

III. METEOROLOGICAL AND DISPERSION CONDITIONS

Apart from the respective air pollution sources, air quality is significantly affected by meteorological conditions. These conditions enable the dispersion of polluting substances in the air, influence the amount of emissions from anthropogenic or natural sources, resuspension, and affect the formation of secondary pollutants as well as the rate of their removal from the air. One of the ways in which the dispersion conditions can be expressed numerically is in terms of the ventilation index (VI) which is defined as a product of the mixing layer depth and the average air flow velocity in it¹. However, situations with poor dispersion conditions do not necessarily mean occurrence of high concentrations of pollution substances. Important factors include duration of the situati-

on, starting level of pollution, distribution of sources, and their emissions to the layer under the inversion. The effect of meteorological conditions on anthropogenic emissions from heating is determined on the basis of calculation of heating days and temperatures that occurred during these days. Temperature conditions in the heating season (January–May, September–December) or parts thereof are characterized in terms of degree-days, i.e. the sum of the differences in the reference indoor temperatures and the average daily outdoor temperatures on heating days. A more detailed specification of the influence of meteorological conditions on air quality is given in (CHMI 2020d).

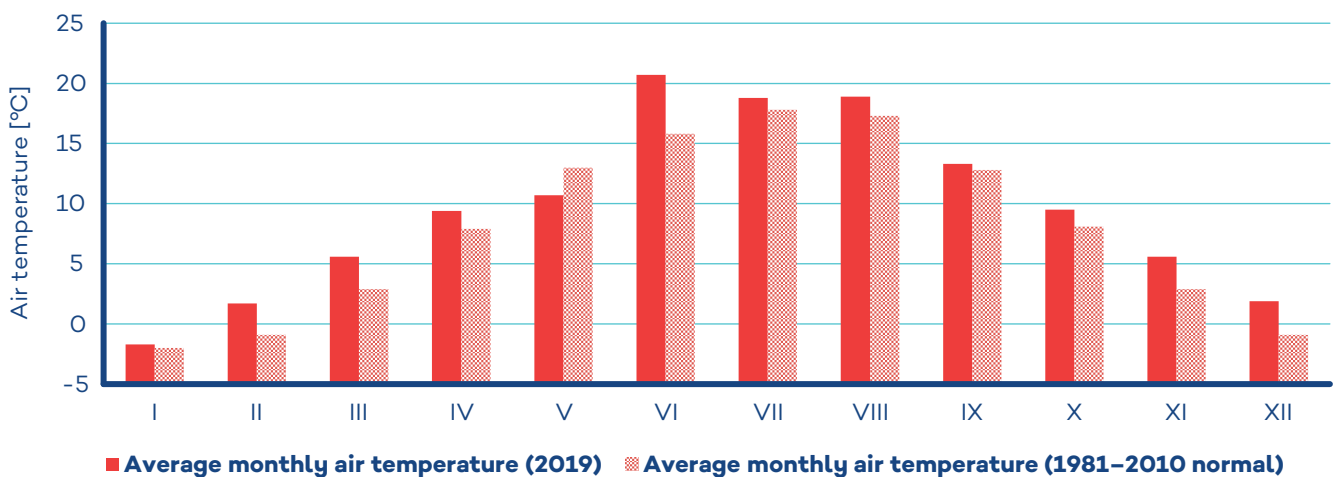


Fig. III.1 Average monthly air temperature in 2019 compared to the normal of 1981–2010

1 The mixing layer is understood as the layer of air between the Earth’s surface and the lower boundary of the lowest temperature-blocking layer.

Meteorological and dispersion conditions in 2019

In terms of temperature, the year 2019 was extremely above normal. The average annual temperature of 9.5 °C was 1.6 °C above the normal of 1981–2010. Consequently, after 2018, the year 2019 becomes the second warmest year observed in the series of annual average temperatures since 1961. During the year, only May recorded negative deviation (−2.3 °C) from the monthly temperature normal of 1981–2010. This month was classified as strongly subnormal. Three months, January, July and September, were assessed as normal in terms of temperature. The months of February (deviation +2.6 °C), April (deviation +1.5 °C), October (deviation +1.4 °C) and December (deviation +2.8 °C) were ev-

luated as above normal in view of temperature. March (deviation +2.7 °C), August (deviation +1.6 °C) and November (deviation +2.7 °C) were assessed as strongly above normal in temperature and June (deviation +4.9 °C) as extremely above normal (Fig. III.1).

