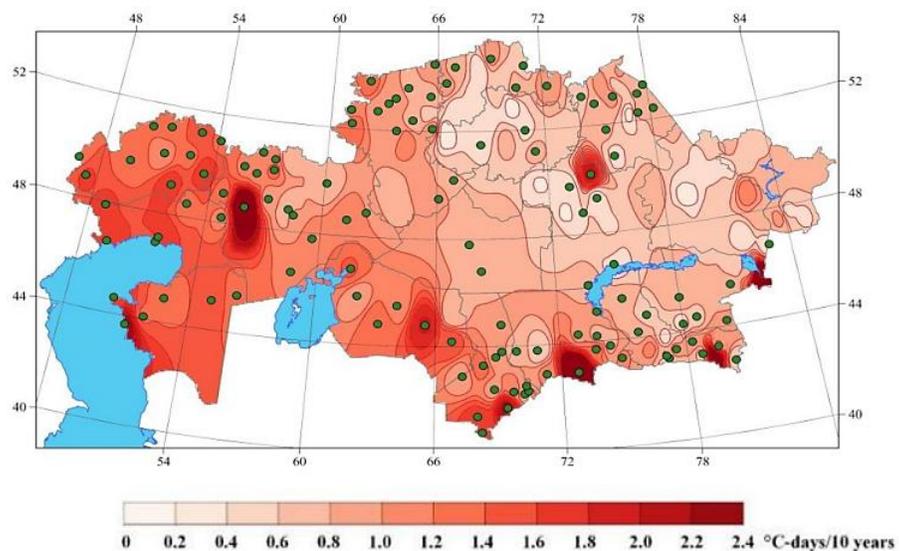
Not only the average air temperature and precipitation levels are changing, but also other characteristics of the regimes of these key climate elements



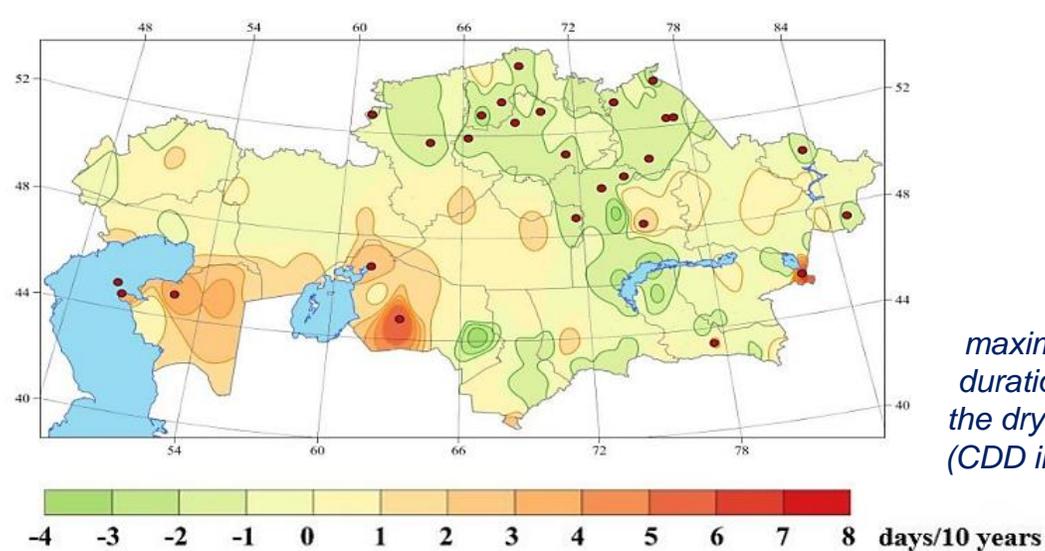
maximum daily temperature is equal to or above 30 °C (index TXge30)



growing season (GSL index)



maximum duration of heat waves during the warm period (HWD index)

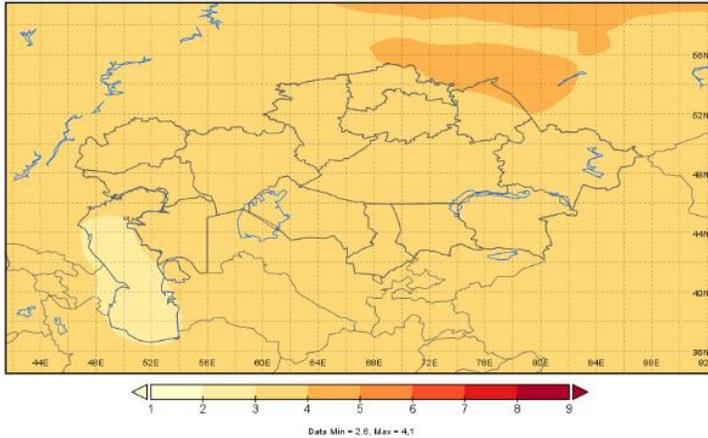


maximum duration of the dry spell (CDD index)

