VERIFICATION OF THE SEECOF-8 WINTER 2012/2013 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA IN RELATION TO DIFFERENT CLIMATOLOGICAL REFERENCE PERIODS AND ANALYSIS OF THE WINTER SEASON

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VERIFICATION OF THE SEECOF–8 WINTER 2012/2013 CLIMATE OUTLOOK FOR THE TERRITORY OF SERBIA IN RELATION TO THE 1961–1990 CLIMATOLOGICAL PERIOD

Temperature

According to the SEECOF-8 outlook, in Serbia, the winter of 2012/2013 was expected to be warmer than normal (temperature in the upper tercile) with 40% probability, normal with 40% probability and below normal with 20% probability, compared to the 1961–1990 climatological reference period.

Meteorological monitoring showed that winter 2012/2013 was warm in entire Serbia. Temperature was above normal according to the tercile method (*Figure* 1).

The outlook for a warm winter was correct for Serbia, but with less confidence.

Precipitation

The SEECOF–8 climate outlook for the winter of 2012/2013 in Serbia indicated near- or below- average conditions (precipitation in lower and middle tercile with 40% probability) .

Monitoring of precipitation showed wet winter conditions in entire Serbia (*Figure* 2).

The outlook indicated wet conditions with very low probability (20%).

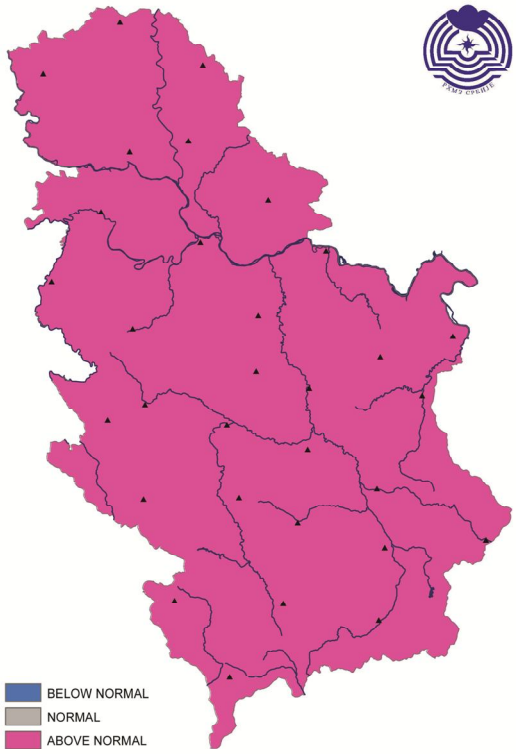

Figure 1. Monitoring of the winter 2012/2013 temperature in Serbia by using the tercile method, in relation to the 1961-1990 reference period.

Figure 2. Monitoring of the winter 2012/2013 precipitation in Serbia by using the tercile method,in relation to the 1961-1990 reference period.

Analysis of the winter season 2012/2013 for Serbia

In most of Serbia winter 2012/13 was warm with above average precipitation

Analysis of the winter season 2012/13 compared to the 1961-1990 climatological base period

Temperature

Mean air temperature during winter ranged from 0.7 °C in Zajecar (eastern Serbia) up to 3.3°C in Belgrade and in the mountain areas from -4,2 °C on Kopaonik Mountain (central Serbia) up to -0,7 °C on Zlatibor Mountain (western Serbia) (*Figure 3*).

During winter, mean air temperature anomalies from the normal[1] for the 1961–1990 base period ranged from 0,6 ºC in Zajecar (eastern Serbia) up to 2,0 ºC in Sjenica (southwestern Serbia), and in the mountain areas from 0,3 °C on Crni Vrh Mountain (eastern Serbia) up to 0,7 °C on Kopaonik Mountain (central Serbia) (*Figure 4*).

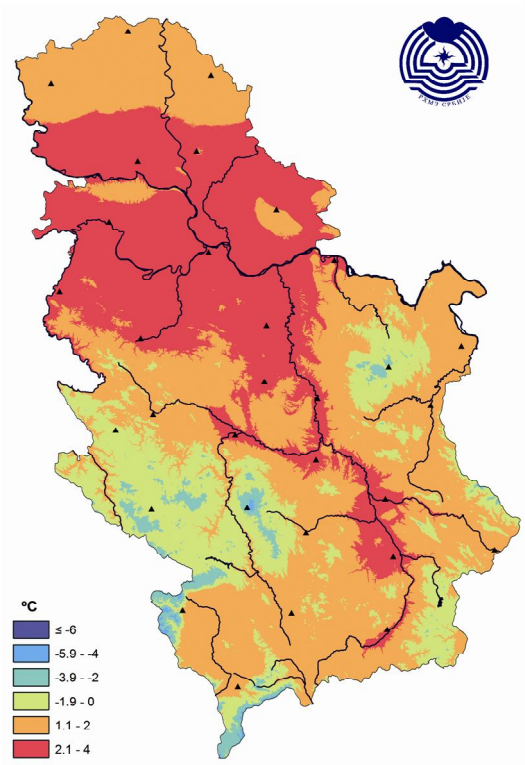

Figure 3. Mean seasonal temperature in Serbia during the winter 2012/2013, in relation to the 1961-1990 climatological reference period.

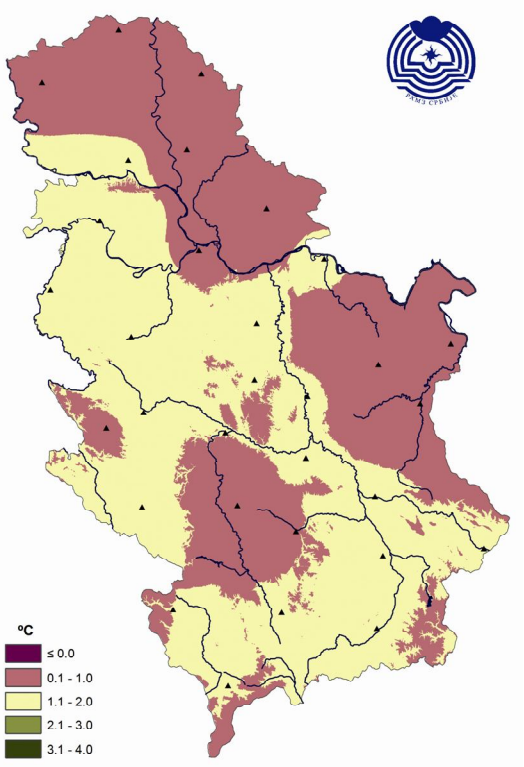

Figure 4. Mean seasonal temperature anomaly in Serbia during the winter 2012/2013, in relation to the 1961-1990 climatological reference period.

[1] Term ***normal*** refers to ***climatological standard normal***, that is, the average value of a particular climate element, calculated for the period from January 1, 1961 to December 31, 1990

According to the percentile method[2], in most of Serbia, mean air temperature during winter was in the **warm** category (*Figure 5*).

