
Action Plan for Improving Air Quality Brno - 2023

CONTENTS:

1. Introduction	2
2. Basic description of the area under consideration	3
3. Air quality in Brno	4
3.1. Five-year average concentrations pursuant to Section 11(6) of Act No 201/2012 Coll.....	4
3.2. Immission load on the territory based on Automated Immission Monitoring data	9
3.3. Areas with exceedances of the immission limit	22
3.4. Analysis of the causes of pollution	23
3.5. Emission limits	23
3.6. Summary.....	25
4. Objectives, instruments and measures	26
4.1. Target, control and update.....	26
4.2. Overview of tools and measures	26
4.3. Description of tools and measures.....	29
4.4. Application of tools and measures.....	87
5. Completion and specification of the AP measures by the districts	91
6. Timetable for the implementation of the Brno Agglomeration PZKO 2020+.....	92
Sources	93
List of possible abbreviations	94

List of attachments:

Příloha č. 1: Timetable for the implementation of PZKO Brno agglomeration 2020+

Příloha č. 2: Measures to improve air quality in European cities - examples of good practice

Příloha č. 3 Alignment of the Action Plan with other strategic documents of the City of Brno

Other supporting documents not included in the AP Annexes:

1. PZKO Brno agglomeration 2020+
2. Indicative supportive monitoring of air quality in selected localities of the city of Brno (implemented within the project Monitoring and measures to improve air quality in the territory of the city of Brno (MOZEKBRNO), 1025/2020, State Environmental Fund of the Czech Republic - Norway Grants)
3. Dispersion study of the city of Brno (implemented within the project Monitoring and measures to improve air quality in the territory of the city of Brno (MOZEKBRNO), 1025/2020, State Environmental Fund of the Czech Republic, Norway Grants)
4. Extract from expert studies

1. Home

The Action Plan for Air Quality Improvement Brno - 2023 defines the basic objectives and the approach of the City of Brno in the field of air quality management. The Action Plan sets out a framework of measures that will directly or indirectly lead to emission reductions, air quality improvements or public awareness of the impact of air pollution sources on air quality and human health. The primary objective of the Action Plan is to reduce air pollution in the city of Brno below the annual limits set by law and to gradually move towards the WHO limits (2023).

The Action Plan for Air Quality Improvement Brno - 2023 is based on the document Action Plan for Air Quality Improvement Brno - 2020. The measures of the previous Action Plan have been evaluated in terms of their further potential and possibilities of implementation, and possibly supplemented with measures resulting from currently addressed problems in the field of air protection. The measures resulting from the Brno Agglomeration Air Quality Improvement Programme CZ06A, update 2020 (issued by the Ministry of Environment on 24 November 2020) were also reflected in the development of the updated Action Plan.

The Action Plan for Improving Air Quality Brno - 2023 can be divided into 3 basic parts - analytical, design and annex parts. The analytical part consists of an evaluation of the current state of air quality in the city and its development in recent years. The design part contains an overview of measures for improving air quality, including their detailed descriptions. The annexed part includes additional documents describing the link of the Action Plan to other strategic documents of the Statutory City of Brno or giving examples of application of some measures in the Czech Republic and abroad.

The Action Plan for Improving Air Quality Brno - 2023 was discussed with the city districts, organisations of the Statutory City of Brno, the Environmental Commission of the RMB and representatives of non-profit organisations during the preparation process. The Action Plan is conceived as an open living document, which will be regularly evaluated, updated and supplemented with new measures. The Action Plan remains open to new ideas, which will be further examined and elaborated. The Action Plan is intended to serve primarily the city, municipal districts and their organisations, as well as non-profit organisations and citizens, as a document shaping and informing about the possibilities of improving air quality, including raising awareness of the consequences of air pollution on the health of the population.

2. Basic description of the area under consideration

Brno is a statutory city, which is the second largest city in the Czech Republic in terms of population and area. The city is located in the South Moravian Region and forms the district of Brno-City. The City of Brno is a municipality with extended jurisdiction only for its own territory. In its administrative division, the city is divided into 29 municipal districts. Brno consists of 48 cadastral territories, which in some cases are divided into several urban districts. The basic characteristics of the territory are given in the table below.

Tab. 1: Basic data of the municipality

Brno	
Statutes	statutory city
Municipality (LAU 2)	Brno
Municipality with extended scope	Brno
District (LAU 1)	Brno-město (CZ0642)
Country (NUTS 3)	South Moravian Region (CZ064)
Number of districts	29
Number of cadastral territories	48
Population ¹⁾	379 466
Population density	1649 inhabitants/km ²
Area - total ¹⁾	230.18 km ²
Agricultural land (arable land, vineyards, garden, permanent grassland) ¹⁾	7 572,56 ha
Non-agricultural land ¹⁾	15 445,76 ha
- of which forest land	6396,09 ha
- of which water area	447,58 ha
- of which built-up area and courtyard	2119,59 ha
- of which other area	6482,5 ha
Address of the municipal office	Statutory City of Brno Municipality of Brno Dominican Square 1 601 67 Brno

¹⁾ data from CZSO, as of 31 December 2021

A part of the Moravian Karst Protected Landscape Area (313 ha) extends into the town. The territory of the city of Brno is located at the junction of two geomorphological areas, its north-western part is represented by the Brno Upland and the south-eastern part by the Western Vněkarpatská Lowland. In terms of climatic characteristics, the central and south-eastern part of Brno is located in a warm climate area, while the north-western part falls into an area with a moderately warm climate. The average annual temperature fluctuates between 8.5 and 9.0 °C, the average monthly temperature of the warmest month of the year (July) ranges from 17.0 to 19.0 °C, the coldest month (January) from - 3.0 to -2.0 °C. The annual precipitation ranges from 450-500 mm (ČHMÚ, 2023a).

Brno occupies a strategic position in the current European transport network. It lies at the crossroads of the D1 and D2 motorways, which are part of the international west-east (E50) and north-south (E55, E65) motorways. The railway corridor Berlin-Prague-Ceská Třebová-Brno-Vienna runs through Brno. Connection to air transport is provided by the international airport, which serves as a backup airport for Prague.

In terms of air quality, Act No 201/2012 Coll. defines a total of 10 zones and agglomerations in the Czech Republic for which the assessment and evaluation of pollution levels is carried out. The division into zones and agglomerations is based on Annex 3 to the Air Protection Act. According to this division, the administrative district of the Brno-City district is the Brno agglomeration (code designation CZ06A).

3. Air quality in Brno

The assessment of the air pollution level in Brno was carried out in accordance with Section 11 of Act No. 201/2012 Coll. on the basis of maps of five-year moving averages of immission concentrations. This assessment was supplemented by an evaluation of Automated Immission Monitoring (AIM) data and areas with exceedances of immission limits defined by the Czech National Institute of Health.

The analysis of the air quality in Brno shows that:

- The immission limits for most of the monitored pollutants are met in Brno.
- According to the five-year average concentrations for the period 2017-2021 (defined according to Section 11(6) of Act No.201/2012 Coll.), the immission limit for annual average BaP concentrations is locally exceeded in the territory of Brno, namely in part of the Bohunice and Brno-jih districts.
- the analysis of the causes of pollution carried out within the framework of the Programme for the improvement of air quality of the Brno agglomeration - CZ06A, update 2020 shows that in the case of BaP pollution, the absolutely dominant Czech source is local heating
- based on AIM measurements, areas with exceedances of the immission limit for average daily concentrations of PM₁₀ (including the maximum number of exceedances of this limit) can be identified as problematic. However, there was intensive construction activity in these areas during the periods of exceedance, which affected the measurement results.
- Based on the AIM measurements, in the past years until 2018, the limits of annual average NO₂ concentrations were exceeded at selected stations, namely at the Svatoplukova and Úvoz traffic stations. Since 2019, however, the annual average immission concentrations do not exceed the limits and have a decreasing trend.

A detailed assessment of the level of air pollution in Brno based on the above data sources is included in the following chapters. An overview of the immission limits valid according to the existing legislation is given in chap. 3.5. The assessment of air quality in the territory of the city (the so-called analytical part of the Action Plan) was carried out as a first step in the case of the Action Plan in December 2022. In the course of further development, commenting and approval of the Action Plan, changes may have been made to selected AIM sites in the territory of the city of Brno or more recent data for the already completed year 2022 may have been published. This information was not available at the time of the analysis of the existing air quality in the territory of the city of Brno and is therefore not presented here.

3.1. Five-year average concentrations according to Section 11(6) of Act No 201/2012 Coll.

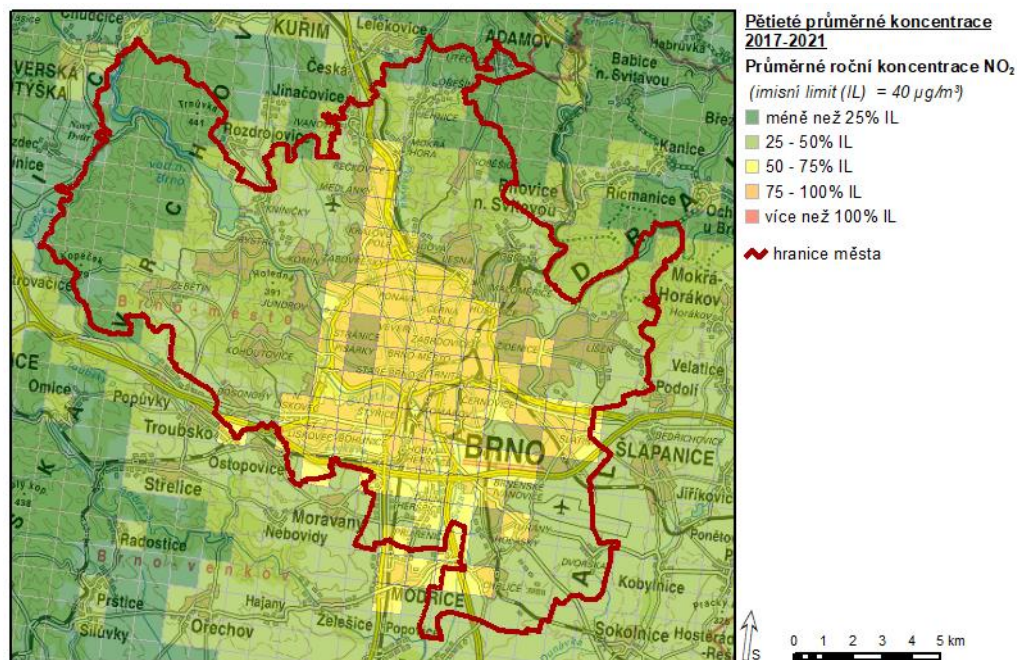
The assessment of pollution levels was carried out on the basis of Section 11(6) of Act No 201/2012 Coll.: "To assess whether any of the immission limits under paragraph 5 are exceeded, the average of the concentration values for a 1 km square² shall be used for the previous 5 calendar years. These values shall be published annually by the Ministry for all zones and agglomerations in a manner allowing remote access." The Ministry of the Environment fulfils this obligation through the Czech Hydrometeorological Institute (CHMI, 2023b). Maximum 8-hour average CO concentrations are not assessed in this way. Emission concentrations of other monitored pollutants in the territory of Brno are given below.

Nitrogen dioxide (NO₂)

The average annual concentrations of the pollutant NO₂, determined as a 5-year average for the period 2017-2021, in the territory of the city of Brno are at the level of 8.5 - 27.8 µg/m³, i.e. at the level of up to about 70% of the immission limit of 40 µg/m³. In the peripheral parts of the city, the average annual

concentrations of NO_2 are at a level of up to 50% of the IL, in the central and southern parts of the city they are at a slightly higher level. According to this method of assessment, the immission limit is not exceeded in the territory of the city. For the maximum hourly concentrations, the values are not set in this way.

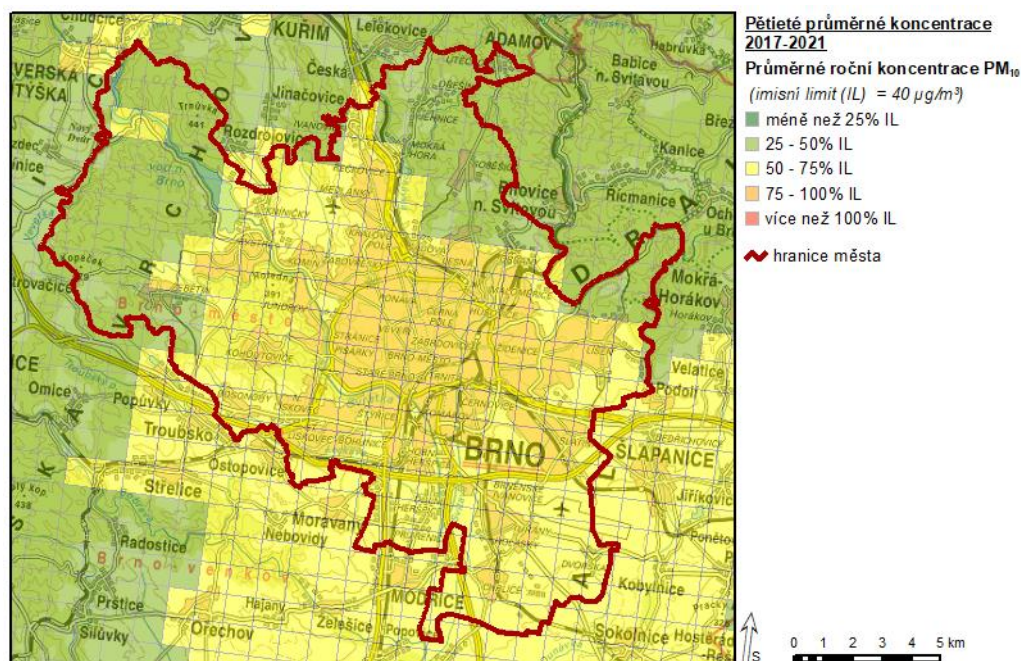
Obr. 1: Five-year averages 2017-2021, annual average NO_2 concentrations, city of Brno



Suspended PM_{10}

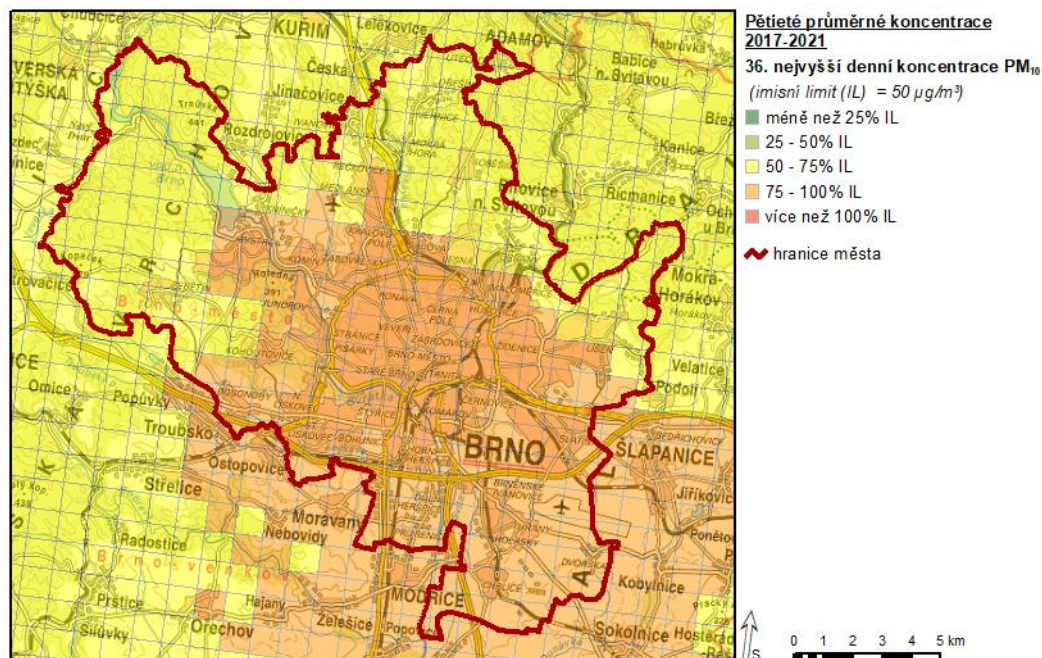
The average annual concentrations of the pollutant PM_{10} , determined as a 5-year average over the period 2017-2021, in the territory of the city of Brno are at the level of $17 - 26.8 \mu\text{g}/\text{m}^3$, i.e. at the level of up to 67% of the immission limit of $40 \mu\text{g}/\text{m}^3$. According to this method of assessment, the immission limit is not exceeded in the territory of the city

Obr. 2: Five-year averages 2017-2021, annual average PM_{10} concentrations, city of Brno



36. the highest calculated average daily concentration of PM_{10} in Brno reaches values of $30-47 \mu g/m^3$. According to the current valid immission limits, this value should reach values of $50 \mu g/m^3$. According to this method of assessment, the emission limit for average daily concentrations of PM_{10} is met throughout the city.

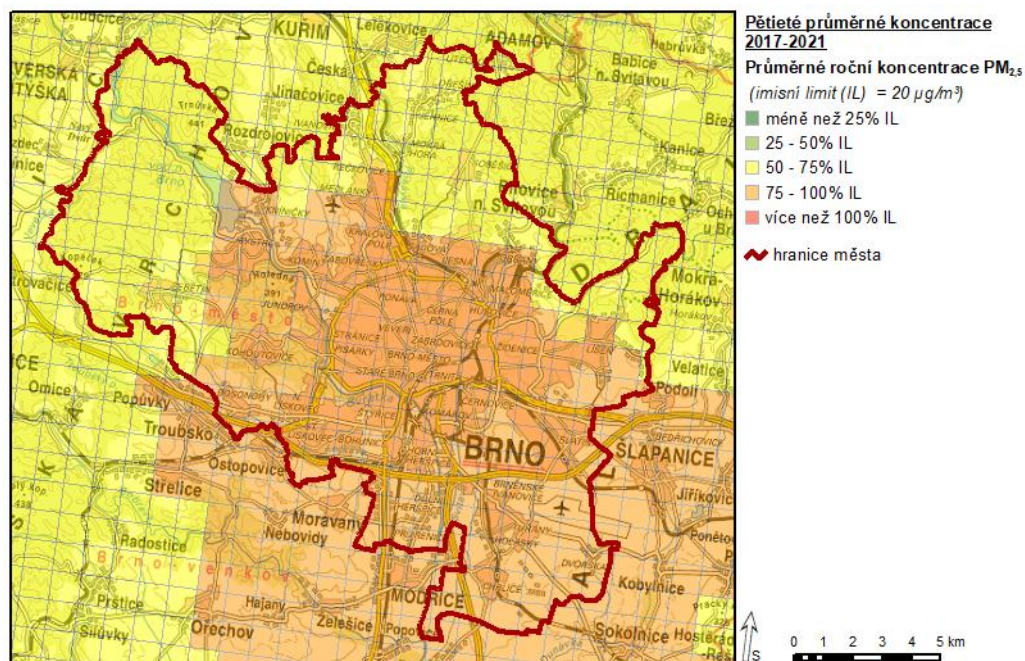
Obr. 3: Five-year averages 2017-2021, 36th highest daily PM_{10} concentrations, city of Brno



Suspended $PM_{2,5}$

The average annual concentrations of the pollutant $PM_{2,5}$, determined as a 5-year average for the period 2017-2021, in the territory of the city of Brno are at the level of $12.1 - 19.3 \mu g/m^3$, i.e. at the level of up to 97% of the immission limit of $20 \mu g/m^3$.^{3,5} Until 31 December 2019, the limit for annual average concentrations of $PM_{2,5}$ was $25 \mu g/m^3$. In the central and southern parts of the city, the average annual concentrations of $PM_{2,5}$ are at a level higher than 75% IL, in the northern peripheral parts of the territory these values are at a lower level. The emission limit is not exceeded in the city territory according to this method of assessment.

Obr. 4: Five-year averages 2017-2021, annual average PM concentrations ,_{2,5} city of Brno

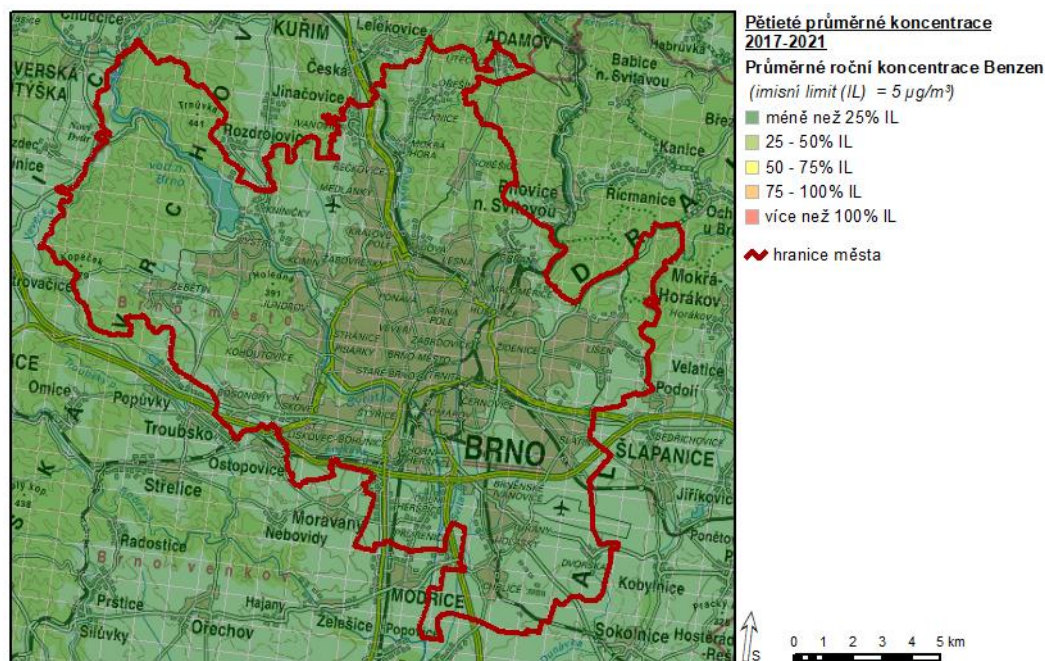


Note: The figure shows the five-year average concentrations of PM_{2,5} for the period 2017-2021 relative to the immission limit for this pollutant valid from 1 January 2020. Until 31 December 2019, the immission limit for annual average concentrations of PM_{2,5} was 25 µg/m³.

