Annex

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Assessment of the SEECOF-27 Climate Outlook for Slovenia for the summer season 2022

SEECOF-27 Climate Outlook for Slovenia for the summer season 2022

The consensus statement of SEECOF-27 climate outlook for the 2022 summer season emphasized that observed sea surface temperatures and forecast for the coming three months of the summer 2022 showed moderate la Niña conditions and negative Indian Ocean Dipole, while positive anomalies were taking place in the equatorial Atlantic. Most models showed a typical atmospheric response to la Niña conditions, with good agreement for a negative PNA pattern. Over the Atlantic a majority of models favoured NAO+ and EA+ scenarios, so zonal circulation was expected to predominate. Soil was dry over north-western parts of the domain, which was associated with an enhancement of heat waves.

The consensus was, that in entire SEECOF region summer temperature was likely to be above-normal, with the probability increasing from the northern and north-eastern region (Zone 2 in Figure 1) to the remainder of the region (Zone 1 Figure 1). For Slovenia, the probabilities for below-, near- and above-normal temperature were estimated to be 10, 20 and 70 %.

Uncertainties in regional predictions are higher for precipitation than for temperature. The consensus was that most of the Ukraine was likely to experience below- or near-normal conditions in terms of summer precipitation sums. Most of the SEECOF region would receive below-normal precipitation sums with the probabilities increasing from the north-west (Zone 1 in Figure 2) towards east of the region (Zone 3 in Figure 2). For Slovenia that meant probabilities of 50, 30 and 20 % for below-, near- and above-normal precipitation.

It was noted that certain parts of the countries, particularly mountain regions might receive near- or above-normal summer precipitation totals due to the episodes of enhanced convection accompanied by heavy precipitation. Due to dry season masking, it was not possible to forecast summer precipitation totals along the eastern coasts of Eastern Mediterranean, Crete, Israel and Jordan.

Figures 1 and 2 show the probabilistic consensus forecast for tercile categories of anomalies of seasonal temperature and precipitation, relative to the period 1981–2010.

