STATE OF THE ENVIRONMENT REPORT – SLOVAK REPUBLIC

2018

25th anniversary of annual reports

MINISTRY OF ENVIRONMENT OF THE SLOVAK REPUBLIC

SLOVAK ENVIRONMENT AGENCY

COMPONENTS OF THE ENVIRONMENT AND THEIR PROTECTION

AIR

KEY QUESTIONS AND KEY FINDINGS

What is the trend in the generation of pollutants in the Slovak Republic?

Emissions of basic pollutants have significantly decreased over the long term (1990-2017). In 2017 there was a decrease in NO_X, CO, PM_{10} and $PM_{2.5}$ emissions compared to 2016. SO_2 emissions slightly increased. Total NH_3 emissions have continued to decline over the long term after a significant decline between 1990 and 2005.

Emissions of non-methane volatile organic compounds (NMVOC) have fallen over the long term (1990-2017).

When comparing 2000 and 2017, there was a decrease in emissions of Pb, while there was a relatively significant decrease in emissions of Cd and Hg despite their slight increase in 2017 compared to the preceding year.

Emissions of persistent organic pollutants (POPs) significantly decreased in the 1990 to 2005 period. Subsequently, in the 2005 to 2017 period there was a fall in emissions of dioxins and furans (PCDD/PCDF) and polycyclic aromatic hydrocarbons (PAH) and an increase in emissions of polychlorinated biphenyls (PCB). There was an increase in emissions of PCDD/PCDF, PCB and PAH in 2017 compared to 2016.

Are the limit values for air pollutants intended to protect human health being met?

In 2018 the human health protection limit value for 24-hour concentrations was exceeded at 5 PM_{10} monitoring stations and 2 NO_2 monitoring stations. The health protection target value for BaP was also exceeded at 4 monitoring stations.

The reduction in national emissions of ozone precursors did not bring about a decrease in ground-level ozone concentrations in the SR. In 2018 some characteristics of ground-level ozone concentrations remained at their relatively high levels from previous years.

Are the limit values for air pollutants intended to protect vegetation being met?

The limit values of air pollutants (SO_2, NO_X) established for the protection of vegetation were not exceeded. The limit values were exceeded for ground-level ozone.

What is the trend in the status of the ozone layer and the intensity of solar radiation over the territory of the Slovak Republic?

The trend for total atmospheric ozone was below the long-term average of -0.1%, while total daily doses of ultraviolet erythema radiation decreased slightly compared to 2017.

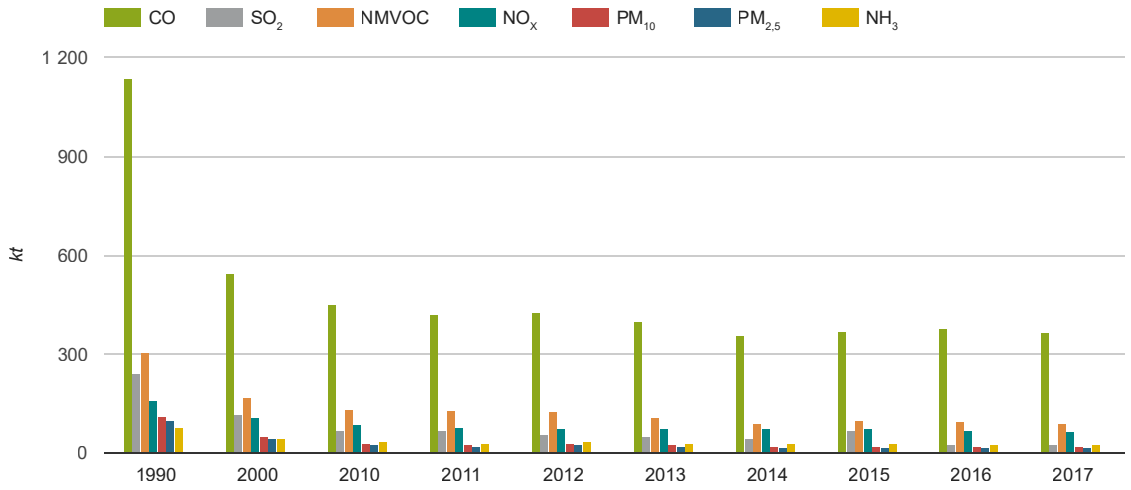
EMISSION SITUATION

Trend in emissions of selected pollutants

Over the long term (1990-2017) a significant decrease in **emissions of basic pollutants** has been recorded. A comparison of the years between 2005 and 2017 shows a **decrease in emissions of SO_2** of **68.6%**, **NO_X** of **36.4%** and **CO** of **34.4%**. The trend in particulate emissions between 2005 and 2017 shows a **decrease of 44%** for **PM_{10}** and **47.4 %** for **$PM_{2.5}$**. A year-on-year comparison (2016-2017) shows a continuation of the slight decrease in emissions, with the exception of SO_2, where a slight rise was recorded.

