4 | Emissions of pollutants

Key question

Have we succeeded in reducing air pollution with pollutants that adversely affect human health and ecosystems?

Key messages

The emission of air pollutants significantly decreased in the period 1990–2000. Emission reduction continued also after 2000, in the period 2000–2016, the greatest decline was in SO_2 emissions by 52.0%, NO_x by 46.0%, VOC emissions by 42.1%, total suspended particulates by 37.0%, CO emissions by 25.7% and emissions of NH_3 by 15.9%.
In 2016, SO_2 emissions decreased year-on-year by 12.8% and NO_x emissions by 4.4%. Total emissions of the individual pollutants are approximating the binding limits of national emissions from 2020.

TSP and VOC emission production stagnated in 2016, compared with the previous year.

In 2016, CO emissions production grew year-on-year by 4.9% and NH_3 emissions by 2.4%

Overall assessment of the trend

Change since 1990

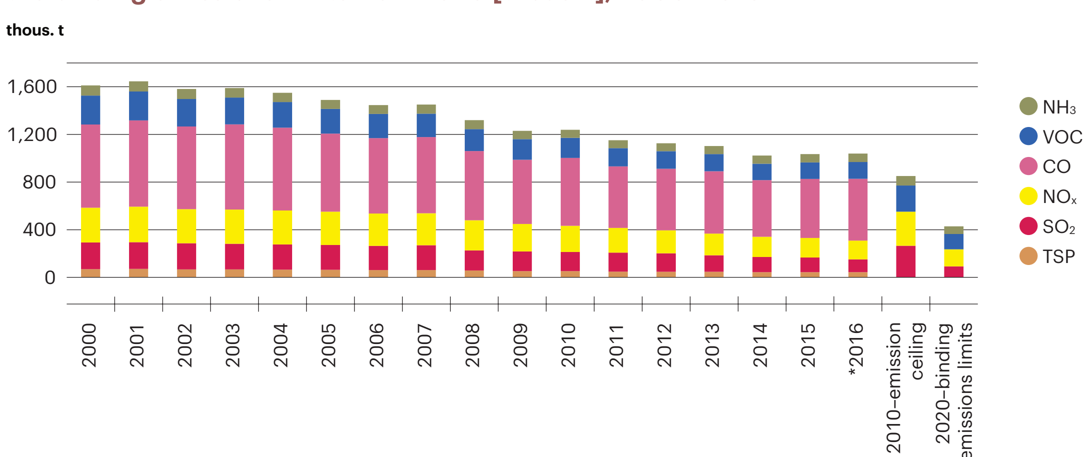
Change since 2000

Last year-on-year change

Indicator assessment

Chart 1

Development of total emissions of pollutants in the Czech Republic and the level of national emission ceilings for 2010 and the binding emissions limits from 2020 [thous. t], 2000–2016