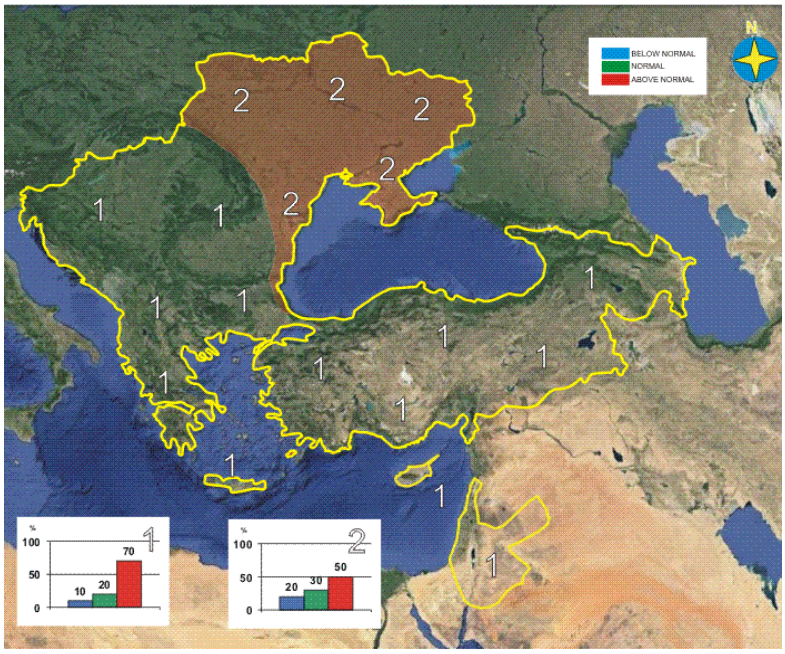

Figure 1. Graphical presentation of the summer 2022 temperature outlook

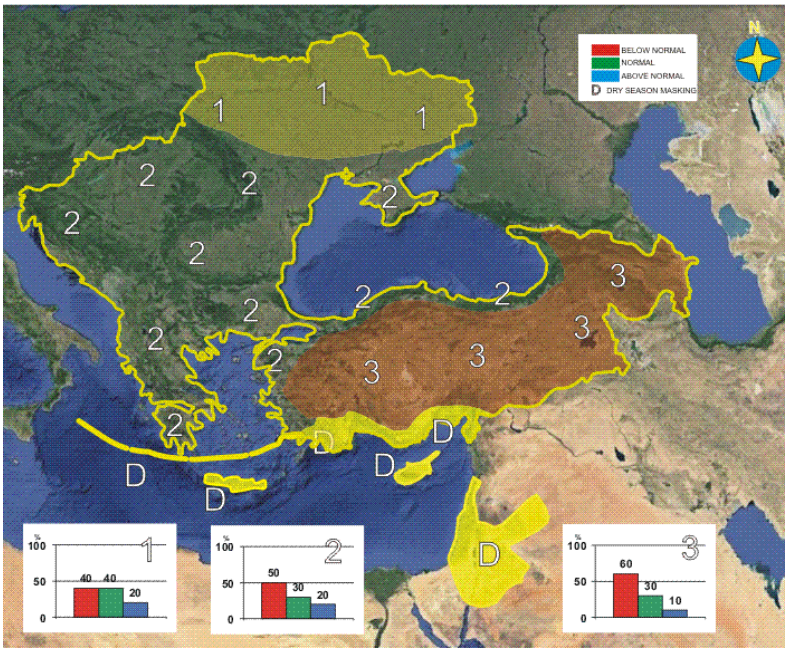

Figure 2. Graphical presentation of the summer 2022 precipitation outlook

Analysis of the summer season 2022

Average air temperature in Slovenia in summer 2022 was above the average of the 30-year period 1981–2010 in whole country (Figure 3). Corresponding air temperature anomalies for summer 2022 (months June, July and August) were between 1.9 °C and 4.4 °C, average anomaly was 2.8 °C (surface weighted average value). In the western and central part of the country the anomalies were above 3°C, decreasing towards east, north-east and south-east where the anomalies were between 1.5 and 2.0 °C. Summer 2022 has been the second warmest since at least 1950.

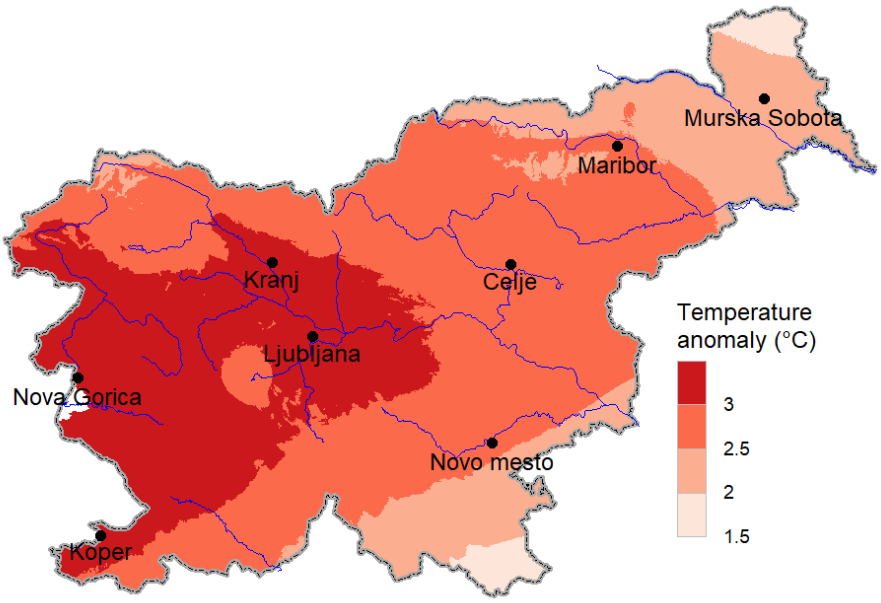

Figure 3. Mean air temperature anomaly in Slovenia in summer 2022, relative to the 1981–2010 average. Data are from 34–35 meteorological stations.

According to tercile ranks, thermal conditions in Slovenia in summer 2022 were above normal in the whole country (Figure 4).