In view of precipitation over the territory of the Czech Republic, the year 2019 was normal. The average total annual precipitation of 634 mm corresponds to 92% of the normal of 1981–2010. During the year, 7 months were assessed as normal in terms of precipitation. Precipitation was below normal in April (60% of the normal), June (67% of the normal) and July (66% of the normal). The months of January (148% of the normal) and May (132% of the normal) were assessed as above normal concerning precipitation (Fig. III.2).

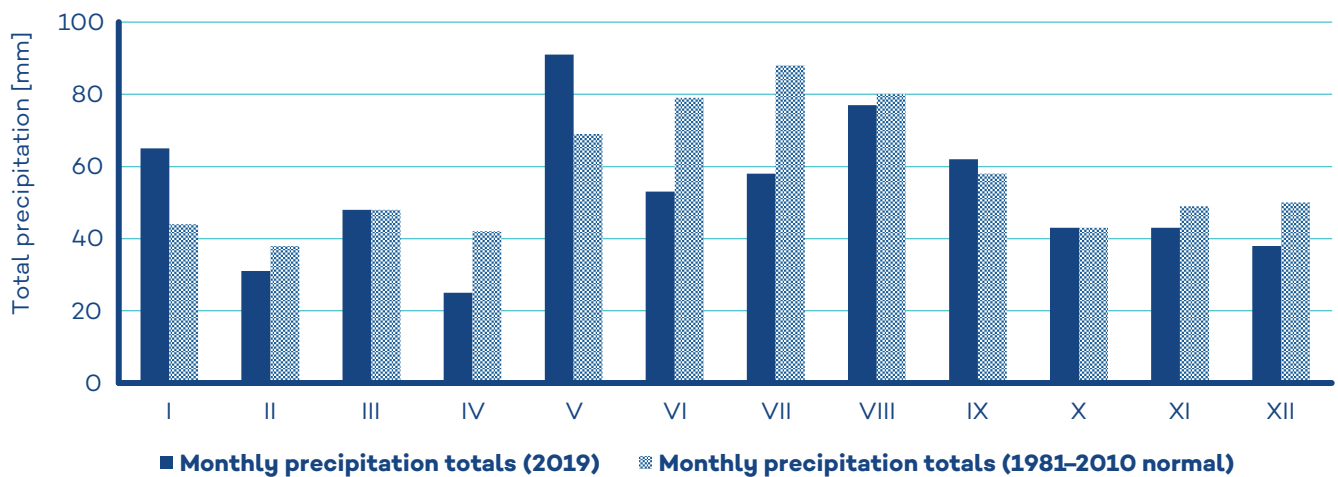


Fig. III.2 Monthly precipitation totals compared to the normal of 1981–2010

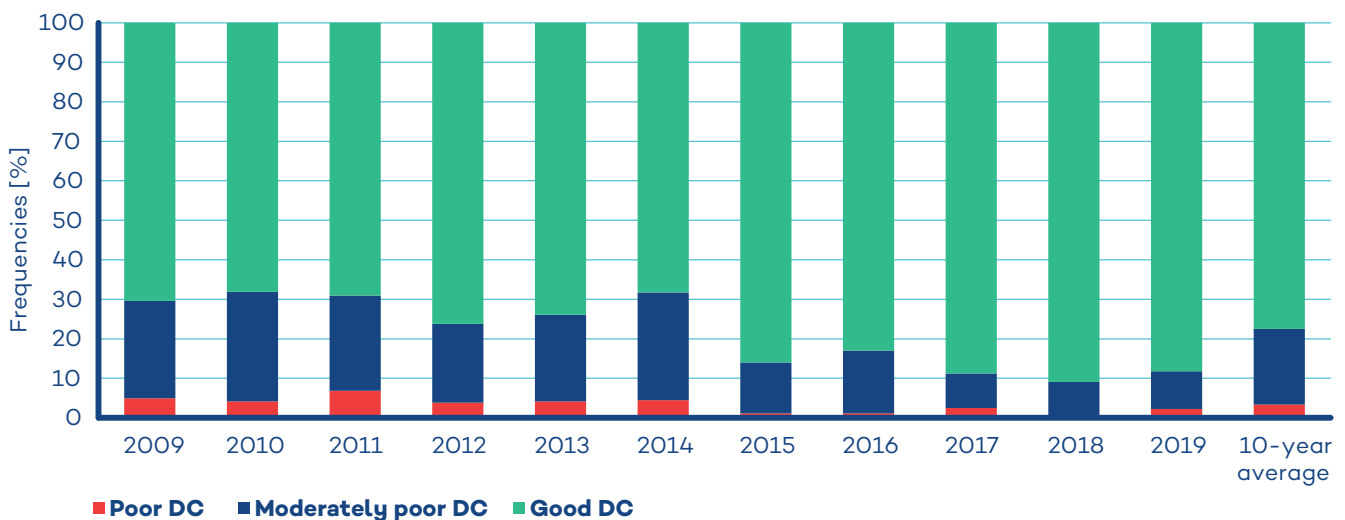


Fig. III.3 Frequency of occurrence of dispersion conditions (DC), 2009–2019

III. Meteorological and Dispersion Conditions

In 2019, the dispersion conditions were improved compared to the long-term average of 2007–2018. On a national average, good dispersion conditions occurred in 88% of cases, representing 115% of the long-term average. The year 2019 thus becomes the year with the most frequent occurrence of good dispersion conditions after 2018 (Fig. III.3). Based on the evaluation of the ventilation index averaged for individual regions and agglomerations, poor dispersion condi-

tions occurred during the year in all regions and agglomerations (Fig. III.4). The most frequent occurrence of good dispersion conditions was recorded in the Moravian-Silesian region without the O/K/F-M agglomeration and in the South Moravian region without the Brno agglomeration (89%). The most significant improvement in dispersion conditions compared to the long-term normal occurred in the Ústí nad Labem, Liberec and Hradec Králové regions (Fig. III.5).

