2 Air quality

Overall assessment of the trend	Change since 2000	Change since 2010	Last year-on-year change
Emissions of basic air pollutants			
Emissions of heavy metals[12]			
Air quality in terms of human health protection			
Air quality in terms of ecosystem and vegetation protection			

Because **air quality** has a major impact on human health, quality of life, ecosystems and vegetation, compliance with air pollution limits for pollutants and long-term reductions in the overall air pollution load need to be ensured. This plan has been successfully implemented in the last two years in particular. Emissions of pollutants are decreasing and air quality in the Czech Republic has been gradually improving over an extended period. Concentrations of air pollutants in the Czech Republic are mainly influenced by local heating of households, transport, and industrial and energy production. They also depend on weather conditions and cross-border transport. In 2019 and 2018, the dispersion conditions were very good compared to the long-term average, and at the same time the temperatures in these years were well above the normal. Improvements in air quality can therefore be attributed both to weather (especially dispersion) conditions, but also to the further introduction of modern technologies in the production and heating technology renewal in households (the effect of boiler subsidies).

The decrease in **pollutant emissions** reflects developments in the national economy, the impact of the introduction of more efficient technological and production processes, reductions in material and energy intensity, and the obligation to meet legislative requirements for emissions from air polluting sources. In order to meet commitments under Directive 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants, which spell out emission reductions relative to 2005, it is clear from the latest emissions balance report that NO_x, VOC,[13] SO_2 and NH_3 emissions in 2018[14] reached the reduction required for 2020. $PM_{2.5}$ emissions in 2018[15] were 11% higher than the 2020 target (Chart 3). A similar drop in emissions is evident throughout Europe.

[12] *Because the Report was publicated in January 2021, the assessment relates to 2018. Because of the way they are processed, final data for the year 2019 will not be available until February 2021 at the earliest.*

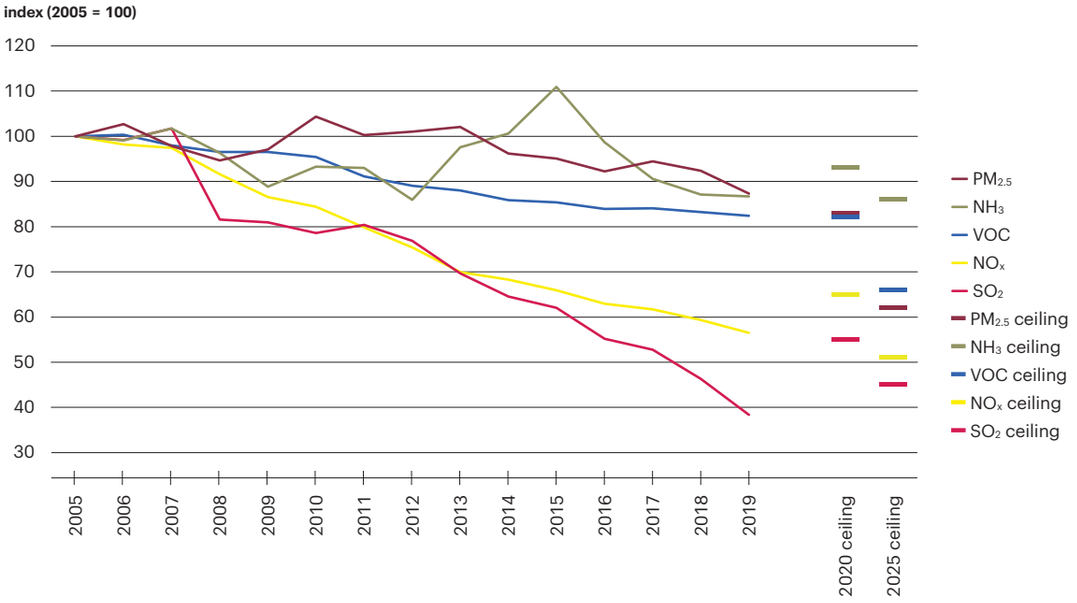
[13] *NO_x and VOC emissions from the agricultural sector are not included in the assessment of compliance with the emission ceiling.*

[14] *Final data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in February 2021 at the earliest.*

[15] *Final data for the year 2019 were not available at the time of publication.*

Chart 3

Emissions of selected pollutants in the Czech Republic and national emission ceilings for the years 2020 and 2025 [index, 2005 = 100], 2005–2019[16]



Data for the year 2019 are only provisional.