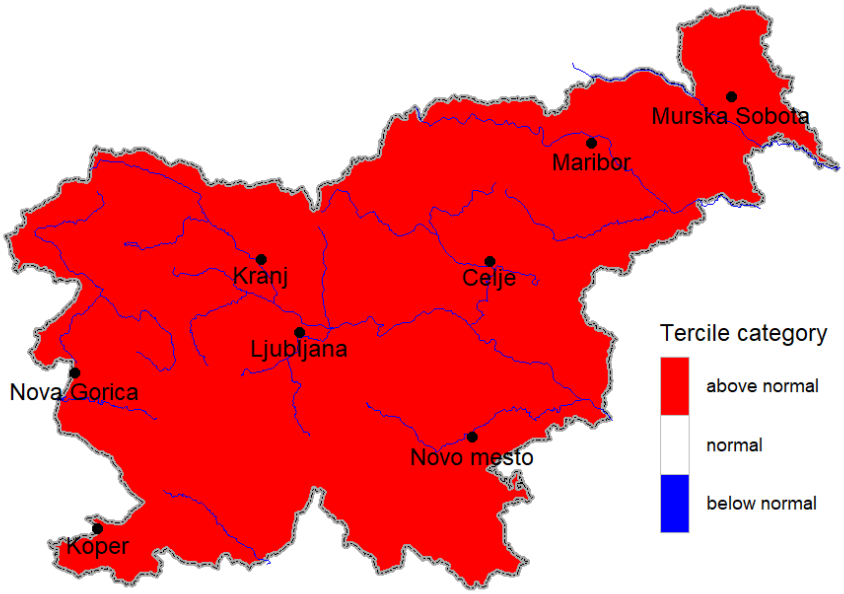

Figure 4. Mean air temperature tercile category of anomaly in Slovenia in summer 2022, relative to the period 1981–2010. Data are from 34 meteorological stations.

Precipitation in summer is usually very heterogeneous due to its convective nature. Precipitation index in Slovenia in summer 2022 was below average in whole country (Figure 5). Precipitation index was within the range from 25 % to 103 %, with surface weighted average value of 59 %. It was especially dry in the central and western half of Slovenia, where the precipitation index was between 20 and 60 %. Summer 2022 has been

among the three driest since 1961 at the national level, however it was by far driest summer at some stations in central and western Slovenia.

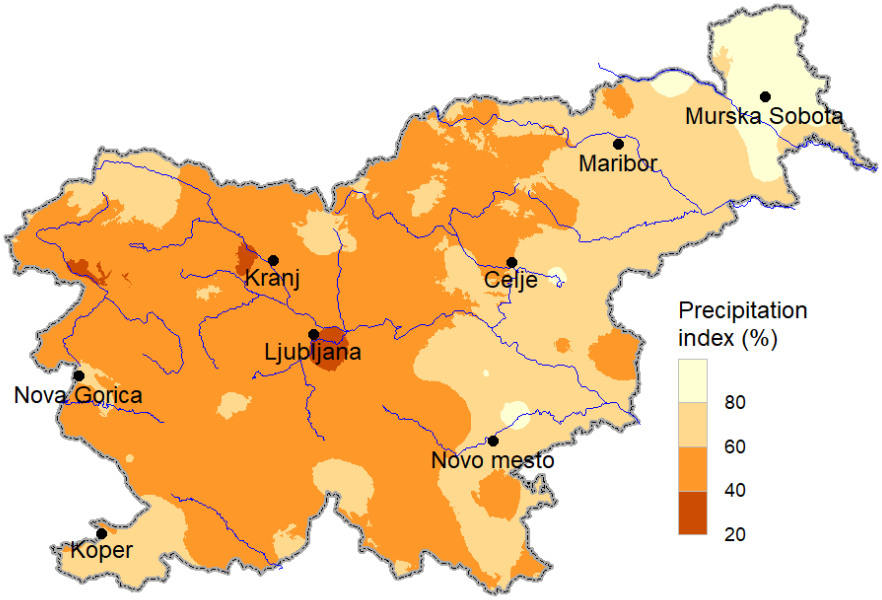

Figure 5. Precipitation index in Slovenia in summer 2022, relative to the 1981–2010 average. Data are from 156–157 meteorological stations.

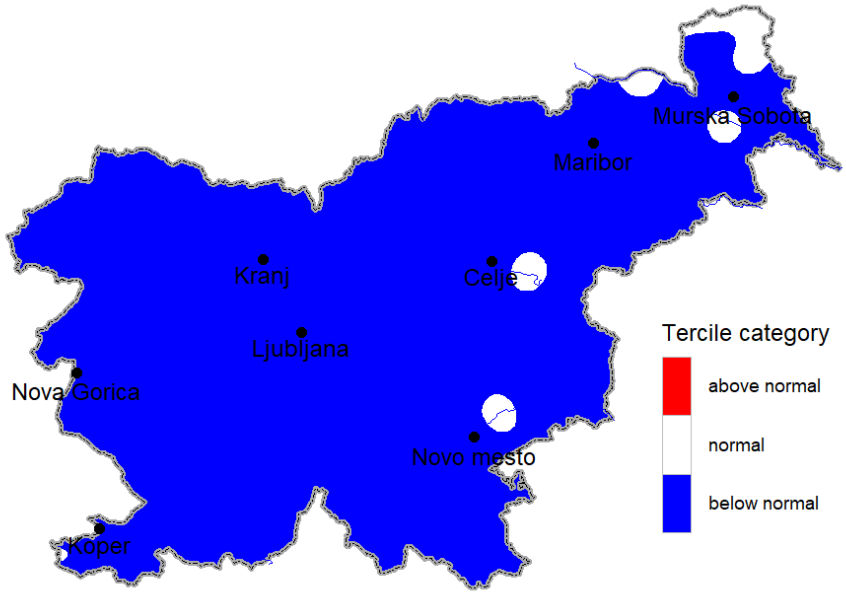

Figure 6. Precipitation tercile category of anomaly in Slovenia in summer 2022, relative to the period 1981–2010. Data are from 156 meteorological stations.