Benzene

The average annual concentrations of the pollutant benzene, determined as a 5-year average for the period 2017-2021, in the territory of the city of Brno are at the level of 0.7 - 1.2 µg/m³, i.e. at the level of up to 24% of the immission limit of 5 µg/m³. According to this method of assessment, the emission limit is not exceeded in any part of the city. Annual average benzene concentrations are below the 25% IL throughout the area.

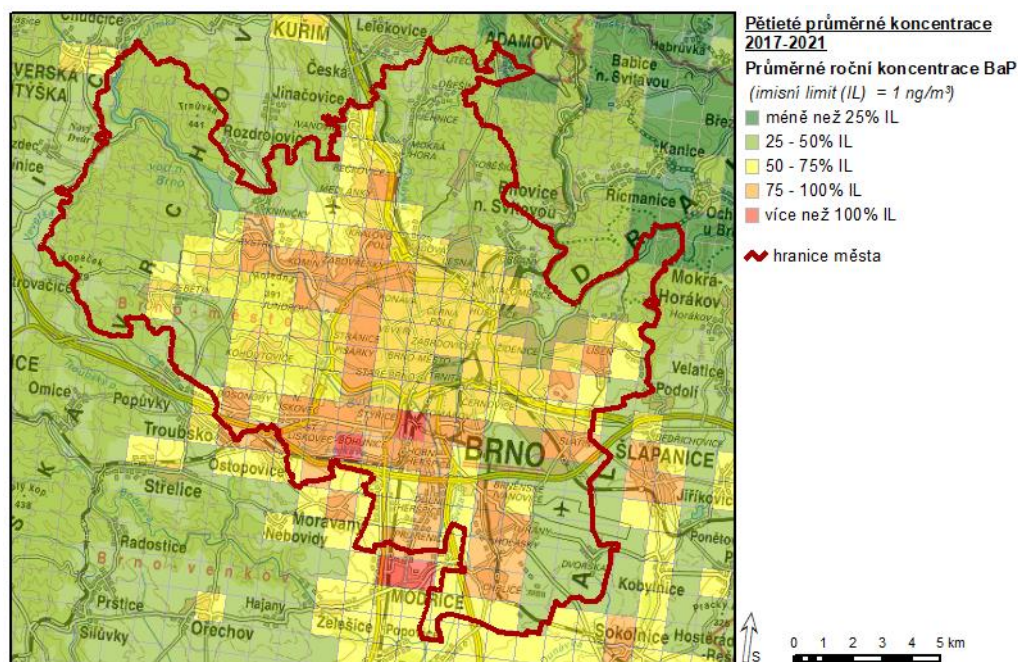
Obr. 5: Five-year averages 2017-2021, annual average benzene concentrations, city of Brno



Benzo(a)pyrene (BaP)

The average annual concentrations of BaP, determined as a 5-year average for the period 2017-2021, in the territory of Brno are at the level of 0.2 - 1.2 ng/m³, i.e. at the level of up to 120% of the immission limit. Concentrations above 75% of the immission limit are found mainly in the central and southern parts of the city, locally also in the eastern parts of the territory. According to this method of assessment, the emission limit is exceeded locally in parts of the Bohunice and Brno-jih districts. The emission limit for average annual concentrations of BaP is also exceeded in the territory of Modřice, bordering the city of Brno.

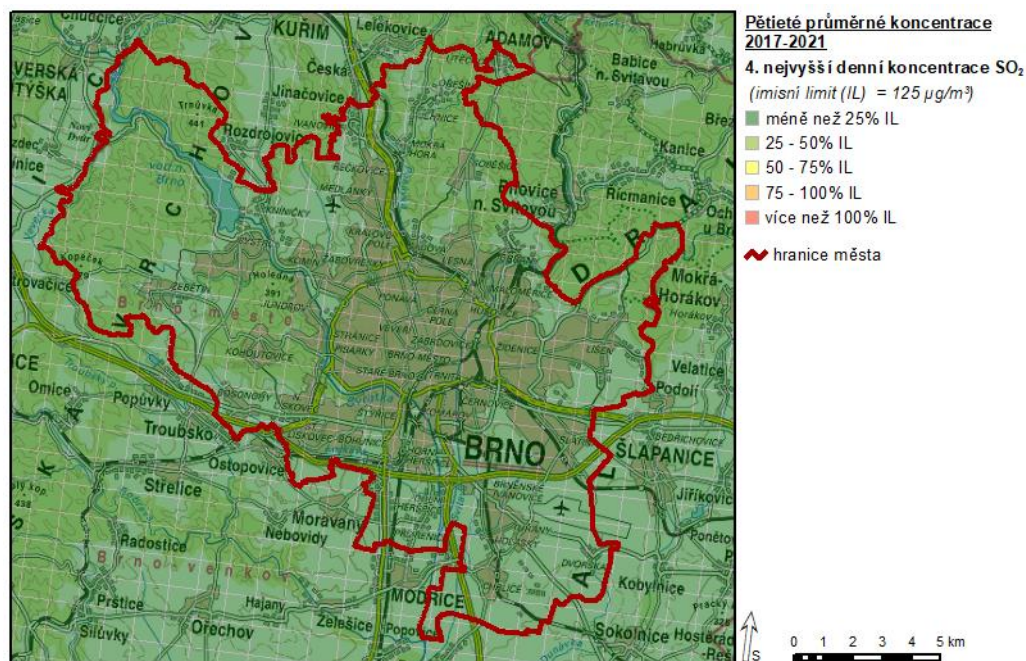
Obr. 6: Five-year averages 2017-2021, annual average BaP concentrations, city of Brno



Sulphur dioxide (SO₂)

The emission limit for daily concentrations of SO₂ is met throughout the city. According to the current valid immission limits, this value should reach values of 125 µg/m³. According to the five-year averages for the period 2017-2021, the 4th highest calculated daily concentration of SO₂ in the city reaches values of 7-13 µg/m³.

Obr. 7: Five-year averages 2017-2021, 4th highest daily SO₂ concentrations, 2 city of Brno



Heavy metals - As, Cd, Ni, Pb

Heavy metal concentrations in Brno have long been below 25% of the relevant immission limits. The average annual concentrations of As determined as a 5-year average for the period 2017-2021 in the territory of the city are at the level of 0.6-1.0 ng/m³ (immission limit 6 ng/m³), the average annual concentrations of Cd at the level of 0.1-0.2 ng/m³ (immission limit 5 ng/m³), average annual Ni concentrations at 0.4-1.3 ng/m³ (immission limit 20 ng/m³) and average annual Pb concentrations at 4.0-6.7 ng/m³ (immission limit 0.5 µg/m³).

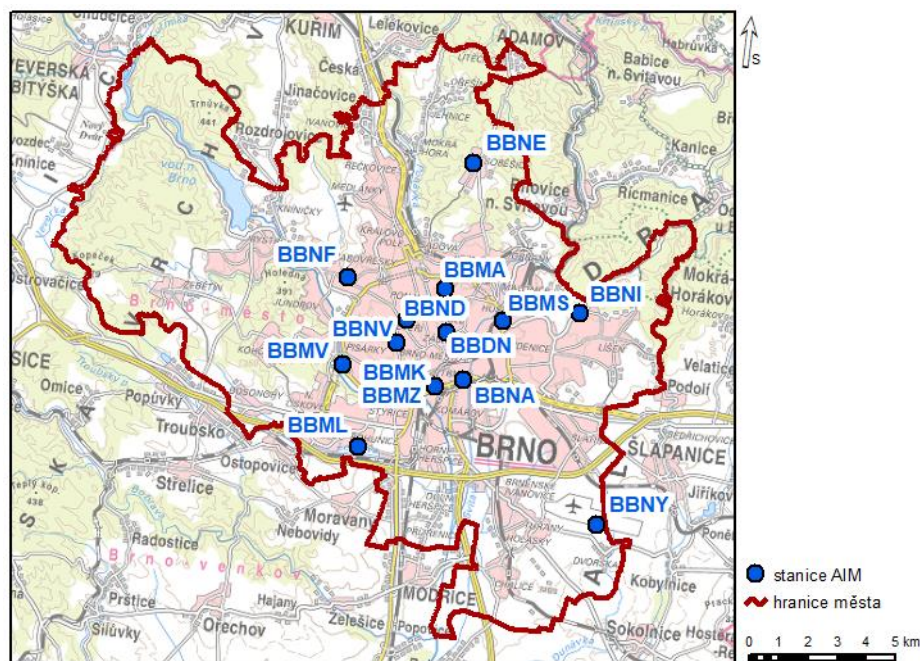
3.2. Immission load on the territory based on the Automated Immission Monitoring data

3.2.1. Basic characteristics of individual sites

For the purpose of air quality assessment based on the Automated Immission Monitoring data, both background and traffic immission monitoring stations located in Brno were used. The basic characteristics of each station are given below. Information on the locations, including numerical data for the traffic stations, was taken from the ISKO database¹. The location of the stations of the automated immission monitoring in the subject area is shown on Obr. 8. The period 2012-2021 was chosen for the assessment of the immission load in the subject area based on AIM data.

¹ ISKO - List of immission measurement sites, as of 12/2022

Obr. 8: Location of AIM stations in the city of Brno



Location Brno - Children's Hospital

The Brno Children's Hospital (BBDN) is located on the premises of the Children's Hospital in Brno - Černé Pole. The station is located in a slightly elevated position, open to the centre of Brno at an altitude of 225 m above sea level. According to the Eol classification, the station is characterised as background, zone type urban, zone characteristics residential, commercial. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement is to determine the highest pollutant concentration in the area. The automated measurement program has been in operation permanently since January 1, 2014, measurements by active samplers since 2016.

Location Brno - Arboretum

The Brno-Arboretum Station (BBMA) is located in the grounds of the Mendel University Arboretum in Brno towards the building Tř. gen. Píky 3 (11 thousand vehicles/day - 5% of which are freight traffic, traffic speed - 70 km/h), at a distance of 105 m. The station is located at an altitude of 250 m above sea level. According to the Eol classification, the station is characterised as background, zone type urban, zone characteristics residential, natural. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement is to determine a representative concentration for the populated parts of the area. The automated measurement programme has been in operation permanently since 27 October 2012.

Location Brno - Kroftova

The Brno - Kroftova station (BBNF) is located on the premises of the Brno branch of the Czech National Institute of Meteorology. The station is located in a built-up area of the Brno - Žabovřesky municipality, with a busy road nearby and mainly family houses. The station is located at an altitude of 235 m above sea level. According to the Eol classification, the station is characterised as a transport station, zone type urban, zone characteristics residential. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement is to determine a representative concentration for the populated parts of the area. A manual measurement programme has been operated continuously at the site since 1971.

Location Brno - Lány

The automated monitoring station Brno - Lány (BBML) is located in the urban area of Brno - Bohunice (SW of the city of Brno), in close proximity to the premises of the Secondary School of Gardening and Secondary School of Economics (grass undergrowth), which is followed by the gardens of nearby houses. The D1 motorway (60 thousand vehicles/day, 22 % of which is traffic) at a distance of 415 m, traffic speed 0 to 130 km. The station is located at an altitude of 228 m above sea level. According to the Eol classification, the station is characterised as background, zone type suburban, zone characteristics residential, natural. The representativeness of the site is of a precinct scale (0,5 to 4 km). The aim of the measurement is to determine a representative concentration for the populated parts of the area. The automated measurement programme managed by SMB has been in operation since 1 January 2000.

Location Brno - Líšeň

The station Brno - Líšeň (BBNI) is located on the premises of the Horníkova Primary School in Brno - Líšeň. The station is located on the edge of the built-up area of the Brno - Líšeň housing estate, overlooking the city of Brno and the Velká Klajdovka locality. The station is located at an altitude of 340 m above sea level. According to the Eol classification, the station is characterised as background, zone type urban, zone characteristics residential. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement is to determine a representative concentration for the populated parts of the area. An automated measurement program has been in operation at this station since 2015, and a manual measurement program, including PAH and TK measurements, has been in operation at the site since 2009.

Location Brno - Masná

The station Brno - Masná (BBNA) is located in the premises of the ZÚ on Masná Street. The station is located in the centre of Brno. The station is located at an altitude of 214 m above sea level. According to the Eol classification, the station is characterised as background, zone type urban, zone characteristics commercial, residential. The representativeness of the site is medium scale (100-500 m). An automated measurement program has been in operation at this station since 2015, a manual measurement program has been in operation at the site since 2006.

Location Brno - Soběšice

The station Brno - Soběšice (BBNE) is located in the northern part of the Statutory City of Brno in Soběšice, which is a part of the Brno - Sever municipality. Soběšice has the character of a "satellite town", typical buildings are family houses. The station is located at an altitude of 380 m above sea level. According to the Eol classification, the station is characterised as background, zone type suburban, zone characteristics residential. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement is to determine a representative concentration for the populated parts of the area. The manual measurement programme has been in operation permanently since 1 January 1971.

Location Brno - centre

The station Brno - střed (BBND) was located in the centre of Brno on the premises of the Faculty of Science of Masaryk University in Brno. In close proximity to the site is the busy intersection of Kotlářská and Kounicova streets. The station was handed over to the CHMI at the end of 2004 by the Municipality of Brno - previous measurements under the management of SMB can be found in the ISKO database with the site code BBNX. The station was located at an altitude of 230 m above sea level. According to the Eol classification, the station is characterised as traffic, zone type urban, zone characteristic residential. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement was to determine a representative concentration for the populated parts of the

area. The automated measurement programme managed by the CHMI was in operation from 1 November 2004 to 31 December 2013. It is currently not in operation (relocated to Úvoz Street).

Location Brno - Svatoplukova

The station Brno - Svatoplukova (BBMS) is located in the premises of the barracks in Židenice. In close proximity to the site there is a busy road in Svatoplukova Street (46 thousand vehicles/day - 11% of which is freight traffic, traffic speed - 40 km/h, distance of the station from the road (VMO) - 3 m, from the intersection - 200 m, from the public transport stop (bus, trolleybus) - 5 m). The station is located at an altitude of 213 m above sea level. According to the Eol classification, the station is characterised as transport, zone type urban, zone characteristic residential. The representativeness of the site is microscale (a few m to 100 m). The aim of the measurements is to determine a representative concentration for the populated parts of the area. The automated measurement programme managed by SMB has been in operation since 1 January 2000.

Location Brno - Tuřany

The AIM Brno - Tuřany (BBNY) station is located in the area of Brno - Tuřany Airport. The site is located in the south-eastern part of Brno, compared to the city centre it lies at a higher altitude on the so-called Tuřany terrace. The station is located at an altitude of 241 m above sea level. According to the Eol classification, the station is characterised as background, zone type suburban, zone characteristic residential. The representativeness of the site is regional scale - urban or rural (4-50 km). The objective of the measurement is to determine the highest pollutant concentration in the area. The automated measurement programme has been in operation permanently since 1 January 1994.

Location Brno - Úvoz (hot spot)

The Brno - Úvoz (hot spot) station (BBNV) is located near the intersection of Úvoz and Údolní streets and is focused on measuring air pollution from traffic on Úvoz street. The station is located at an altitude of 235 m above sea level. According to the Eol classification, the station is characterised as traffic, zone type urban, zone characteristic residential. The representativeness of the site is medium scale (100-500 m). The aim of the measurements is to determine the influence of significant sources on the level of immissions. The automated measurement program has been in operation permanently since 1 January 2008, measurements with active samplers since 2016

Location Brno - Výstaviště

The station Brno - Výstaviště (BBMV) is located near BVV. The station is located in the area of MÚK Hlinky - Bauerova, the total traffic on the ramps and roads of MÚK (40 thousand vehicles/day - of which 12 % freight traffic, traffic speed - 50 km/h, distance of the station from the road - 8 m, from the intersection - 200 m, VMO, public transport - BUS). The station is located at an altitude of 202 m above sea level. According to the Eol classification, the station is characterised as a transport, urban zone type, commercial zone characteristic. The representativeness of the site is of district scale (0,5 to 4 km). The aim of the measurement is to establish a representative concentration for the populated parts of the area. An automated measurement programme managed by SMB has been in operation since 1 January 2000.

Location Brno - Zvonařka

The station Brno - Zvonařka (BBMZ) is located in the centre of Brno near the Zvonařka bus station. The station is located in the street greenery, in front of the building Opuštěná 2, the area of ÚAN Zvonařka, VMO (43 thousand vehicles/day - 10% of which are freight traffic, traffic speed - 40 km/hr, distance of the station from the road - 10 m, distance from the intersection - 50 m, from the bus stop - 12 m). The station is located at an altitude of 200 m above sea level. According to the Eol classification, the station is characterised as transport, zone type urban, zone characteristic commercial. The representativeness of the site is microscale (a few m to 100 m). The aim of the measurement is to determine a

representative concentration for the populated parts of the area. The automated measurement programme managed by MMB has been in operation since 1 January 2000.

The Brno - Zvonařka site has been significantly affected by intensive construction activity since 1 September 2018 and its classification did not correspond to the station type - transport. Therefore, the classification of this station was changed to the station type - industrial. At the same time as the change of classification of the station, the designation of the site was changed (new station code BBMK). An automated measuring programme managed by MMB is still in operation here.

Tab. 1: Basic data of selected stations of immission monitoring

Stations	Station code	Type of station	Zone type	Character. zones	Subcategories	Representativeness	Administrator ¹⁾	Type of measuring program ²⁾
Brno-Children's Hospital	BBDN	background	Urban	residential, commercial	-	4 - 50 km	CHMI	A, D
Brno-Arboretum	BBMA	background	Urban	residential, natural	-	4 - 50 km	SMB	A
Brno-Kroftova	BBNF	Transport	Urban	Residential	-	4 - 50 km	CHMI	M
Brno-Lány	BBML	background	Suburban	residential, natural	-	0.5 - 4 km	SMB	A
Brno-Líšeň	BBNI	background	Urban	Residential	-	4 - 50 km	CHMI	A, P, O
Brno-Masna	BBNA	background	Urban	commercial, residential	-	100 - 500 m	ZÚ	A, P, O
Brno-Soběšice	BBNE	background	Suburban	Residential	-	4 - 50 km	CHMI	M
Brno-central ³⁾	BBND	Transport	Urban	Residential	-	4 - 50 km	CHMI	A, D
Brno-Svatoplukova	BBMS	Transport	Urban	Residential	-	several m to 100 m	SMB	A
Brno-Turany	BBNY	background	Suburban	Residential	-	4 - 50 km	CHMI	A
Brno-Úvoz (hot spot)	BBNV	Transport	Urban	Residential	-	100 - 500 m	CHMI	A, D, 9
Brno-Výstaviště	BBMV	Transport	Urban	Business	-	0.5 - 4 km	SMB	A
Brno-Zvonařka ⁴⁾	BBMZ	Transport	Urban	Business	-	several m to 100 m	SMB	A

¹⁾ designation of the site administrator: the ČHMÚ - ČHMÚ, pob. Brno; SMB - Statutory City of Brno; ZÚ - Health Institute Ostrava

²⁾ designation of the type of measurement program: A - automated measurement program; M - manual measurement program; P - measurement of polycyclic aromatic hydrocarbons; O - measurement of heavy metals in PM₁₀; 9 - measurement of particle number distribution - FIDAS; D - measurement by passive dosimeters and active samplers

³⁾ Measurements at the Brno-střed station were terminated on 31 December 2013.

⁴⁾ as of 1 September 2018 the code designation and classification of the station Brno - Zvonařka will be changed. The station is now designated by the code BBMK, type of station industrial.

3.2.2. Evaluation of the immission load in 2012-20 21

The emission concentrations of the assessed pollutants measured at the above mentioned measuring stations are presented below in tabular and graphical form. The cases of exceedances of the immission limits are indicated in the tables for the pollutant and year in question. The data are supplemented by the mean and median value of the measured concentrations.

Nitrogen dioxide (NO₂)

For average annual concentrations of NO₂, an immission limit of 40 µg/m³ is set according to current legislation. In addition to the immission limit for annual average concentrations, an immission limit is also set for short-term concentrations for the pollutant NO₂. The emission limit for maximum hourly concentrations is set at 200 µg/m³ with a permissible frequency of exceedance of 18 hours per year.

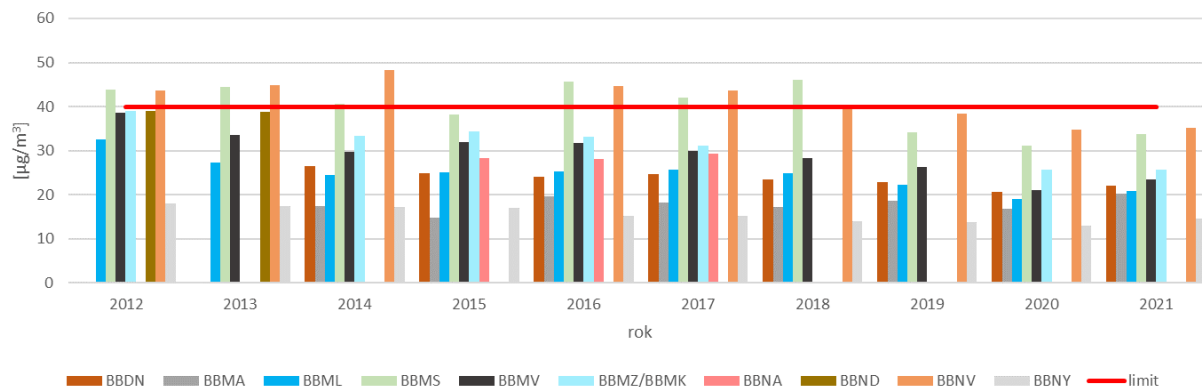
Tab. 2: Measured values at selected AIM stations, annual average NO₂

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	26,6	24,8	24,1	24,6	23,5	22,9	20,7	22,0	23,7	23,8
BBMA	Brno-Arboretum	-	-	17,4	14,8	19,6	18,2	17,3	18,6	16,9	20,2	17,9	17,8
BBML	Brno-Lány	32,5	27,4	24,4	25,1	25,2	25,8	24,8	22,3	19,1	20,9	24,8	25,0
BBMS	Brno-Svatoplukova	43,9	44,5	40,6	38,2	45,7	42,1	46,0	34,1	31,2	33,8	40,0	41,4
BBMV	Brno-Výstaviště	38,6	33,5	29,7	32,0	31,7	30,0	28,4	26,3	21,1	23,5	29,5	29,9

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBMZ/BBMK	Brno-Zvonařka	39,1	-	33,3	34,3	33,2	31,2	-	-	25,7	25,8	31,8	33,2
BBNA	Brno-Masna	-	-	-	28,4	28,1	29,3	-	-	-	-	28,6	28,4
BBND	Brno-central	39,1	38,9	-	-	-	-	-	-	-	-	39,0	39,0
BBNV	Brno-Úvoz (hot spot)	43,6	44,9	48,2	-	44,6	43,7	39,9	38,4	34,7	35,2	41,5	43,6
BBNY	Brno-Turany	18,0	17,4	17,2	17,1	15,2	15,3	14,0	13,8	12,9	14,6	15,6	15,3

Note: The values given are in units of $\mu\text{g}/\text{m}^3$. The IL for annual average concentrations of NO_2 under current legislation is $40 \mu\text{g}/\text{m}^3$.