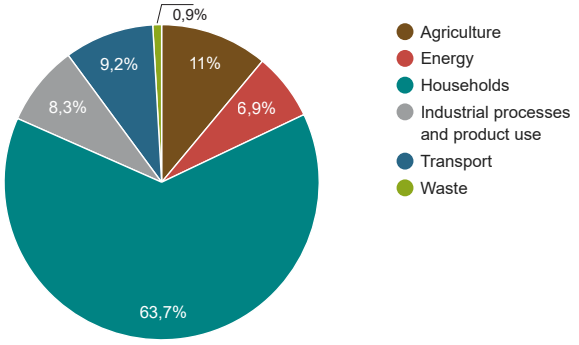
This positive development trend is a result of legislative and technological progress and a change in the fuel base. The trend was also affected by a change in the structure and volume of industrial production.

Chart 001 I Trend in emissions of basic pollutants



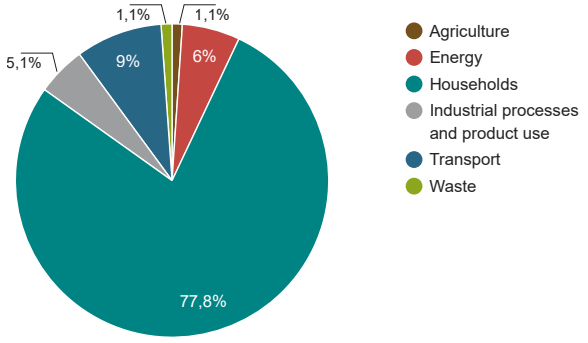
Source: Slovak Hydrometeorological Institute

Chart 002 I Share in emissions of PM_{10} by sector (2017)



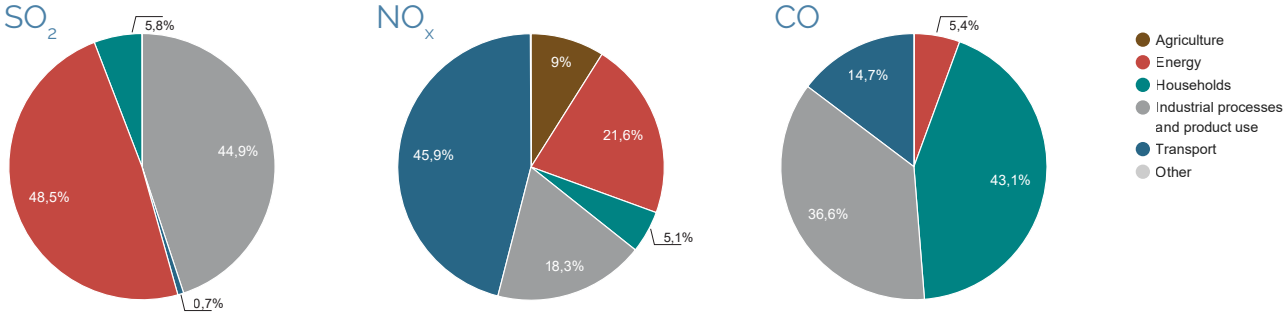
Source: Slovak Hydrometeorological Institute

Chart 003 I Share in emissions of $PM_{2.5}$ by sector (2017)



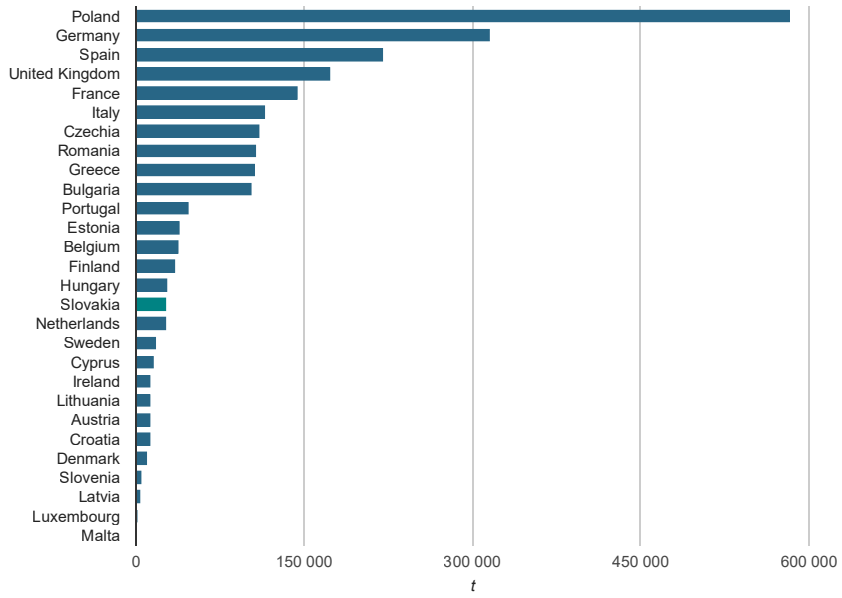
Source: Slovak Hydrometeorological Institute

Chart 004 - 006 I Share in emissions of SO_2, NO_X and CO by sector (2017)