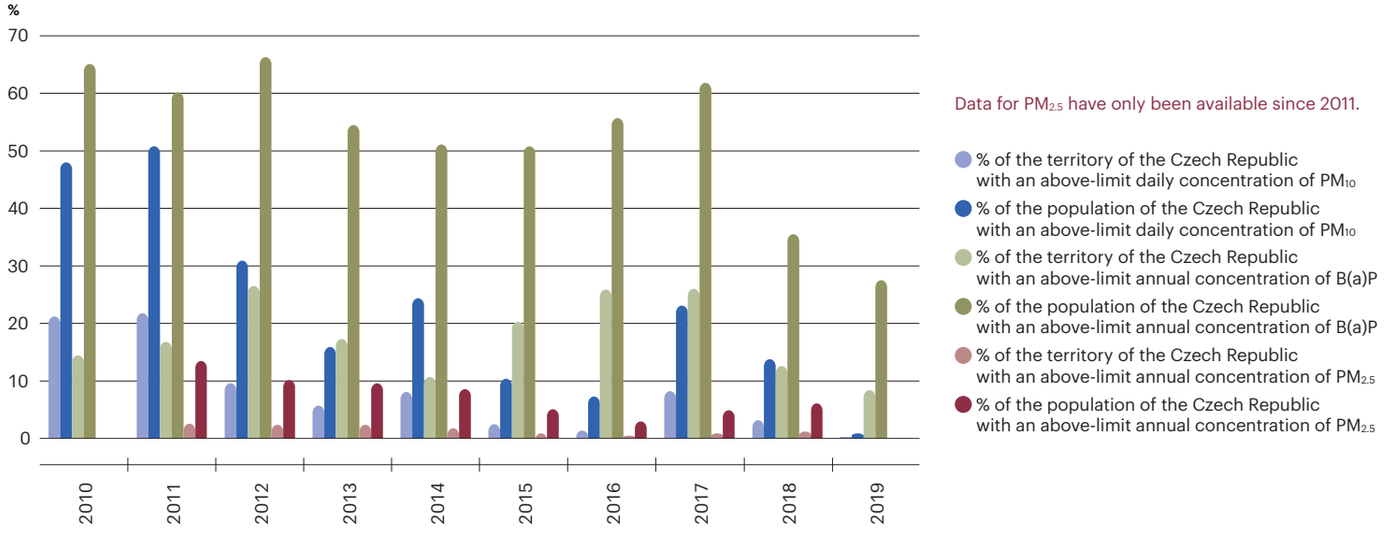
Data source: Czech Hydrometeorological Institute

The **limit values for suspended PM_{10} and $PM_{2.5}$ particles** have long been exceeded in the Czech Republic. However, in 2019 the limit for the annual average concentration of PM_{10} in the Czech Republic was not exceeded. Year-on-year fluctuations can mainly be attributed to weather conditions and, in the winter, they are associated with the inverse nature of the weather and temperature, which significantly affects the intensity of household heating. The limit value for the 24-hour average concentration of PM_{10} (Chart 4) was exceeded only on 0.3% of the territory in 2019 (compared to 3.2% of the territory in 2018), with 0.9% of the population of the Czech Republic being exposed to above-limit concentrations in that reporting year (compared to 13.8% of the population in 2018). The highest number of exceedances of the 24-hour average concentration of PM_{10} could be found at stations covering the densely populated area of Ostrava/Karviná/Frýdek-Místek. The limit value for the 24-hour average concentration of $PM_{2.5}$ (Chart 4) was exceeded only on 0.04% of the territory in 2019 (compared to 1.2% of the territory in 2018), with 0.1% of the population of the Czech Republic being exposed to above-limit concentrations in that reporting year (compared to 6.1% of the population in 2018).