According to this, the precipitation was within the first tercile (below-normal) in major part of Slovenia (95 % of meteorological stations) and within the second tercile (normal) only in a few points (5 % of all stations) (Figure 6).

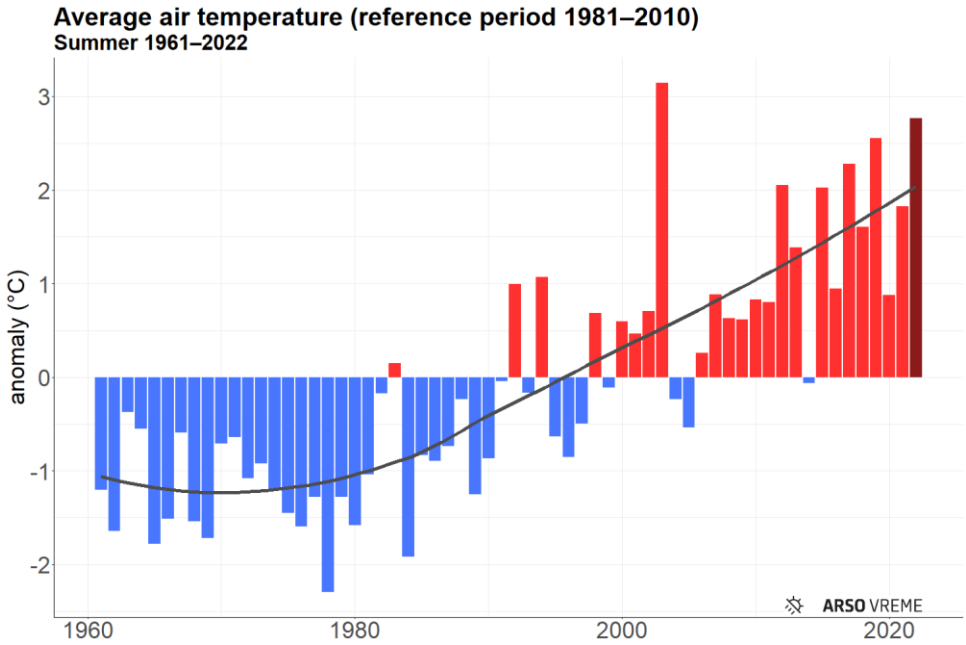

Figure 7. Summer mean air temperature anomaly in Slovenia in the period 1961–2022, relative to the 1981–2010 average. Summer 2022 is marked with dark red colour.