Obr. 9: Evolution of annual average NO_2 concentrations, 2012-2021

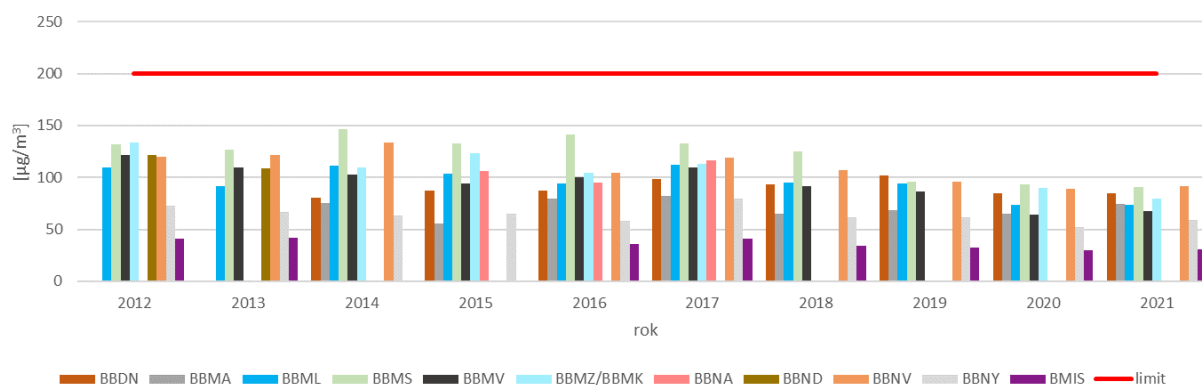


Tab. 3: Measured values at selected AIM stations, 19th highest hourly NO_2

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	80,7	87,2	87,0	98,1	93,0	102,0	84,7	84,4	89,6	87,1
BBMA	Brno-Arboretum	-	-	75,0	55,7	79,4	82,3	64,7	68,3	65,2	74,2	70,6	71,3
BBML	Brno-Lány	109,8	91,2	110,9	103,3	94,1	112,5	95,1	94,3	73,6	74,0	95,9	94,7
BBMS	Brno-Svatoplukova	131,6	127,0	146,5	132,4	141,2	132,9	125,3	96,0	93,0	90,5	121,6	129,3
BBMV	Brno-Výstaviště	122,0	109,2	103,1	93,9	100,4	109,2	91,4	86,7	63,9	67,9	94,8	97,2
BBMZ/BBMK	Brno-Zvonařka	133,3	-	110,0	123,0	104,8	112,7	-	-	90,1	79,8	107,7	110,0
BBNA	Brno-Masna	-	-	-	106,4	94,9	116,7	-	-	-	-	106,0	106,4
BBND	Brno-central	121,3	108,7	-	-	-	-	-	-	-	-	115,0	115,0
BBNV	Brno-Úvoz (hot spot)	119,9	121,9	133,7	-	104,6	119,0	106,9	96,2	89,3	91,6	109,2	106,9
BBNY	Brno-Turany	72,9	66,8	63,5	65,0	58,2	79,4	61,6	61,8	52,0	59,3	64,1	62,7

Note: The values given are in units of $\mu\text{g}/\text{m}^3$. The IL for maximum hourly concentrations of NO_2 under current legislation is $200 \mu\text{g}/\text{m}^3$ with a permissible exceedance frequency of 18 hours per year.

Obr. 10: Trends in 19th highest hourly NO_2 concentrations per calendar year, 2012-2021



From the above data it is evident that NO_2 concentrations are highly dependent on location - it is crucial whether the site is close to a line source (transport). The highest annual average NO_2 concentrations are measured at the most traffic-laden sites, which are also cordoned off by development. These are the sites Brno - Svatoplukova and Brno - Úvoz. At these stations the immission limit for annual average NO_2 concentrations has been exceeded in the past. At the other AIM measuring stations in Brno, the annual average NO_2 concentrations have been measured for a long time below the immission limit of

40 µg/m³. Although more cars pass near the Brno - Zvonařka site than at Úvoz, due to the openness of the site there is sufficient dispersion and the immission limit has not been exceeded. Since 2019, the annual average concentrations at all assessed stations have been measured below the immission limit (including the stations Brno - Svatoplukova and Brno - Úvoz).

The emission limit for the hourly concentration of NO₂ is not exceeded in the long term in the whole Czech Republic or in Brno. The trend of concentrations is relatively balanced at all stations in the monitored period, unlike for suspended particles, the concentration values are not influenced by meteorological conditions. The traffic intensity in the vicinity of the station plays a major role. However, nitric oxide NO, which does not have an immission limit, is much more characteristic of the station. Although the immission limit for the average annual concentration of NO₂ has been exceeded in previous years at the Brno - Svatoplukova and Brno - Úvoz sites, the immission limit for maximum hourly concentrations here was approximately the same as the national average in those years.

Suspended particulate matter fractions PM₁₀ and PM_{2,5}

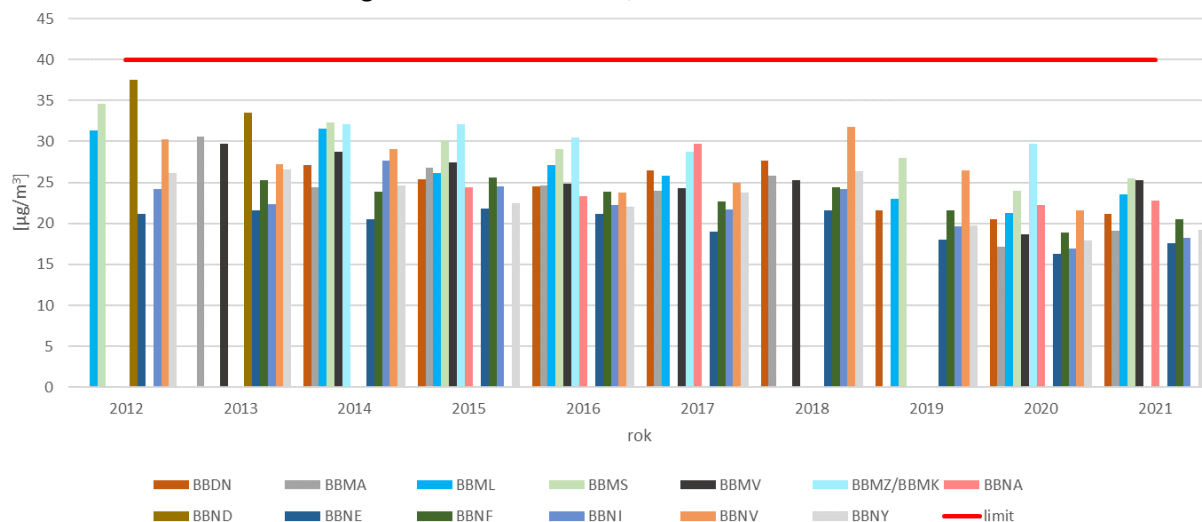
For annual average concentrations of PM₁₀ an immission limit of 40 µg/m³ is set, for annual average concentrations of PM_{2,5} an immission limit of 20 µg/m³ is set according to the current legislation in force from 1 January 2020. Until 31 December 2019, the immission limit for annual average concentrations of PM_{2,5} was 25 µg/m³. In addition to the immission limit for annual average concentrations, an immission limit for short-term concentrations has been set for the pollutant PM₁₀. The immission limit for average daily concentrations is set at 50 µg/m³ with a permissible frequency of exceedance of 35 days per year.

Tab. 4: Measured values at selected AIM stations, annual average PM₁₀

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	27,1	25,4	24,5	26,5	27,7	21,6	20,5	21,2	24,3	25,0
BBMA	Brno-Arboretum	-	30,6	24,4	26,8	24,6	24,0	25,8	-	17,1	19,1	24,1	24,5
BBML	Brno-Lány	31,3	-	31,6	26,1	27,1	25,8	-	23,0	21,3	23,5	26,2	26,0
BBMS	Brno-Svatoplukova	34,6	-	32,3	30,2	29,1	-	-	28,0	24,0	25,5	29,1	29,1
BBMV	Brno-Výstaviště	-	29,7	28,8	27,4	24,8	24,3	25,3	-	18,7	25,3	25,5	25,3
BBMZ/BBMK	Brno-Zvonařka	-	-	32,1	32,1	30,5	28,7	-	-	29,7	-	30,6	30,5
BBNA	Brno-Masna	-	-	-	24,4	23,3	29,7	-	-	22,3	22,8	24,5	23,3
BBND	Brno-central	37,5	33,5	-	-	-	-	-	-	-	-	35,5	35,5
BBNE	Brno-Soběšice	21,2	21,6	20,5	21,8	21,2	19,0	21,6	18,0	16,3	17,6	19,9	20,9
BBNF	Brno-Kroftova	-	25,3	23,9	25,6	23,9	22,7	24,4	21,6	18,9	20,5	23,0	23,9
BBNI	Brno-Líšeň	24,2	22,4	27,7	24,5	22,3	21,7	24,2	19,6	16,9	18,2	22,2	22,4
BBNV	Brno-Úvoz (hot spot)	30,3	27,2	29,1	-	23,8	25,0	31,8	26,5	21,6	-	26,9	26,9
BBNY	Brno-Turany	26,2	26,6	24,6	22,5	22,0	23,8	26,4	19,8	17,9	19,2	22,9	23,2

Note: The values given are in units of µg/m³. The IL for annual average concentrations of PM₁₀ under current legislation is 40 µg/m³.

Obr. 11: Trends in annual average PM concentrations ,₁₀ 2012-2021

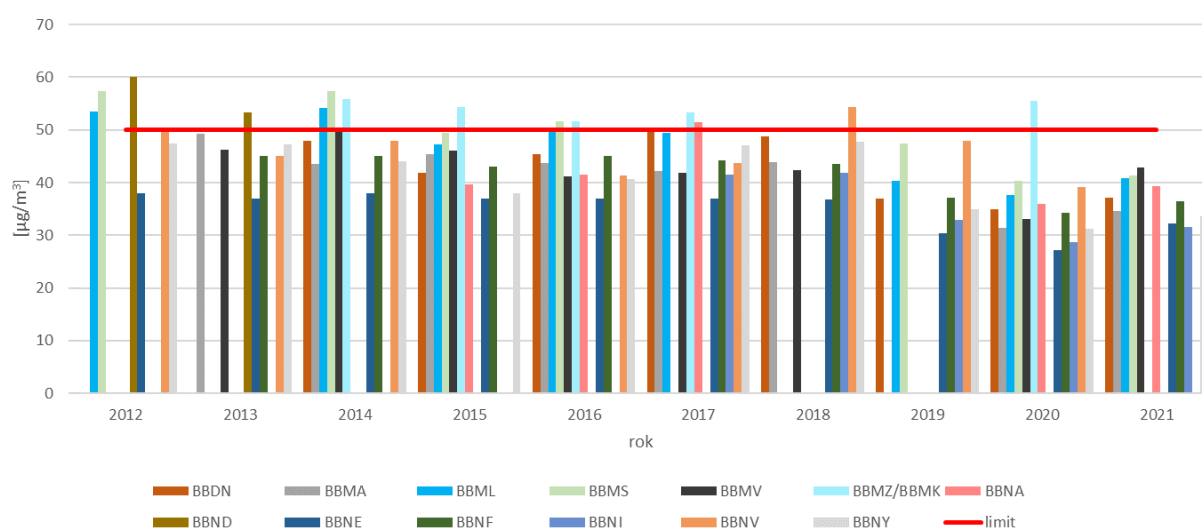


Tab. 5: Measured values at selected AIM stations, 36th highest daily PM₁₀

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	47,9	41,8	45,4	50,3	48,8	36,9	35,0	37,1	42,9	43,6
BBMA	Brno-Arboretum	-	49,3	43,6	45,4	43,7	42,2	43,9	-	31,4	34,6	41,8	43,7
BBML	Brno-Lány	53,5	-	54,1	47,3	49,7	49,5	-	40,4	37,7	40,8	46,6	48,4
BBMS	Brno-Svatoplukova	57,4	-	57,4	49,5	51,7	-	-	47,4	40,3	41,4	49,3	49,5
BBMV	Brno-Výstaviště	-	46,2	49,6	46,1	41,2	41,8	42,4	-	33,1	42,9	42,9	42,7
BBMZ/BBMK	Brno-Zvonařka	-	-	55,8	54,3	51,6	53,4	-	-	55,5	-	54,1	54,3
BBNA	Brno-Masna	-	-	-	39,6	41,6	51,5	-	-	36,0	39,3	41,6	39,6
BBND	Brno-central	60,1	53,4	-	-	-	-	-	-	-	-	56,8	56,8
BBNE	Brno-Soběšice	38,0	37,0	38,0	37,0	37,0	37,0	36,8	30,4	27,2	32,2	35,1	37,0
BBNF	Brno-Kroftova	-	45,0	45,0	43,0	45,0	44,2	43,6	37,1	34,3	36,4	41,5	43,6
BBNI	Brno-Líšeň	-	-	-	-	-	41,5	41,9	33,0	28,7	31,6	35,3	33,0
BBNV	Brno-Úvoz (hot spot)	50,0	45,0	48,0	-	41,3	43,8	54,4	48,0	39,2	-	46,2	46,5
BBNY	Brno-Turany	47,5	47,2	44,0	38,0	40,6	47,1	47,8	34,9	31,3	33,6	41,2	42,3

Note: The values given are in units of $\mu\text{g}/\text{m}^3$. The IL for average daily concentrations of PM₁₀ under current legislation is 50 $\mu\text{g}/\text{m}^3$ with a permissible frequency of exceedance of 35 days per year.

Obr. 12: Trends in 36th highest daily PM₁₀ concentrations per calendar year, 2012-2021

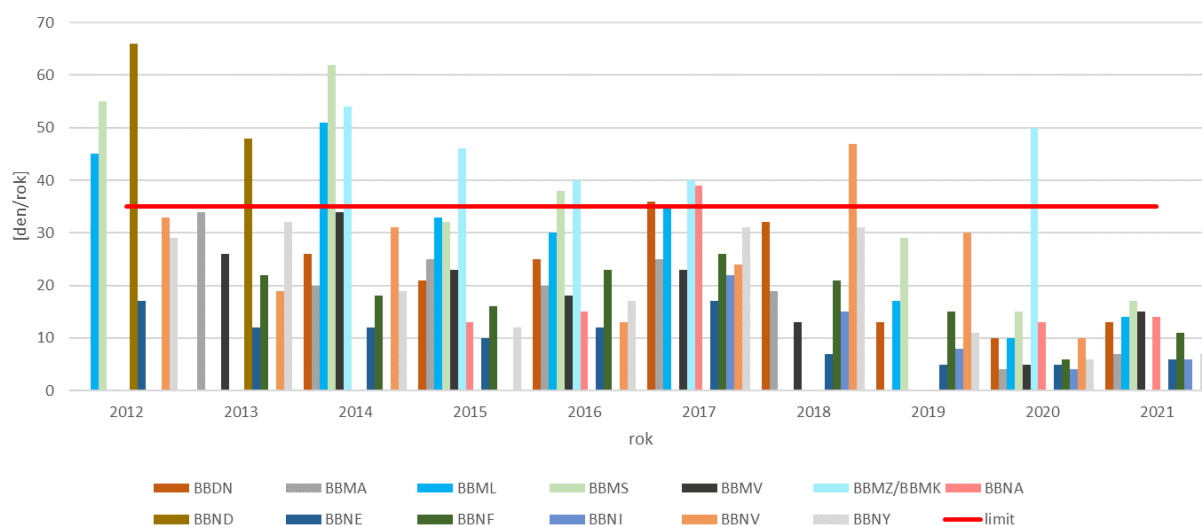


Tab. 6: Measured values at selected AIM stations, frequency of IL exceedances for daily PM₁₀

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	26	21	25	36	32	13	10	13	22	23
BBMA	Brno-Arboretum	-	34	20	25	20	25	19	-	4	7	19	20
BBML	Brno-Lány	45	-	51	33	30	35	-	17	10	14	29	32
BBMS	Brno-Svatoplukova	55	-	62	32	38	-	-	29	15	17	35	32
BBMV	Brno-Výstaviště	-	26	34	23	18	23	13	-	5	15	20	21
BBMZ/BBMK	Brno-Zvonařka	-	-	54	46	40	40	-	-	50	-	46	46
BBNA	Brno-Masna	-	-	-	13	15	39	-	-	13	14	19	14
BBND	Brno-central	66	48	-	-	-	-	-	-	-	-	57	57
BBNE	Brno-Soběšice	17	12	12	10	12	17	7	5	5	6	10	11
BBNF	Brno-Kroftova	-	22	18	16	23	26	21	15	6	11	18	18
BBNI	Brno-Líšeň	-	-	-	-	-	22	15	8	4	6	11	8
BBNV	Brno-Úvoz (hot spot)	33	19	31	-	13	24	47	30	10	-	26	27
BBNY	Brno-Turany	29	32	19	12	17	31	31	11	6	7	20	18

Note: Values are in units of day/year. The IL for average daily concentrations of PM₁₀ under current legislation is 50 µg/m³ with a permissible frequency of exceedance of 35 days per year.

Obr. 13: Evolution of the number of days with exceedances of the daily IL for PM₁₀ per calendar year, 2012-2021

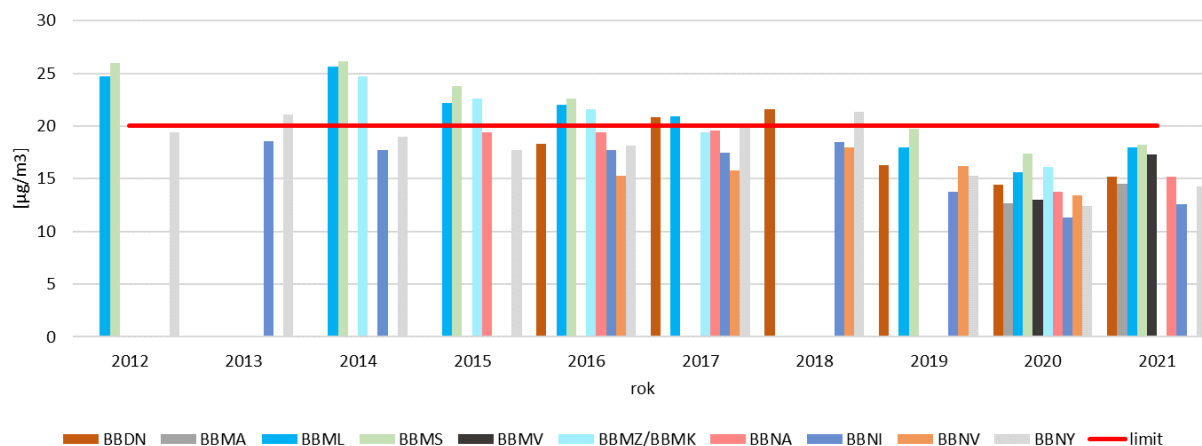


Tab. 7: Measured values at selected AIM stations, annual average PM_{2,5}

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	-	-	18,3	20,8	21,6	16,3	14,4	15,2	17,8	17,3
BBMA	Brno-Arboretum	-	-	-	-	-	-	-	-	12,7	14,5	13,6	13,6
BBML	Brno-Lány	24,7	-	25,6	22,2	22,0	20,9	-	18,0	15,6	18,0	20,9	21,5
BBMS	Brno-Svatoplukova	26,0	-	26,1	23,8	22,6	-	-	19,7	17,4	18,2	22,0	22,6
BBMV	Brno-Výstaviště	-	-	-	-	-	-	-	-	13,0	17,3	15,2	15,2
BBMZ/BBMK	Brno-Zvonařka	-	-	24,7	22,6	21,6	19,4	-	-	16,1	-	20,9	21,6
BBNA	Brno-Masna	-	-	-	19,4	19,4	19,6	-	-	13,8	15,2	17,5	19,4
BBNI	Brno-Líšeň	-	18,6	17,7	-	17,7	17,5	18,5	13,8	11,3	12,6	16,0	17,6
BBNV	Brno-Úvoz (hot spot)	-	-	-	-	15,3	15,8	18,0	16,2	13,4	-	15,7	15,8
BBNY	Brno-Turany	19,4	21,1	19,0	17,7	18,1	19,8	21,3	15,3	12,4	14,3	17,8	18,6

Note: The values given are in units of µg/m³. The IL for annual average concentrations of PM_{2,5} is 20 µg/m³ under the current legislation applicable from 1 January 2020. Until 31 December 2019, the immission limit for annual average concentrations of PM_{2,5} was at 25 µg/m³. The currently valid IL was considered for the evaluation.

Obr. 14: Trends in annual average PM concentrations $_{2,5}$ 2012-2021



Note: The emission limit for annual average concentrations is 20 $\mu\text{g}/\text{m}^3$ according to the current legislation in force from 1 January 2020³. Until 31 December 2019, the immission limit for annual average concentrations of $\text{PM}_{2,5}$ was 25 $\mu\text{g}/\text{m}^3$. The currently valid IL was considered for the evaluation.