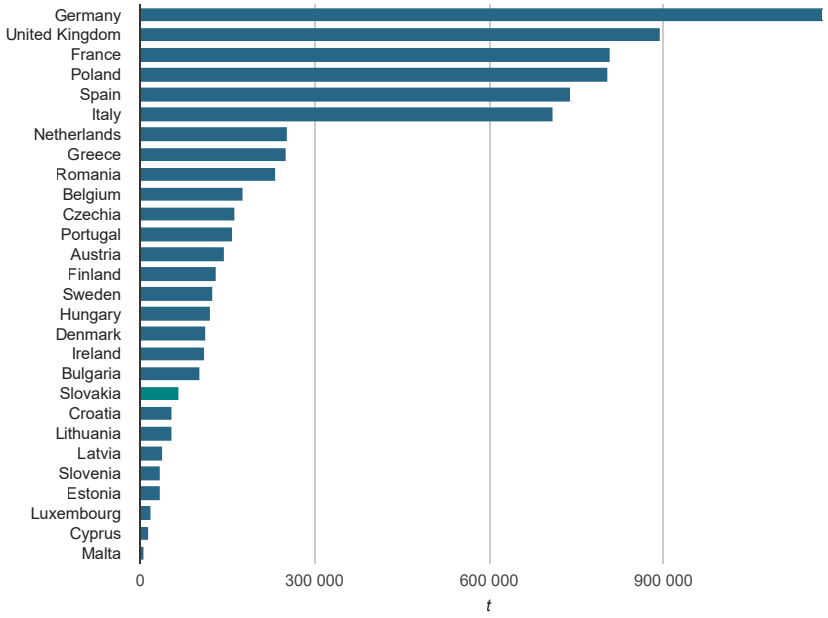
Source: Slovak Hydrometeorological Institute

Chart 007 I International comparison of emissions of SO_2 (2017)



Source: Eurostat

Chart 008 I International comparison of emissions of NO_X (2017)

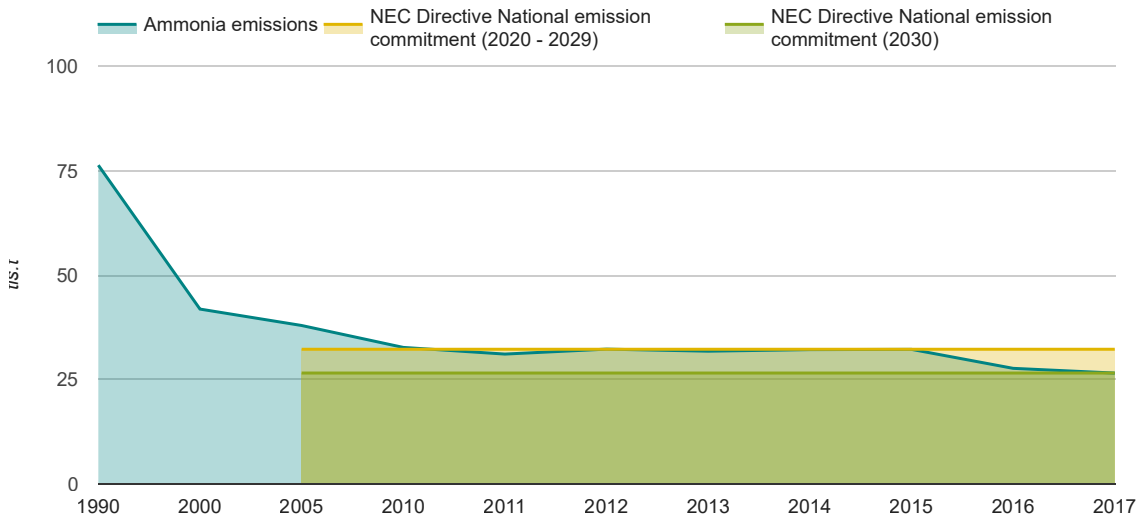


Source: Eurostat

The generation of emissions of **ammonia (NH_3)** in 2017 was 26 545 tonnes, a slight decrease compared to 2016.

From the perspective of the longer-term trend, ammonia emissions **fell in 2017 by 30% compared to 2005**.

Chart 009 I Trend in emissions of ammonia from the perspective of compliance with international commitments