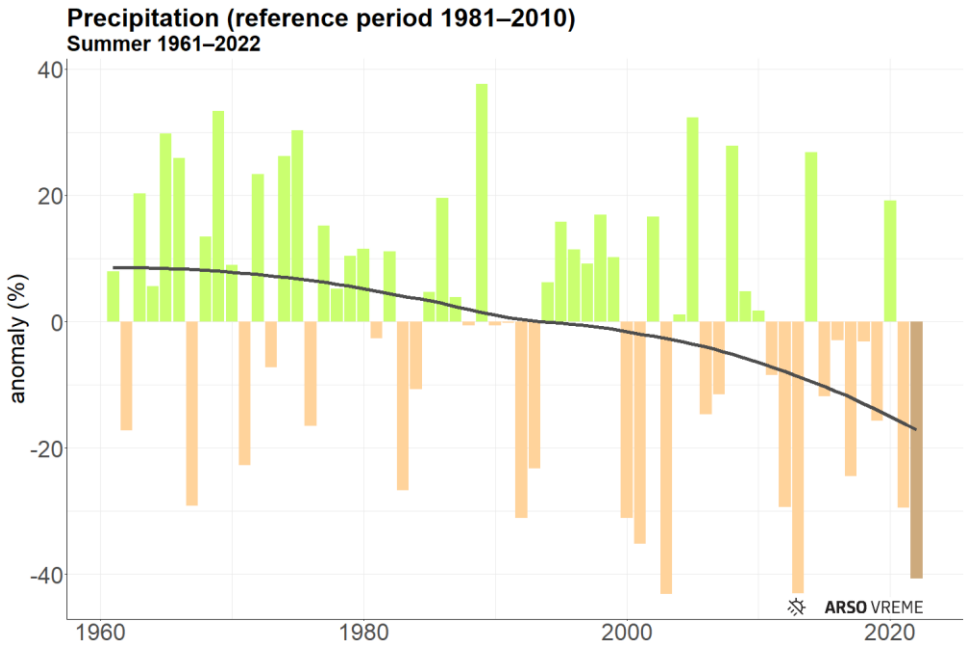

Figure 8. Summer precipitation anomaly in Slovenia in the period 1961–2022, relative to the 1981–2010 average. Summer 2022 is marked with dark brown colour.

Since 2001 there have been 19 summers with positive and only three with negative temperature anomaly, but negative anomalies have been much smaller than positive (Figure 7). The record as the warmest summer still holds the summer 2003 with temperature anomaly 3.1 °C, summer 2022 has been the second warmest since 1961 and thus overtook the summer 2019. Linear summer temperature trend in the period 1961–2022 of 0.5 °C/decade is statistically significant. Summer precipitation index has statistically significant negative trend of approximately –4%/decade. There have been 14 summers with below-average precipitation index since 2001 (Figure 8).

June 2022 was very hot. Average air temperature was well above the average of the 30-year period 1981–2010 in whole country. Air temperature anomalies were between 2.8 °C and 5.1 °C (Figure 9), average anomaly was 3.7 °C (surface weighted average value). It has been the third warmest June since at least 1950. According to tercile ranks, thermal conditions in Slovenia were above-normal everywhere.

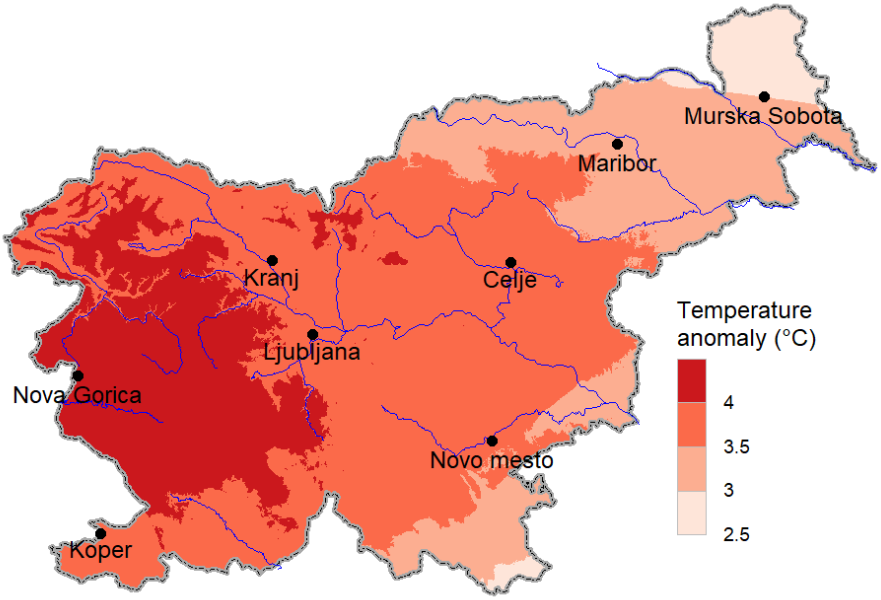

Figure 9. Mean air temperature anomaly in Slovenia in June 2022, relative to the 1981–2010 average. Data are from 35 meteorological stations.