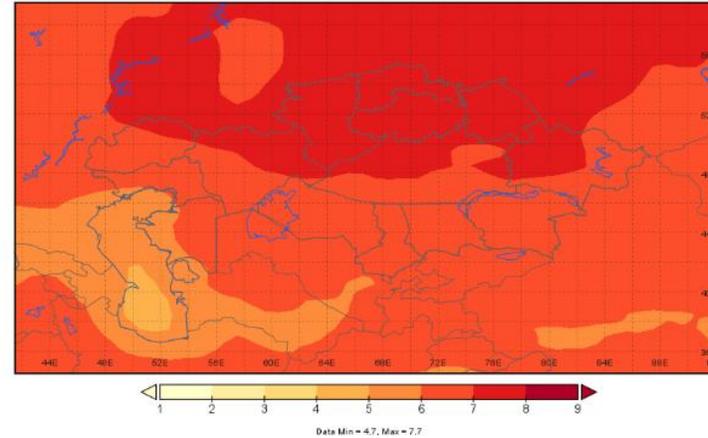
Probable climate changes in Kazakhstan by the end of the XXI century

Expected change in air temperature

SSP2-4.5

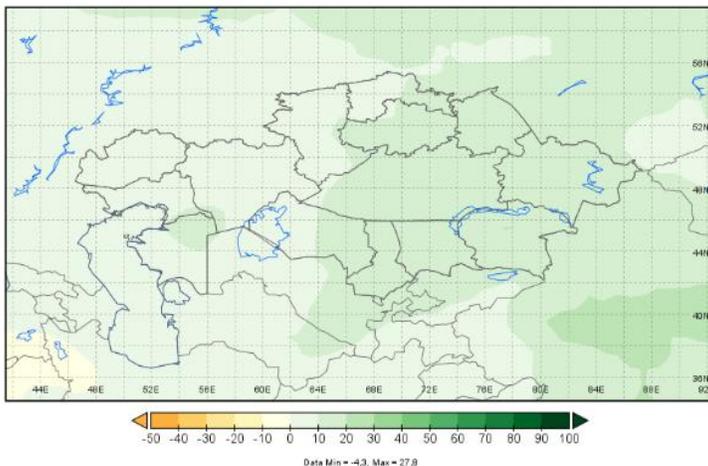


SSP5-8.5

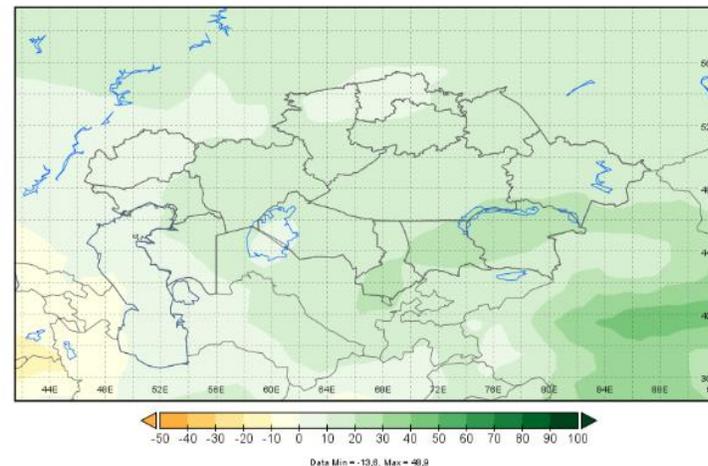