[16] *The data for the year 2019 are only provisional. The chart shows the relative values of emissions, where 2005 = 100%.*

Chart 4

Percentage of the Czech Republic's area and population exposed to above-limit average 24-hour concentrations of suspended PM_{10} particles and above-limit annual average concentrations of suspended $PM_{2.5}$ and B(a)P [%], 2010–2019



Data source: Czech Hydrometeorological Institute

Only five **smog situations**, lasting for a total of 385 hours, and two regulations due to high concentrations of suspended PM_{10} particles were declared in 2019. This improvement of the situation compared to the previous year can be attributed mainly to very good dispersion conditions prevailing even in the winter. In 2019, 88% of days had good dispersion conditions (the 2007–2018 average is 77%). Another important factor was the above-average temperature. This meant there fewer heating days and therefore the heating intensity was lower. Suspended particulate matter is a problem not only in the Czech Republic, but also in other European countries. Roughly 15% of the urban population of the EU28 countries was exposed to above-limit 24-hour concentrations of PM_{10} in 2018,[17] and 4% of the urban population was exposed to above-limit annual concentrations of $PM_{2.5}$.

Long-term exposure to suspended particles increases **mortality**, with vulnerable people (the chronically ill and the elderly) always affected most. In 2019, this translated into approximately 4.7 thous. persons nationwide, of whom about 3.1 thous. in a normal urban environment.[18] The year-on-year decrease in the concentration of PM_{10} pushed down mortality by 1.9 thous. persons compared to 2018.

Suspended particles of size fractions PM_{10} and $PM_{2.5}$ are emitted into the air by various **sources** (Chart 5). In 2018,[19] in both cases the dominant source was household heating, accounting for 73.9% of total $PM_{2.5}$ emissions and 58.7% of total PM_{10} emissions. The second most significant source of emissions was transport, especially because of resuspension and tyre and brake wear. Besides the emission of primary suspended particulate matter by these sources, secondary suspended particles are also formed by chemical reaction from precursors (NO_x, SO_2, NH_3, and VOC).

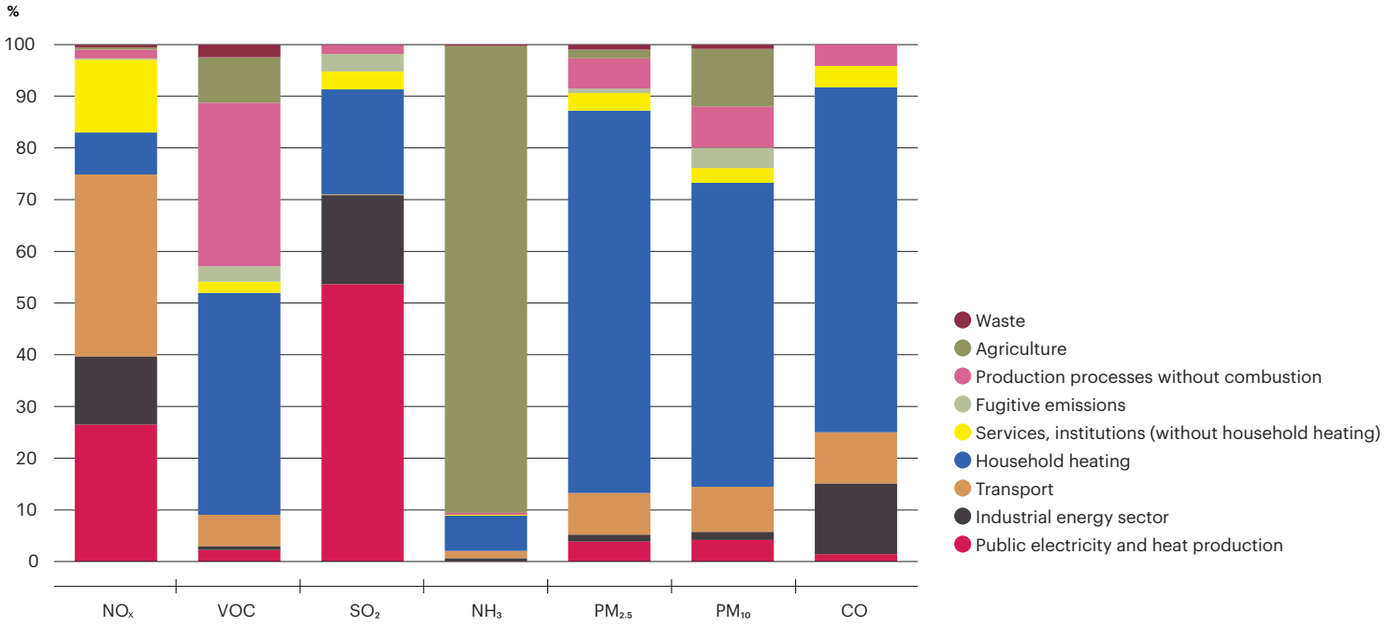
[17] *Data for the year 2019 were not available at the time of publication.*