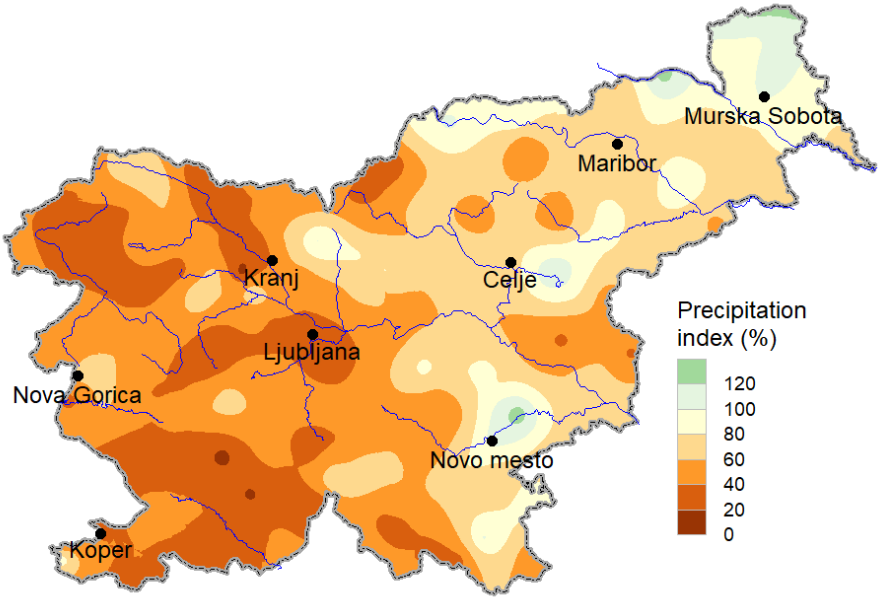

Figure 10. Precipitation index in Slovenia in June 2022, relative to the 1981–2010 average. Data are from 156 meteorological stations.

June 2022 was very dry, except in some south-eastern and north-eastern parts of the country. It has been among the eight driest Junes since 1961. Precipitation index was below average

everywhere, except some smaller areas in south-east and north-east (Figure 10). It was within the range from 15 % to 132 %, its average value was 59 % (surface weighted average value). Precipitation index was within first (below normal) tercile almost everywhere, except in some south-eastern and nort-eastern parts of the country where it was within second (average) or third (above normal) tercile.

Average air temperature in *July 2022* was above the multi-annual average of the 30-year period 1981–2010 in whole Slovenia. Anomalies were between 1.2 °C and 4.8 °C (Figure 11), their average value was 2.5 °C (surface weighted average value). It has been the second warmest July since at least 1950. According to tercile ranks, thermal conditions in Slovenia were above normal everywhere.

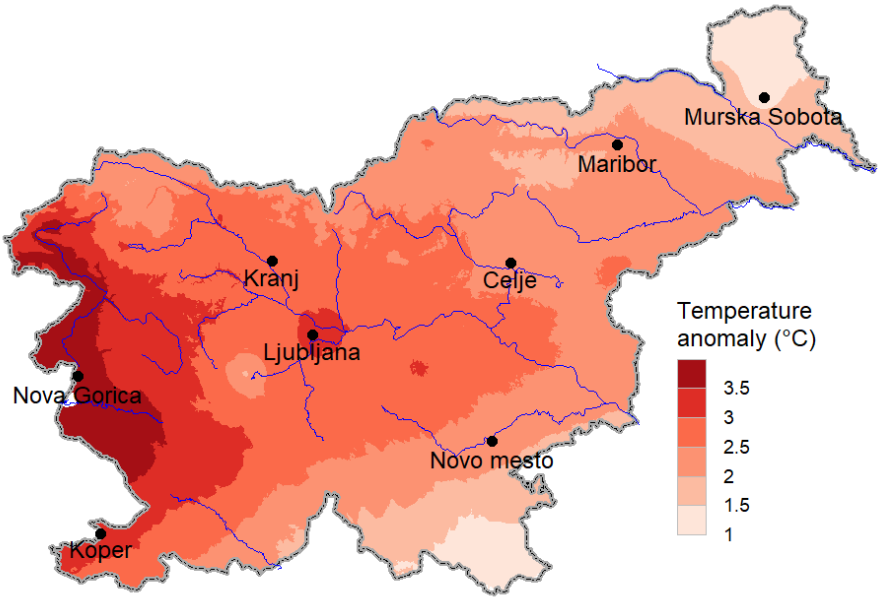

Figure 11. Mean air temperature anomaly in Slovenia in July 2022, relative to the 1981–2010 average. Data are from 35 meteorological stations.

July 2022 was very dry, too (Figure 12). The precipitation index was within the range from 13 % to 125 %, its average value was 63 % (surface weighted average value). It has been the fifth driest July since 1961. The precipitation index was within the first (below-normal) tercile in most of the country, within the second (normal) tercile in the south and parts of the east and north-east, and above-normal only in some points.

August 2022 temperature was above average. Air temperature anomalies were between 1.1 °C and 3.3 °C (Figure 13), the average anomaly was 2.1 °C (surface weighted average value). It has been among the seven warmest since at least 1950. According to tercile ranks, thermal conditions in Slovenia were above-normal.