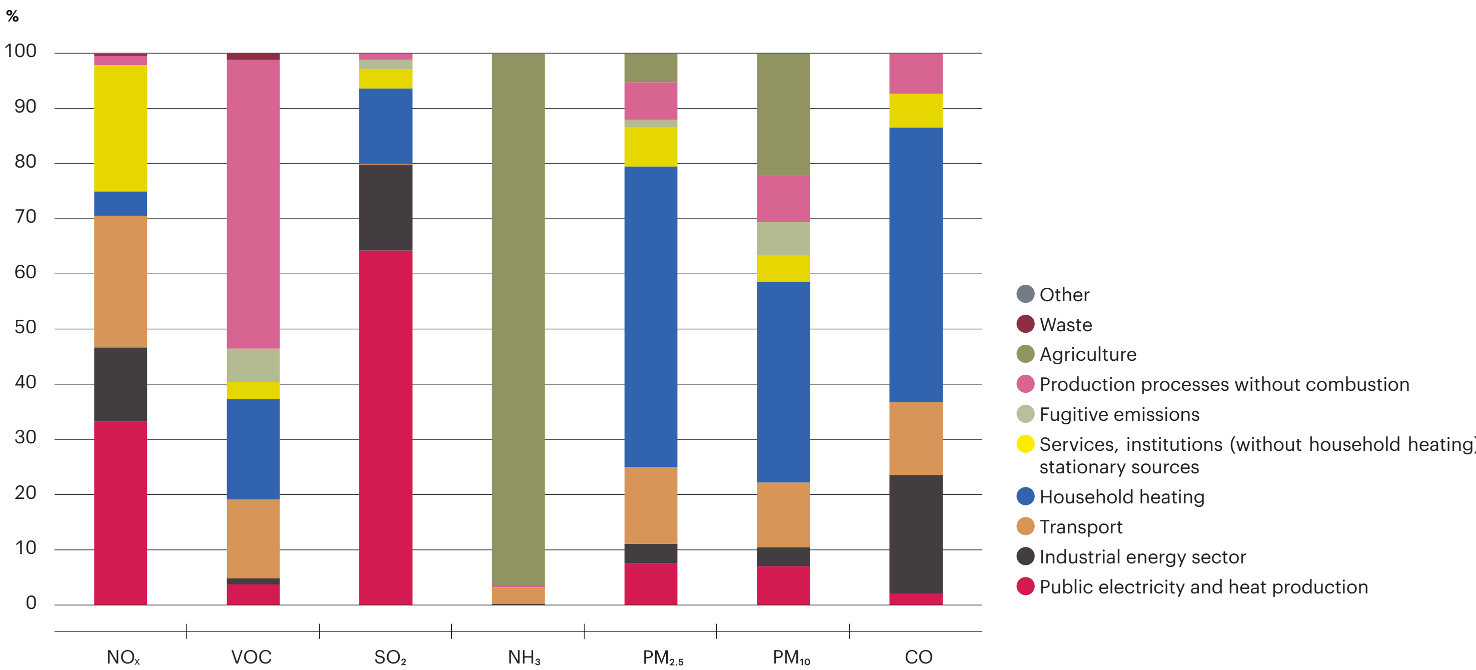


** Preliminary data*
The binding limits for the emissions of TSP and VOCs have not been established.
Emissions from the use of nitrogen fertilisers have been included in the NH_3 emission balance since 2008.
The emission inventory was corrected for the presented period 2000–2016 due to adjustments of emission factors.

Source: Czech Hydrometeorological Institute

Chart 2

Sources of emissions of pollutants in the Czech Republic [%], 2015



Data for the year 2016 are not, due to the methodology of their reporting, available at the time of publication.

Source: Czech Hydrometeorological Institute

The **emissions of pollutants into the air** have been declining over the long term, year-on-year fluctuations are caused primarily by the meteorological conditions and economic activity including industrial production and transport.

The largest decrease in pollutants was recorded in the period between 1990 and 2000, mainly at its beginning, as a result of structural changes in the national economy.

In the period **2000–2016**, the trend of declining emissions of pollutants into the air continued, overall, the largest decreases occurred between 2000 and 2016 (Chart 1) in the case of SO_2 emissions by 52.0% to 107.2 thous. t^{-1}, NO_x emissions by 46.0% to 157.2 thous. $t.year^{-1}$, and also for VOC emissions by 42.1% to a total of 140.5 thous. $t.year^{-1}$. The least decrease occurred in emissions of NH_3, which fell only by 15.9% to a total of 71.4 thous. $t.year^{-1}$.

The fluctuations in emissions between years in the period 2000–2016 reflected the state of development of the national economy in each year, and the biggest change was therefore recorded between the years 2007–2008, and also between the years 2008–2009 due to a downturn of the national economy caused by economic crisis. In 2008, emissions of SO_2 decreased sharply year-on-year by 19.2% and CO by 9.0%, in 2009, the largest year-on-year decrease was seen in TSP emissions by 10.5% and NO_x emissions by 8.6%.

In 2016, however, the overall positive development halted. A year-on-year decline was observed only for emissions of SO_2 by 12.8% and NO_x emissions by 4.4%. TSP emissions stagnated year-on-year in 2016 at the level of 43.9 thous. $t.year^{-1}$. On the contrary, CO emissions grew by 4.9%, NH_3 emissions by 2.4% and VOC emissions by 1.1%.