Expected change in precipitation

SSP2-4.5



SSP5-8.5



Main features of probable climate change in Kazakhstan

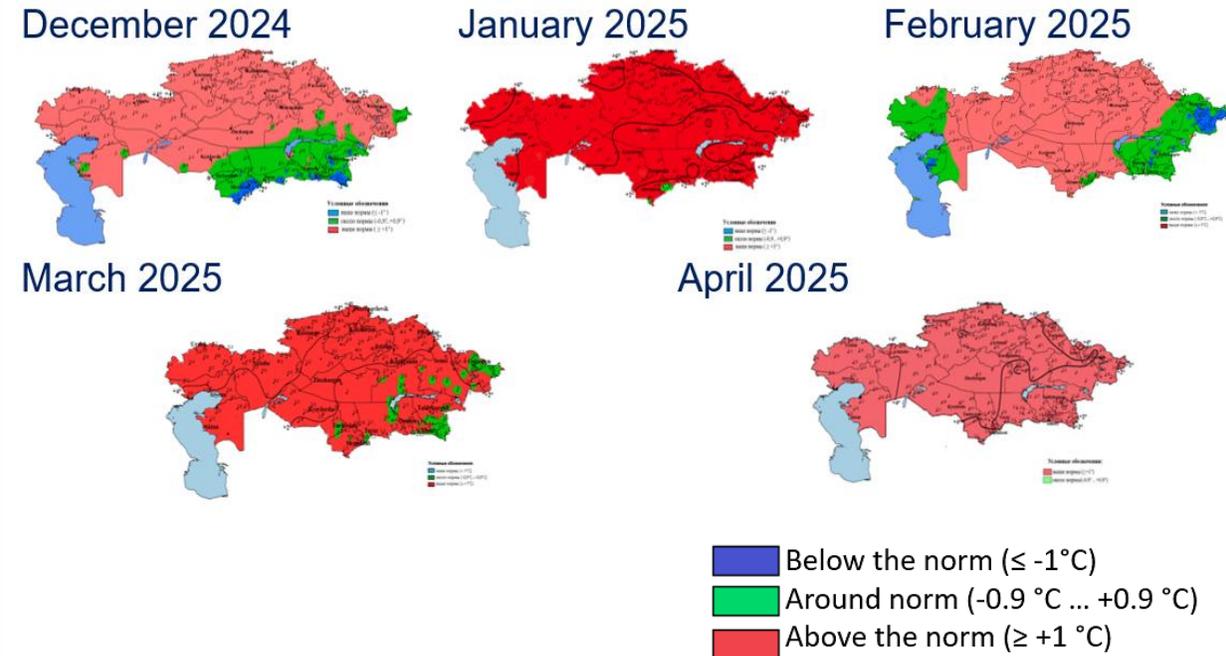
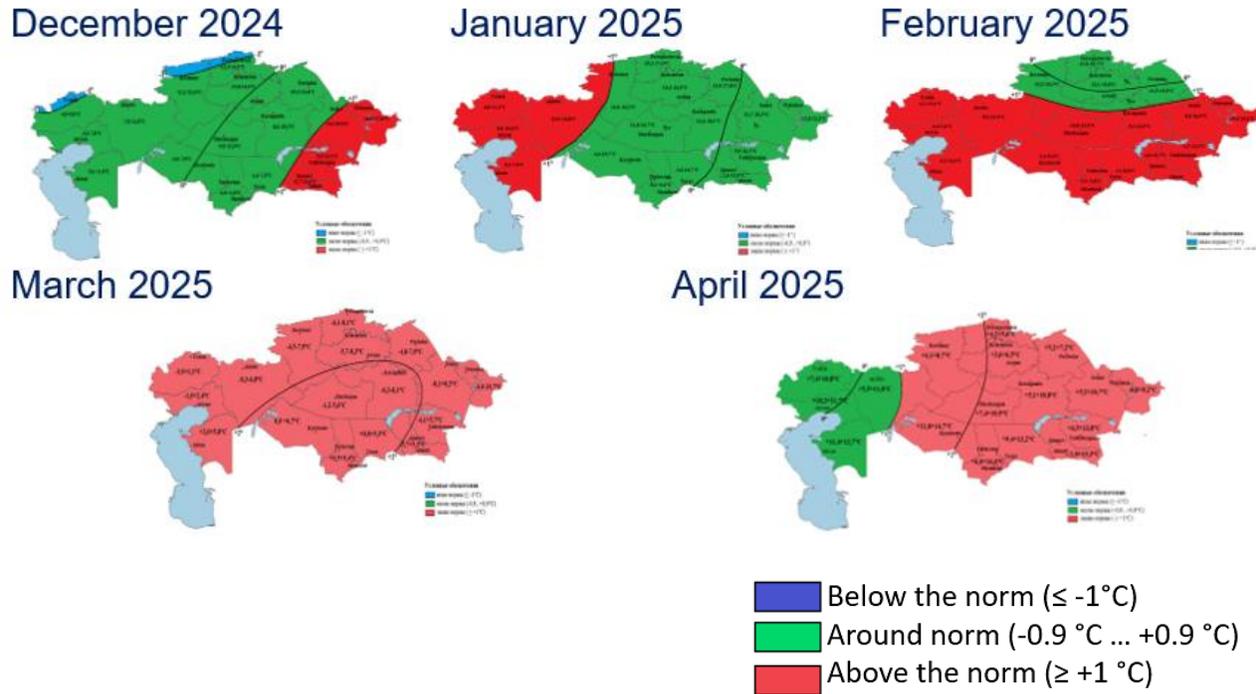
(relative to the period 1986-2005)