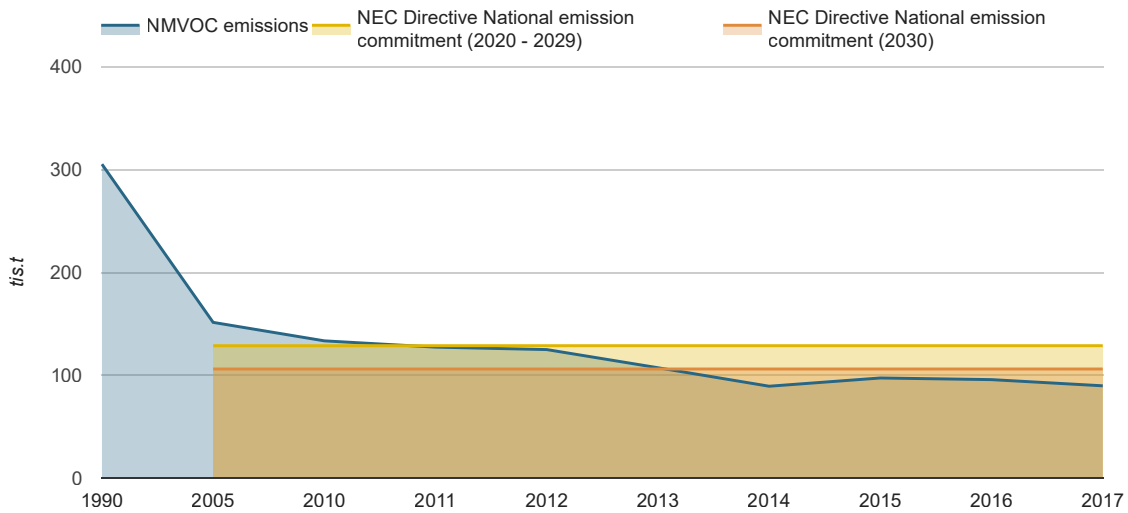


Source: Slovak Hydrometeorological Institute

There has been a long-term decrease in **emissions of non-methane volatile organic substances (NMVOC)**. A comparison of 2005 and 2017 shows a **decrease of 40.8%**.

Since 2000 the trend in NMVOC emissions has been a slight decrease and their quantity is holding at an approximately constant level with slight fluctuations in individual years.

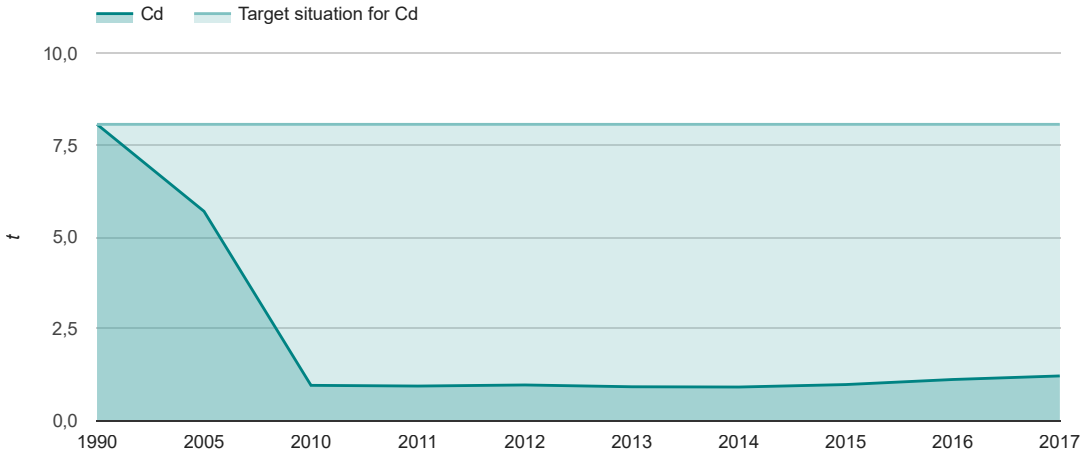
Chart 010 I Trend in NMVOC emissions from the perspective of compliance with international commitments



Source: Slovak Hydrometeorological Institute

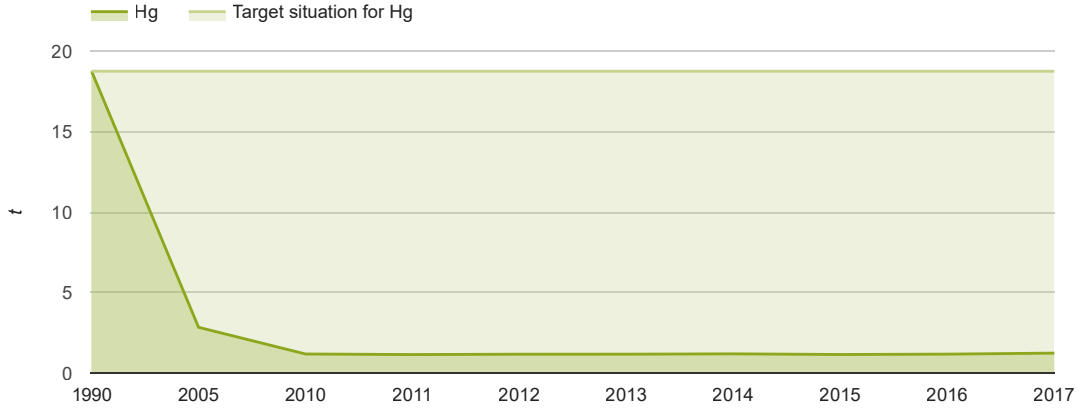
Emissions of heavy metals have significantly decreased compared to their values from 1990. In recent years emissions of heavy metals have been characterised by slight fluctuations. A comparison of 2005 and 2017 shows a **decrease in emissions of Pb of 18.5%, Cd of 78.7% and Hg of 56.2%**. In 2017 a slight rise in emissions of Cd, Hg and Pb was recorded compared to 2016.