Emissions of SO_2 and NO_x are steadily decreasing, in particular as a result of the introduction of technologies and manufacturing processes with the BAT, the use of fuels with a lower sulphur content and the reduction of the energy intensity of the economy. A significant role is currently played by the diversification of electricity production, i.e., the decrease in production of electricity in coal-fired power plants and, on the contrary, its increase in nuclear power plants and also the production of electricity from RES. A great influence is also the obligation to meet the legislative requirements of the transposition of Directive of the European Parliament and of the Council 2010/75/EU on industrial emissions into Czech legislation. An important negative factor affecting the production of SO_2 and NO_x emissions is, however, the long-term pro-export term nature of electricity generation, especially in the case that most of the electricity is produced in steam plants for solid fuels. The long-term reduction of NO_x emissions is also associated with a decrease in these emissions from the transport sector, in particular as a result of a gradual modernisation and replacement of the vehicle fleet, leading to a decline in transportation emissions.

Stagnation in the emissions of NH_3 is associated in particular with the set agricultural policy of the Czech Republic and with the implementation of the Common Agricultural Policy of the EU. The reduction of emissions of NH_3 in the long term is, however, contributed to by the diminishing numbers of livestock, especially swine.

The development of VOC and CO emissions is associated with trends in industrial production, while CO emissions from industrial sources come from iron and steel plants in Ostrava and Třinec and their development thus corresponds to the volume of production of these devices. Developments in PM_{10}, $PM_{2.5}$, VOC and CO emissions also reflect the development of the meteorological conditions in the heating season in that year and, moreover, are significantly influenced by the type of fuel used in household combustion heaters. The decrease TSP presented also as PM_{10}, $PM_{2.5}$, was caused in the early 1990s by the application of end technology in coal power plants, at present, the emission development is influenced by growth of industrial production and construction.

The values of pollutant emissions in 2016 met the set emission ceilings for 2010. To achieve the binding emission limits from 2020 it is required to reduce the emissions of SO_2 by 16.6%, NO_x emissions by 10.0%, VOC emissions by 8.9% and NH_3 emissions by 11.6% (Chart 1).

The main source of emissions of pollutants into the air in 2015[1] was, in general, household heating, public electricity and heat production, and the industrial energy sector and transport. However, the representation of the individual sectors in the individual emissions of pollutants varies (Chart 2). In the case of NO_x, the main producer was the sector of public electricity and heat production (33.2%), followed by the transport sector (23.8%). The main producer of SO_2 emissions was public electricity and heat production (64.2%) and household heating (13.7%). In the case of the VOC emissions, the main source are manufacturing processes without combustion, especially the use of solvents, VOCs are also emitted by domestic heating. In the case of PM_{10}, $PM_{2.5}$ and CO emissions, the main source is local domestic heating (54.5%, 36.4% and 49.8% respectively) and also in the case of PM_{10}, $PM_{2.5}$ emissions it is transport (13.9% and 11.8% respectively), in the case of CO it is industrial energy (21.6%). NH_3 emissions originate mainly from the agricultural sector (96.5%).

Detailed indicator assessment and specifications, data sources

CENIA, key environmental indicators

http://indicators.cenia.cz

[1] *Data for the year 2016 are not, due to the methodology of their reporting, available at the time of publication.*

7 | Air quality in terms of the protection of ecosystems and vegetation

Key question

Are the limit values for the protection of ecosystems and vegetation exceeded?

Key messages

The limit values for annual or for winter average SO_2 concentration was not exceeded at any rural locality in 2016, and the annual limit value for annual average concentration of NO_x for the protection of ecosystems and vegetation was not exceeded either in 2016.

In 2016, the limit value for ozone for the protection of ecosystems and vegetation was exceeded at a total of 8 stations ranked as rural or suburban, and compared to 2015 the number of stations with an exceeded limit value increased.