- Further **widespread increase in air temperature** in all seasons;
- Annual temperatures will increase: by **2.5-3.3 °C** by 2050, by **3.6-6.8 °C** by 2090;
- Increase in the number of hot days (above 35-40 °C);
- Increase in the length of the growing season;
- Decrease in the frequency of frosty days;
- Change in **annual precipitation** amounts: **increase** by 7-8 % by 2050, by 11-14 % by 2090.
- Winters will be warmer and wetter. This is especially characteristic of northern, foothill and mountainous regions
- In the summer period under the severe scenario (SSP5-8.5), a probable decrease in precipitation is expected in the southern regions.

Review of the (DJFMA 2024) season (Temperature)

advisory weather forecast

observed weather



Meteorological value	December 2024	January 2025	February 2025	March 2025	April 2025	Average
$\Delta T, \%$	71	80	55	91	84	76
Justifiability of monthly weather forecasts for the Republic of Kazakhstan						

Review of the (DJFMA 2024) season (Precipitation)

advisory weather forecast

observed weather

December 2024



January 2025



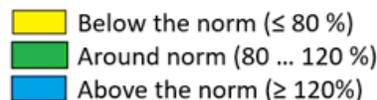
February 2025



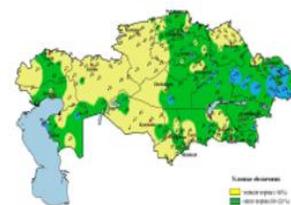
March 2025



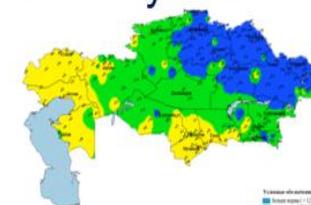
April 2025



December 2024



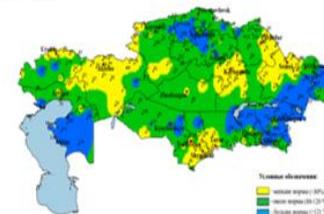
January 2025



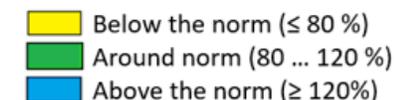
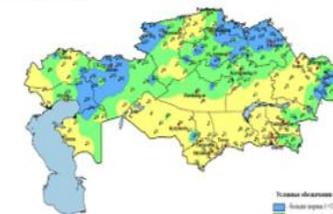
February 2025