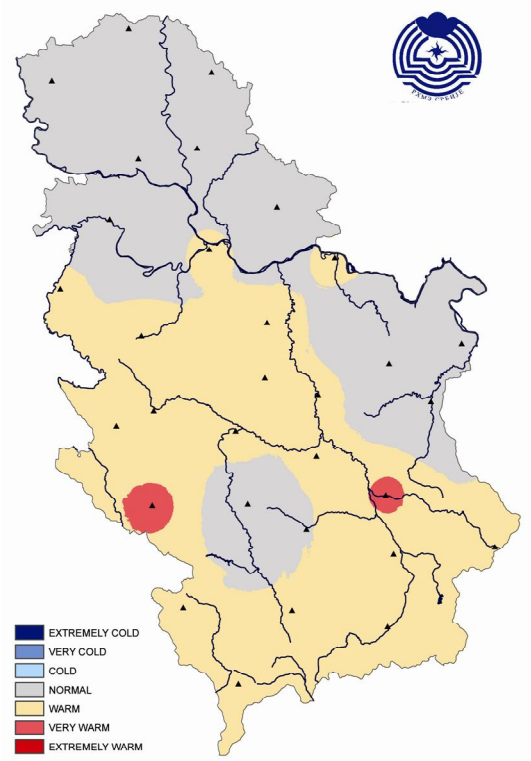

Figure 5. Assessment of mean seasonal temperature in Serbia during the winter 2012/2013 by using the percentile method, compared to the 1961-1990 climatological reference period.

According to the tercile method, mean air temperature during winter was above average across entire Serbia.

The maximum daily air temperature during winter, measuring 19.2°C was observed in Loznica (western Serbia) on February 2.

The number of ice days with maximum daily air temperature below 0 ˚C ranged from 4 in Loznica (western Serbia) up to 14 in Kikinda and Palic (northern Serbia). The greatest number of ice days, total of 56, was recorded on Kopaonik Mountain (central Serbia), 53 days on Crni Vrh Mountain (eastern Serbia), 24 on Zlatibor Mountain (western Serbia) and 23 in Sjenica (southwestern Serbia) (*Фигуре 6*).

The number of frosty days with the daily minimum temperature below 0°C ranged from 33 in Belgrade up to 60 in Zajecar (eastern Serbia), while on mountains it was in a range from 69 on

[2] **n**th percentile of a variable refers to the value of the observed variable below which there is n percent of data previously arranged in an ascending order.

Zlatibor Mountain (western Serbia) up to 86 on Kopaonik Mountain (central Serbia) (*Figure 7*).

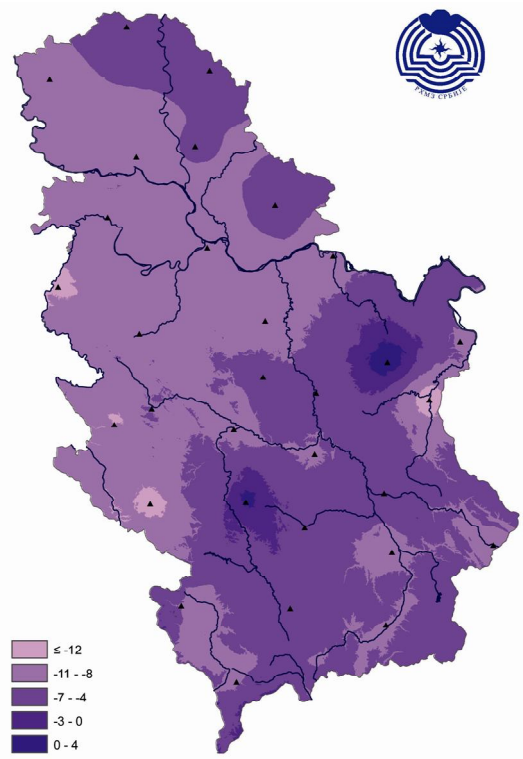

Figure 6. Anomaly of the number of ice days during the winter 2012/2013 in relation to the 1961-1990 normal.

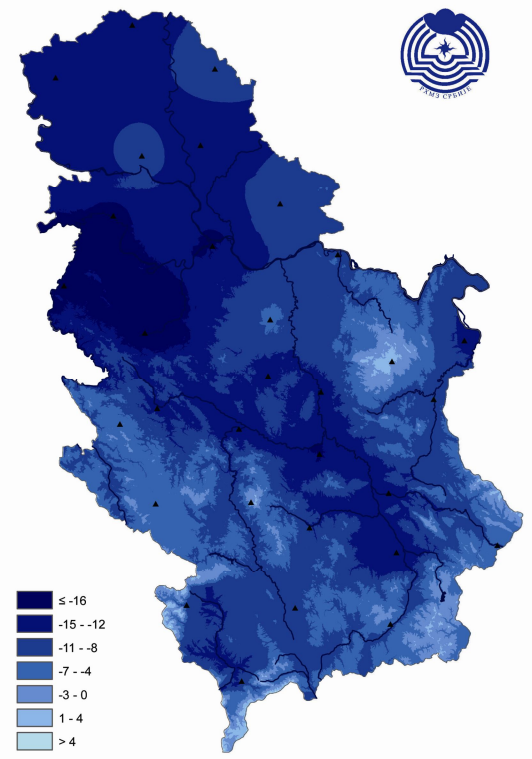

Figure 7. Anomaly of the number of frosty days during the winter 2012/2013 in relation to the 1961-1990 normal.

The winter minimum temperature, measuring -24.2°C was observed in Sjenica on December 13.

The Figures 8 to 13 show the trend of average temperatures during winter for the Belgrade, Novi Sad, Loznica, Zlatibor, Vranje and Nis.