Overall assessment of the trend

Change since 1990 N/A

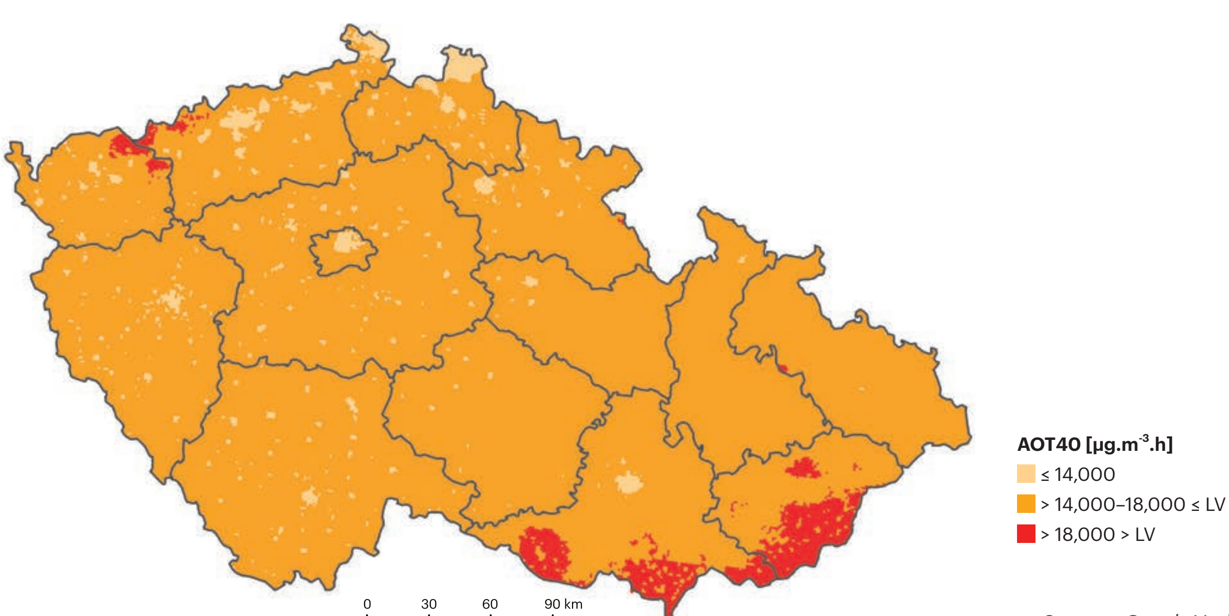
Change since 2000

Last year-on-year change

Indicator assessment

Figure 1

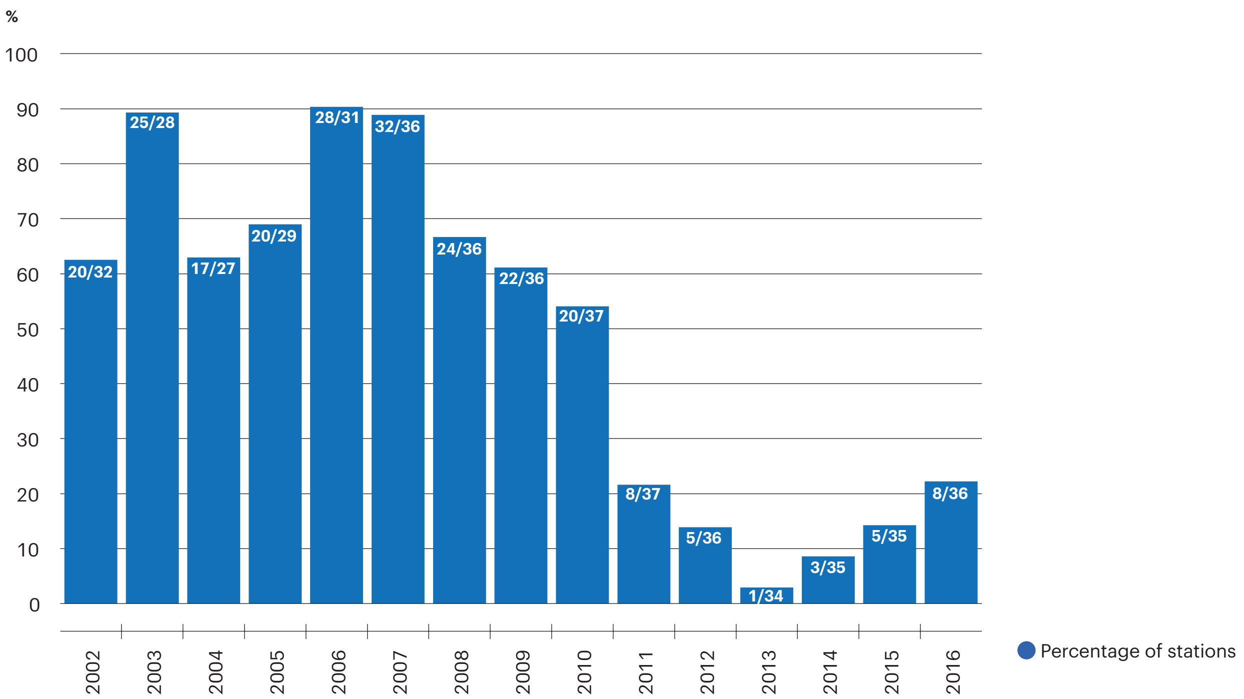
Field of AOT40 exposure index values, 5-year average [µg.m^{-3}.h], 2012–2016