March 2025



April 2025

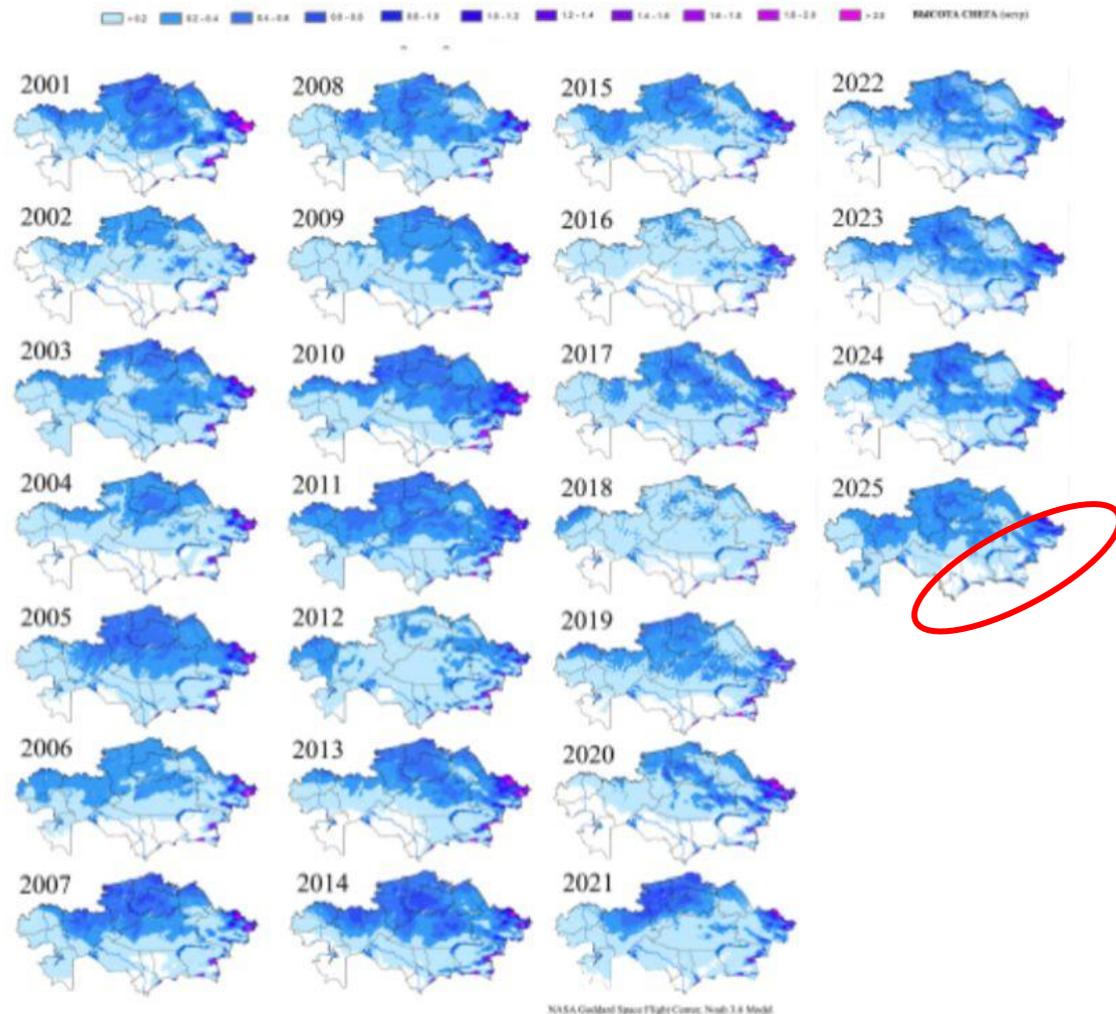


Justifiability of monthly weather forecasts for the Republic of Kazakhstan

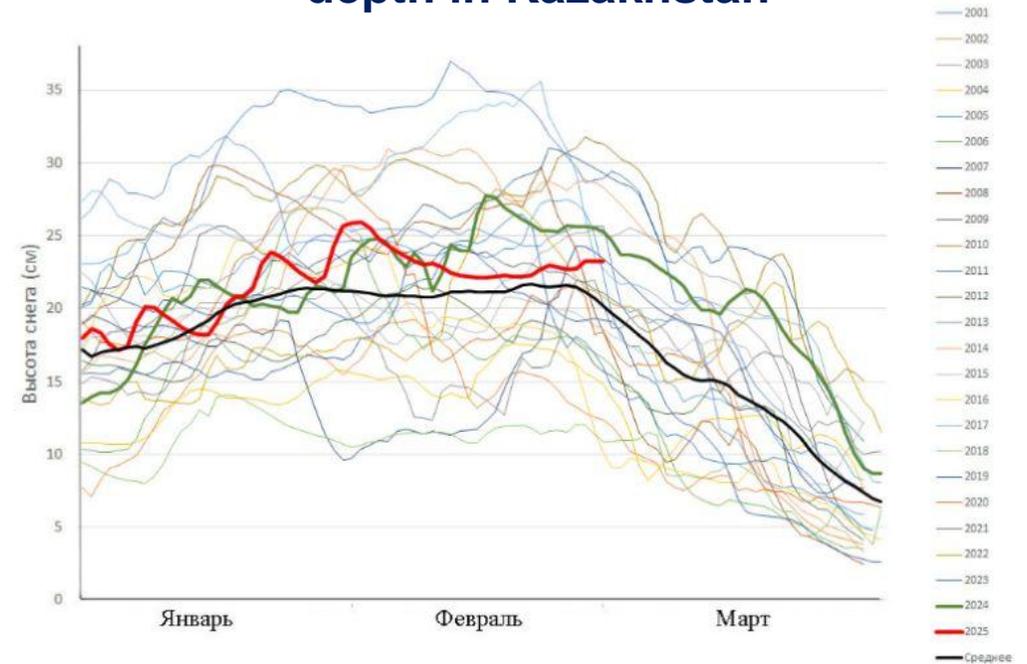
Meteorological value	December 2024	January 2025	February 2025	March 2025	April 2025	Average
$\Delta R, \%$	56	50	35	50	63	51
$\Delta R, \%$ - anomaly of atmospheric precipitation						

Snow depth in Kazakhstan (Jan-Mar 2025)

Snow depth FEWS NET USGS (2001-2025)