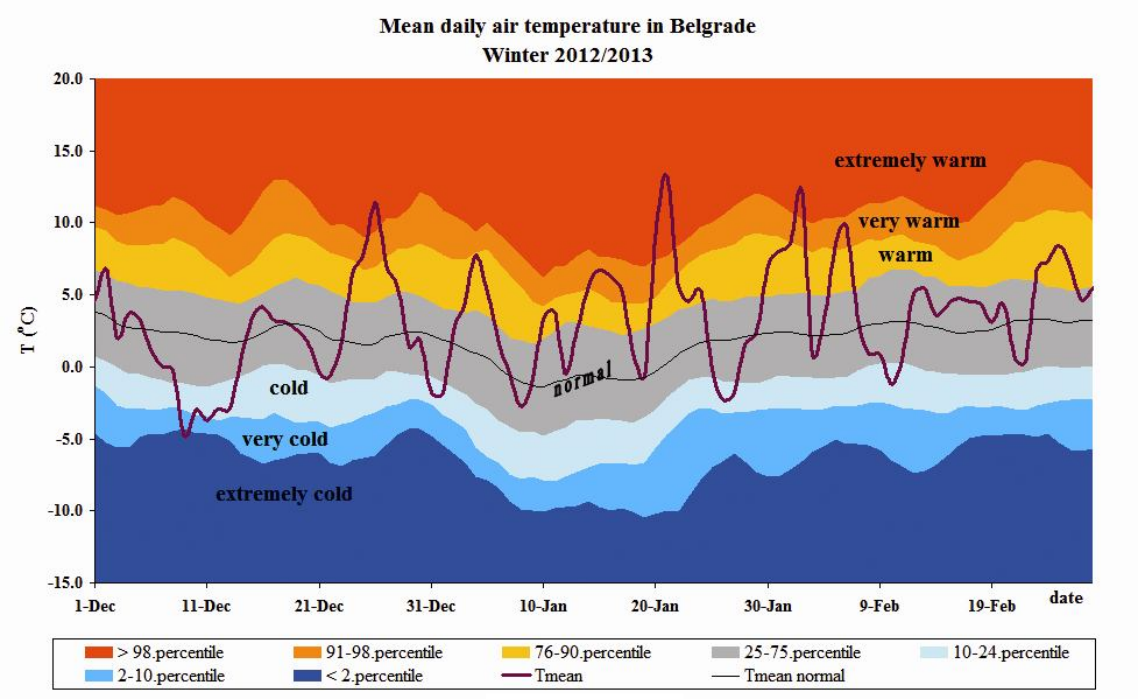

Figure 8

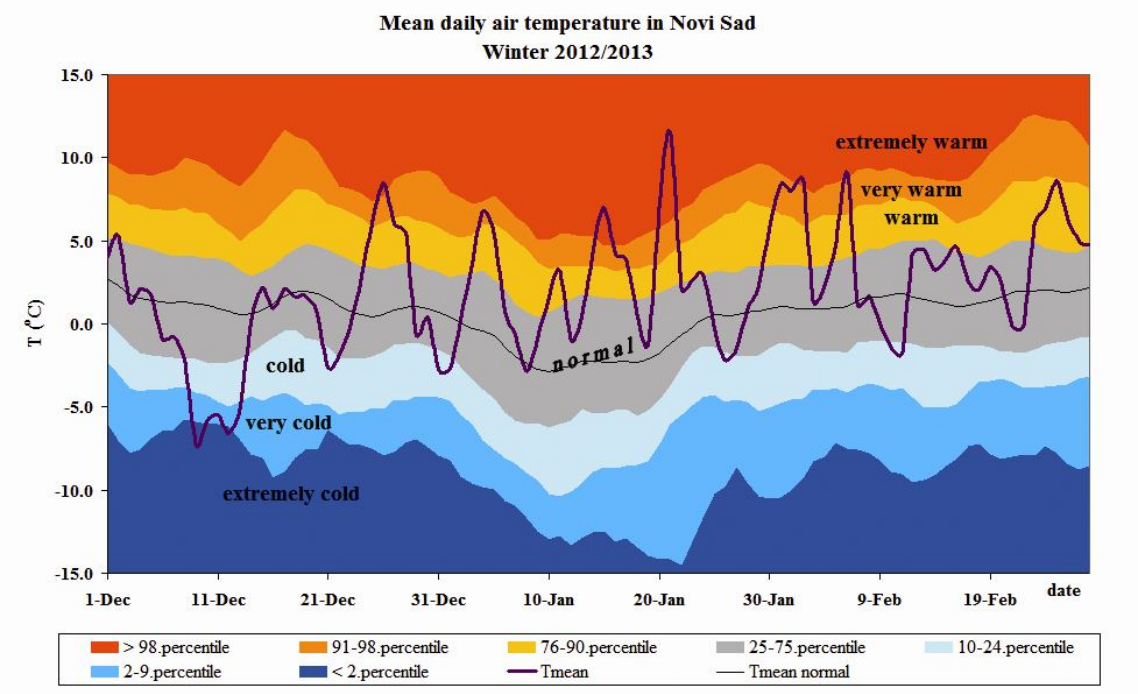

Figure 9

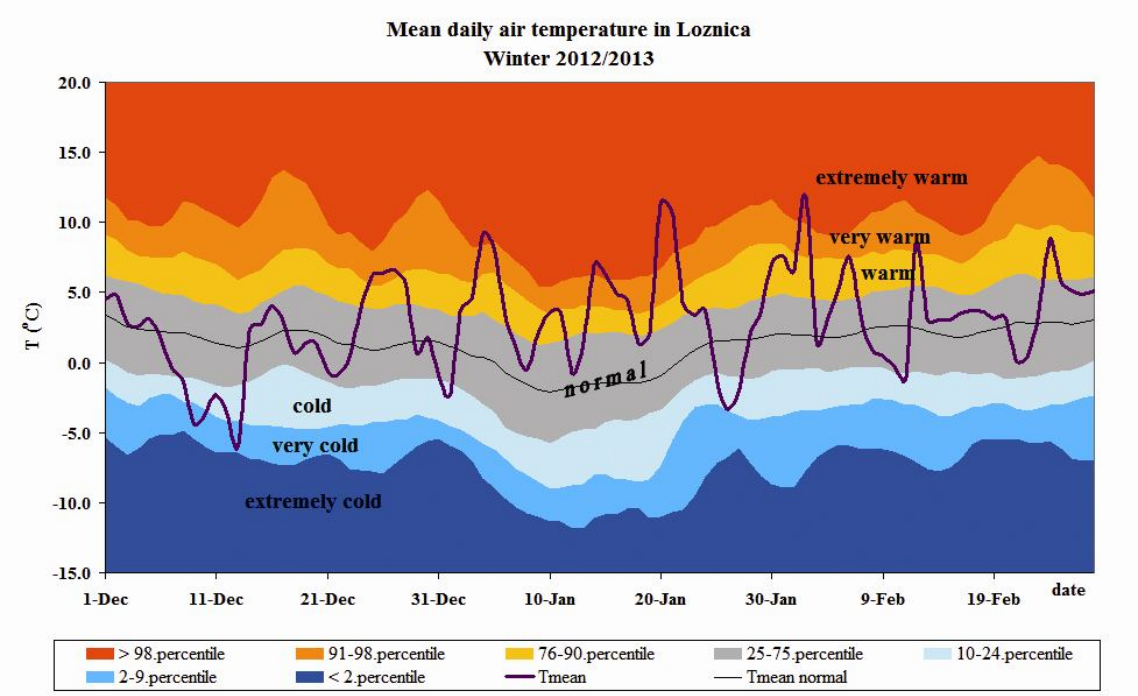

Figure 10

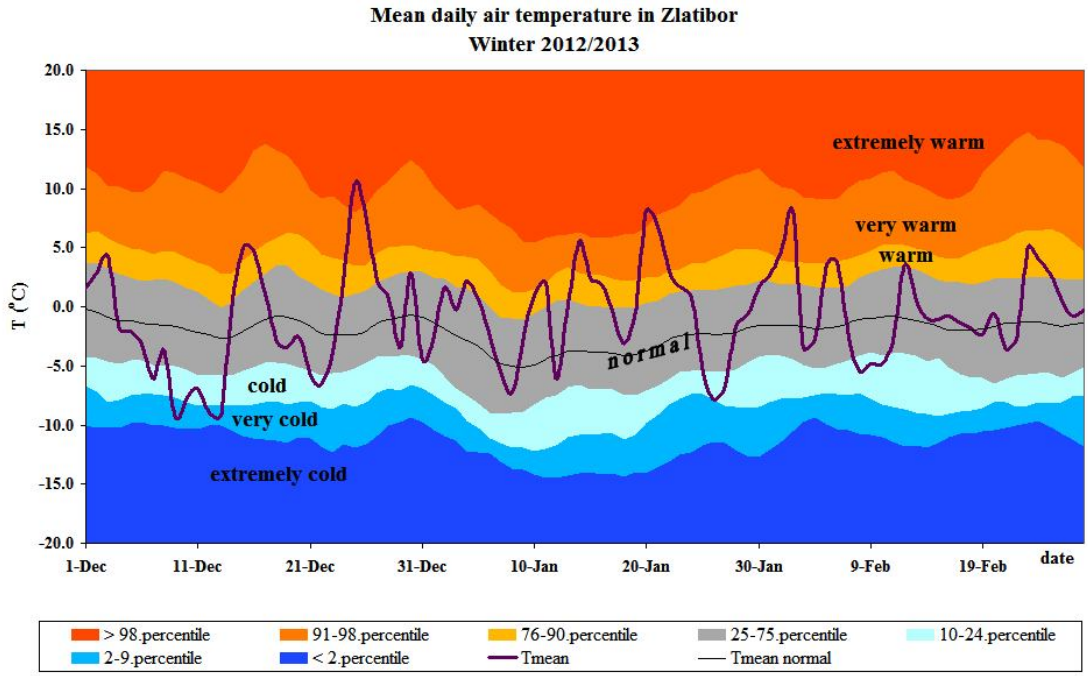

Figure 11

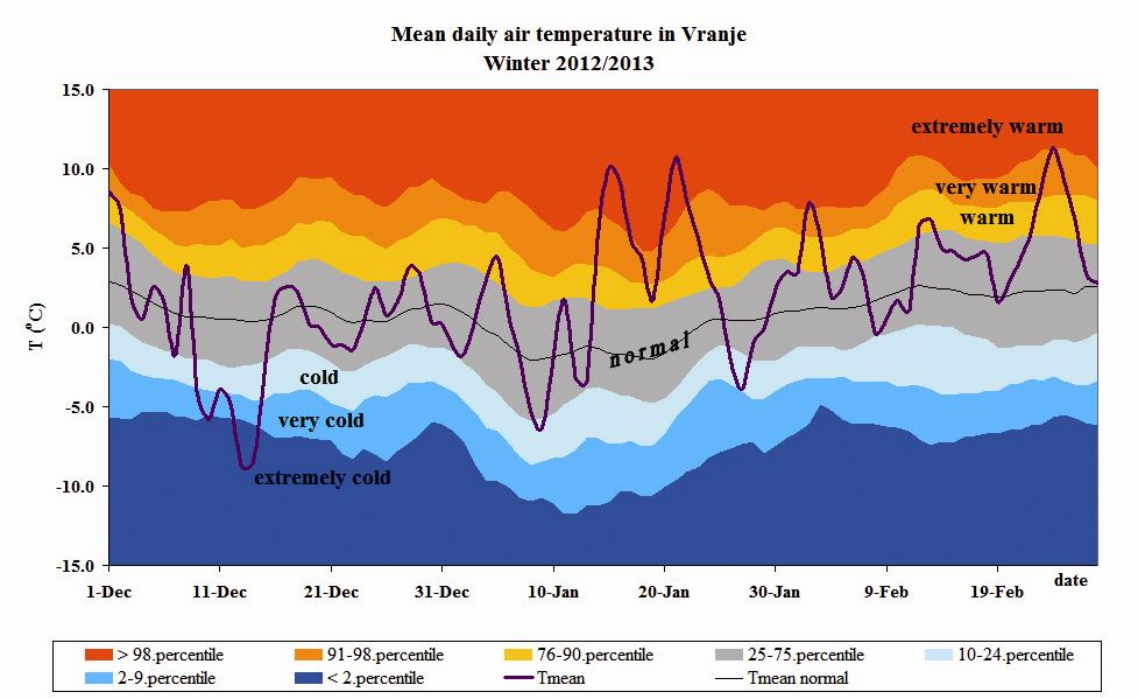

Figure 12