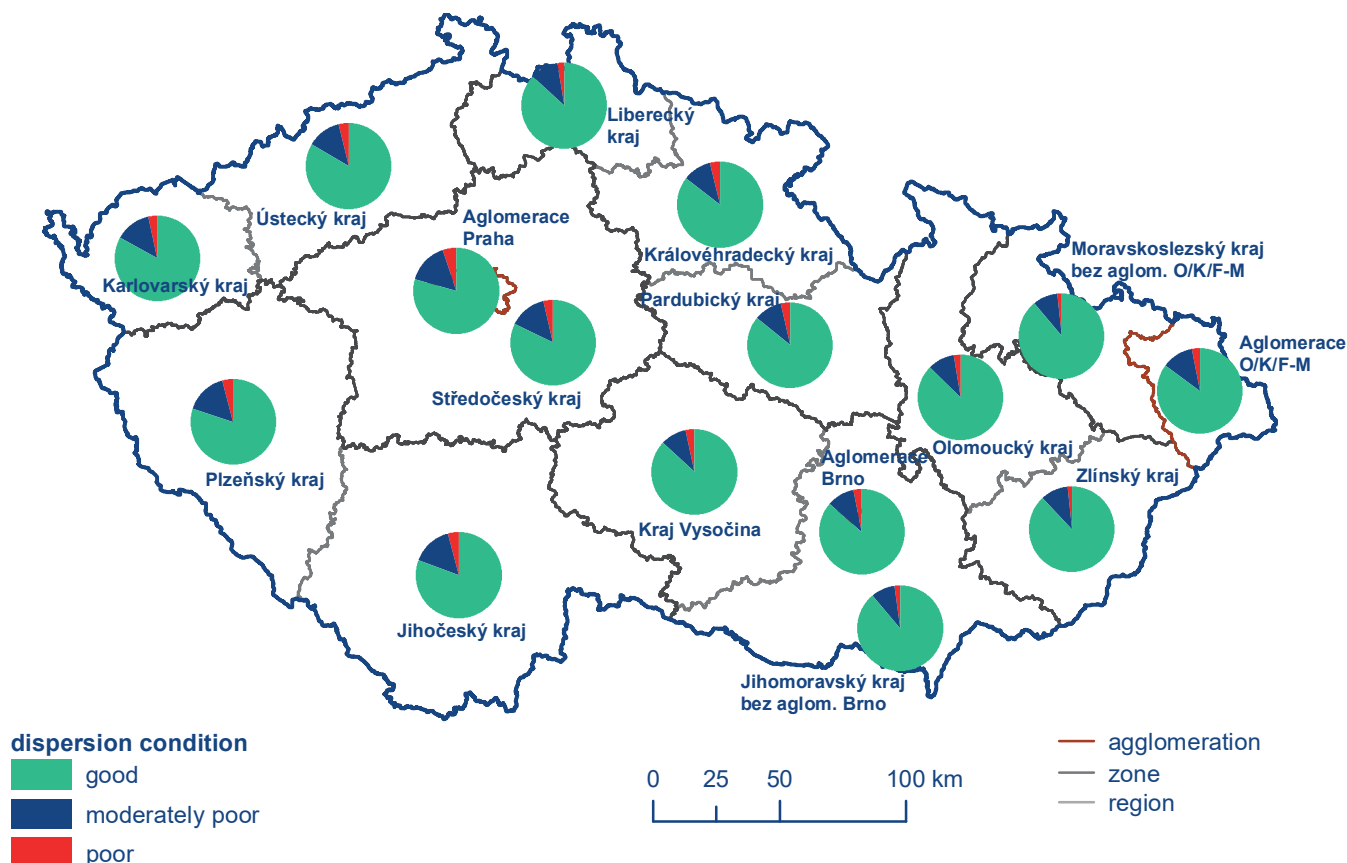


Fig. III.4 Composition of daily averages of ventilation index in regions and agglomerations of the Czech Republic in 2019



Fig. III.5 Frequency of occurrence of dispersion conditions (DC) by months of 2019

The number of degree-days during 2019 in the Czech Republic was significantly below normal compared to the long-term average 1988–2017, lower values were reached only in 2000, 2014 and 2018. In 2014, the highest average daily temperature on heating days was also reached. (Fig. III.6). During the individual months, the number of degree-days was below the long-term average, except for January and May with January assessed as normal

in view of temperature and May as strongly below normal (Fig. III.7). The largest decrease in the number of degree-days compared to the long-term average was recorded in December, which is climatologically assessed as strongly above normal in temperature and has an improving effect on estimated emissions from domestic heating.