Daily monitoring data of average snow depth in Kazakhstan

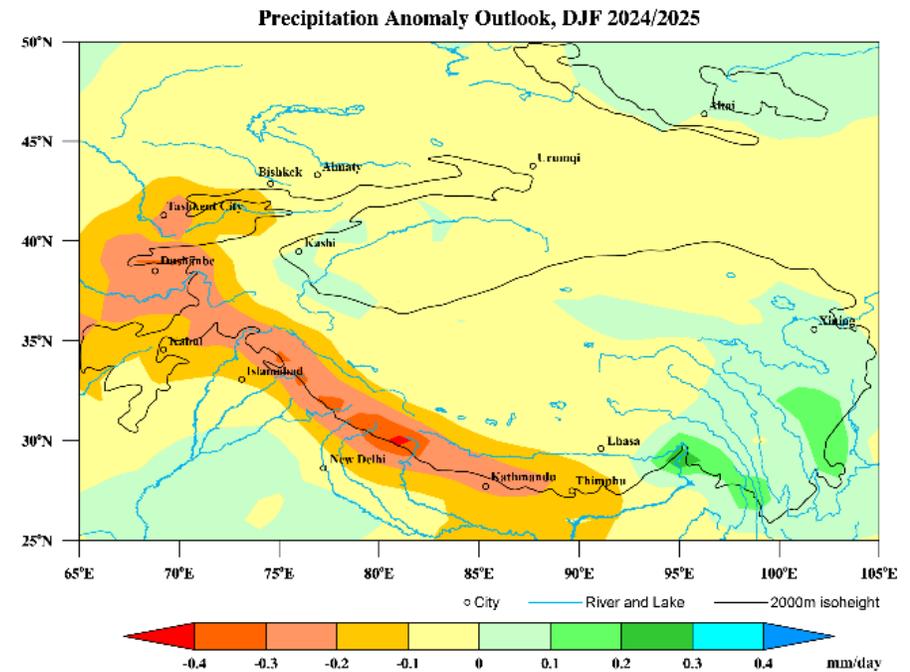
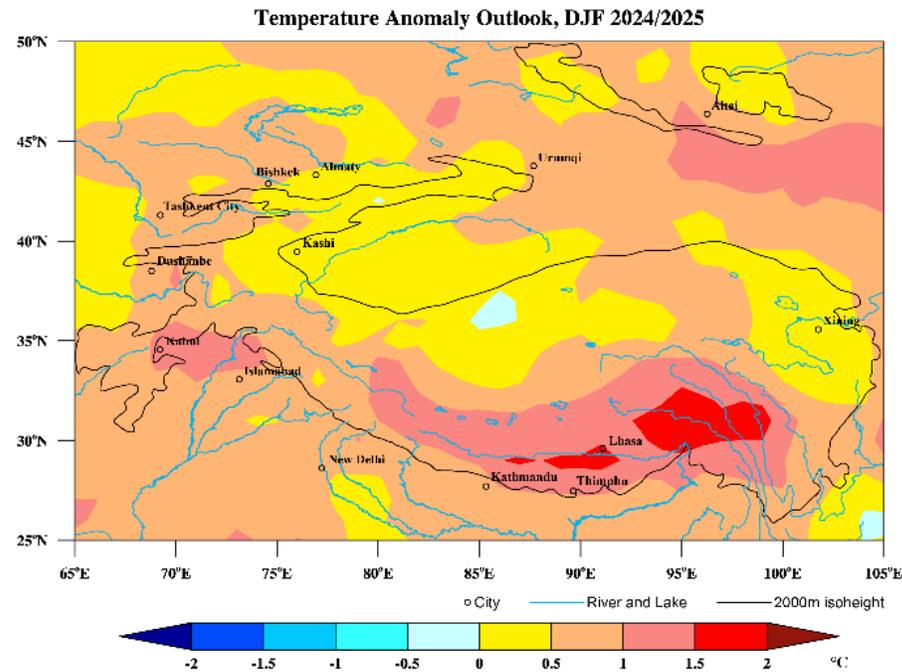


Red line – 2025

Black line – average for 2001-2024

Review of the (DJF 2024/2025) season

- ❑ The seasonal forecasts provided by meteorological models for the period demonstrated varying degrees of alignment with observed climate data across Kazakhstan.
- ❑ Preliminary analysis indicates that both temperature forecasts were generally accurate; however, the precipitation forecast based on the Multi-Model Ensemble (MME) showed less consistency with actual observations.