Source: Czech Hydrometeorological Institute

Chart 1

Percentage of stations at which the limit values, expressed as AOT40 (5-year average) for the protection of vegetation, were exceeded [%], 2002–2016

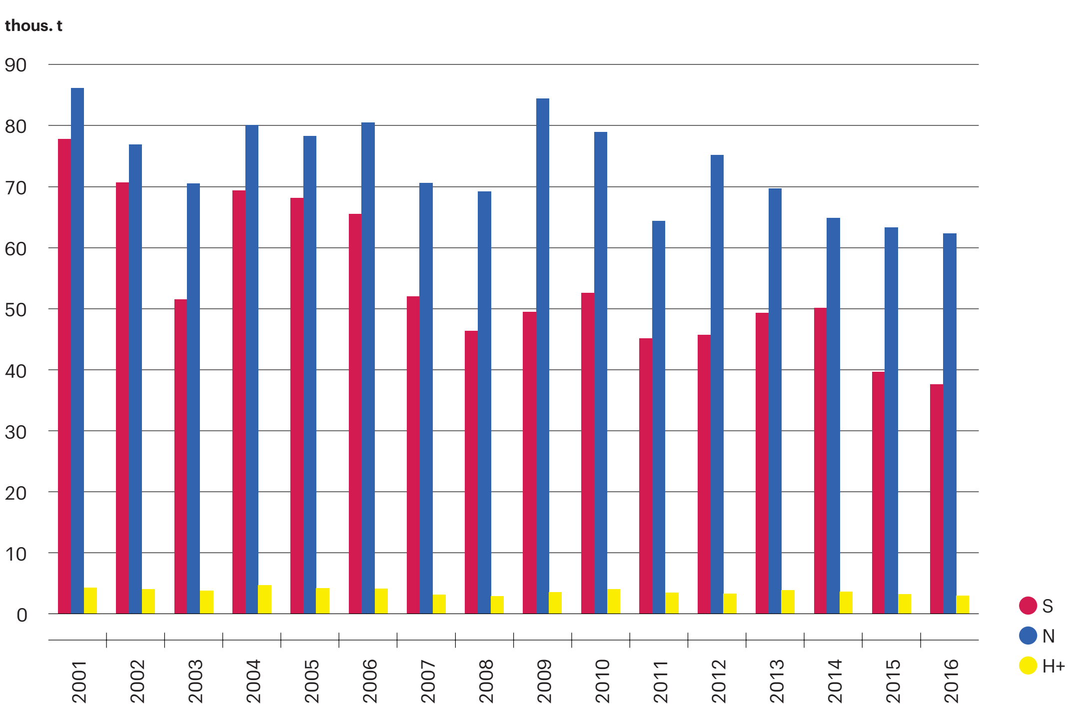


The number in the chart indicates the number of stations at which the limit value was exceeded (before the slash) out of the total number of stations (after the slash). These are rural and suburban stations for which the AOT40 calculation is relevant under the legislation

Source: Czech Hydrometeorological Institute

Chart 2

Trends in the total atmospheric deposition of sulphur, nitrogen and hydrogen ions in the Czech Republic [thous. t], 2001–2016



Source: Czech Hydrometeorological Institute

In 2016, the **ozone** (AOT40[5]) **limit value** for the protection of ecosystems and vegetation (period 2012–2016) was not exceeded in most of the territory of the Czech Republic (Figure 1). In comparison with the previous assessed period 2011–2015, the situation has not changed significantly.