Based on the above data, it can be concluded that the immission limit for annual average concentrations of PM_{10} has not been exceeded at any of the stations assessed since 2012. On average, the highest concentrations were measured at the most traffic-exposed locations Brno - Svatoplukova and Brno - Zvonařka. In 2018, the highest annual average concentrations of PM_{10} were at the Brno-Uvoz station, where the measurements were affected by construction activity taking place near the measuring station. In 2020, a similar phenomenon can be observed at the Brno - Zvonařka station, where the highest concentrations were measured. However, air pollution in the Zvonařka area has been significantly affected in recent years by extensive construction activity taking place in the broad vicinity of the measuring station. In general, higher concentrations are measured at traffic stations, while urban background locations already correlate quite well with the regional background (Mikulov - Sedlec). At the same time, traffic sites show the largest decrease in concentrations, on average reaching the level of background sites in recent years.

The emission limit of 25 $\mu\text{g}/\text{m}^3$ for annual average concentrations of $\text{PM}_{2,5}$ was exceeded at the Brno - Svatoplukova station in 2012 and 2014 and also at the Brno - Lány station in 2014. Since 2015, the immission limit of 25 $\mu\text{g}/\text{m}^3$ has not been exceeded at any AIM station in Brno. As of 1 January 2020, the immission limit for annual average concentrations of $\text{PM}_{2,5}$ is adjusted from the original level of 25 $\mu\text{g}/\text{m}^3$ to 20 $\mu\text{g}/\text{m}^3$. From 2019, the annual average concentrations of $\text{PM}_{2,5}$ at all measuring stations in Brno are measured below the level of 20 $\mu\text{g}/\text{m}^3$.

The emission limit for average daily concentrations of PM_{10} is exceeded mainly at locations affected by traffic (Brno - Zvonařka, Brno - Svatoplukova). In 2017, exceedances also occurred at the urban background locations Brno - Dětská nemocnice and Brno - Masná. In 2018, the immission limit for average daily concentrations of PM_{10} was exceeded only at the AIM station Brno-Uvoz in the vicinity of which major construction activity was taking place in that year. In 2020, the immission limit for average daily concentrations of PM_{10} was exceeded only at the station Brno - Zvonařka. In the vicinity of this measuring station, intensive construction of several projects has been taking place in recent years, which in their concurrence significantly affect the air quality in the locality. Apart from the Brno - Úvoz and Brno - Zvonařka measuring stations, where the measurements were mainly affected by construction activities, the immission limit has been met at all other measuring stations since 2018.

In particular, meteorological conditions, emissions from local heating sources (domestic heating) and traffic volume have an influence on the legislative characteristics, related to the average daily

concentration of PM₁₀. The highest number of exceedances tends to be recorded in the winter months, when the effects that increase PM₁₀ concentrations across the board - meteorological conditions and associated seasonal sources (local heating sources) - combine. As an example, in 2017, very unfavourable dispersion conditions prevailed throughout Central Europe in January and the first half of February, resulting in a large number of days with exceedances of the immission limit during this period at all stations.

Carbon monoxide (CO)

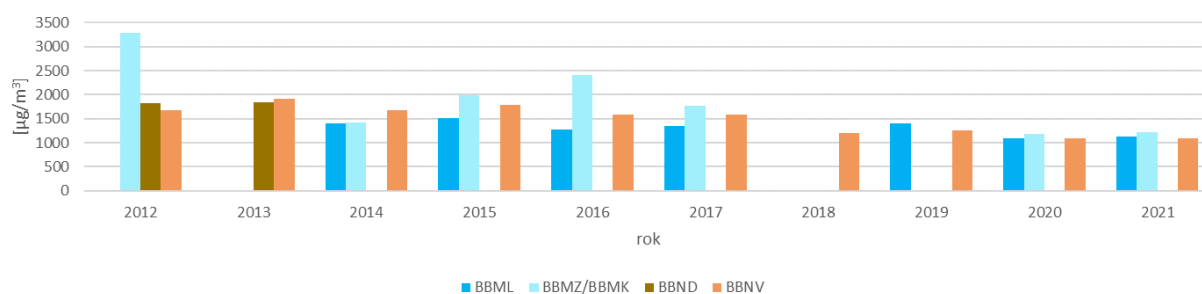
The CO emission limit is set as a maximum 8-hour moving average per year. The value of the immission limit is set at 10 mg/m according to the current legislation³.

Tab. 8: Measured values at selected AIM stations, maximum 8-hour average CO

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBML	Brno-Lány	-	-	1397,9	1514,4	1266,8	1354,2	-	1397,9	1092,1	1121,2	1306,4	1354,2
BBMZ/BBMK	Brno-Zvonařka	3281,2	-	1421,9	1980,3	2402,6	1776,5	-	-	1179,5	1223,2	1895,0	1776,5
BBND	Brno-central	1829,6	1844,6	-	-	-	-	-	-	-	-	1837,1	1837,1
BBNV	Brno-Úvoz (hot spot)	1675,0	1909,2	1672,1	1793,6	1589,7	1587,6	1206,0	1250,1	1084,0	1082,8	1485,0	1588,7

Note: The values given are in units of µg/m³. The IL for the maximum 8-hour moving average of CO concentrations under current legislation is 10 mg/m³.

Obr. 15: Evolution of maximum 8-hour moving averages of CO per calendar year, 2012-2021



Concentrations of the air pollutant CO are measured at only a small number of measuring stations. The maximum 8-hour average CO concentrations are measured below the immission limit over the long term. There is no annual average concentration limit for this pollutant.

Benzene

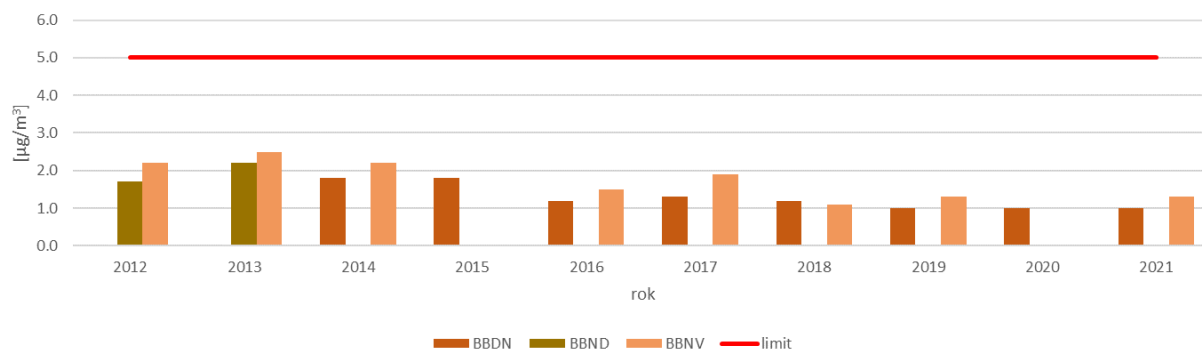
For the pollutant benzene, the current legislation sets an immission limit for average annual concentrations of benzene in air at 5 µg/m³.

Tab. 9: Measured values at selected AIM stations, annual average benzene concentrations

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBDN	Brno - Children's Hospital	-	-	1,8	1,8	1,2	1,3	1,2	1,0	1,0	1,0	1,3	1,2
BBND	Brno-central	1,7	2,2	-	-	-	-	-	-	-	-	2,0	2,0
BBNV	Brno-Úvoz (hot spot)	2,2	2,5	2,2	-	1,5	1,9	1,1	1,3	-	1,3	1,8	1,7

Note: The values given are in units of µg/m³. The IL for annual average concentrations of benzene under current legislation is 5 µg/m³.

Obr. 16: Trends in annual average benzene concentrations, 2012-2021



The above data show that at all sites where benzene monitoring is carried out, concentrations are in the vicinity of the lower assessment limit. Concentrations measured in recent years have not varied significantly.

Benzo(a)pyrene (BaP)

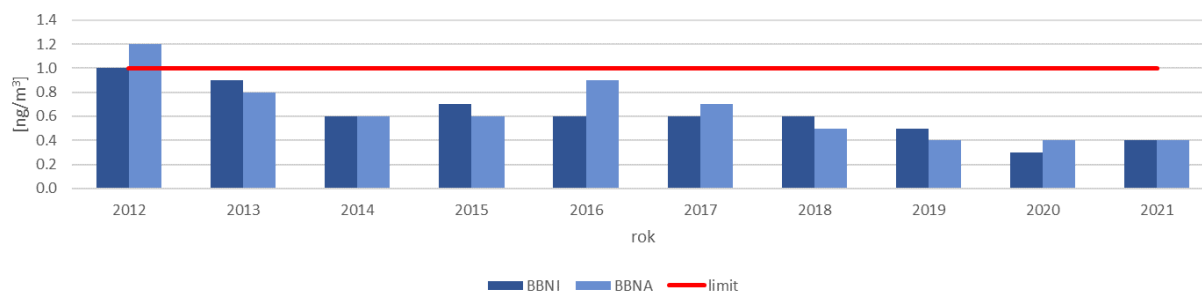
Benzo(a)pyrene is a legislative representative of polyaromatic hydrocarbons (PAHs), for which an immission limit for annual average concentrations is set at 1 ng/m³.

Tab. 10: Measured values at selected AIM stations, annual average BaP concentrations

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBNA	Brno-Masna	1,2	0,8	0,6	0,6	0,9	0,7	0,5	0,4	0,4	0,4	0,7	0,6
BBNI	Brno-Líšeň	1,0	0,9	0,6	0,7	0,6	0,6	0,6	0,5	0,3	0,4	0,6	0,6

Note: Values are in units of ng/m³. The IL for annual average BaP concentrations under current legislation is 1 ng/m³.

Obr. 17: Trends in annual average BaP concentrations, 2012-2021



In Brno, average annual BaP concentrations are measured at only 2 stations, namely at the stations Brno - Líšeň and Brno - Masná. From the measured data it is evident that BaP concentrations have been below the limit at both locations in recent years. Slightly higher concentrations in the city centre could be due to traffic. In 2013-2015, however, the concentration in Brno-Masná has dropped dramatically to 50% of the 2012 concentration, so the concentrations here are similar to those in the Brno-Líšeň background site or in the rural background sites of the South Moravian Region. In 2016, there was a slight increase in the Brno-Masná site, but the immission limit was not exceeded. In terms of average monthly concentrations, the winter months are very important - while in summer the concentrations are practically zero, in winter they vary on average between 1-3 ng/m³.

Sulphur dioxide (SO₂)

For average annual concentrations of SO₂, an immission limit of 20 µg/m³ (immission limit for the protection of ecosystems and vegetation) is set according to the current legislation. In addition to the immission limit for annual average concentrations, immission limits are also set for short-term concentrations for the pollutant SO₂. The immission limit for average daily concentrations is set at 125 µg/m³ with a permissible exceedance frequency of 3 days per year, the immission limit for maximum

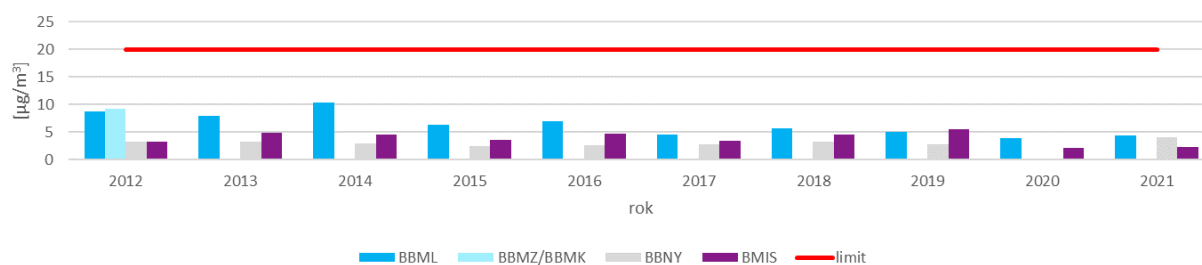
hourly concentrations is set at $350 \mu\text{g}/\text{m}^3$ with a permissible exceedance frequency of 24 hours per year.

Tab. 11: Measured values at selected AIM stations, annual average SO_2

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBML	Brno-Lány	8,7	8,0	10,3	6,4	7,0	4,6	5,7	5,1	3,9	4,4	6,4	6,1
BBMZ/BBMK	Brno-Zvonařka	9,3	-	-	-	-	-	-	-	-	-	9,3	9,3
BBNY	Brno-Turany	3,3	3,3	3,0	2,5	2,6	2,7	3,3	2,7	-	4,1	3,1	3,0

Note: The values given are in units of $\mu\text{g}/\text{m}^3$. The IL for annual average concentrations of SO_2 under current legislation is $20 \mu\text{g}/\text{m}^3$.

Obr. 18: Evolution of annual average SO_2 concentrations, 2012-2021

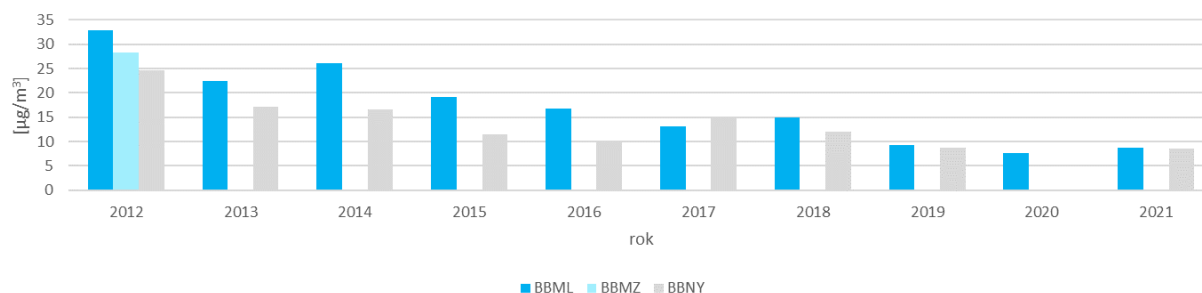


Tab. 12: Measured values at selected AIM stations, 4th highest daily SO_2

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBML	Brno-Lány	32,9	22,5	26,2	19,1	16,8	13,1	15,0	9,3	7,7	8,8	17,1	15,9
BBMZ	Brno-Zvonařka	28,3	-	-	-	-	-	-	-	-	-	28,3	28,3
BBNY	Brno-Turany	24,6	17,2	16,6	11,4	9,9	15,1	12,0	8,7	-	8,6	13,8	12,0

Note: The values given are in units of $\mu\text{g}/\text{m}^3$. The IL for average daily concentrations of SO_2 under current legislation is $125 \mu\text{g}/\text{m}^3$ with a permissible frequency of exceedance of 3 hours per year.

Obr. 19: Evolution of the 4th highest daily SO_2 concentrations, 2012-2021

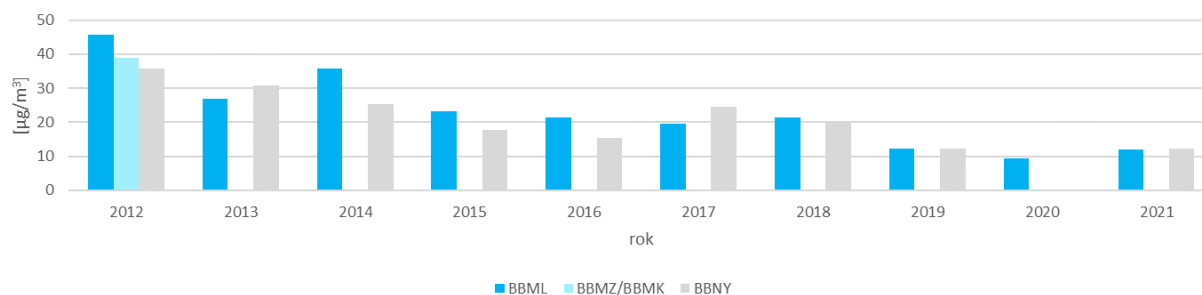


Tab. 13: Measured values at selected AIM stations, 25th highest hourly SO_2

Station code	Station name	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	diameter	median
BBML	Brno-Lány	45,8	26,9	35,7	23,2	21,3	19,7	21,3	12,2	9,3	12,0	22,7	21,3
BBMZ/BBMK	Brno-Zvonařka	38,9	-	-	-	-	-	-	-	-	-	38,9	38,9
BBNY	Brno-Turany	35,7	30,9	25,3	17,8	15,4	24,5	20,2	12,2	-	12,2	21,6	20,2

Note: The values given are in units of $\mu\text{g}/\text{m}^3$. The IL for maximum hourly concentrations of SO_2 under current legislation is $350 \mu\text{g}/\text{m}^3$ with a permissible frequency of exceedance of 24 hours per year.

Obr. 20: Evolution of the 25th highest hourly SO_2 concentrations, 2012-2021



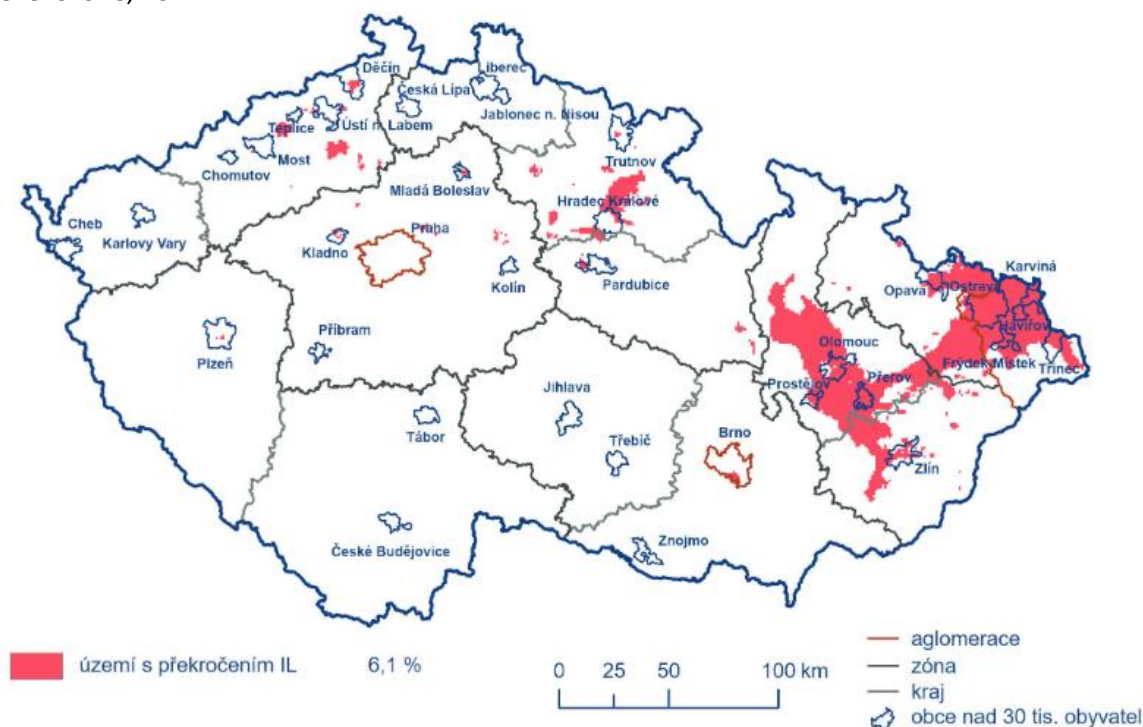
Concentrations of the pollutant SO₂ in the air have been measured only at background measuring stations in Brno since 2013. The measured concentrations are below the immission limits for both annual average and maximum short-term concentrations.

3.3. Areas with exceedances of the immission limit

The Air Protection Act sets immission limits for selected pollutants without further distinction between immission and target immission limits. In its yearbooks, the CHMI regularly defines areas with exceedances of the immission limits in bulk for all pollutants that are monitored from the point of view of human health protection. The map of areas with exceedances of at least one immission limit without ozone provides comprehensive information on air quality in the Czech Republic.

In 2021, 6.1% of the Czech Republic's territory, where approximately 19.7% of the population lives, was defined as an area with an exceedance of immission limits. In the territory of the city of Brno this is 7.75% of the territory. The designation of areas with deteriorated air quality in 2021 in the Brno agglomeration is due to above-limit annual average concentrations of BaP. For comparison, the table below gives an overview of the development of the area with exceedances of the immission limits for health protection without ground-level ozone for the Brno city area (Brno agglomeration), and for the South Moravian Region (without Brno agglomeration).

Obr. 21: Designation of areas with exceedances of the health-based immission limits without ground-level ozone, 2021



Source.

Tab. 14: Evolution of the area of health protection IL exceedances without ground-level ozone

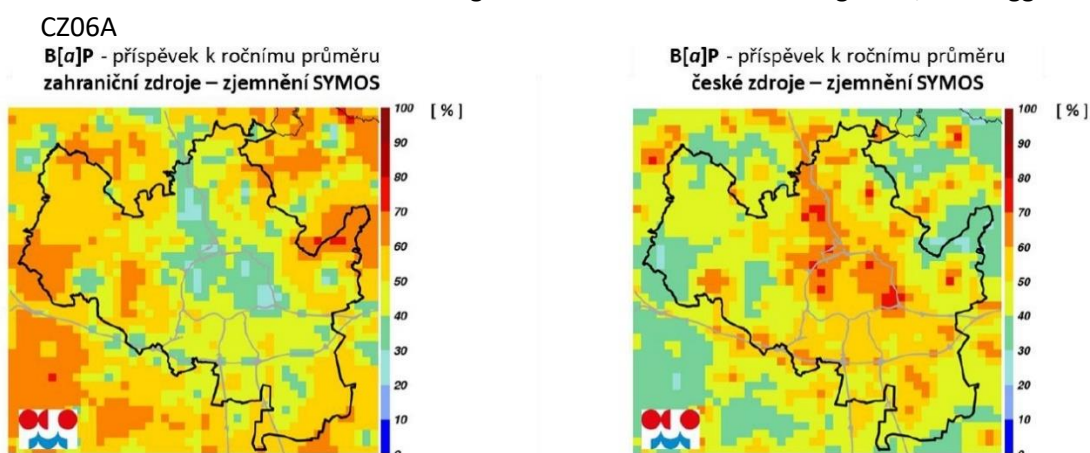
Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
South Moravian Region (without the Brno agglomeration)	31,18	12,94	2,45	2,5	4,24	12,17	3,71	0,07	0,05	0,05
Brno agglomeration	46,77	28,89	0,43	-	2,72	15,05	20,59	0,87	4,27	7,75

Note: The values given are in units of % of the area of the territorial unit.