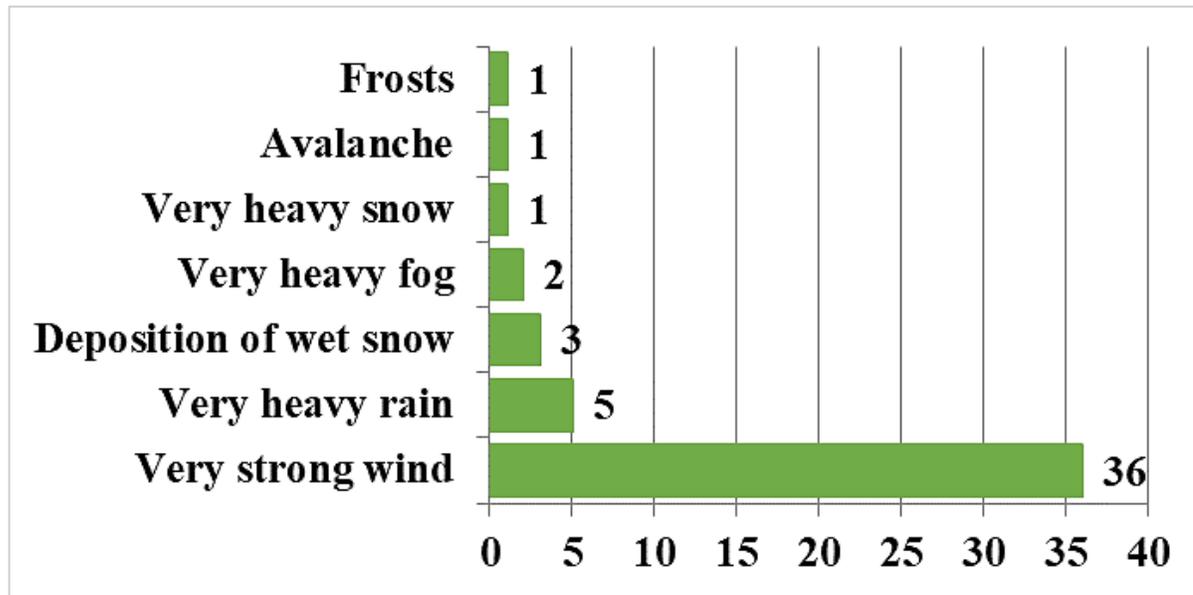


Surface Air Temperature and Precipitation anomaly, MME, DJF 2024-25 for TP region

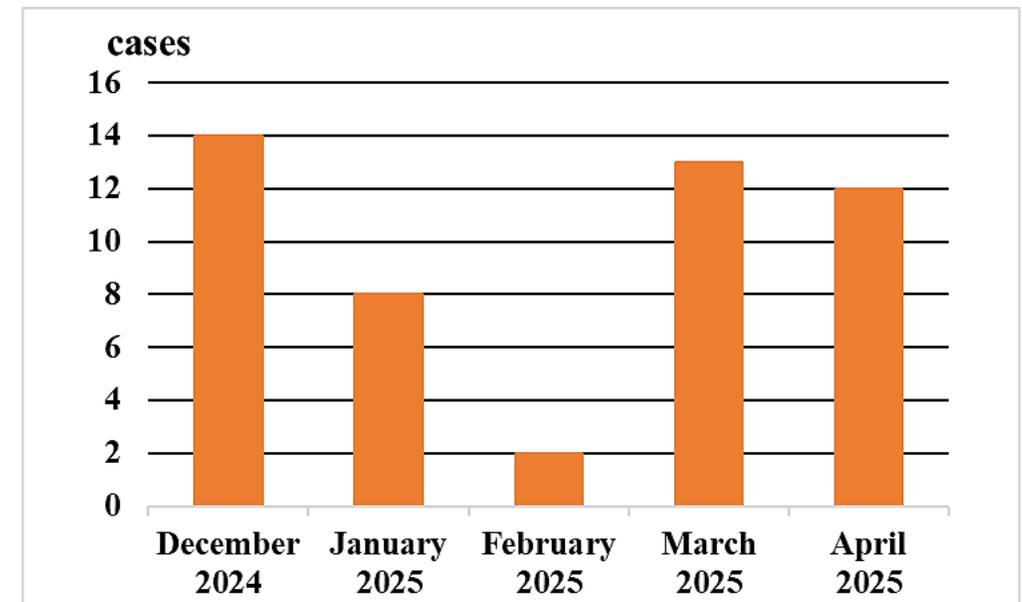
High-impact Climate Events from December 2024 to April 2025

In Kazakhstan from December 2024 to April 2025, the following dangerous hydrometeorological phenomena occurred, but did not have serious consequences for vital activities and other sectors of the economy.