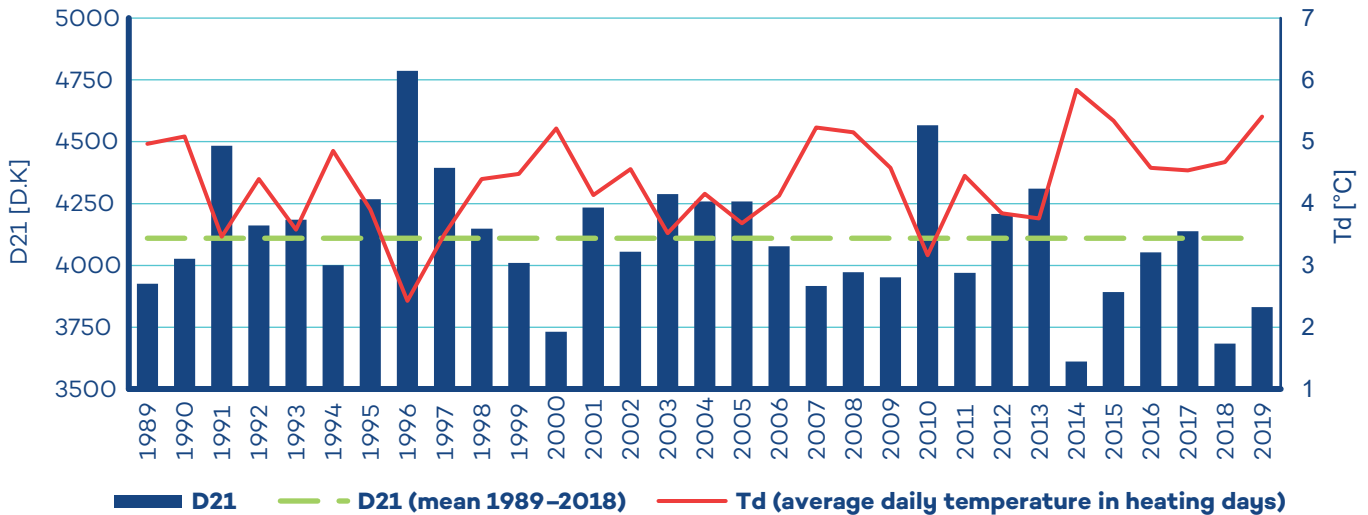


Fig. III.6 Annual heating seasons in the Czech Republic expressed as degree-days (D21) and their average for the 1989–2019 period

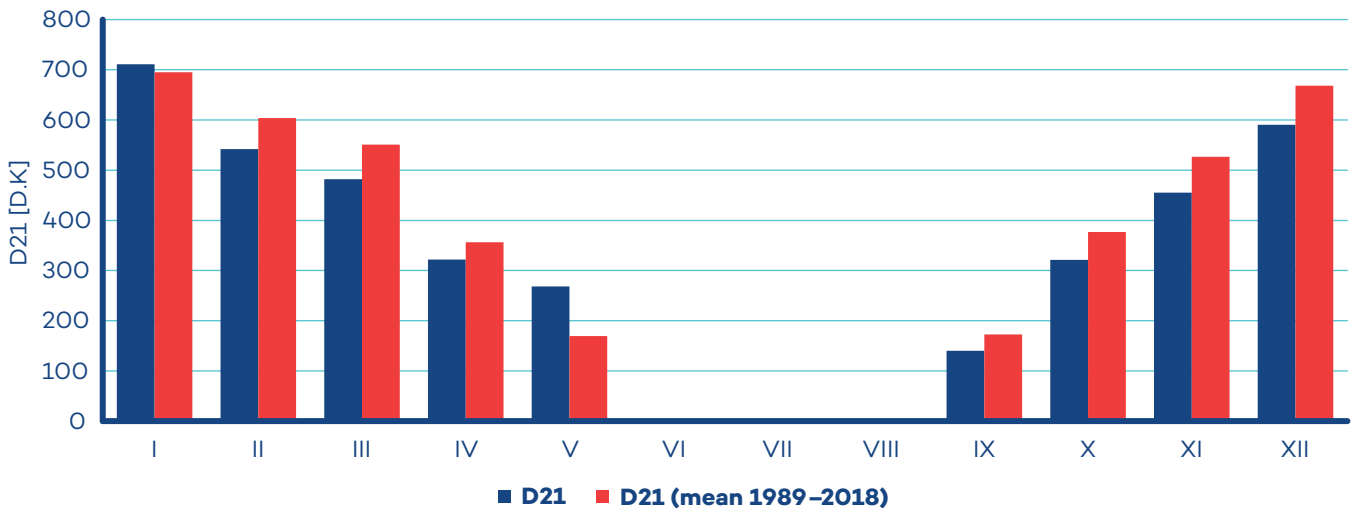


Fig. III.7 Annual variation of degree-days in the territory of the Czech Republic in the heating season 2019 (I–V, IX–XII) in comparison with the average of 1989–2019