Chart 011 I Trend in cadmium emissions into the air from the perspective of compliance with international commitments



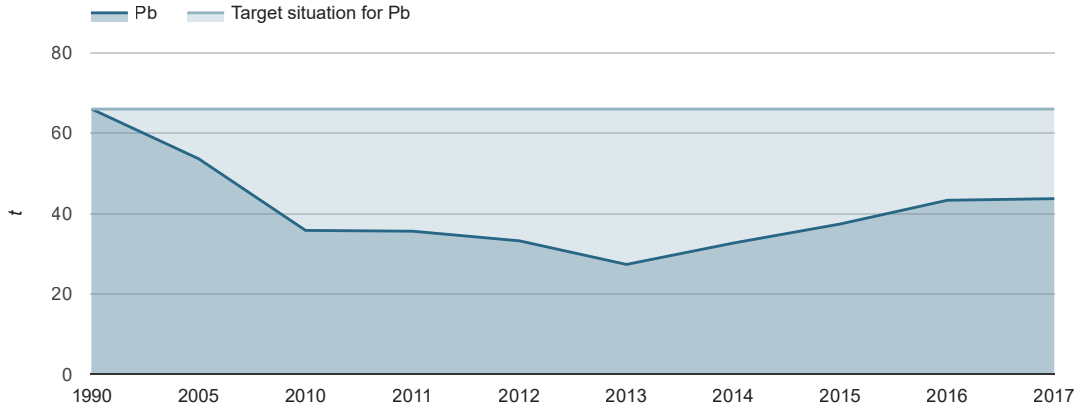
Source: Slovak Hydrometeorological Institute

Chart 012 I Trend in mercury emissions into the air from the perspective of compliance with international commitments



Source: Slovak Hydrometeorological Institute

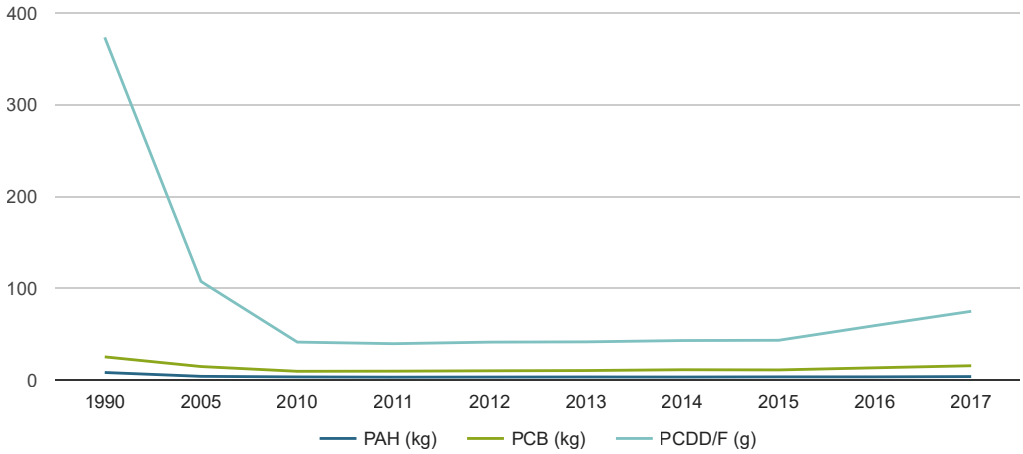
Chart 013 I Trend in lead emissions into the air from the perspective of compliance with international commitments



Source: Slovak Hydrometeorological Institute

Emissions of persistent organic pollutants (POPs) significantly decreased in the 1990 to 2000 period. Subsequently, there was a **decrease in emissions of dioxins and furans (PCDD/PCDF)** between 2005 and 2017 **of 30.2%, and of 5.8% for polycyclic aromatic hydrocarbons (PAH)** accompanied by a **slight rise of 5.9%** in the case of **emissions of polychlorinated biphenyls (PCB)**. There were year-on-year increases in emissions of PCDD/PCDF, PCB and PAH.