distribution by type of natural hydrometeorological phenomena



distribution of hydrometeorological events by month

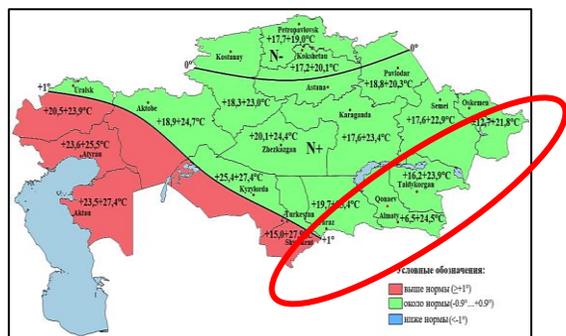


Review of the advisory weather forecast for the winter season

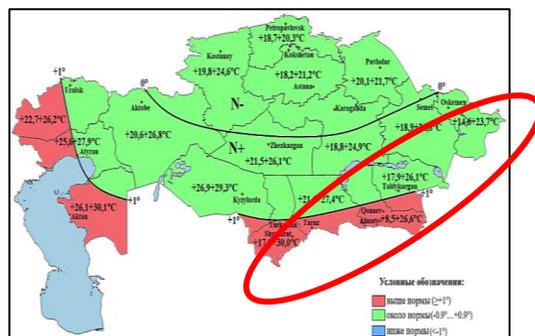
Expected deviations of the average monthly air temperature from the norm in:

Expected deviations of the average monthly precipitation from the norm in:

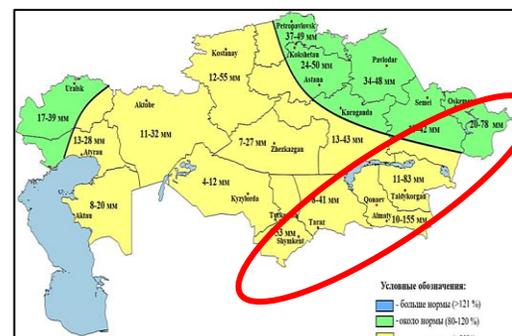
June 2025



July 2025



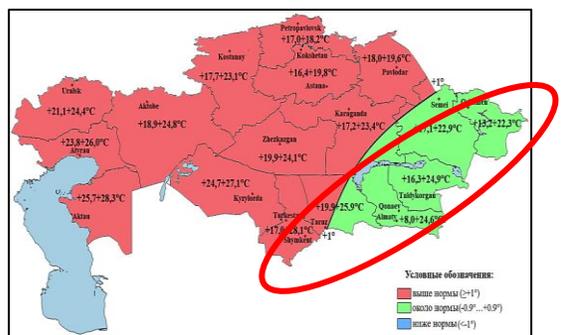
June 2025



July 2025



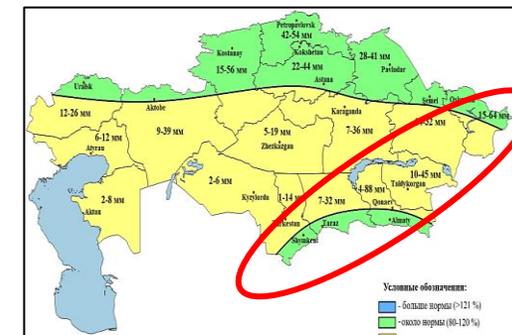
August 2025



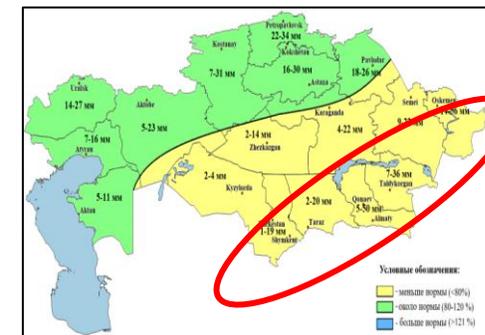
September 2025



August 2025



September 2025



- Below the norm ($\leq -1^{\circ}\text{C}$)
- Around norm ($-0.9^{\circ}\text{C} \dots +0.9^{\circ}\text{C}$)
- Above the norm ($\geq +1^{\circ}\text{C}$)

- Below the norm ($\leq 80\%$)
- Around norm ($80 \dots 120\%$)
- Above the norm ($\geq 120\%$)

A warm summer is expected, with air temperatures **around or above the climatic norm**.

In the summer season precipitation **below and around the norm is expected**.

Thank you for your attention!