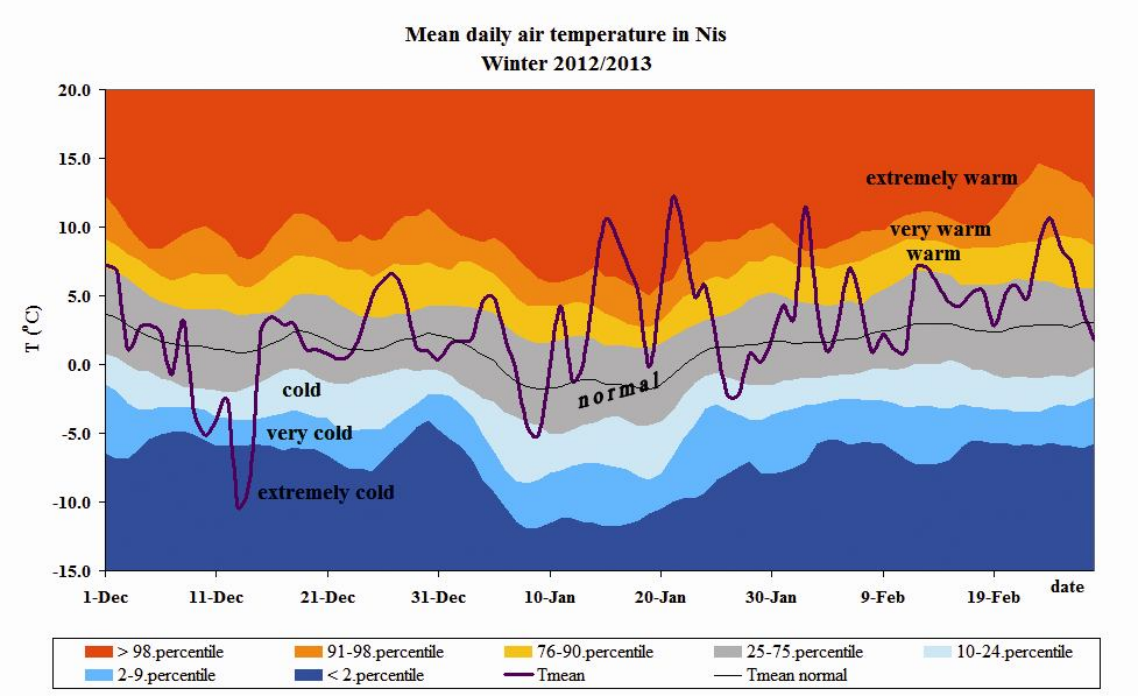

Figure 13

Precipitation

Most of Serbia, during winter experienced above-average precipitation sums compared to the 1961–2000 base period (precipitation sums ranged from 114% up to 204% of normal) (*Figure 14*).