Chart 014 I Trend in emissions of persistent organic pollutants

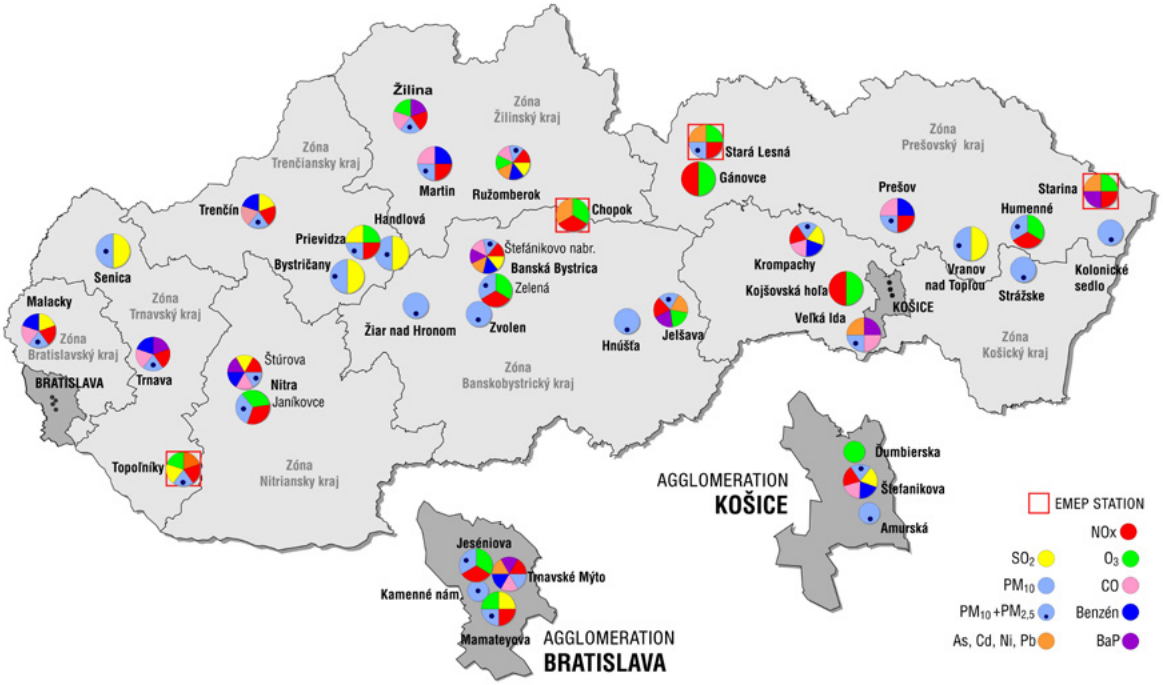


Source: Slovak Hydrometeorological Institute

The **Aarhus Protocol on Persistent Organic Pollutants** was signed in 1998, **an addition to the Geneva Convention on Long-Range Transboundary Air Pollution**, the goal of which is to reduce POPs emissions to 1990 levels. The SR signed this protocol in the same year. The target is still being met.

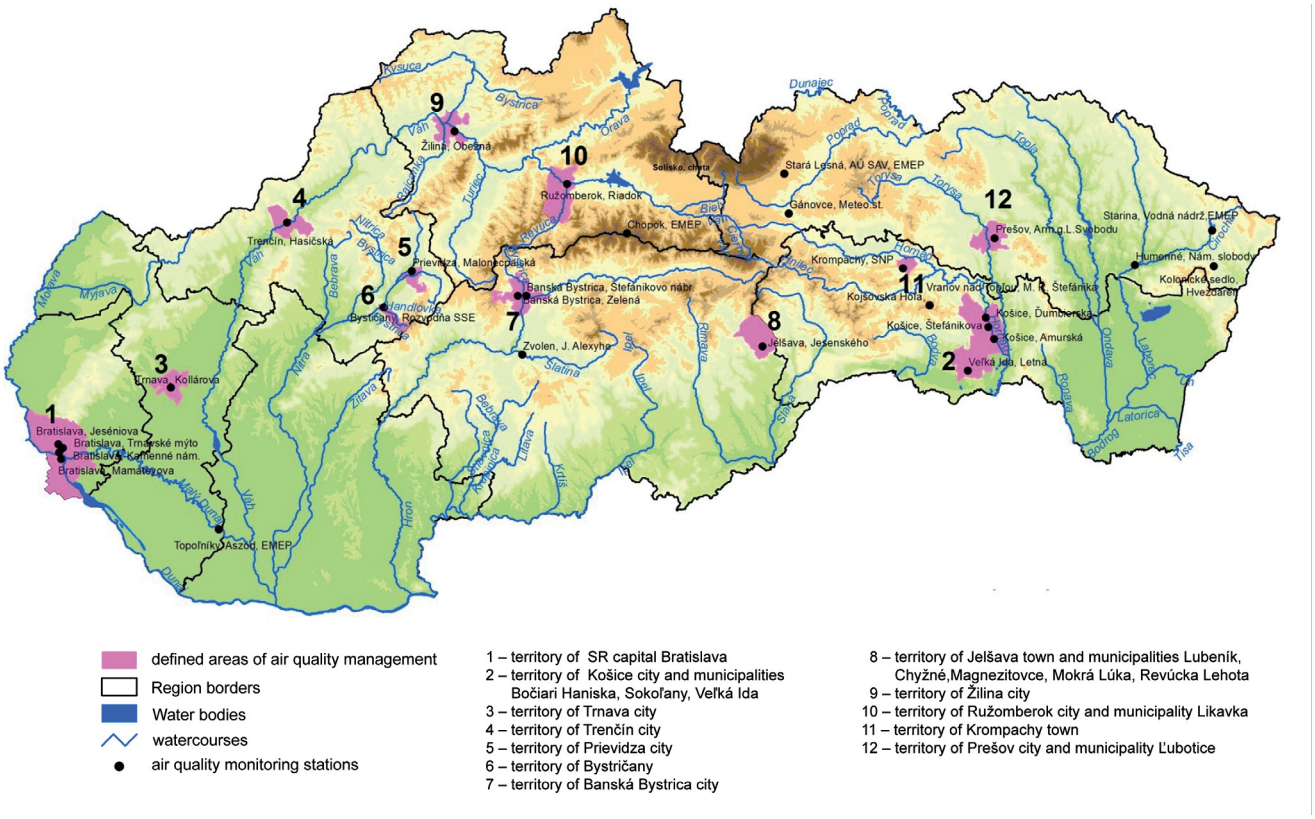
EMISSION SITUATION

Map 002 I National air quality monitoring network



Source: Slovak Hydrometeorological Institute

Map 003 I Air quality management areas



Source: Slovak Hydrometeorological Institute

SULPHUR DIOXIDE

In 2018 the limit value for average hourly and average daily SO_2 values was not exceeded in any agglomeration or zone. Also, no alert thresholds were exceeded at monitoring stations in the Slovak Republic this year.