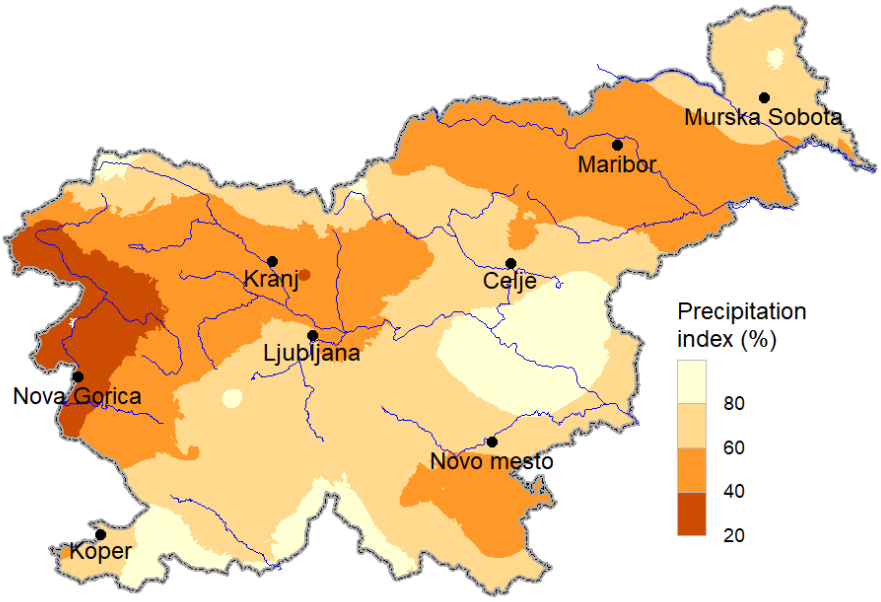

Figure 12. Precipitation index in Slovenia in July 2022, relative to the 1981–2010 average. Data are from 157 meteorological stations.

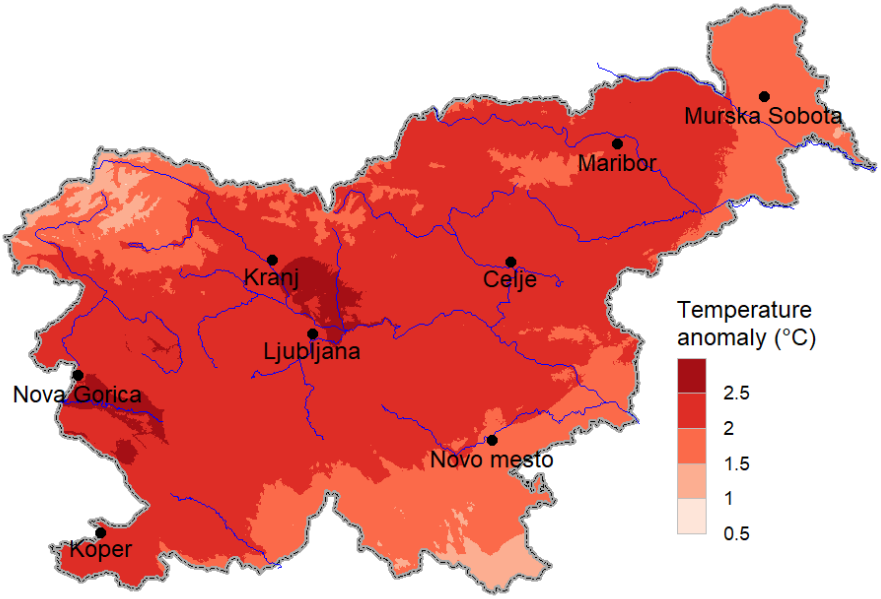

Figure 13. Mean air temperature anomaly in Slovenia in August 2022, relative to the 1981–2010 average. Data are from 35 meteorological stations.

Precipitation index in *August 2022* was below average almost everywhere, except in the small area in the north-east where it was above-average (Figure 14). Precipitation index was within the range from 16 % to 147 %, its average value was 57 % (surface weighted average value). In the most of the country the precipitation was within the first (below-average) tercile, within second (normal) in the south-west and north-east and within third (above-normal) tercile in the small area in the north-east only.