[18] *According to the methodology used by the National Institute of Public Health, a normal urban environment encompasses data from urban stations, where stations with a very high traffic load (i.e. over 10,000 vehicles per day) and stations significantly affected by industrial production are excluded from the assessment.*

[19] *Data for the year 2019 were not available at the time of publication.*

Chart 5

Sources of selected emissions of pollutants in the Czech Republic [%], 2018



Data for the year 2019 were not available at the time of publication.

Data source: Czech Hydrometeorological Institute

Benzo(a)pyrene poses a very serious air quality problem in the Czech Republic, as it increases the individual lifetime risk of cancer. While the highest concentrations can be found in industrial localities, above-limit concentrations have also long been present at urban stations. The overwhelmingly predominant source of benzo(a)pyrene emissions is household heating (98.8% in 2018[20]). In 2019, the limit value for benzo(a)pyrene was exceeded on 8.4% of the territory, an area in which 27.5% of the population was living (Chart 4). In 2018, it was exceeded on 12.6% of the territory, accounting for 35.5% of the population. Benzo(a)pyrene concentrations follow a well-established annual pattern, with peaks in the winter (due to the worsening dispersion conditions and pollution caused by local household heating). Other European populations are also exposed to above-limit annual concentrations of benzo(a)pyrene – accounting for 15% of the EU28 urban population in 2018.[21]