According to the percentile method, in most of Serbia during winter, precipitation totals were in the rainy and very rainy categories, whereas in central, eastern and southwestern parts of Serbia it was extremely rainy (*Figure 15*).

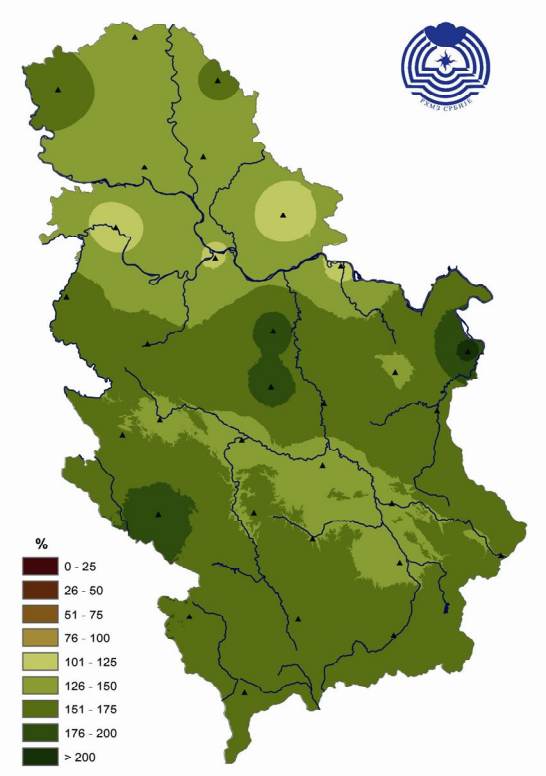

Figure 14. Precipitation sum for the winter 2012/2013 in Serbia in percentages from the 1961-1990 normal

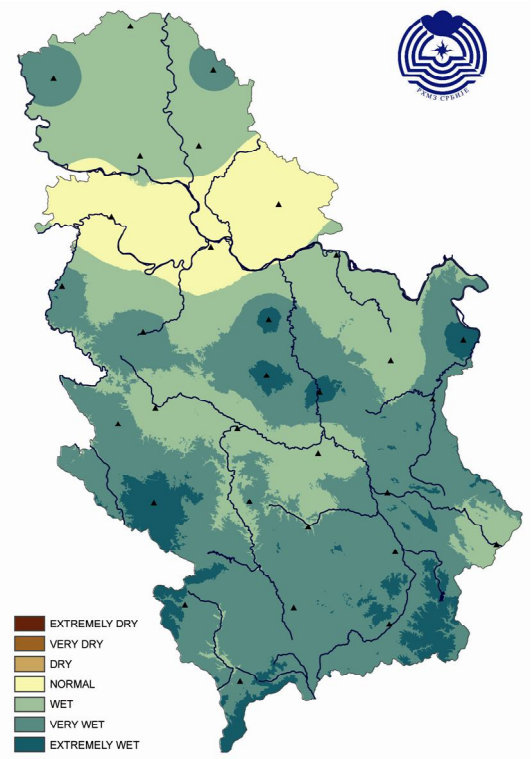

Figure 15. Assessment of precipitation sums for the winter 2012/2013 in Serbia by using the percentile method, for the 1961-1990 reference period.

According to the tercile method, precipitation amount was above average across entire Serbia.

Maximum daily precipitation amount, measuring 53.2mm, was observed in Vranje (southeastern Serbia) on February 26 2012, thereby breaking the previous maximum daily precipitation record during winter, measuring 43.8mm (December 15 1930).

The greatest deviation of number of days with precipitation of 1mm and higher was observed in central Serbia, amounting to 18 days.

The low-lying areas of Serbia characterized below-average number of days with the snow cover (from 2 up to 12 days) (*Figure 16*) whereas in the mountain areas that number was above average, ranging from 3 on Kopaonik Mountain (central Serbia) up till 15 on Zlatibor

Mountain (western Serbia). Maximum snow depth reached 87cm and was recorded on Kopaonik Mountain on February 21.

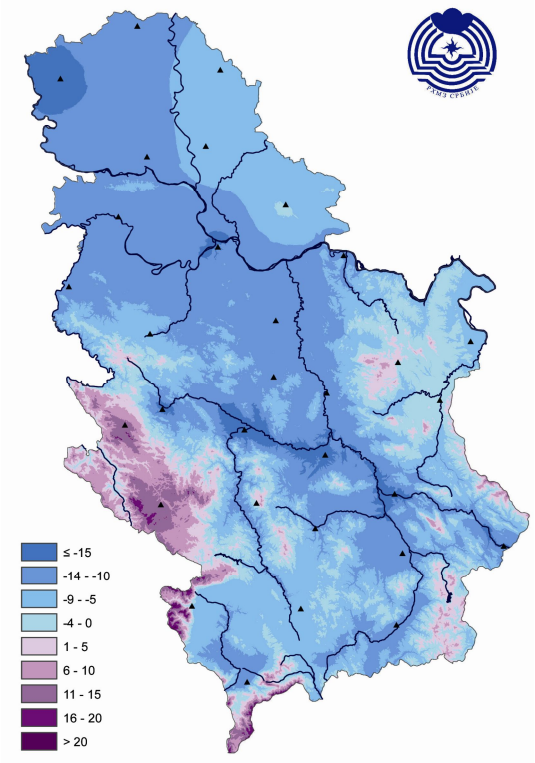

Figure 16. Anomaly of the number of days with the snow cover during the winter 2012/2013 in relation to the 1961-1990 normal.

Sunshine duration (Insolation)

During winter, all of Serbia experienced below-average sunshine duration. Insolation ranged from 104.9 hours in Nis (southeastern Serbia) to 194.4 hours in Smederevska Palanka (central Serbia) (*Figure 17).*

Insolation expressed in percentages of normal, ranged from 49% in Nis (southeastern Serbia) to 92% in Pozega (western Serbia) (*Figure 18*).