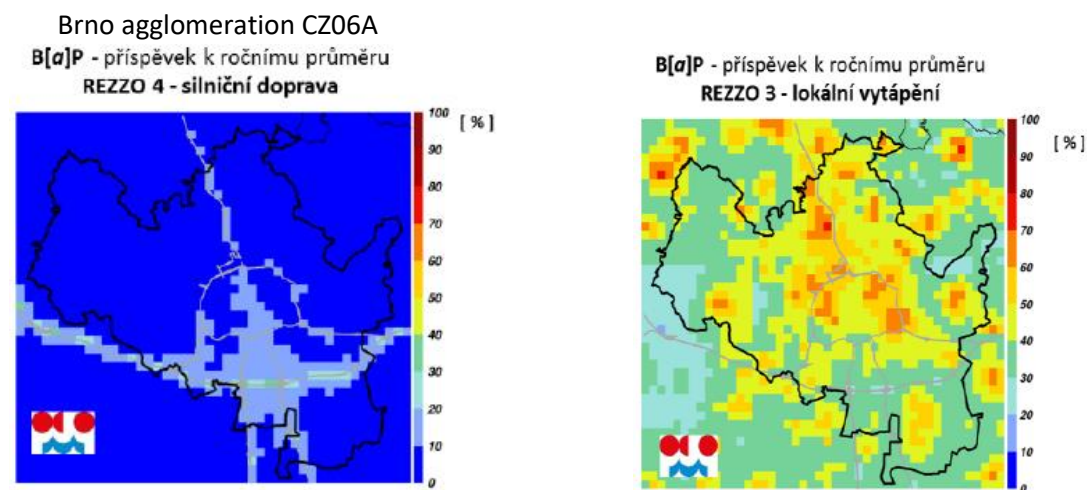
3.4. Analysis of the causes of pollution

On the territory of the City of Brno, the immission limit for annual average concentrations of BaP is exceeded on the basis of the five-year average concentrations 2017-2021 (defined pursuant to Section 11(6) of Act No. 201/2012 Coll.). The analysis of the causes of BaP air pollution in the Brno city area (including the figures below) was taken from the Brno Agglomeration Air Quality Improvement Programme - CZ06A, update 2020. The relative contribution of foreign and Czech sources to the annual average BaP concentration is shown in Obr. 22. The share of Czech sources (local heating) reaches 70-80 % in locations with high BaP emissions. See Obr. 23 shows the relative contributions of selected types of Czech sources to annual average BaP concentrations. The categories selected are those whose contribution to the annual average BaP concentration exceeded 10% or whose contribution to the annual average exceeded 10% of the immission limit. It is clear from the results that the absolutely dominant Czech source is local heating.

Obr. 22: Contribution of Czech and foreign sources to the annual average BaP, Brno agglomeration



Obr. 23: Contribution of Czech sources (road transport and local heating) to the annual average BaP,



3.5. Immission limits

The emission limits are given in Annex 1 to Act No. 201/2012 Coll., on air protection, which was prepared on the basis of the relevant EU directives. All the permissible air pollution levels for gaseous pollutants mentioned above refer to standard conditions (volume converted to a temperature of 293.15 K and a normal pressure of 101.325 kPa). All permissible levels of air pollution are arithmetic averages. An overview of the immission limits for all pollutants applicable under current legislation is

given below. From 1 January 2020, an amendment to Act No 369/2016 Coll. applies, which modifies the immission limit for annual average concentrations of PM_{2,5} from the original level of 25 µg/m³ to 20 µg/m³.

Tab. 15: Emission limits declared for the protection of human health and the permissible frequency of their exceedance

Pollutant	Averaging time	Immission limit	Maximum number of overruns
Sulphur dioxide	1 hour	350 µg.m ⁻³	24
Sulphur dioxide	24 hours	125 µg.m ⁻³	3
Nitrogen dioxide	1 hour	200 µg.m ⁻³	18
Nitrogen dioxide	1 calendar year	40 µg.m ⁻³	-
Carbon monoxide	max. daily eight-hour average ⁽¹⁾	10 mg.m ⁻³	-
Benzene	1 calendar year	5 µg.m ⁻³	-
PM ₁₀	24 hours	50 µg.m ⁻³	35
PM ₁₀	1 calendar year	40 µg.m ⁻³	-
PM _{2,5}	1 calendar year	20 µg.m ⁻³	-
Lead	1 calendar year	0,5 µg.m ⁻³	-

Note

- (1) The maximum daily 8-hour average concentration is determined by examining 8-hour moving averages calculated from hourly data and updated hourly. Each eight-hour average is assigned to the day on which it ends, i.e. the first calculation is made from the hourly concentrations during the period 17:00 of the previous day and 01:00 of that day. The last calculation for a given day is made for the period 16:00 to 24:00.

Tab. 16: Emission limits set to protect ecosystems and vegetation

Pollutant	Averaging time	Immission limit
Sulphur dioxide	calendar year and winter period (1 October - 31 March)	20 µg.m ⁻³
Oxides of nitrogen ⁽¹⁾	1 calendar year	30 µg.m ⁻³

Note

- (1) The sum of the volume ratios (ppbv) of nitric oxide and nitrogen dioxide expressed in units of nitrogen dioxide concentration by mass.

Tab. 17: Emission limits for total particulate matter PM₁₀ promulgated to protect human health.

Pollutant	Averaging time	Immission limit
Arsenic	1 calendar year	6 ng.m ⁻³
Cadmium	1 calendar year	5 ng.m ⁻³
Nickel	1 calendar year	20 ng.m ⁻³
Benzo(a)pyrene	1 calendar year	1 ng.m ⁻³

Tab. 18: Emission limits for tropospheric ozone

Purpose of the	Averaging time	Immission limit	Maximum number of overruns
Protection of human	max. daily eight-hour average ⁽²⁾	120 µg.m ⁻³	25 ⁽³⁾
Protection of	AOT40 ⁽⁵⁾	18000 µg.m ⁻³ .h ⁽⁶⁾	0

Notes

- (1) Compliance with the immission limit shall be assessed on the basis of an average over 3 calendar years;
- (2) The maximum daily eight-hour average concentration shall be determined by examining eight-hour moving averages calculated from hourly data and updated hourly. Each eight-hour average is attributed to the day on which it ends, i.e. the first calculation is made from hourly concentrations during the period 17:00 of the previous day and 01:00 of that day. The last calculation for a given day is made for the period 16:00 to 24:00 hours;
- (3) In the case of compliance with the immission limit at the maximum number of exceedances in a zone or agglomeration, it is necessary to strive to achieve zero exceedances;
- (4) Compliance with the immission limit shall be assessed on the basis of an average over 5 calendar years;
- (5) For the purposes of this Act, AOT40 means the sum of the differences between an hourly concentration greater than 80 µg.m⁻³ (=40 ppb) and a value of 80 µg.m⁻³ in a given period using only hourly values measured between 08:00 and 20:00 CET each day, calculated from hourly values during the summer period (1 May to 31 July);
- (6) In the case of compliance with the immission limit in a zone or agglomeration of 18000 µg.m⁻³.h, an immission limit of 6000 µg.m⁻³.h shall be sought.

3.6. Summary

The five-year average concentrations (defined according to Section 11(6) of Act No 201/2012 Coll.) for the period 2017-2021 in the territory of the City of Brno do not exceed the existing immission limits, with the exception of the annual average concentrations of BaP. The immission limit for the annual average concentrations of BaP is exceeded locally in part of the territory of the Bohunice and Brno-jih districts. The emission limit for average annual concentrations of BaP is also exceeded in the territory of the town of Modřice, bordering the town of Brno. In other parts of the city, according to the five-year average concentrations for the period 2017-2021, the immission limits for all monitored characteristics are met.

For the purpose of air quality assessment based on Automated Immission Monitoring (AIM) data, both background and traffic immission monitoring stations located in the Brno city area were used. The measurement outputs of the AIM stations depend on their location. In the past years, immission limits for annual average concentrations were exceeded for the pollutant NO₂ at stations significantly affected by traffic. At the same time, a trend of higher concentrations of PM₁₀ could be observed in the past years in locations with intensive construction activities, where the immission limits for average daily concentrations of PM₁₀ were also exceeded (Brno - Úvoz (2018), Brno - Zvonařka (2020)). As of 2019, the measured concentrations of pollutants at all AIM stations in the territory of the City of Brno (except for sites affected by construction activities taking place in their vicinity) do not exceed the relevant immission limits for annual average and short-term concentrations.

Pollutants with exceeded immission limits contribute to the definition of an area with poor air quality. In 2021, 7.75% of the territory of the city of Brno (Brno agglomeration) was defined as an area with exceeded immission limits. The designation of areas with deteriorated air quality in 2021 in the agglomeration is due to above-limit annual average concentrations of BaP. The analysis of the causes of pollution, carried out as part of the update of the PZKO 2020+, shows that in the case of BaP pollution, the absolutely dominant Czech source is local heating

4. Objectives, instruments and measures

4.1. Target, control and update

The aim of the Action Plan is to achieve compliance with the immission limits set by the Air Protection Act throughout the whole of the Brno agglomeration.

The goal of the action plan is to have by 2028:

- air pollutant concentrations were reduced so that air quality was improved, especially where immission limits are exceeded in the agglomeration,
- air quality is maintained and improved also where current pollutant concentrations are below the immission limits and approaching the World Health Organization limits (WHO, 2023).

Due to the wide range and number of possible measures to achieve the stated objective that it may contain, and also because of its openness to further suggestions, the Action Plan for Improving Air Quality is designed as a document that is regularly evaluated and updated, open to further additions. Updating is planned as necessary, together with an evaluation of the results of the measures already implemented.

4.2. Overview of tools and measures

The objectives of the Action Plan include primarily those objectives whose fulfilment can be influenced by the City of Brno, municipal districts and municipal organisations and companies within their partial or full competences by applying appropriate instruments or implementing appropriate measures (e.g. construction of transport or energy infrastructure, promotion of energy savings, setting development conditions for sources of pollution, integration of the public transport system with an emphasis on reducing the impact of individual car transport, limiting the burning of certain fuels or the burning of plant residues, educational and training activities).

The list of proposed instruments and measures is summarised below. The measures are divided into several groups, according to the areas they target or the way they are implemented. A more detailed description of the individual measures is given in Chapter 2. 4.3. The description of the measures includes a timeframe. In general terms, the measures can be divided into measures with a short-term implementation horizon, measures with a long-term implementation horizon and ongoing measures. For intermediate measures, the effect of the measure is linked to its long-term and regular implementation. In the case of measures with a long-term time horizon, the implementation year indicated below is indicative only and may be changed on the basis of future developments of the project or other objective circumstances that cannot be defined in advance.

List of measures:

A Transport measures	29
A.1 Traffic at rest	29
A.1.a Resident parking (OPS)	29
A.1.b Rest areas, P+R systems	31
A.1.c Development of a network of charging stations for electric vehicles and construction of filling stations for hydrogen vehicles	32
A.2 Development of public transport	34
A.2.a Construction and reconstruction of tram and trolleybus lines	34
A.2.b Construction and development of public transport interchanges and related infrastructure	36
A.2.c Economic support (subsidies) for the operation of public transport	38
A.2.d Environmentally friendly public transport - promoting the introduction and use of alternative fuel vehicles	39
A.2.e Ensuring a high standard of public transport quality	40

A.2.f Promotion of public transport as one of the possible alternatives to car transport	41
A.3 Implementation of the backbone network of capacity roads for car transport and other important transport structures	42
A.3.a Complete completion of the Brno Grand Ring Road (VMO) and related roads	42
A.3.b Implementation of other significant transport constructions on the territory of the city of Brno	42
A.3.c Support for projects for the construction of capacity roads in the administration of superior territorial units, which lead to a reduction of the immission load from traffic on the territory of the city of Brno	42
A.4 Troubleshooting spot problems on communication networks	47
A.5 Promotion of cycling	49
A.6 Cleaning and maintenance of the GCCOS and other roads	51
A.7 Reduction of emissions from the operation of MMB vehicles and SMB organisations	52
B Measures for the heating and energy sector	53
B.1 Territorial energy concept	53
B.2 Support for the conversion of domestic heating systems - installation and use of new environmentally friendly and/or renewable sources	55
B.3 Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned	57
B.4 Reduction of energy consumption of buildings managed or owned by MMB, SMB and its organisations, development of energy management system	59
B.5 Reconstruction and modernisation of heat energy supply systems, their extension	61
C Measures for public spaces, buildings and greenery	62
C.1 Establishment of new vegetation elements	62
C.2 Ensuring adequate space for tree root ball	63
C.3 Motivational programmes of the Statutory City of Brno aimed at the development of greenery in the city	64
D Measures for agriculture, horticulture and construction	66
D.1 Incineration of garden materials	66
D.2 Dust control from construction activities	68
E Administrative tools and measures	70
E.1 Effective control of compliance with the requirements imposed on stationary source operators by the Air Protection Act	70
E.2 Spatial planning and land use planning, building permits	72
E.3 Statement on the application for the issue and amendment of an integrated permit	74
E.4 Statements in planning, construction and building permit procedures and in environmental impact assessments from the point of view of air protection	76
E.5 Air protection in public procurement	78
E.6 Records of unlisted sources of air pollution	80
F Information and other tools and measures	82
F.1 Education and awareness	82
F.2 Voluntary agreements with resource operators, demonstration projects	84
F.3 Updating the website	85
F.4 Operation and renewal of air quality monitoring	86

Note: The options are grouped and ranked according to context, targeting and delivery. The order and numbering of the options does not reflect the level of effectiveness of the measures or their urgency.

4.3. Description of tools and measures

A Transport measures

A.1 Traffic at rest

A.1.a Resident parking (OPS)

Description

There is a shortage of parking spaces in the city for permanent residents (residents), vehicles of companies and other organizations in the area (subscribers) or visitors. The aim is to facilitate parking for residents, subscribers and short-term visitors (increase turnover). Other drivers should use the P+R car park for parking and take public transport to the centre or, if possible, choose public transport to the destination areas. Parking spaces at electric vehicle charging stations should also be regulated to ensure the necessary turnover rate while ensuring that spaces are not occupied by vehicles other than EVs and hybrids.

Cil / applications

The aim of the measure is to improve air quality in Brno by regulating parking. In addition, the development of Zone E can be considered as one of the partial steps to promote electric vehicles as an alternative to personal transport with combustion engines.

Fulfillment indicator

The number of Ops per year.

Implementation and financing options

The project is funded by public funds and money collected from the parking system

Timing

The implementation of the resident parking project in Brno began in September 2018 and has gradually expanded in the following years. It is expected that the trend of expanding the resident parking areas will continue in the following years, in cooperation with the district. The timetable for the expansion of the RPAs in 2024 is set out below. The timetable for the further expansion of the resident parking areas will be set in subsequent years, in agreement with the respective municipalities.

Schedule for implementation of resident parking areas in 2024:

- 22 Apr 2024 area 2-06 (Vychodilova)
- 3. 6. 2024 area 4-06 (Soběšická)
- 24. 6. 2024 area 10-01 (Rybnická)
- 15. 7. 2024 Area 10-02 (Oblá)
- 5. 8. 2024 area 5-01 (Slevačská)
- 16 Sep 2024 area 5-02 (Rokycanova)
- 7/10/2024 area 5-03 (Copernicus)
- 4. 11. 2024 area 50-04 (Strakatého)

Effect on air quality

Focus: NO₂ , PM₁₀ , PM_{2,5} .

Reduction in air pollutant concentrations due to a reduction in the number of cars looking for a parking space.

Risks

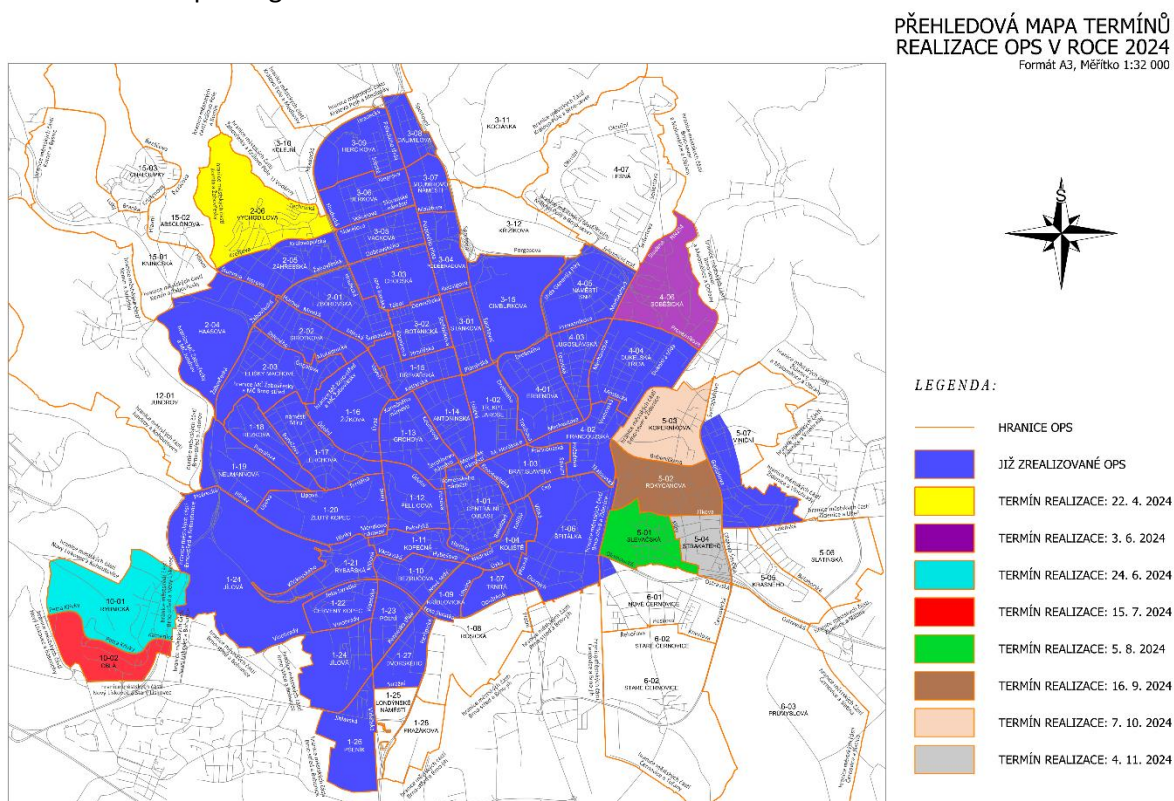
Displacement of car traffic into urban areas where resident parking is not in place. Localised increase in immissions.

Current status

In Brno, resident parking was introduced in 2018 in and around the historic city centre. Gradually, other locations were added under resident parking from the city centre to the outskirts of the city. The

expansion of the resident parking area was continuously approached in 2023 and the gradual expansion of the resident parking areas is also envisaged in 2024. The current status of resident parking and the timetable for the expansion of the OPS in 2024 is shown in the figures below. The resident parking areas in Brno are divided into zones A, B and C according to the level of regulation. From August 2022, Zone E is also newly defined and is being established at electric vehicle charging stations.

Obr. 24 Resident parking areas - timetable for 2024



(Source: www.parkovanivbrne.cz)

Link to other instruments and measures

(Note: sub-measures of the measure A.1 *Traffic at rest* are interlinked and are not listed below by name)

A.2 - Development of public transport

A.5 - Promotion of cycling

E.2 - Spatial planning and territorial management, building permits

A.1.b Parking lots, P+R systems

Description

The construction of P+R car parks is one of the city's priorities. Several car parks with a total capacity of several thousand cars are planned in the coming years. The introduction of a combined payment for P+R parking with a ticket for public transport in the range of 100+101 zones can be considered in the future, and this instrument can be considered in different variants not only for one-off use, but especially for longer-term use, e.g. monthly.

Cil / applications

To enable vehicles arriving in Brno to park conveniently near public transport stops and new transport terminals in order to get to the desired location in the shortest possible time. P+R car parks should be created in different parts of the city. In order to make the system comprehensive, it is necessary to provide catchment car parks at all entrances to the city from the main directions. Motivating drivers to use the P+R interceptor car parks is equally important. This is determined by a combination of several factors - e.g. location of parking areas in relation to road infrastructure and in relation to the location of public transport lines and stops, cost of parking, adjustment of timetables in relation to P+R parking in the locality, etc.

Fulfillment indicator

Number of newly built parking spaces in the P+R system.

Implementation and financing options

The parking lots are paid from own resources.

Timing

Continuous implementation until the required capacity of the P+R parking system is reached.

Effect on air quality

Focus: NO_x , PM_{2,5} , PM₁₀

The anticipated reduction in the number of cars entering the city will reduce emissions from the operation of these vehicles.

Risks

Non-use of P+R car parks even after their completion and sufficient capacity.

Current status

The first P+R car park was opened in 2015 at the Central Cemetery. Next, P+R Polní (parking house RIVER PARK) and P+R Líšeň u Zetoru were put into operation. There are also several parking houses in Brno, but most of them are in the wider centre of Brno and therefore do not serve the function of P+R parking lots.

Link to other instruments and measures

(Note: sub-measures of the measure A.1 Traffic at rest are interlinked and are not listed below by name)

A.2 - Development of public transport

A.3 - Implementation of the backbone network of capacity roads for car transport and other important transport structures

E.2 - Spatial planning and territorial management, building permits

A.1.c Development of a network of charging stations for electric vehicles and construction of filling stations for hydrogen cars

Description

Larger cities are currently facing problems with car traffic, both in terms of road congestion and air pollution. The current trend of developing electric vehicles is therefore one way to contribute to reducing emissions and improving air quality. The rise of electromobility depends not only on the financial availability of this type of vehicle, but also on the availability of the accompanying infrastructure (e.g. charging stations, service points, etc.). The development of electric vehicles should already be taken into account in spatial planning and in the planning of development and other investment projects. In the case of street revitalisation with the contemplated construction of charging stations in selected existing parking spaces, the principle of placing such a charging station in the space of the road or its part (e.g. a parking space) should be prospectively respected, not at the expense of space for pedestrians or cyclists (i.e. in the space of a pavement or cycle path). This principle represents the principle of internalisation of externalities, where the burden is borne by the originator (in this case road transport).