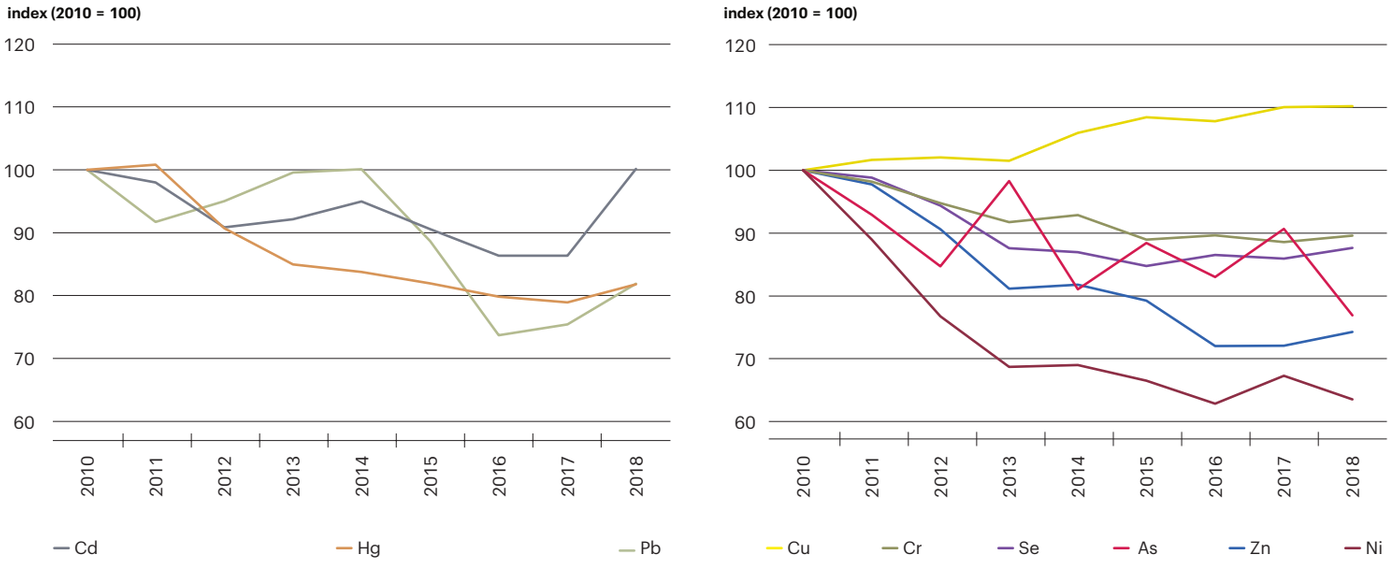
High concentrations of **nitrogen oxides** (NO_x) mainly cause respiratory problems, particularly at congested location, where the main source is road transport (Chart 5). NO_x emissions in the Czech Republic have long been declining. They went down by 43.5% between 2005 and 2019, and by 4.8% year-on-year in 2019. In 2019, when the weather and dispersion conditions were favourable, the annual limit value for NO_2 was exceeded at just one traffic-heavy location (three locations in 2018). The daily and hourly air pollution limits for **sulphur dioxide** were not exceeded anywhere in 2019. SO_2 emissions have long been reporting the most significant decline. They went down by 61.7% between 2005 and 2019, and by 17.2% year-on-year in 2019 (Chart 3).

Heavy metals have carcinogenic and mutagenic properties. They accumulate in living organisms and the environment. Air pollution limits for heavy metals were not exceeded in 2019. Heavy metal emissions (Chart 6) have been declining since 2010, despite highly volatility between individual years due to economic developments, the specific characteristics of each heating season, and the variable content of heavy metals in the fuels and raw materials used. The one exception is copper emissions, which are constantly growing as transport intensifies (by 10.1% since 2010). Between 2010 and 2018,[22] emissions of nickel, zinc, lead and mercury decreased the most. In 2018, year-on-year cadmium emissions increased by 16.0% and lead emissions by 8.6%. The main sources of heavy metal emissions in the Czech Republic in 2018 included the public energy and heat production sector (producing 87.6% of the selenium emitted and 42.9% of mercury emissions), tyre and brake wear (74.9% of copper emissions), iron and steel production (58.4% of lead emissions), and local household heating (44.5% of cadmium emissions).

[20, 21, 22] *Data for the year 2019 were not available at the time of publication.*

Chart 6

Heavy metal emissions in the Czech Republic [index, 2010 = 100], 2010–2018



Data for the year 2019 were not available at the time of publication.