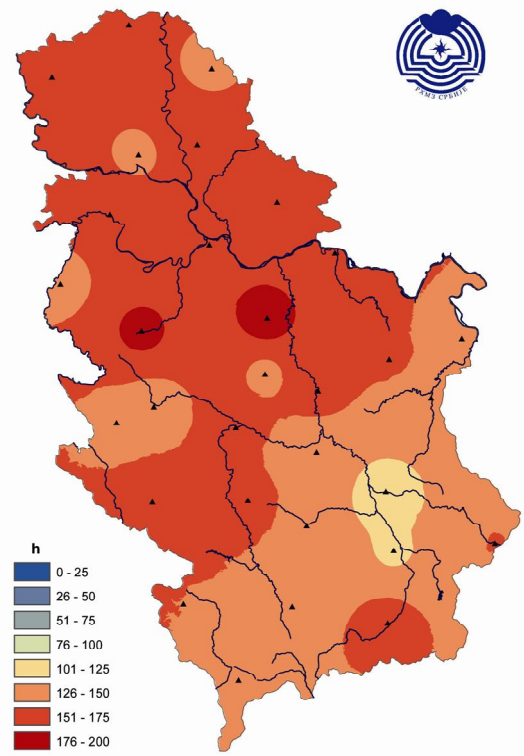

Figure 17. Insolation during winter 2012/2013, expressed in hours

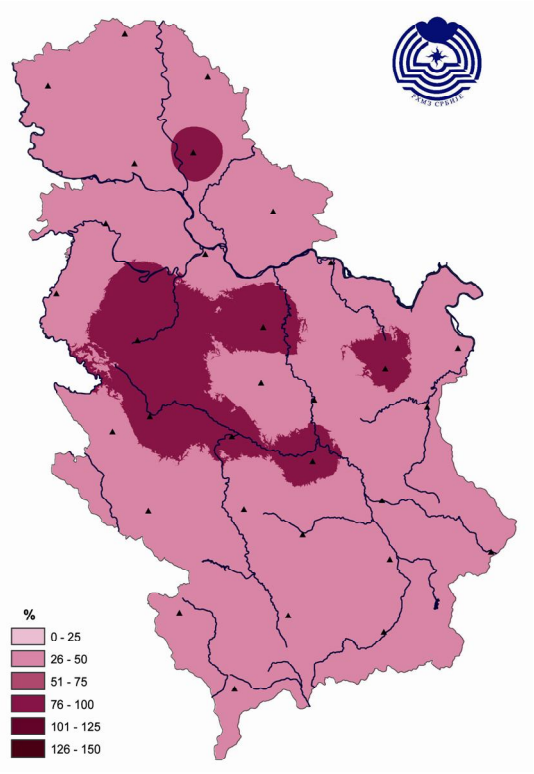

Figure 18. Insolation during winter 2012/2013, expressed in percentages of normal

Analysis of the winter season 2012/13 in Serbia compared to the 1971–2010 climatological base period

Temperature

During winter, mean air temperature anomalies from normal for the 1971-2010 base period ranged from 0.2 ºC in Zajecar (eastern Serbia) up to 1.6 ºC in Sjenica (southwestern Serbia), while on mountains they were in a range from 0.1 ºC on Crni Vrh (eastern Serbia) up to 0.9 ºC on Zlatibor Mountain (western Serbia) (*Figure 19).*

According to the percentile method, mean air temperature during winter was in the warm and normal categories (*Figure 20*).

According to the tercile method, all of Serbia during winter featured above average mean air temperature.

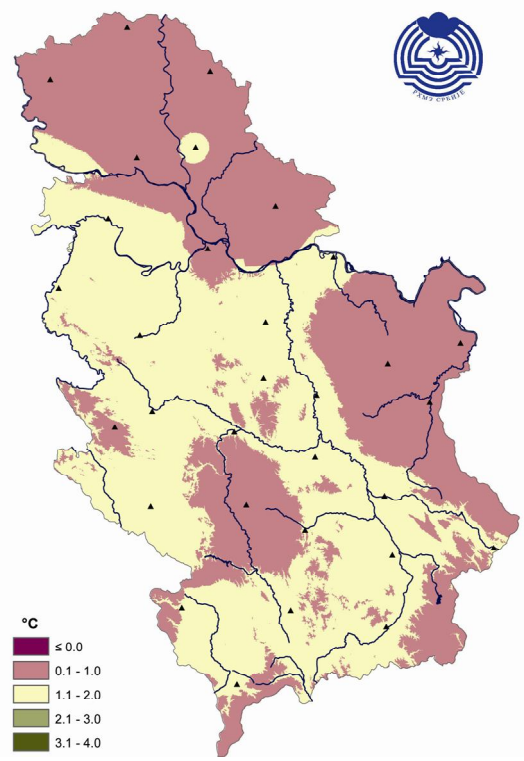

Figure 19. Mean seasonal temperature anomaly in Serbia during the winter 2012/2013, in relation to the 1971-2000 climatological reference period.

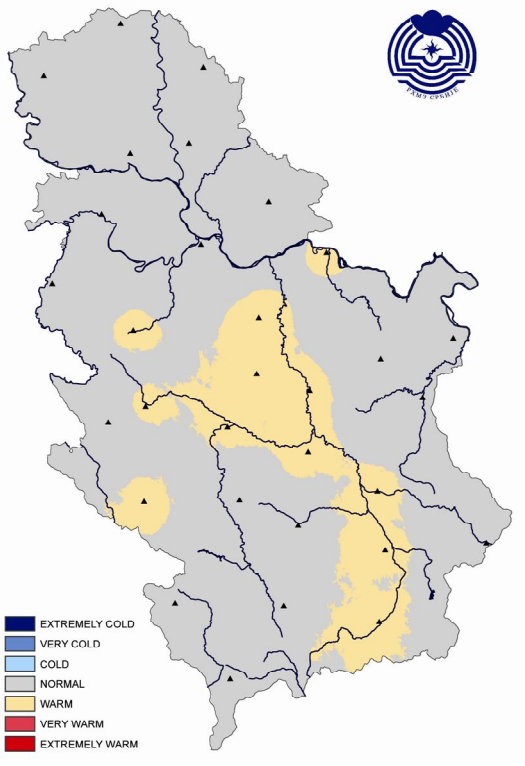

Figure 20. Assessment of mean seasonal temperature in Serbia during the winter 2012/2013 by using the percentile method, compared to the 1971-2000 climatological reference period.

Precipiation

All of Serbia, during winter experienced above average precipitation sums compared to the 1971–2000 base period (precipitation sums ranged from 132% up to 215% of normal) (*Figure 21*).

According to the percentile method, in most of Serbia during winter, precipitation totals were in the extremely rainy and very rainy categories (*Figure 22*).

According to the tercile method, precipitation amount was above average across entire Serbia.