The limit value for ozone for the protection of ecosystems and vegetation (18 000 $\mu g.m^{-3}$) was exceeded in 2016 at 8 stations out of a total of 36 rural and suburban stations (this is the average for the years 2012–2016). The highest values were measured at the station Štítná n. Vláří (21,105.8 $\mu g.m^{-3}.h$), where the highest concentrations have been measured in the long term. Compared to 2015 (average for the years 2011 to 2015), there was an increase in the number of sites where exceedance was recorded, because in 2015 the ozone limit value for the protection of ecosystems and vegetation was exceeded only at 5 of the total 35 stations (Chart 1).

Interannual changes in the values of the AOT40 exposure index are affected not only by ozone precursor emissions, but more particularly by the meteorological conditions (temperature, precipitation, solar radiation) in the period from May to July for which the indicator is calculated. Also for that reason, the highest concentrations of ozone and the most exceedances of the limit value were achieved in the years 2003, 2006 and 2015, which were characterised by favourable conditions for the formation of ground-level ozone.

The **limit value** for the annual average concentration of **SO_2** (20 $\mu g.m^{-3}$) for the protection of ecosystems and vegetation was not exceeded in 2016 at any one of the 19 stations classified as rural. Similarly, in 2016, none of the 18 stations classified as rural reported exceeded limit values for the winter, i.e. for the period October–March, average concentration of SO_2 (20 $\mu g.m^{-3}$) for the protection of ecosystems and vegetation. The highest annual average SO_2 concentration was measured in 2016 at the Krupka station (8.7 $\mu g.m^{-3}$), the highest winter average concentration of SO_2 was measured at the station of Věřňovice (12.5 $\mu g.m^{-3}$).

The **limit value** for the annual average concentration of **NO_x** (3 $\mu g.m^{-3}$) for the protection of ecosystems and vegetation was not exceeded in 2015 as well as in 2016 at any one of the 19 stations classified as rural. The highest annual average concentrations of NO_x were achieved at the site in Věřňovice (22.9 $\mu g.m^{-3}$).

The total **atmospheric deposition** (Chart 2) consists of wet and dry elements and represents the direct input of pollutants into other environmental areas. Despite the long-term decline of pollutants there remains a high burden of ecosystems caused by the atmospheric deposition in many areas of the Czech Republic. Currently it is mainly caused by emissions from traffic (NO_x) and emissions from energy sources (NO_x and SO_2). A significant proportion is also represented by the long-range transport of pollution from neighbouring countries of Central Europe.

In 2016, the total atmospheric deposition of **sulphur** amounted to a total of 37,662 t of sulphur for the total area of the Czech Republic and thus reached the lowest value since 2001. The total deposition of sulphur has its maximum in the Ore Mountains (Krušné hory) where the maximum values of the throughfall deposition of sulphur are also achieved. In the last decade, the value of the total **nitrogen** deposition remains in the range of 70,000–80,000 t per year as a result of the production of NO_x emissions. In 2016, the total deposition of nitrogen (oxidised + reduced forms) was 62,351 $t.year^{-1}.km^{-2}$ which is also the lowest value since 2001. In the case of total **hydrogen** ion deposition the value reported in 2016 was 2,987 $t.year^{-1}$ for the area of the Czech Republic, which is the lowest value since 2008.

Detailed indicator assessment and specifications, data sources

CENIA, key environmental indicators

http://indicators.cenia.cz

[5] For the purposes of the Act No. 201/2012, AOT40 means the sum of the differences between the hourly concentration greater than 80 $\mu g.m^{-3}$ (= 40 ppb) and the value 80 $\mu g.m^{-3}$ in the given period using only the hourly values measured every day between 08:00 and 20:00 CET, calculated from hourly values during the summer season (May 1–July 31).