The critical value for vegetation protection is 20 µg/m³ per calendar year and winter period. This limit value was not exceeded at any EMEP station during 2018, either for the calendar year or winter period. All the values were below the lower limit for vegetation protection.

NITROGEN DIOXIDE

In 2018 the annual limit value for NO_2 was exceeded at the Bratislava, Trnavské mýto and Prešov, Arm. gen. L. Svobodu stations. The limit value for hourly concentrations for human health protection was not exceeded at any monitoring station. In 2018 no alert threshold was exceeded for NO_2.

The critical value for vegetation protection (30 µg/m³ per calendar year expressed as NO_X) was not exceeded at any EMEP station in 2018. Values were well below the lower limit for vegetation protection.

PM_{10}

In 2018 the permitted number of cases of exceeding limit values for average annual PM_{10} concentrations did not occur at any monitoring station. The limit value for 24-hour concentrations for human health protection was exceeded at five AMS: Košice, Štefánikova; Banská Bystrica, Štefánikovo nábr.; Jelšava, Jesenského; Veľká Ida, Letná and Trenčín, Hasičská. PM10 monitoring adequately covers the territory of Slovakia.

$PM_{2,5}$

For $PM_{2.5}$ particles only an annual limit is set, at 25 µg/m³. In 2018 this value was not exceeded at any monitoring station.

The health-related consequences arising from air pollution depend on the size and composition of the particles and are more severe the smaller the particles. European and, since implementation, also Slovak legislation have therefore shifted attention to $PM_{2.5}$. One of the indicators that should characterise the burden on the population through increased $PM_{2.5}$ concentrations is the average exposure indicator (AEI), which is defined for the relevant year as the continuous mean concentration averaged over all sampling sites for the past 3 years. Pursuant to Annex No 11 to Decree 360/2010, a limit value of 20 µg/m³ should be achieved in 2020. The value of the average exposure indicator in 2018 was 18.1 µg/m³.

CARBON MONOXIDE
The limit value for CO was not exceeded at any monitoring stations in Slovakia in 2018, while air pollution for the previous 2012 to 2018 period was also under the lower limit.

BENZENE
The highest benzene level was measured at the Krompachy, SNP station in 2018, however the average annual concentrations were significantly under the limit value of 5 µg/m^3.

Pb, As, Ni, Cd
Neither the limit value nor the target value were exceeded in 2018.
Average annual concentrations of heavy metals measured at National Air Quality Monitoring Network stations are mostly only a fraction of the target, respectively limit, value.

BaP
The average annual concentration BaP at the Veľká Ida, Letná; Banská Bystrica, Štefánikovo nábr.; Žilina, Obežná and Jelšava, Jesenského stations exceeded the target value of 1 ng/m^3. The exceeding of the target value at the AMS at Veľká Ida may be attributed to industrial activity (mainly coke production) and partly to household heating; in Jelšava household heating using solid fuel had a significant impact, while at the other two stations the most significant problem in relation to BaP was road transport. BaP at all stations except Veľká Ida is characterised by significantly higher values in the colder half of the year, partly influenced by unfavourable dispersion conditions.

Ground-level ozone

Annual averages of ground-level ozone concentrations in the SR in 2018 were in the interval of 36 to 95 µg/m^3. The highest average annual ground-level ozone concentration in 2018 was recorded at the Chopok station (95 µg/m^3).

The target value for human health protection for ground-level ozone concentration is 120 µg/m^3 (maximum daily 8-hour value) pursuant to Decree of the Ministry of the Environment of the SR No 244/2016 on air quality. This value must not be exceeded for more than 25 days in a year over an average of three years. An overview of when the target value was exceeded for the 2016 to 2018 period is provided in the following map. Neither the warning threshold (240 µg/m^3) nor the reporting threshold (180 µg/m^3) for alerting the public and for warning the public were exceeded in 2018.