The same applies to hydrogen and other alternative fuel vehicles. To further develop this type of mobility, an infrastructure of filling stations for hydrogen cars will be needed.

Cil / applications

The aim of the measure is to support the development of a network of charging stations for electric vehicles by increasing their number and charging capacity. Building a network of hydrogen filling stations.

Fulfillment indicator

Number of new charging points for electric vehicles. Number of charging stations built

Implementation and financing options

The charging stations are paid for from the operators' own resources, with the possibility of obtaining subsidies. Infrastructure networks for hydrogen vehicles will be to a greater extent the investment plans of future operators and to a lesser extent the infrastructure of the city.

Timing

Ongoing performance.

Effect on air quality

Focus: NO_x

The projected increase in the number of vehicles without internal combustion engines will reduce emissions, particularly NO_x, from the operation of internal combustion engines.

Risks

Preference for the use of cars with internal combustion engines (so-called petrol and diesel engines) despite the sufficient and available network of charging stations for electric vehicles.

Current status

As it stands, there are several dozen charging stations for electric vehicles in Brno, which are owned and operated by different companies.

Link to other instruments and measures

(Note: sub-measures of the measure A.1 *Traffic at rest* are interlinked and are not listed by name below)

A.7 - Reduction of emissions from the operation of MMB vehicles and SMB organisations

B.1 - Territorial energy concept

E.2 - Spatial planning and territorial management, building permits

A.2 Development of public transport

The use of public transport has a positive effect on reducing emissions from line sources. Emissions per 'passenger-kilometre' are significantly lower for both bus and rail transport. The use of public transport also contributes to a higher overall fluidity of road transport.

A.2.a Construction and reconstruction of tram and trolleybus lines

Description

The construction of new tram and trolleybus lines is an important step for the city of Brno. It boasts one of the highest rated transport companies in Europe. Tram lines, which have greater transport capacities, are needed to serve (not only) the new localities being built in the city.

Cil / applications

Capacitating or optimising the routing of tram lines to areas with high passenger volumes. Partial replacement of selected bus lines with trolleybus or tram lines.

Fulfillment indicator

Number of newly built km of tram and trolleybus lines. Number of reconstructed km of tram lines.

Implementation and financing options

The constructions are financed by the City of Brno, DPMB, TB, ŘSD and co-financed by the EU through the Operational Programme Transport or supported through the ITI instrument.

Timing

The implementation of the tram line to the Campus was completed and put into operation during the preparation of the Action Plan.

The construction of the tram line to the Kamechy housing estate is currently in the project preparation phase. The expected date of commencement of construction works is in 2025.

Furthermore, the plans for the extension of the Lesná tramway line (assumption of the start of construction in 2024) and the reopening of the tramway line to the old Líšná (assumption of the start of construction in 2025) are in the project preparation phase.

The construction of a new reversible tram loop in Pisárky was started in 2023. The construction of a cableway Pisárky - Kampus is being considered in the future.

In connection with the implementation of the new railway stop Brno - Starý Lískovec, it is planned to extend the trolleybus line Osová - Žst. Starý Lískovec, terminal. The implementation date has not been set yet.

Reconstruction of existing tram lines is carried out continuously depending on the available financial resources of the operator and the condition of individual lines.

Effect on air quality

Focus: mainly NO₂ , PM₁₀ , PM_{2,5} and partly BaP.

The construction of the tram lines will reduce emissions from car and bus traffic to the newly connected areas.

Risks

Time and investment requirements for the development of tram lines.

Inappropriate location of the stops of the new tram lines, and the related need to supplement tram transport with bus transport.

Preference for passenger car transport despite the area being connected by tram.

Current status

Currently, the project documentation for the extension of the Lesná tram line is being finalised, with the first stage of construction expected to start next year. A new reversible loop in Pisárky is under

construction, enabling better organisation of tram traffic in the area Pisárky - Staré Brno. Other projects are in various stages of project preparation. In the course of preparation and preparation of the action plan, the tram line to the Bohunice Campus was put into operation.

Link to other instruments and measures

(Note: sub-measures of the measure *A.2 Development of public transport* are interlinked and are not listed below by name)

A.1 - Traffic at rest

A.3 - Implementation of the backbone network of capacity roads for car transport and other important transport structures

E.2 - Spatial planning and territorial management, building permits

A.2.b Construction and development of public transport interchanges and related infrastructure

Description

Several major transport constructions are being prepared in Brno, which will lead to new routing of car and public transport. These are mainly the construction of the southern centre with a new train terminal, as well as a site in the southern part of the Brno agglomeration with the passing VRT and its "Brno" transport terminal. An equally significant impact on the transport infrastructure will be the completion of the VMO and the X/43 road and other transport constructions considered in the Principles of Territorial Development of the South Moravian Region as amended by Updates No. 1 and 2, related to the transport services of the city of Brno. In all cases, these are locations where there will be an increase in both passenger and public transport. This will need to be accommodated by designing adequate parking spaces (P+R) and the construction and development of public transport interchanges and related infrastructure. All modes of transport, including walking and cycling, should be taken into account in the planning and development of interchanges.

The construction/designation of dedicated lanes for public transport vehicles or modification of the intersection control system in favour of public transport vehicles may also help to favour public transport over private car transport. In the case of busy roads with numerous congestions, this measure can lead to a significant increase in journey times, which is one of the factors for passengers' mode choice.

Cil / applications

Improving and increasing the use of public and public transport in places where private car transport is not desirable. The construction and development of interchanges should aim to make public transport more attractive and increase passenger comfort when travelling longer distances so that passengers do not prefer private car transport to public transport when they need to change.

Fulfillment indicator

Implementation of the construction of VRT, VMO, design of new interchanges with appropriate transport infrastructure, their discussion within the framework of zoning plans, planning and construction procedures.

Implementation and financing options

Transport Infrastructure Funds, the budget of the City of Brno, the South Moravian Region and the state budget. Involvement of private entities, for example in the case of parking houses and parking areas.

Timing

Ongoing implementation, depending on the implementation of the above mentioned objectives (2023-2035)

Effect on air quality

Focus: NO₂ , PM₁₀ , PM_{2,5} and partly BaP.

Assumption of a reduction in the intensity of car traffic (at the expense of public transport) and the associated reduction in emissions from road vehicles.

Risks

Time imbalance.

Construction of only interchanges without proper accompanying infrastructure.

The construction of dedicated/delineated lanes may narrow or reduce the number of other lanes, which can lead to congestion.

Current status

At present, there are several interchanges of JMK IDS lines in Brno. These interchanges are in different conditions in terms of interchange facilities, comfort and safety of passenger movement. Further development of the transfer nodes is linked to the development of public transport and other constructions to which the transfer nodes should be connected.

Link to other instruments and measures

(Note: sub-measures of the measure *A.2 Development of public transport* are interlinked and are not listed below by name)

A.1 - Traffic at rest

A.3 - Implementation of the backbone network of capacity roads for car transport and other important transport structures

E.2 - Spatial planning and territorial management, building permits

A.2.c Economic support (subsidies) for the operation of public transport

Description

The City of Brno is trying to motivate citizens to make more use of public transport services. Children up to 10 years of age can ride public transport for free, students and seniors can ride at discounted prices. Working-age citizens are usually not eligible for any discounts, so the city has launched a subsidy programme for this group. The subsidy can be used if certain conditions are met. It is the targeting of the support to the working commuter group that needs to be given great attention in the future, as it is this group that puts pressure on the transport system at peak times. The programme should therefore be continuously monitored and evaluated with a view to setting up a system that will encourage the working-age population to use public transport instead of IAD.

Cil / applications

The aim of the measure is to increase the number of applicants for subsidies to 50 000 people.

Fulfillment indicator

The number of applicants for the subsidy in a given year.

Implementation and financing options

The City has included the grant program in its budget. An applicant qualifies for the grant if he/she has no outstanding overdue obligations to the City and has paid the municipal waste collection fee.

Timing

The grant program is also in the budget for 2024. It is an effort to maintain it for future years.

Effect on air quality

Focus: NO_x , PM_{2,5} , PM₁₀

By increasing the number of holders of the yearly public transport subscription ticket, the number of individual car transport trips is realistically reduced, which will result in lower emissions from car transport.

Risks

Preference for individual car transport even after the purchase of a "šalinkart". The provision of a subsidy does not guarantee the use of public transport.

Current status

The subsidy has been provided since 2017 and each year over 30,000 city residents benefit from this support. The subsidy is provided for the purchase of an electronic basic non-transferable annual subscription ticket for public transport, which must always include zones 100 and 101, or other related zones according to the valid tariff of the Brno City Transport Company, a.s., and can be applied for by anyone who is a fee payer for the municipal waste management system in the city of Brno. The condition for granting the subsidy is the payment of the fee for the municipal waste management system in the year of the application and in the year of the decision on the application, regardless of the due date, and no later than the time of the decision on the application.

Link to other instruments and measures

(Note: sub-measures of the measure A.2 Development of public transport are interlinked and are not listed below by name)

A.2.d Environmentally friendly public transport - promoting the introduction and use of alternatively powered vehicles

Description

Road transport is the dominant source of emissions for nitrogen oxides, carbon monoxide and hydrocarbons and a significant source of particulate emissions. In addition to technical condition, fuel type is an important factor influencing emissions from motor vehicles. The purchase of new vehicles can be partly reduced by retrofitting the current fleet to alternative fuels. In this case, the most common fuels used are electric, hybrid, CNG and others, and possibly hydrogen in the future.

Cil / applications

By the end of 2035, all vehicle traffic related to city operations will be alternatively powered. The expected effect is to reduce emissions of virtually all pollutants. A significant contribution is the development of alternative drives versus commercial ones. A desirable side effect is a reduction in carbon monoxide emissions.

Fulfillment indicator

Ongoing reporting, prioritising the purchase of new alternative fuel vehicles over conventional combustion engine vehicles.

Implementation and financing options

Possibility of obtaining subsidies for alternative fuel vehicles.

Timing

Ongoing performance.

Effect on air quality

Focus: NO₂ , PM₁₀ , PM_{2,5} and partly BaP.

The measure is aimed at reducing emissions from car transport with standard internal combustion engines.

Risks

High acquisition costs.

The development of the necessary infrastructure will not be in line with the development of propulsion systems.

Current status

The Brno City Transport Company is continuously renewing its fleet. In 2014-2018, it purchased a total of 160 CNG buses and set up a CNG filling station in the Slatina depot. In 2018, a pilot project was carried out in which DPMB provided one bus for testing another alternative fuel - biomethane obtained from wastewater treatment. In spring 2022, an electric bus was lent to the Brno City Transport Company by the manufacturer for testing. The electric bus was tested on selected public transport lines. However, the current situation in the energy sector does not favour the development of electromobility by DPMB due to high prices.

Link to other instruments and measures

(Note: sub-measures of the measure A.2 Development of public transport are interlinked and are not listed below by name)

A.2.e Ensuring a high standard of public transport quality

Description

The increased decline of passengers and their shift to individual car transport must also be countered by increasing the attractiveness of public transport. It is necessary to ensure the comfort of travel for passengers as well as for service staff.

Cil / applications

In order to increase the attractiveness for travellers, it is necessary to ensure that the means of transport are of sufficient quality. When selecting a supplier of transport services, it is necessary to require, in particular, high vehicle reliability, low energy consumption and low maintenance requirements to enable a higher level of vehicle cleanliness to be achieved. At the same time, the audit of bus stops and their subsequent modifications can make the fleet sufficiently attractive to retain and attract new passengers who have not used public transport due to the unreliability and inconvenience of the current fleet.

Fulfillment indicator

Fleet renewal, increase in the number of passengers transported, reduction in the number of cars in the central part of Brno.

Implementation and financing options

Transport Infrastructure Funds, the budget of the City of Brno, the South Moravian Region and the state budget.

Timing

Ongoing performance.

Effect on air quality

Focus: NO₂ , PM₁₀ , PM_{2,5} and partly BaP.

The assumption that public transport will be used to the detriment of private car transport will lead to a reduction in emissions from car transport.

Risks

Decline in public transport use.

A reduction in the scope of public transport services due to a decline in its use would lead to a significant loss in its quality.

Current status

Currently, public transport in Brno is operated by Dopravní podnik města Brna, a.s. One of DPMB's policies is to provide services that will maintain customer interest in public transport. In order to ensure the quality of the services provided, DPMB regularly renews its fleet, carries out inspection and servicing of the technical condition of vehicles, incl. Their cleanliness.

Link to other instruments and measures

(Note: sub-measures of the measure A.2 Development of public transport are interlinked and are not listed below by name)

A.2.f Promotion of public transport as one of the possible alternatives to car transport

Description

From an air quality perspective, public transport is an acceptable alternative to private car transport. Measures for the development of public transport (construction of lines and interchanges, improvement of services, etc.) contribute in particular to retaining existing passengers and preventing their transfer to private car transport. However, not only retaining existing passengers but also attracting new ones is desirable. A well-targeted promotional campaign can also be used for this purpose.

Cil / applications

Appropriate promotion of public transport can attract new people to this mode of travel who have previously preferred to travel by car. The promotion campaign should be spatially targeted so that it is noticed not only by public transport passengers but also by other citizens. The campaign can focus, for example, on the comparison between public and private car transport in terms of environmental, economic or transport aspects, the quality of the service provided, or other areas that will have the desired effect of attracting new passengers.

Fulfillment indicator

Promotional campaigns implemented.

Implementation and financing options

Financing from the funds of the client and the public transport operator, possibility of obtaining subsidies.

Timing

Ongoing performance.

Effect on air quality

This is a support measure that does not lead to a direct reduction in the emission burden, but creates room for future reductions in emissions from passenger car transport.

Risks

The campaign will not have the desired effect and will not increase the number of people using public transport as an alternative to private car transport.

Promotional materials placed only in public transport vehicles run the risk of inappropriate placement from the point of view of the target group (people using private car transport).

Current status

The Brno City Transport Company regularly carries out campaigns aimed at raising awareness and promoting public transport. These campaigns are targeted at the transport company's vehicles and at bus stops.

Link to other instruments and measures

(Note: sub-measures of the measure A.2 *Development of public transport* are interlinked and are not listed below by name)

F.1 - Education and awareness

A.3 Implementation of the backbone network of capacity roads for car transport and other important transport structures

For the measure of implementation of the backbone network of capacity roads for car transport, 3 sub-measures have been defined, which are interrelated and have a common objective. The description of these sub-measures is therefore presented together.

A.3.a Complete completion of the Brno Grand Ring Road (VMO) and related roads

A.3.b Implementation of other significant transport constructions in the territory of the city of Brno

A.3.c Support for projects for the construction of high-capacity roads in the administration of superior territorial units, which lead to a reduction of the immission load from traffic in the territory of the city of Brno

Description

The superior communication system of the city consists of the Great Urban Ring Road (VMO) and a system of radial roads.

Although the VMO is a key transport construction on the territory of the agglomeration, its real effect will only become apparent with the simultaneous implementation of other constructions that either directly connect to the VMO or significantly affect the intensity and composition of the traffic flow on the VMO, although some of them lie outside the SMB territory. In particular, these are the constructions leading to the capacity increase of the D1 motorway in the vicinity of Brno (or the D1 sections Kývalka - Slatina, Slatina - Holubice), the southern tangent of Brno connecting D52 and D2 and the X/43 section between Troubsko (D1) and Kuřimí.

The aim of the complete completion of the VMO, selected connecting roads and other capacity roads in the vicinity of the city is to reduce the negative effects of traffic on air quality in the city centre and populated areas. The aim is, among other things, to contribute to the reduction of transit traffic in the city centre. Some of the other major transport constructions planned in Brno also contribute to this objective.

Cil / applications

The following sections of the VMO are key in terms of their impact on air quality:

- Section Žabovřesky I (Stage II)

The Žabovřesky I. section of the VMO is located in the north-western sector of the VMO and is defined by the Kníničská MÚK and the bridge at ul. Veslařská. It is a critical place both from the traffic point of view and from the point of view of the immission load of the immediate surroundings, because congestion occurs here every day (accumulation of traffic flows from the Bystrc, Komín, Jundrov districts). The implementation of the second stage will remove the bottleneck between two already built sections - the construction of the Hlinky and Žabovřeská 2 MÚK, where the route is limited by the Svratka River and the steep rocky slope of the Wilson Forest. The commissioning of this part of the ring road will improve the immission situation both in the given place (by reducing emissions and resuspension from passing vehicles) and will improve the passability of the north-western part of the VMO, which will consequently relieve traffic in the centre of Brno itself. These effects should then also be reflected at the AIM Brno - Úvoz station.

- Sections of Tomkovo Square and Rokytova

They are situated in the northern part of the VMO, they are short sections connected to each other. After the construction of both structures, Svatoplukova Street and the Provazníková-Karlova intersection will be significantly relieved of traffic heading to/from the Vinohrady and Líšeň housing estates. In addition to increased traffic flow, the construction of noise barriers will also contribute to the reduction of the immission load here.

- VMO Vinohrady

This is the section connecting the VMO from the Rokytova MÚK to the Líšeňská MÚK and further via Jedovnicka Street with the Ostrava radiálá. This construction will significantly relieve the traffic exposed parts of Židenice, Vinohrady and Líšeň, which are currently used by traffic heading to D1 or I/43 (direction Svitavy). In addition to the above, the traffic intensity on the currently congested Svatoplukova and Bubeníčková streets will be reduced. A significant positive aspect of this construction in terms of its impact on air quality will be its tunneling under the Vinohrady housing estate in the direction from the Rokytova MÚK to the Líšeňská MÚK.

- MÚK Ostravská radiála and Bratislavská radiála

These interconnecting constructions will provide a link between the radial road to Olomouc and the D1 motorway towards Bratislava. In the case of the Ostrava radial, the Zvonařka and Olomoucká streets will be relieved in particular. The Bratislavská radial will then conveniently divert traffic from the built-up areas of the Černovice and Komárov districts, especially from the vicinity of the busy intersection of Černovická, Hněvkovského and Svatopetrská streets (it lies in the middle of the built-up area and the average daily traffic intensity towards D2 exceeds 32,000 vehicles).

- Section Brno - south (Bratislavská radiála - Heršpická)

It will divert traffic running along Heršpická, Opuštěná, Zvonařka, Hladíkova, Olomoucká streets, i.e. through the urbanised area of the city. The existing route is used by all modes of transport (individual passenger and freight, public transport) and is therefore one of the most exposed places in Brno. The construction of this part, which is connected to the Ostravská and Bratislavská radials, will divert a significant part of the traffic from the urban districts of Černovice, Komárov and Trnitá.

- Section Pražská radiála - Heršpická

In this part, the southern and western parts of the VMO are connected (from Heršpická Street towards Žabovřeská Street). In addition to the modifications of the parameters (increasing the flow and safety of traffic) of the existing route in Bauerova Street (it runs along BVV and the Riviera recreational area), the congested intersections of Poříčí x Vídeňská x Křížová and Poříčí x Heršpická Streets, which are located in the built-up area of the Brno - střed district, will be relieved. In addition, part of the route between Bauerová and Heršpická streets will pass through the Červený Kopec tunnel under the Štýřice and Bohunice districts.

Furthermore, the capability of the D1 motorway in the approximately 30 km section from Kývalka to Holubice was identified as key. The entire width of the construction will be widened by one lane to a six-lane layout. The road surface will be reconstructed (noise-reducing surface) and noise barriers will be built in places where the widened road will pass through residential areas (e.g. Popůvky, Starý Lískovec, Bohunice, Slatina, etc.). The D1 reinforcement consists of a total of seven structures:

- MÚK Kývalka - MÚK Brno-západ
- MÚK Brno-west - MÚK-Brno-centrum
- Brno-centrum - Brno-jih
- MÚK Brno-jih
- Brno-South - Brno-East
- MÚK Černovická terasa (construction consists of 1st and 2nd stage)
- Brno East - Holubice

Other high-capacity roads whose implementation will affect the air quality in Brno include:

- D52 Brno, South Tangent, including the D2 capacity increase

The construction will connect the D52 motorway with the D1 motorway, using the D2 motorway, thus increasing the capacity and connecting the TEN-T network. The diversion of transit traffic from D52 to D2 will alleviate Vídeňská Street, which currently has a mix of transit, destination and local car traffic, together with mass transit and pedestrian and cycling traffic. The increase in the traffic load on the D2 motorway will be compensated by transferring part of the traffic to the new parallel collectors (road

I/42), which will ensure the connection of local links without the need to use the D2 motorway (Brno city - commercial zones along the D2 motorway - Chrlice).

- X43 Troubsko - Kuřim

The road will divert transit traffic from eastern Bohemia to D1, which will reduce traffic intensity on the VMO and in the centre of Brno. According to the Update No. 1 of the ZÚR JMK, the construction will follow the so-called Bystrka track, while the selection of a specific technical solution will be subject to further steps of spatial planning and environmental impact assessment. The preferred option will be the one with the lowest impact on air quality in the residential area.

In addition to the above-mentioned constructions of VMO and other capacity roads in the territory of Brno and its surroundings, it can be assumed that air quality may also be favourably affected locally by some other transport constructions. An example of this is the construction of Bystrc, Kamenolom MÚK (crossing of roads in Kníničská and Bystrcká streets and the tram line to Bystrc), which is aimed at increasing traffic flow. By improving traffic flow, the frequency of congestion, which is a source of increased emissions, is reduced. A new planned local road is also a bridge over the Svitava River, which could be built between two newly emerging neighbourhoods - Nová Zbrojovka and Nová Mosilana. Its implementation would relieve traffic on the existing bridges and thus reduce the risk of congestion in these areas.

Fulfillment indicator

Number of km of newly built and opened road sections.

Implementation and financing options

The investor of most of the constructions is the Regional Directorate of Transport together with the City of Brno, which financially participates in the service roads, sidewalks, planting of greenery, etc. The City of Brno cooperates with the Regional Directorate of Public Works in the preparation of the construction, especially with regard to property settlement, securing the necessary opinions and permits, etc.