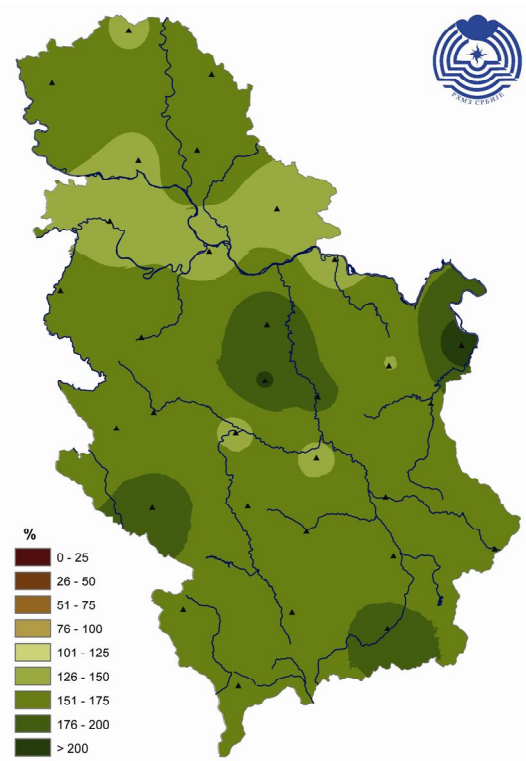

Figure 21. Precipitation sum for the winter 2012/2013 in Serbia in percentages from the 1971-2000 normal

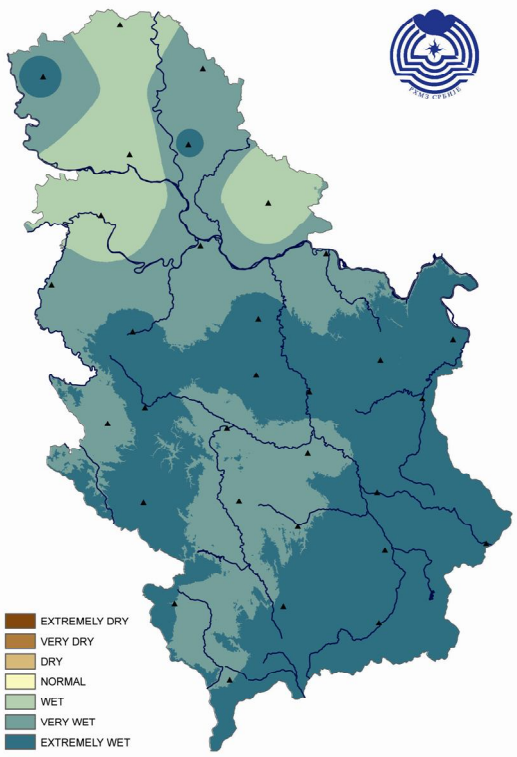

Figure 22. Assessment of precipitation sums for the winter 2012/2013 in Serbia by using the percentile method, for the 1971-2000 reference period.

Analysis of the winter season 2012/13 in Serbia compared to the 1981-2010 climatological base period

Temperature

During winter, mean air temperature anomalies from normal for the 1981-2010 base period ranged from 0.1 ºC in Zajecar (eastern Serbia) to 1.5 ºC in Sjenica (southwestern Serbia), while on mountains they were in a range from 0.2 ºC on Kopaonik Mountain (central Serbia) to 0.9 ºC on Zlatibor Mountain (western Serbia) (*Figure 23)*.

According to the percentile method, mean air temperature during winter was in the warm and normal categories (*Figure 24*).

According to the tercile method, all of Serbia during winter featured above average mean air temperature.

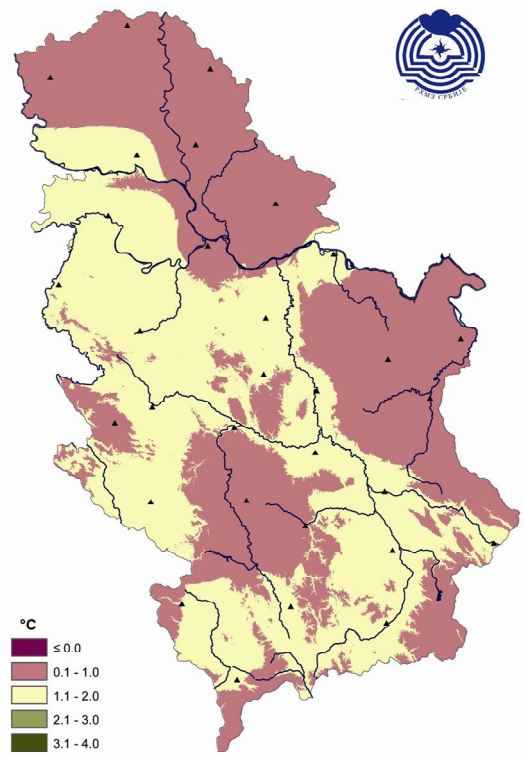

Figure 23. Mean seasonal temperature anomaly in Serbia during the winter 2012/2013, in relation to the 1981-2010 climatological reference period.

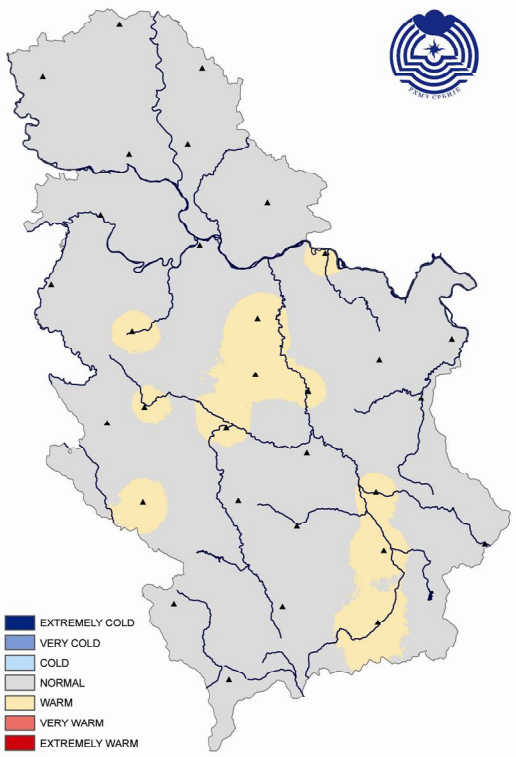

Figure 24. Assessment of mean seasonal temperature in Serbia during the winter 2012/2013 by using the percentile method, compared to the 1981-2010 climatological reference period.

Precipitation

During winter, most of Serbia characterized above average precipitation sums compared to 1981-2010 base period (precipitation totals ranged from 111% up to 192% of normal) (*Figure 25).*

According to the percentile method, in most of Serbia during winter, precipitation sums were in the very rainy and extremely rainy categories (*Figure 26*).