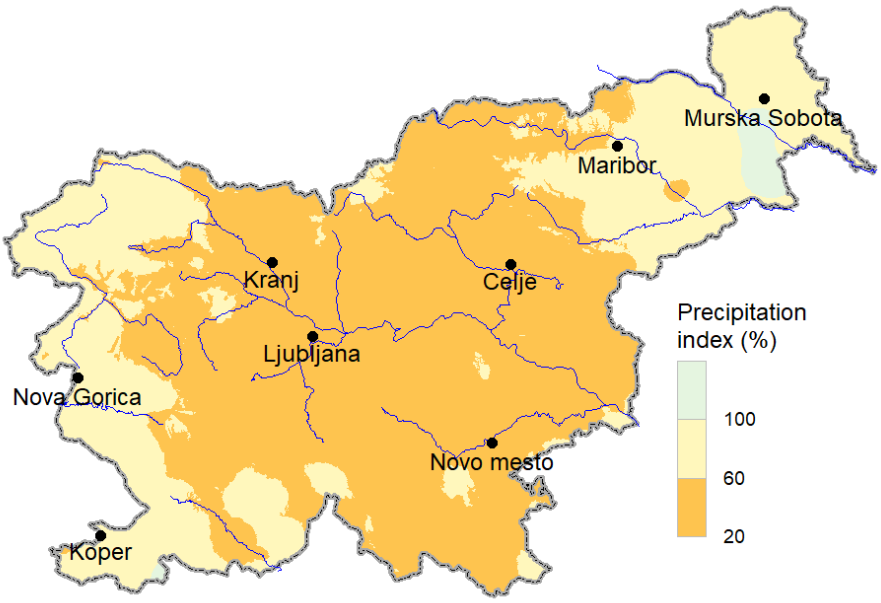

Figure 14. Precipitation index in Slovenia in August 2022, relative to the 1981–2010 average. Data are from 157 meteorological stations.

The summary for summer 2022 and monthly (June, July and August) temperature and precipitation conditions can be found in Table 1.

Table 1. The summary for summer 2022 temperature and precipitation in Slovenia

SLOVENIA	Temperature anomaly, relative to the period 1981–2010	Average temperature anomaly	Precipitation index, relative to the period 1981–2010	Average precipitation index
June 2022	2.8 to 5.1 °C	3.7 °C	15 to 132 %	59 %
July 2022	1.2 to 4.8 °C	2.5 °C	13 to 125 %	63 %
August 2022	1.1 to 3.3 °C	2.1 °C	16 to 147 %	57 %
Summer 2022	**1.9 to 4.4 °C**	**2.8 °C**	**25 to 103 %**	**59 %**

High Impact Events

Highlights for the summer 2022 in Slovenia:

- Temperature above average, the second warmest summer since at least 1950,
- Very hot June, the third warmest since at least 1950, very hot July, the second warmest since at least 1950, hot August, among the seven warmest since at least 1950,
- Precipitation below average, the third driest summer since 1961, the driest in some weather stations in central and west Slovenia,

- Very dry June, the eighth driest since 1961, very dry July, the fifth driest since 1961, dry August.

Most noticeable high impact events:

- Drought/Dry spell from approx. 28 April to 7 September in all country, especially in central and western Slovenia. There were significant regional differences as May was wet in some parts of eastern Slovenia. In some regions, especially in the western Slovenia, this drought was actually a part of a drought starting in June 2021. Huge losses in agriculture, probably around 100 million euro. Ongoing damage in spruce forests due to massive bark beetle attack (due to water stress and high temperature).

- Thunderstorm/Squall lines in 2 June in several places in eastern half of Slovenia. Severe supercell thunderstorms, raging from Austrian Carinthia through Koroška, Štajerska and Dolenjska regions in Slovenia to northwestern Croatia. One severe thunderstorm also in extreme northwestern Slovenia. Supercell storms brought heavy downpours, severe wind gusts and devastating hail in some places. Damaged cars and infrastructure by hail. Heavy damage by hail, downpours and severe wind gusts in agriculture. Many trees were down and roofs damaged due to wind. Many building flooded, some landslides.

- Heatwave from 15 June to 25 August. Intense heatwave, especially in the littoral region (Bilje recorded seven consecutive days with daily maximum temperature over 35 °C, station record). Peak of heatwave on 22 and 23 July. Some stations recorded highest July temperature ever: Dobliče 39.4 °C, Tolmin 38.9 °C and Ljubljana 37.9 °C. Heat stress and drought heavily affected agriculture.

Verification of the SEECOF-27 Climate Outlook in Slovenia for summer season 2022

In the table 2 a verification summary of the SEECOF-27 climate outlook for the summer season 2022 (DJF) can be found. The climatological reference period is 1981–2010.

Table 2. SEECOF-27 climate outlook verification summary for Slovenia for summer 2022

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)	
	Observed	SEECOF-27 climate outlook for temperature	Observed	SEECOF-27 climate outlook for precipitation
SLOVENIA	warmer than normal	warmer than normal	drier than normal	drier than normal

Users' Perception of the SEECOF-27 Outlook

Meteorological Service at the Slovenian Environment Agency for the time being doesn't provide seasonal outlook for the country.