Timing

The following timetable is assumed for the completion of the VMO:

- section Žabovřesky I (stage II): implementation 2020-2024, commissioning 2024
- Tomkovo náměstí and Rokytova sections: implementation 2020-2024, commissioning 2024
- VMO Vinohrady: implementation 2030-2035, commissioning 2035
- MÚK Ostravská radiála: implementation 2025-2030, commissioning 2030
- MÚK Bratislavská radiála: implementation 2030-2035, commissioning 2035
- Brno - South section: implementation 2030-2035, commissioning 2035
- section Pražská radiála - Heršpická: implementation 2030-2035, commissioning 2035

For the construction of the D52 Brno, South Tangent, including the D2 capacity increase, the project is expected to be completed by 2030-2035.

For the D1 motorway capacity expansion project, it is assumed that it will be implemented in stages according to the individual project structures. The current schedule of ŘSD for the D1 motorway widening in the section Kývalka - Holubce (as of 05/2023):

- construction of the MÚK Kývalka - Brno západ - start of construction 2026
- construction of MÚK Brno západ - MÚK Brno centrum - start of construction 2026
- construction of Brno centre - Brno south motorway - start of construction 08/2023
- construction of the Brno South Interchange - start of construction 2024
- construction of the Brno East Interchange - Holubice Interchange - start of construction 2027
- construction of connection of BPZ Černovická terasa to D1 - start of construction 2024

The construction of the project Bystrc, MÚK Kamenolom affects roads of various categories and owners (class II roads, local roads, tram and trolleybus tracks, etc.). The exact date of implementation will therefore depend on the financial possibilities of all the entities concerned and the coordination of the construction works. The new bridge over the Svítava River is still in the project preparation phase, the implementation date is not set and will depend on the overall planned development of the site.

Effect on air quality

Focus: suspended PM of all fractions, NO_x.

A reduction in the volume of car traffic in the central parts of the city can be expected and thus an increase in traffic flow, which will reduce the impact of road traffic on the concentrations of PM of all fractions and NO_x.

Risks

The construction of new roads increases the immission load along the new roads. Secondly, there may also be an increase in the immission load along existing roads that will serve as feeder roads to the higher capacity road network. Therefore, when designing and preparing the documents for the permitting of new roads, it is necessary to implement as far as possible technical or compensatory measures to ensure that there is no excess deterioration of the immission situation in the residential development.

Current status

The current status of the VMO implementation is shown in the figure below. City ring road structures that have already been put into full operation are marked in blue. Circuit sites ready for implementation or under implementation are marked in orange.

Obr. 25: Current status of the VMO



Among the other above mentioned constructions outside the VMO sections, the D1 motorway extension in the section MÚK Brno centrum - MÚK Brno jih is currently under construction. The other D1 capacity expansion constructions are gradually being prepared. For the construction of D52 Brno, South Tangent, a survey procedure was conducted according to Act No. 100/2001 Coll., on environmental impact assessment, and a binding consent opinion was issued.

Link to other instruments and measures

(Note: sub-measures of the measure *A.3 Implementation of the backbone network of capacity roads for car transport* are interlinked and are not listed below by name)

A.1 - Traffic at rest

A.2 - Development of public transport

E.2 - Spatial planning and territorial management, building permits

A.4 Troubleshoot spot problems on communication networks

Description

The extent to which PM concentrations are affected by road traffic depends mainly on the flow of traffic. If traffic flow is reduced by traffic lights, traffic jams or other obstructions, PM concentrations increase due to abrasion of brake linings, clutch linings, tyres and road abrasion. Also, idling and starting unnecessarily increases NO_x and suspended PM emissions from vehicle exhausts. If traffic is flowing, suspended PM concentrations can be close to urban background levels, as demonstrated by the results of measurements at the Brno-Výstaviště immission monitoring station.

Cil / applications

The aim of this measure is primarily to improve the coordination of construction works that interfere with the communication network and reduce the flow of traffic. The timing of these works (so that diversion routes can be made available) must be emphasised already in the permitting process. This measure will help to improve the flow of traffic in the city centre.

Fulfillment indicator

Operation and regular updating of the Central Closure Register, operation of the Traffic Information System, coordination of construction works, number of implemented projects leading to increased traffic flow.

Implementation and financing options

Statutory City of Brno - OD, OI, Region, ŘSD.

Improved traffic flow can be achieved e.g. by improving the coordination of construction and excavation works affecting the communication network and by appropriate selection of detour routes, which does not require any explicit costs for the implementation of this measure.

Timing

Ongoing performance.

Effect on air quality

Focus: suspended PM of all fractions, NO_x.

Increasing traffic flow can be expected to reduce the impact of road traffic on concentrations of PM of all fractions and NO_x.

Risks

Non-implementation of the measures due to organizational and financial complexity on the part of the investor and the construction contractor.

Current status

The Brno City Council regularly collects and supplements the requirements of all investors who wish to carry out excavation work in public spaces in the current year and in the following four years. These requirements are listed in the excavation coordination application (BKOM). They are continuously analysed, providing information to each other, especially to the network administrators, in order to ensure not only the coordination of project documentation, but also the implementation itself. Every six months MMB issues a coordination schedule which is available on the official board. Despite efforts to coordinate excavation works, there are clashes or concurrent closures on diversion routes. Therefore, the construction coordination system needs to be continuously improved.

Link to other instruments and measures

A.3 - Implementation of the backbone network of capacity roads for car transport and other important transport structures

A.6 - Cleaning and maintenance of ZACOS

D.2 - Dust control from construction activities

E.2 - Spatial planning and territorial management, building permits

E.4 - Statements in zoning, construction and building permit proceedings and in environmental impact assessments from the point of view of air protection

A.5 Promotion of cycling

Description

The increase in motor traffic in recent years has brought with it congestion on the existing road network and the associated environmental degradation. The bicycle could be one solution, but optimal conditions need to be created. Therefore, to be competitive even when choosing a means of transport over longer distances, it is essential to integrate it into an integrated transport system.

Cil / applications

The basic pillar of the promotion of cycling should be the construction of a network of comprehensive routes providing relatively fast and, above all, safe connections to important destinations, not only recreational ones. However, in addition to the implementation of cycle routes and cycle paths, the development of cycling transport must also include the implementation of related elements (cycle stands, etc.). Prospectively, when revitalising streets, consideration is also given to off-street routing of the cycle path network, taking into account the budgetary and spatial possibilities of individual sections, so as to achieve greater perceived safety of cycling, which is one of the factors motivating its use.

In addition to the technical provision of cycling transport in the city (cycle paths, cycle stands, etc.), it is also important to motivate citizens to use this mode of transport. To this end, several campaigns are underway, the best known of which are the nationwide "Bike to Work" challenges. Bike-sharing schemes are another possible way of motivating citizens to use cycling. There is also potential for linking cycling and public transport, e.g. by building the necessary infrastructure and providing bikesharing services at bus stops and interchanges. The promotion of cycling appears across many strategic documents of the City of Brno, therefore the promotion of the use of bikesharing systems should also be given sufficient emphasis.

Fulfillment indicator

Number of km of newly built cycle paths, cycle lanes or dedicated cycle lanes. Number of new bicycle racks. Number of users of bikesharing services.

Implementation and financing options

The construction of cycle paths and other related elements are implemented from the city budget or with the help of EU subsidies.

Timing

Ongoing performance.

Effect on air quality

Focus: NO_x

Reducing vehicle emissions by using an alternative mode of transport, in this case the bicycle.

Risks

Non-implementation of measures or implementation of only part of the cycle paths ending on the most congested roads of the city.

Preference for car transport at the expense of alternative modes of transport, in this case cycling.

Current status

MMB continuously builds new cycle paths and cycle lanes in the city and supports further development of cycling transport. In the past years, bike racks have been installed at public buildings (offices, schools, etc.) and the city plans to continue these activities.

The Brno City Council is regularly involved in awareness-raising and motivational events for the promotion and development of cycling. It issues safety recommendations for cycling traffic (e.g. in the

form of information leaflets). In the past years, the Brno City Council has also been involved in the "Do Work on a Bike" challenges, not only through the participation of its employees, but also through other support (in 2022, MMB was the general partner of the Do Work on a Bike Brno 2022 event).

The city of Brno also shows a positive attitude towards bikesharing. This is also evident in the Memorandum of Understanding on the development of cycling (especially in the area of bike-sharing systems). This is a document by which the City of Brno and the providers of shared services have committed themselves to cooperation and the creation of suitable conditions for the operation of a shared mobility system in the City of Brno.

Link to other instruments and measures

A.2 - Development of public transport

E.2 - Spatial planning and territorial management, building permits

F.1 - Education and awareness

A.6 Cleaning and maintenance of ZACOS and other roads

Description

By ensuring optimal road cleaning, we can achieve a reduction in PM₁₀ and PM_{2,5} particles from the air. If road cleaning is not implemented, it leads to constant swirling and possibly reduction of dust particles, which can then be more risky for the human body. The City of Brno has been implementing this activity since 2013 and is constantly striving for better implementation.

Cil / applications

Reduce concentrations of suspended PM₁₀ in the air by reducing dust on roads by maintaining an effective extent and frequency of road cleaning. Excessive road cleaning for large developments will focus on reducing dust and improving air quality in areas burdened by poor air quality, high traffic volumes and population concentrations. Coordination of roadway and sidewalk cleaning is recommended for roadway cleaning. It is always necessary to choose the appropriate cleaning agent for cleaning, taking into account its cleaning efficiency and possible negative side effects on air quality (e.g. possible airborne dust from blowers, etc.). When choosing the cleaning method and cleaning agent, the type of road surface (asphalt, concrete, pavement, etc.) should also be taken into account. Particularly in the case of road cleaning by external contractors, appropriate procedures should be provided to minimise dust generation (e.g. by combining wet cleaning with a dust collector). In general, leaf and dust extractors may be preferred to blowers.

Fulfillment indicator

Depending on the possibilities - e.g. tons of rubbish or number of km of effectively cleaned roads.

Implementation and financing options

Appropriated funds from the City budget for regular maintenance of roads in the WACOS area.

Timing

Ongoing performance.

Effect on air quality

Focus: PM₁₀ , PM_{2,5}

Reducing the amount of dust particles that stick to the road surface. Passing large numbers of vehicles causes particles to swirl back into the air (secondary dust), but also to become smaller, increasing their danger to human health.

Risks

Financial demands in times of reduced budgets of the City of Brno

Current status

Maintenance of roads is obligatory by law twice a year. Spring cleaning (cleaning of gritting material after winter) and autumn cleaning (cleaning of fallen leaves). These are carried out by BKOM on approximately 700 km of streets and roads (ZÁKOS and traffic marked roads of 1st and 2nd class, roads owned by the Regional Directorate of Transport (motorway on- and off-ramps and feeder roads such as Ostravská Street), SÚS JMK (e.g. Kníničská Street).

The municipality carries out cleaning according to the set days of block cleaning (each municipality according to its discretion and possibilities) on all roads in its territorial district. BKOM, on the basis of an order from the MMB OD, carries out in the period April-October (in terms of the Road Act) overlimit cleaning of selected roads at least 4 times a year and flushing of roads with sprinkler trucks on 13 circuits 23 times a year.

Link to other instruments and measures

A.3 - Implementation of the backbone network of capacity roads for car transport and other important transport structures

A.7 Reduction of emissions from the operation of MMB vehicles and SMB organisations

Description

The City of Brno operates a fleet of vehicles necessary for its operation. The City of Brno also includes countless organisations with smaller or larger fleets of vehicles, whether cars or trucks.

Cil / applications

When buying new vehicles, give preference to alternative fuel vehicles (electric and hydrogen).

Fulfillment indicator

The key indicator is the number of alternatively powered vehicles.

Implementation and financing options

Sources from the city budget or grant programs from the State Environment Fund.

Timing

Continuous and ongoing performance required.

Effect on air quality

Focus: NO₂

The vehicles of the MMB and its organisations are overwhelmingly operated mainly on the territory of the city, thus contributing to the immission load. Although the reduction of emissions from the MMB vehicle fleet will probably not have a significant positive effect on air quality, given their low share in total motor traffic, the Statutory City of Brno should set an example to the public.

Risks

Financial demands in times of reduced budgets of the City of Brno.

Current status

Fleet renewal is carried out continuously according to the current state of the vehicles. Municipal organisations already use alternative fuel vehicles to a large extent. For example, the Brno City Transport Company operates 160 CNG buses, and SAKO also operates several CNG vehicles. The Cemetery Administration, the Public Greenery and the Brno Zoo already operate several electric cars for their activities. The first electric collection vehicle is also operated by SAKO.

Link to other instruments and measures

E.5 - Air protection in public procurement

F.2 - Voluntary agreements with resource operators, demonstration projects

B Measures for the heating and energy sector

B.1 Territorial energy concept

Description

A municipality has the right to establish a territorial energy concept (TEC) for its territorial district or part thereof in accordance with the state energy concept and may issue binding legislation for its implementation. One of the basic objectives is to contribute to achieving a reduction in local PM emissions through a comprehensive solution of the city's energy supply with heat_{2,5}. At present, in addition to the requirements for heat supply, requirements for cold supply are also beginning to emerge, and this trend will increase in the future. In the production of cold by absorption, the source of heat is then essential from an air protection point of view, so as to avoid the excessive creation of new combustion sources.

Cil / applications

When preparing the EIA, it is necessary to ensure a link with the Action Plan and other programme documents related to air protection and the environment. All these documents must be prepared in such a way that they can be regularly updated.

Consequently, the ÚEK will create the conditions for the economic management of energy in accordance with the needs of economic and social development, including environmental protection and careful management of natural energy resources. The preparation of the EIA will enable the optimisation of the energy strategy in the municipality.

It is advisable to prepare the UEK in the area of interest, especially with a focus on the possible connection of existing decentralised block boiler houses for the purpose of construction and building of a central heat supply system. It is advisable to assess the gasification in individual parts of the city, the possibility of using renewable energy sources and the replacement of the current unsuitable local heating stations with automatically controlled boilers.

Fulfillment indicator

Preparation and approval of the update of the SMB UEK for the next period in view of new facts in heat and fuel supply.

Implementation and financing options

The major energy suppliers in the city of Brno will finance the evaluation of the existing UEK and its update to the changed fuel market conditions.

Timing

The SMB EIA was updated during 2023. The next update will be linked to the results. Report on the implementation of the SMB UEK, which must be prepared no later than 5 years after the adoption of the spatial energy concept.

Effect on air quality

This is a support measure that does not lead to a direct reduction of the emission burden, but creates a framework for reducing emissions from heating and electricity generation.

Risks

Development of the concept on the basis of erroneous documents.

Inconsistency with relevant concept and programme documents.

Current status

The Spatial Energy Concept of the Statutory City of Brno was approved in September 2018. The evaluation of the functioning and impacts of the Spatial Energy Concept of the Statutory City of Brno in the years 2018 to 2023 was prepared in the form of the Report on the implementation of the SMB

UEC during 2023, which was followed by the start of work on the update of the Spatial Energy Concept for the next five-year cycle. The updated SMB UEC was submitted to the Energy Commission of the Brno City Council for approval.

Link to other instruments and measures

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

B.3 - Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned

B.4 - Reducing energy consumption of buildings managed or owned by MMB, SMB and its organisations, development of energy management systems

B.5 - Reconstruction and modernisation of heat energy supply systems, their expansion

E.2 - Spatial planning and territorial management, building permits

B.2 Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

Description

The operation of combustion heat sources, particularly solid fuel sources used for domestic heating, is a very significant source of PM₁₀ and PM_{2,5}. The problem is often not the emission parameters of the combustion heat source itself, but rather the incorrect operation of the source, the use of incorrect fuels, etc. There is therefore scope for awareness-raising activities by the air protection authority.

Subsequently, it is necessary to inform the citizens of the town about the upcoming ban on the use of solid fuel boilers of emission class 1 and 2, of which at least several dozen are still in operation.

Cil / applications

The aim of this measure is primarily to inform citizens through all available electronic information channels and an awareness campaign to provide them with instructions on how to properly operate a combustion source, what to look out for and to draw attention to the legislative conditions for burning solid fuels. The measure also includes inviting experts in the field.

Support for the conversion of old non-compliant solid fuel boilers will be implemented in the form of an information campaign and lectures for the public and housing association presidents.

Fulfillment indicator

The measure is of a fulfilled/not fulfilled nature.

Implementation and financing options

The creation of information materials and the information campaign will be covered by the city budget (OŽP MMB). Existing information channels can be used.

Timing

Ongoing performance. Information and awareness-raising activities on this topic must be carried out continuously until at least the end of 2025.

Effect on air quality

This is an awareness-raising measure - no direct effect on air quality is envisaged. However, this measure is essential for public awareness.

Risks

Fuel market situation.

Increasing costs for the acquisition of new green sources and the associated prolongation of the operation of older less environmentally friendly facilities.

Current status

A large number of solid fuel combustion sources are operated in Brno. Some of these sources, which meet only emission class 1 or 2, will have to be decommissioned from September 2024.

Improper operation of the combustion source is also proving to be a significant problem. The aim of this measure is to provide citizens with guidance on how to operate a combustion source correctly, what to look out for and to draw attention to the legislative conditions for burning solid fuels.

Link to other instruments and measures

B.1 - Territorial energy concept

B.3 - Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned

E.1 - Effective control of compliance with the requirements imposed on operators of stationary sources by the Air Protection Act

B.3 Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned

Description

The measure is based on the measure set out in PZKO 2020+ for the Brno agglomeration. The aim of the measure is to increase the awareness of operators of stationary combustion sources, mainly solid fuel combustion sources, about the contribution of these sources to the overall level of air pollution and the factors that contribute to increased pollution. At the same time, the aim is to motivate operators to use only quality fuels for heating in accordance with the manufacturer's instructions.

Cil / applications

The SMB (independently or in cooperation with the region or surrounding municipalities) will, in addition to the activities implemented at a higher territorial level, conduct awareness campaigns to increase the awareness of the public or operators, e.g. through seminars, contact campaigns, press and other promotional materials related to the combustion of quality fuel. The involvement of locally competent persons qualified to check the technical condition and operation of stationary combustion sources, chimney sweeps or heating engineers can be an important factor in the success of the campaign. Information campaigns must emphasise the positive impacts of correct operation of the source, not only in terms of environmental and health impacts, but also in terms of economic benefits for the individual operator.

A properly operated source may have higher real efficiency (using dry vs. wet wood), may have lower maintenance requirements for the source and flue (fouling of flue for wet wood or imperfectly burned coal), lower fire risk (higher for clogged flue, unnecessarily high flue gas temperature), higher lifetime of the source and its accessories (lifetime decreases with waste combustion, when operating without a prescribed accumulation vessel, etc.). The public can also be informed, for example by chimney sweeps, who already carry out regular checks of flue gas ducts in households in accordance with Act No 133/1985 Coll, on fire protection, as amended.

In order to improve the quality of the wood used (or fuel in general), SMB will cooperate, if possible, with professionally qualified persons carrying out inspections of the technical condition and operation of combustion sources (pursuant to Section 17(1)(h) of the Air Protection Act) or with chimney sweeps carrying out chimney cleaning in the territory of SMB (e.g. as part of mass cleaning). Professionally qualified persons and chimney sweeps should, in cooperation with the SMB, inform the population about the correct storage of wood and the need to burn only wet wood, which will not only increase combustion efficiency and reduce heating costs, but also reduce the amount of pollutants emitted into the air, including carcinogenic benzo(a)pyrene, to which operators of boilers burning wet wood are excessively exposed.

Fulfillment indicator

Number of awareness campaigns carried out or supported.

Implementation and financing options

The information materials already published by the city can be used for awareness campaigns. For the creation of new promotional materials, funds from the city budget, city districts, or subsidy programmes can be used.

Timing

Ongoing performance.

Effect on air quality

Focus: especially PM₁₀ , PM_{2,5} , BaP

The measure is indirect. Awareness-raising campaigns to increase operators' awareness of the impact of solid fuel combustion on air quality do not have a direct impact on air quality, but may lead to a positive change in the behaviour of solid fuel operators.

Risks

Awareness campaigns carried out to raise the awareness of operators about the effects of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned will not have the desired effect. Even with regular and intensive awareness-raising activities, the behaviour of operators of combustion sources will not change.

Inappropriate targeting of the awareness campaign.

Current status

The impact of solid fuel combustion on air quality, the importance of proper maintenance and servicing of sources, and the choice of fuel to be burned are among the topics that the City has already addressed in its current state through awareness campaigns organized by the City or other organizations.

Link to other instruments and measures

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

F.1 - Education and awareness

F.3 - Updating the website

B.4 Reducing energy consumption of buildings managed or owned by MMB, SMB and its organisations, development of energy management systems

Description

Reducing the energy performance of buildings is a hot topic at the moment, especially in times of rising energy prices. Reducing the energy performance of buildings is twofold. Firstly, it is the economical use of energy and the prevention of unnecessary heat leakage from heated buildings through uninsulated facades. Indirectly, the beneficial effect of reducing consumption is to reduce the amount of fuel burned for heating or electricity generation.

In 2015, the City of Brno started to implement an energy management system (EnMS) within the buildings of the MMB and its contributory organizations and gradually connected the buildings of the city districts and their contributory organizations. The purpose of energy management is to create systems and processes necessary for reducing energy consumption, improving energy efficiency, energy use and consumption. The implementation of this standard is intended to lead to the reduction of greenhouse gas emissions and other related environmental impacts and the reduction of energy costs through systematic energy management.

Cil / applications

The aim of the measure is mainly to reduce heat losses during distribution and thus optimise the amount of heat produced. Reducing the energy consumption of buildings can be done in various ways - e.g. insulation of buildings, replacement or repair of leaking windows, revision of heating systems (identification of possible leaks in heating distribution systems, streamlining of heat production and distribution, revision of heat sources - installation of equipment with higher efficiency). It is recommended to implement energy efficiency reduction measures also in organisations and buildings where, for various reasons, an energy management system is not in place and is not being considered for the future. It is also necessary to reduce the energy consumption of buildings in municipal flats owned by SMB (municipal districts).

Fulfillment indicator

Number of buildings with Energy Management in place. Number of projects implemented with the main or secondary objective of reducing the energy performance of buildings.