According to the tercile method, precipitation amount was above average across entire Serbia.

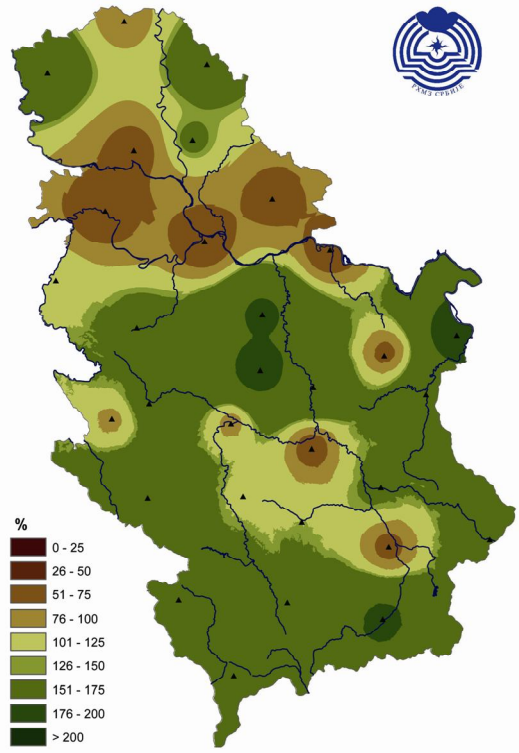

Figure 25. Precipitation sum for the winter 2012/2013 in Serbia in percentages from the 1981-2010 normal

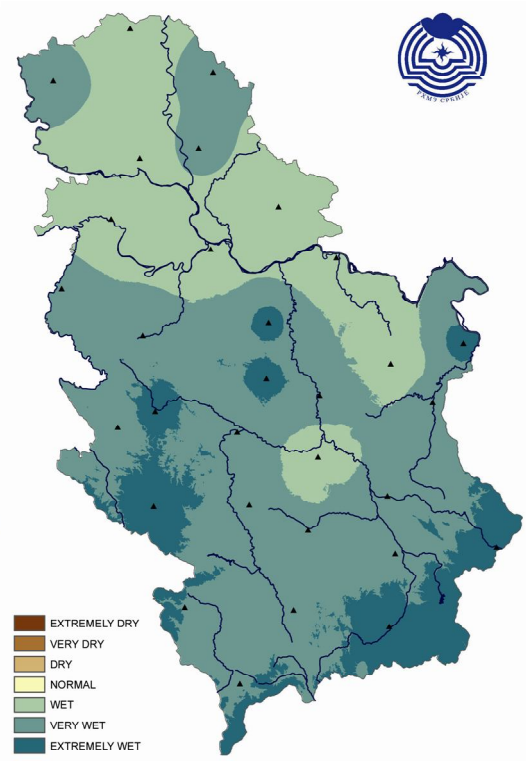

Figure 26. Assessment of precipitation sums for the winter 2012/2013 in Serbia by using the percentile method, for the 1981-2010 reference period.

Agrometeorological conditions during winter 2012/2013

During winter 2012/2013 agrometeorological conditions were estimated as favorable. The winter was somewhat warmer than usual but without significant temperature extremes, positive or negative. Periods of warming and cooling did not last more than a few days, hence the overwintering of winter and other crops wasn't seriously affected. During the winter months (December 2012 - February 2013) a significant rainfall surplus was recorded. On the territory of Serbia rainfall surplus was registered respectively of 49% in December 2012, in January 44% and in February over most of the territory of Serbia 100% more precipitation than average (1971 - 2000) was recorded. The Standardized precipitation index (SPI-3) for the period December 2012 - February 2013 shows that in the largest part of the territory of Serbia conditions of increased humidity prevailed.

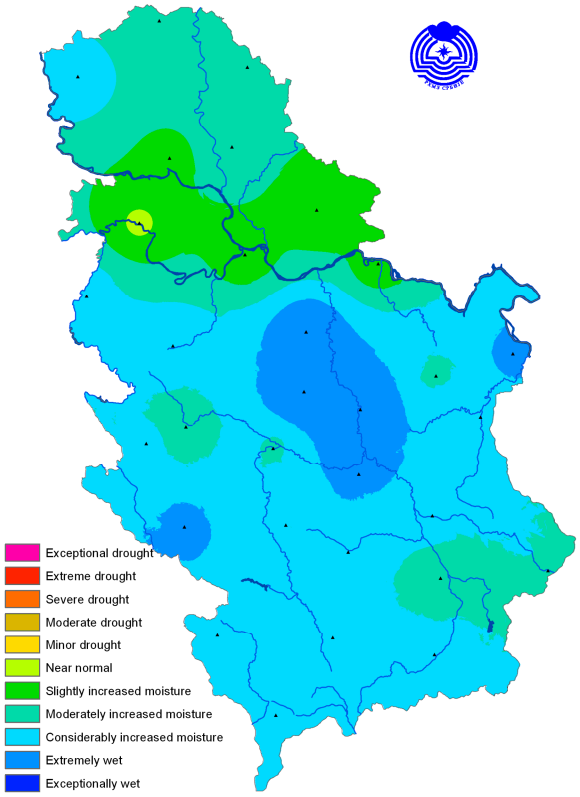

Figure 27. Moisture conditions, SPI3, 1.12.2012 -28.2.2013

Brief description of hydrological phenomena on rivers in Serbia during the winter (01st December 2012 – 28th February 2013)

After a very unfavourable hydrological situation during the autumn, water levels on all rivers in Serbia gradually increased in the second half of December 2012 and in January 2013. During January and most of February, water levels ranged from mid-low to mid-high for that time of year.

At the end of February 2013, due to intense melting of snow and heavy rainfall in the area of Croatia, Bosnia and Herzegovina and Montenegro, moderate and major increases in water levels occurred on the stretch of the Sava River that flows through Serbia, reaching the regular flood defense level only at the Sabac hydrological station.

Intense melting of snow and heavy rainfall during the third decade of February caused major increases in water levels on the rivers in western, central, eastern and southeastern Serbia. The regular flood defense levels were surpassed on the Juzna Morava, Toplica, Veternica and Jablanica rivers, and the occurrence limits on the Timok River, on the upper flow of the Kolubara River, and on the Ljig, Jasenica, Kubrsnica and Lugomir rivers. Major floods were recorded on the torrential flows in the Pcinja and Zajecar districts. Hydrological situation in Serbia stabilized at the end of February 2013.

The winter 2012/2013 was also characteristic due to the lack of ice on the rivers in Serbia, with the exception of the rivers and streams of the Banat region (ice cover formed on the Tamis, Moravica and Begej rivers in mid-December 2012, and for a short period in January 2013). The lack of ice on the rivers indicated that the winter was mild, that is, moderately cold, and that colder periods frequently alternated with warmer periods.