Data source: Czech Hydrometeorological Institute

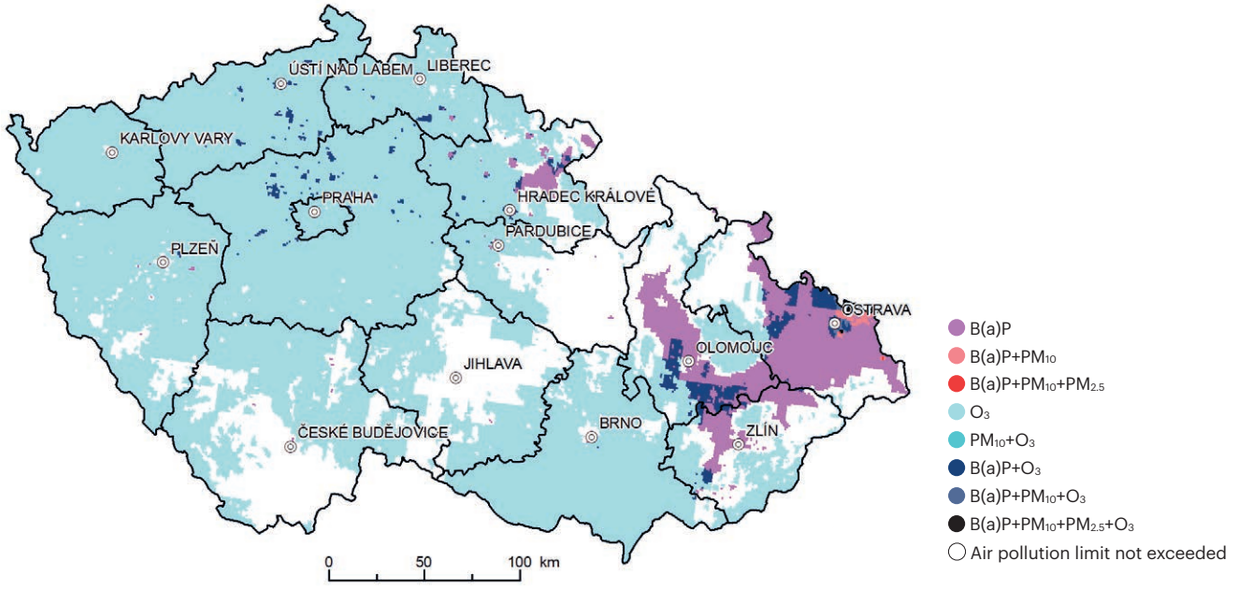
Another substance that significantly affects human health and ecosystems is **ground-level ozone**, which damages the respiratory system in particular. Its concentrations are mainly influenced by meteorological conditions (the intensity and duration of sunshine, temperature and precipitation). The highest concentrations are usually measured in the period from April to September. The years 2018 and 2019 were very favourable for the formation of ground-level ozone due to the high temperatures in the summer months. In 2019, the limit value applicable to ozone in order to protect human health was exceeded on 70.5% of the territory, with 56.9% of the population exposed to above-limit concentrations. In 2019, six smog situations were announced because of ground-level ozone (in June and July), lasting for a total of 90 hours. In 2019 (calculated as the average for the years 2015–2019), the limit value for ozone (AOT40) for the protection of ecosystems and vegetation was exceeded at 64.1% of stations in the Czech Republic.

In 2019, at least one air pollution limit was exceeded (excluding ground-level ozone) on 8.4% of the territory of the Czech Republic.[23] 27.5% of the population was living in that area. After including ground-level ozone, in 2019 the limit value of at least one pollutant was exceeded in 77.1% of the area of the Czech Republic, where 75.6% of the population was living. The concentration of pollutants is exceeded in at numerous sites, with the Moravian-Silesian and Zlín Regions remaining the most polluted areas (Figure 6).

[23] *Act No. 201/2012 on air protection, Annex 1, points 1+2+3: exceedance of the limit value (excluding ground-level ozone) for at least one of the listed pollutants (SO_2, CO, PM_{10}, $PM_{2.5}$, NO_2, benzene, Pb, As, Cd, Ni, benzo(a)pyrene)*

Figure 6

Areas where human health protection limit values for air quality were exceeded in the Czech Republic [%], 2019



Data source: Czech Hydrometeorological Institute

Detailed data sources

https://issar.cenia.cz