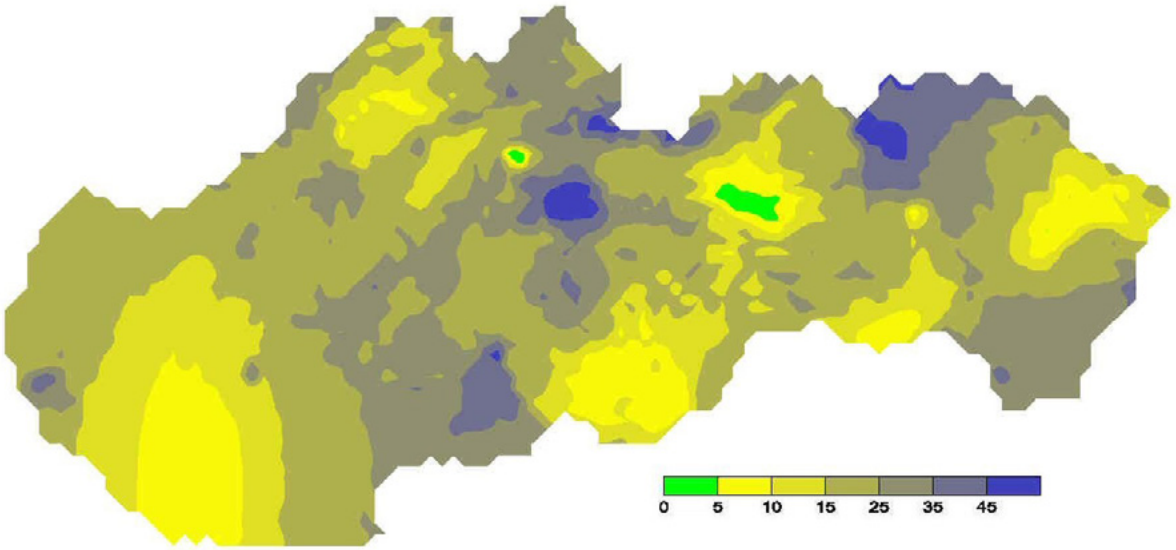
Table 002 I Number of days when the target value for human health protection was exceeded

Station	2016	2017	2018	Average 2015-2018
Bratislava, Jeséniova	11	38	54	**34**
Bratislava, Mamateyova	6	22	33	20
Košice, Ďumbierska	8	10	16	11
Banská Bystrica, Zelená	2	17	20	13
Jelšava, Jesenského	9	11	11	10
Kojšovská hoľa	20	23	41	28
Nitra, Janíkovce	17	42	44	**34**
Humenné, Nám. slobody	3	7	2	**4**
Stará Lesná, AÚ SAV, EMEP	4	3	33	13
Gánovce, Meteo. st.	0	0	4	1
Starina, Vodná nádrž, EMEP	5	3	7	5
Prievidza, Malonecpalská	*0	19	9	14
Topoľníky, Aszód, EMEP	7	8	6	7
Chopok, EMEP	28	*31	82	**55**
Žilina, Obežná	6	3	12	7
Ružomberok, Riadok	0	0	1	0

** this year was not included in the average due to a lack of data in the summer period values*
in bold in red *mean the target value was exceeded.*
Colouring: ■ > = 90 % of required valid measurements

Source: Slovak Hydrometeorological Institute

Map 004 I Number of days in which the target value of ozone for human health protection (120 µg/m³) was exceeded (2016-2018)

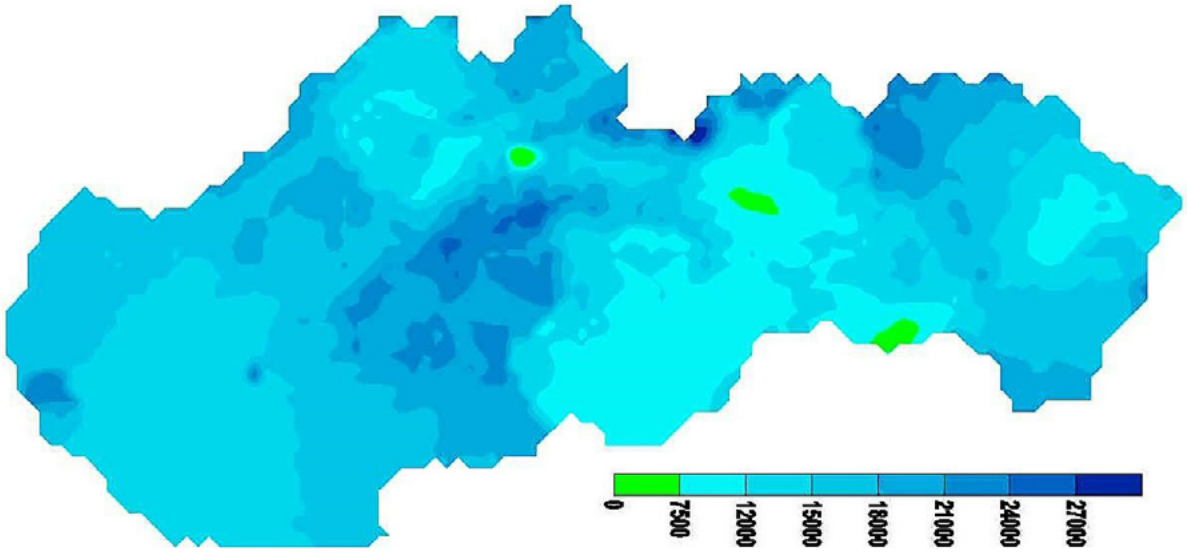


Note: IDWA interpolation results

Source: Slovak Hydrometeorological Institute

The target value of the AOT40 exposure index for the protection of vegetation is 18 000 µg/m³/h. This value refers to concentrations calculated as an average for a five-year period. The average for 2014 to 2018 was exceeded at the Bratislava-Jeséniova, Banská Bystrica-Zelená, Nitra-Janíkovce and Chopok stations.

Map 005 I Average AOT40 values (µg/m³/h) for a five-year period (2014-2018) for the protection of vegetation



Note: IDWA interpolation results

Source: Slovak Hydrometeorological Institute