Implementation and financing options

Possibility of financing from the budget of the City of Brno, municipal districts and finances of SMB organisations. Possibility of using subsidy projects.

Timing

Ongoing performance.

Effect on air quality

Focus: NO_x , CO, PM₁₀ , PM_{2,5}

The measure is indirect. The implementation of the Energy Management does not have a direct impact on air quality. This is only expected to occur with the implementation of construction and energy modifications to individual buildings, which will lead to a reduction in energy consumption and thus a reduction in emissions from its production.

Risks

Implementation of projects to reduce the energy performance of buildings will be inadequate or inappropriately implemented. The project will not be properly targeted. If the project is not designed appropriately, reducing the consumption of one type of energy may lead to an unwanted increase in the consumption of another type of energy.

Current status

Energy management is currently in place in about 250 buildings. Measures to reduce the energy consumption of buildings managed by MMB and SMB organisations are implemented on an ongoing basis, taking into account the financing possibilities of these projects.

Link to other instruments and measures

B.1 - Territorial energy concept

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

B.5 - Reconstruction and modernisation of heat energy supply systems, their expansion

E.2 - Spatial planning and territorial management, building permits

B.5 Reconstruction and modernisation of heat energy supply systems, their expansion

Description

The city of Brno has a large network of thermal energy supply spread over almost the entire territory of the city. The main benefit of the measure is the complete replacement of steam distribution systems with hot water ones. Thanks to the conversion of the heat transfer medium, the final consumer will save on average 8-15 % of the consumed heat. The conversion of the heating medium has been underway since 2010 and is expected to be completed in 2027. At the same time, the network is planned to be extended (connecting the Bohunice and Starý Lískovec districts to the hot water network). It is also planned to bring heat from the Dukovany NPP by the end of 2031.

A partial task of the reconstruction and modernisation of heat energy supply systems is also the modernisation of block boiler houses, during which old boilers will be replaced with new, more emission-efficient ones.

Cil / applications

Reduction of heat losses during distribution and thus optimization of the produced amount of heat. Contribute to the reduction of emissions from heat production by reconstructing individual heat sources.

Fulfillment indicator

The measure of reconstruction and modernisation of CZT systems has the character of output fulfilled/not fulfilled. For other parts of the measure, the number of newly replaced boilers and newly connected households to the district heating network can be considered as a performance indicator.

Implementation and financing options

The project is implemented from the budget of Teplárny Brno, a.s.

Timing

According to the timetable, the "Steam x Hot Water" project will be completed by 2027 and the Dukovany NPP intake by 2031.

Effect on air quality

Focus: NO_x , PM₁₀ , PM_{2,5}

By maintaining the heat energy supply system in Brno and optimizing it, we will prevent the increase of emissions from local heating plants

Risks

High financial intensity of projects.

Current status

The gradual replacement of obsolete steam pipelines with hot water pipelines has been underway since 2010. Currently, preparatory design work is also underway for the Dukovany NPP intake and the Bohunice interconnection.

Link to other instruments and measures

B.1 - Territorial energy concept

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

E.2 - Spatial planning and territorial management, building permits

C Measures for public spaces, buildings and greenery

C.1 Establishment of new vegetation elements

Description

Establishment of new and revitalisation of existing areas of public green space including tree planting, hedgerows and perennial beds. The care of vegetation elements in new revitalisation of streets or parts of streets includes the provision of appropriate irrigation management, which is becoming an essential part of green space management due to climate change and rising average temperatures. When establishing new green areas and installing mobile vegetation elements, it is advisable to focus on locations with a high incidence of sensitive populations (e.g. schools, health facilities, etc.) and on locations with a higher immission load. In places where this is not possible due to the existence of utilities, apply trellises with climbing plants. Their planting can also be used to reinforce existing concrete walls. Replace regularly mown lawns with meadow grasses. The measures also include long-term monitoring of risk areas with sensitive populations and identification of options for managing the green space on the boundaries of these properties (planting of appropriate hedges, trees and mobile vegetation elements - e.g. suitably placed larger planters) to minimise the immission load on the clients of the facility.

Cil / applications

Use of areas in the city's intravilan for planting greenery. In the case of paved areas, mobile vegetation elements can be used. An alternative in case of insufficient unpaved areas is the possibility of planting green facades and roofs.

Fulfillment indicator

Annual increase in green area in m², number of newly implemented measures such as application of climbing plants, revitalized parks, planting of linear greenery, etc.

Implementation and financing options

The implementation is carried out by VZMB from its own budget, then by the OŽP MMB from its own budget within the New Parks for Brno project and by the city districts within the development and maintenance of green areas.

Timing

On an ongoing basis, every year.

Effect on air quality

Focus: PM_{2,5}, PM₁₀

The benefit is not only health (trapping dust particles in the ground level), but also psychological, flowering beds represent, especially for pedestrians, direct contact with nature and are very positively perceived and appreciated.

Risks

Impossibility of planting in public infrastructure protection zones.

Current status

There are a large number of unpaved areas in the city's intramural area that are not planted with greenery (often limited by the presence of utilities) but are suitable for planting other types of vegetation elements.

Link to other instruments and measures

C.2 - Ensuring adequate space for the root ball of trees

E.2 - Spatial planning and territorial management, building permits

C.2 Ensuring adequate space for the root ball of trees

Description

Where space permits, mature trees should be returned to the streets through the issuance of building permits. Trees must have sufficient rooting space not only for satisfactory growth but also for anchoring and providing stability on the site. However, on sites such as streets and squares it is difficult in most cases to create a plan-appropriate bed, so space for tree roots should also be provided beneath paved surfaces. This can be done using a system of rootable cells, which are made of a supporting structure (e.g. fibreglass) and the space in between is filled with a rootable substrate. In the street space, the construction of multi-channels should be promoted to serve to merge utility lines and thus provide sufficient space for the root system of trees. A prerequisite for providing sufficient ground space for tree root ball is, among other things, the provision of parking areas with engineering means that delineate space for parking, for foliage, and for pedestrians or other road users.

Cil / applications

Creation of conditions for the growth and existence of quality and promising trees within new planting or restoration of tree plantations and solitary trees in the built-up area of the city.

Fulfillment indicator

Number of trees planted in the root cell system, meters of multichannels built.

Implementation and financing options

The cost of the Silva Cell structural system for a single tree varies depending on the number of trees in the street and the amount of rooting space created. The actual enforcement of the measure is an administrative matter and does not require any costs. Enforcement of the multicells is a matter of the City negotiating with an appropriate manager and setting up the legal framework for their use.

Timing

On an ongoing basis, every year.

Effect on air quality

Focus: PM₁₀ , PM_{2,5}

Trees trap dust particles and have many other positive effects on the quality of life in the city.

Risks

Risk-free measures

Current status

Trees are planted in the built-up area of the town in a defined area of an unpaved bed (approx. 2x2 m), which is not sufficient for quality growth or for future stability in the habitat.

Link to other instruments and measures

C.1 - Establishment of new vegetation elements

E.2 - Spatial planning and territorial management, building permits

C.3 Motivational programmes of the Statutory City of Brno aimed at the development of greenery in the city

Description

The flat roofs of apartment and family houses and other buildings can be planted with suitable types of greenery after adequate construction modifications. In the same way, areas in the inner areas, whose surfaces are currently often covered with concrete or greenery in poor condition, can be used. The Statutory City of Brno responds to these opportunities with financial support for the development of green spaces - subsidy programmes called Green Roofs! and Vnitroblok! The subsidy programmes are targeted at interested individuals, legal entities and other organisations. More detailed information on the individual subsidy titles is published and regularly updated on the website www.ekodotace.brno.cz under the subsidies tab.

Cil / applications

Financial support for investors who decide to implement a green roof or a green area in an inner block and who also meet the conditions of the subsidy.

Fulfillment indicator

Number of projects supported/amount of green areas implemented.

Implementation and financing options

Support is provided from the budget of the City of Brno (funds are allocated for each calendar year).

As part of the subsidy programme Green Roofs! programme, an eligible applicant who meets the conditions of the subsidy call may receive a subsidy of CZK 700-1400 per 1 m² of planted area, depending on the type and nature of the green area.

Under the Vnitroblok! subsidy programme, an eligible applicant who meets the conditions of the subsidy call can receive a subsidy of CZK 250,000 per project.

The amount of subsidy support may change in the following years depending on the financial possibilities of the Statutory City of Brno.

Timing

Green Roofs Grant Programme! has been successfully running since 2019, and the Vnitroblok! subsidy programme has been running since 2018. The subsidy programmes are planned to continue in future years - ongoing implementation every calendar year.

Effect on air quality

Focus: PM₁₀ , PM_{2,5}

Trees trap dust particles and have many other positive effects on the quality of life in the city (mitigation of climate change, absorption of rainwater...).

Risks

For each calendar year, funds must be secured in the City budget for each grant program.

Current status

Green Roofs Grant Programme! grant programme has been running successfully since 2019 and the Vnitroblok! grant programme has been running since 2018, both of which have managed to support a large number of projects. A brief overview of the implementations is below:

The Green Roofs Programme!:

- 2019:

A total of 105 applications were submitted, all were approved and a total of CZK 17 953 000 was allocated in pledges

A total of 18 projects were completed, for which a total of CZK 2 187 000 was paid

Area of completed projects: 2 310 m²

- 2020:

A total of 99 applications were submitted, all were approved and a total of CZK 17 480 000 was allocated in pledges

A total of 72 projects were completed, for which a total of CZK 9 331 000 was paid out

Area of completed projects: 9 389 m²

- 2021:

A total of 73 applications were submitted, all were approved and a total of CZK 13 279 000 was allocated in pledges

A total of 73 projects were completed, for which a total of CZK 11 922 000 was paid out

Area of completed projects: 10 608 m²

- 2022:

Number of applications submitted: 76

Amount of funds allocated on the basis of these applications: CZK 16 149 000

Number of implemented projects: 76

Amount of funds disbursed for completed projects: 14 669 000 CZK

Area of completed projects: 12 939 m²

The Inner Blocks programme!:

- 2018:

Number of completed projects: 8

Number of disbursements for completed projects: 626 000 CZK

- 2019:

Number of completed projects: 8

Number of disbursements for completed projects: 954 000 CZK

- 2020:

Number of completed projects: 9

Number of disbursements for completed projects: CZK 1 877 308

- 2021:

Number of completed projects: 21

Number of disbursements for completed projects: CZK 3 722 050

- 2022:

Number of completed projects: 9

Number of disbursements for completed projects: CZK 1 877 308

Link to other instruments and measures

C.1 - Establishment of new vegetation elements

E.2 - Spatial planning and territorial management, building permits

D Measures for agriculture, horticulture and construction

D.1 Incineration of garden materials

Description

The proposed measure aims to strengthen the motivation for alternative use of garden waste (composting, chipping) and consequently reduce its burning. The measure also includes strengthening the control of compliance with the general binding decree regulating the burning of dry garden material. Field investigations aimed at educating gardeners will be carried out in cooperation with the municipal districts and the municipal police.

Users of gardens and allotments were offered the possibility of discounted purchase of composters from the city, or the provision of composters free of charge, or the special delivery of large-volume containers for compostable waste for a pre-agreed period of time. Education of residents on the treatment of garden waste will also be reinforced, offering alternative ways of disposing of the material with the aim of minimising the volume of material incinerated in favour of increasing the volume of composting.

Unless legislative obstacles prevent this, a ban on the burning of dry plant materials for disposal will be approved as part of an amendment to the general binding decree (expected in the second half of 2025). A condition for the approval of this amendment to the ordinance is that no later than on the date of entry into force of the ordinance, an alternative method of plant waste management (an efficient and sufficient system of collection points and collection vehicles, composting, etc.) is available in every part of Brno.

Cil / applications

Ideally (if legislative obstacles do not prevent it) to approve by mid-2025 a generally binding ordinance that would prohibit the burning of dry plant materials for the purpose of its disposal in the entire territory of the City of Brno.

Fulfillment indicator

Increase the amount of compostable waste removed from garden colonies as part of dedicated bulk container delivery events. Approval of an amendment to the General Order prohibiting the burning of dry plant material for the purpose of disposal.

Implementation and financing options

Funding of awareness campaigns from the city budget.

Timing

By the end of 2024, have an approved general ordinance.

Effect on air quality

Focus: PM₁₀ , benzo(a)pyrene

Improving air quality by reducing unnecessary burning of garden waste during periods of poor air quality. Reduction in complaints about air pollution.

Risks

General opposition to approval of the ordinance, risk of non-compliance.

Current status

Burning days are approved by the councils of each borough and issued by SMB ordinance. The setting of conditions is therefore within the competence of the municipality. The conditions for burning are different, the decree in 2017 succeeded in banning burning on Sundays and public holidays in the whole territory of Brno. There are many complaints about air pollution from burning garden material, so there is a need to strengthen education and control of compliance with the ordinance.

Link to other instruments and measures

F.1 - Education and awareness

D.2 Dust control from construction activities

Description

Construction sites currently represent the main group of area sources of dust, both in terms of their number and in terms of the resulting immission contributions. It should be noted that there is a well-known set of technically simple measures for the implementation of construction activities that can significantly reduce construction dust. Possible measures to reduce dust emissions from construction and similar activities include, for example, maximum isolation of the construction site from surrounding buildings, transport of construction debris in pipes, or an appropriate form of wetting of potential dust sources, washing of vehicles before leaving the site and covering dusty loads with tarpaulins during transport. A general problem is the non-compliance by some builders with dust control measures and the limited powers of the authorities to control and impose penalties for non-compliance.

Cil / applications

Ensure compliance with basic technical and organizational measures to limit dust from construction activities (sprinkling of dusty areas of the construction site, cleaning of roads around the buildings, cleaning of vehicles before leaving the construction site, etc.). Random inspections will be carried out on construction sites to ascertain compliance with the established dust control measures. The objective is that 100% of the structures comply with the established dust control measures. The baseline year is assumed to be 2020 (0%).

Dust control measures will be strongly required by the competent authorities.

Fulfillment indicator

In addition to the number of investigations (inspections) carried out, the results of the investigations and the deficiencies found will also be recorded.

Implementation and financing options

Measures to limit dust will be enforced within the framework of issuing binding opinions issued by the MMB Environmental Protection Office on the basis of the authorization under Section 11(3) of Act No. 201/2012 Coll., on Air Protection, as amended, if such an opinion is issued on the basis of the above mentioned authorization. The conditions for limiting dust will then be part of the building permit issued by the competent building authority. Checks on the implementation of the measures during construction will be carried out in cooperation between the locally competent building authorities and the air protection authority (OŽP MMB), while the imposition of possible penalties for breaches of the conditions of the building permit was within the competence of the building authorities on the basis of Act No 183/2006 Coll., on spatial planning and building regulations. The new Building Act (Act No. 283/2021 Coll.) continues to provide for a control mechanism in matters of building regulations, including conditions for the protection of public interests set out in the project permit. In locations where it is repeatedly found that bulk construction materials are suspected of being transported in violation of Section 52(2) and (6) of Act No. 361/2000 Coll., on Road Traffic, as amended, these findings (with regard to the protection of personal data) will be passed on to the Police of the Czech Republic for random checks of drivers of vehicles servicing the construction site.

The measure does not require the expenditure of financial resources - it is an administrative measure.

Timing

Ongoing performance. To achieve the desired objective, the activity must be implemented on a continuous basis.

Effect on air quality

Focus: suspended particulate matter PM₁₀ , PM_{2,5}

Risks

The adopted change to the legislative instrument (Air Act) will significantly limit the ability of cities and municipalities to permit, manage and control unlisted stationary sources.

In spite of the establishment of dust control measures and numerous checks on their compliance, these measures will not be regularly implemented on construction sites.

Current status

Since 2018, OŽP MMB, the Air Protection Department, in cooperation with the locally competent building authorities and independently, has been conducting investigations at major construction sites in Brno to verify compliance with basic technical and organisational measures to limit dust. In the case of suspected transport of loose construction materials in violation of Section 52(2) and (6) of Act No. 361/2000 Coll., on Road Traffic, as amended, cooperation with the Police of the Czech Republic proves particularly successful. In view of the increasing number of constructions, it is necessary to further develop this activity and to consistently enforce compliance with the measures.

Link to other instruments and measures

A.4 - Troubleshoot spot problems on communication networks

E.2 - Spatial planning and territorial management, building permits

E.4 - Statements in zoning, construction and building permit proceedings and in environmental impact assessments from the point of view of air protection

E.5 - Air protection in public procurement

F.1 - Education and awareness

F.2 - Voluntary agreements with resource operators, demonstration projects

E Administrative tools and measures

E.1 Effective control of compliance with the requirements imposed on operators of stationary sources by the Air Protection Act

Description

The measure is based on the measure set out in PZKO 2020+ for the Brno agglomeration. The aim of the measure is to ensure and control that operators of combustion sources comply with the requirements of the Air Protection Act, in particular with regard to the mandatory installation of accumulation tanks, regular technical inspections, the fuel to be burned and the installation and operation of boilers in accordance with the manufacturer's and supplier's instructions and Annex 11 of the Air Protection Act.

Cil / applications

Within the scope of exercising its delegated competence under the Air Protection Act, the Municipality of Brno will actively control the fulfilment of the obligation to carry out regular inspections of the technical condition and operation of solid fuel combustion sources pursuant to Section 17(1)(h) of the Air Protection Act. MMB has the possibility to require operators in its administrative district to submit proof of the inspection mentioned in the first sentence.

Fulfillment indicator

Number of checks carried out.

Implementation and financing options

The application of the tool itself falls within the normal agenda of the municipality and does not incur additional costs (personnel costs of existing employees).

The MoE and SMB will continue to continuously explore the possibilities of providing financial support in the form of subsidies or low- or no-interest loans from their financial resources (within their capabilities) and its extent over time to motivate the installation of storage tanks.

Timing

An inspection of the technical condition and operation of solid fuel combustion sources pursuant to Section 17(1)(h) must be carried out every 3 years. The inspection of sources installed before 2016 was carried out in 2019 (or in some cases in 2020), the next inspection was to take place by the end of 2022 (in some cases the inspections will still be carried out in 2023). Therefore, the SMB has verified compliance with this obligation until the end of 2023. Thereafter, given the three-year cycle of inspections of the technical condition and operation of solid fuel combustion sources, this activity will continue smoothly. The inspection of the combustion source pursuant to Section 17(2) or Section 17(1)(e) of the Air Protection Act will be carried out as necessary in the light of the facts found.

The ban on the operation of stationary combustion sources classified below Class 3, or boilers not classified, is effective from 1 September 2024, so all activities aimed at promoting its implementation should be directed no later than this date, but it is necessary to actively support the replacement of all non-compliant sources as soon as possible.

Effect on air quality

Focus: mainly suspended particulate matter PM_{2,5} and benzo(a)pyrene.

Risks

The application of the tool may impose an economic burden on households.

Limited ability of the Authority to enforce compliance.

Current status

The MMB has already fulfilled the requirement of the 2020+ PPA for the Brno agglomeration (the MoE and SMB will examine the possibilities of providing financial support in the form of subsidies or low-interest or interest-free loans from their financial resources (within their capabilities) and its extent in time to motivate the installation of storage tanks, within 6 months of the issuance of the PPA) and informed the MoE of the conclusion of the investigation. MMB and SMB will continue these activities on an ongoing basis.

Link to other instruments and measures

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

B.3 - Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned

E.2 Spatial planning and territorial management, building permits

Description

Within the framework of spatial planning, the municipality has the possibility to influence the location of new buildings and facilities as additional stationary or linear sources of air pollution. It is possible to determine or influence the location of structures/facilities that are not sources according to Act No. 201/2012 Coll. and are not subject to permits from air protection authorities.

Spatial planning systematically and comprehensively addresses the functional use of the territory, establishes the principles of its organisation and coordinates construction and other activities affecting the development of the territory in terms of time and content. It creates the preconditions for ensuring the permanent harmony of all natural, civilisational and cultural values in the territory, especially with regard to the care of the environment and the protection of its main components - soil, water and air. Spatial decision-making concerns the siting of buildings, changes in the use of the territory and the protection of important interests in the territory.

One of the basic tasks of spatial planning is to organize the territory in such a way that its traffic service does not have an unnecessarily large negative impact on the environment. It is already possible to create space for public green spaces, which have a favourable effect on air quality, in the course of land-use planning. When designing technical infrastructure and buildings, the possibility of future requirements for planting vegetation should generally be taken into account. The spatial plan shall be prepared for the entire territory of the municipality (town).

Zoning is a partial remedy to affect air quality in the city. The measure does not have a one-time and quick effect. If properly implemented, a significant beneficial long-term effect can be expected.

Cil / applications

The zoning plan establishes the urban concept, addresses permissible, impermissible, or conditional functional use of areas, their arrangement, determines the basic regulation of the territory and defines the boundaries of the buildable area of the municipality. In order to ensure compliance with the immission limits, it is necessary to give preference to the location of air pollution sources so that the immission situation is not worsened. These measures are recommended to be applied in areas (especially in housing and amenity zones) identified by the Czech National Institute of Health and Environmental Protection as places where the immission limit is being exceeded or where the immission limit is being closely exceeded. In addition, in residential zones, only those operations may be permitted which will not be disturbing to these zones, in particular, will not worsen the immission situation in the place or will not be a nuisance by smell.

According to Act No. 201/2012 Coll., equipment and facilities that are not categorised as listed sources of air pollution may be placed in areas with a threatened fulfilment of the immission limit and in zones for housing (individual and collective), civic amenities, in areas protected in terms of nature and landscape, greenery, parks, cycle and pedestrian paths and pedestrian zones only on the basis of an assessment of the impact of the equipment on air quality in the area in question. For the assessment, the MMB may request the operator to submit an expert opinion from a company with references in the field of air protection or hygiene. The assessment should evaluate in particular the possibility of the immission limit being exceeded by the operation of the installation or by activities directly related to the operation of the installation (in particular the effect of increased traffic intensity). In residential zones, it is appropriate to define some specific requirements for the operation of mobile sources and transport structures (e.g. the requirement for vehicle parking so that the exhaust system is directed into the road rather than towards the residential development, the definition of space for insulating greenery, the preservation of existing greenery along roads as far as possible, etc.).

In connection with the spatial planning, it is necessary to ensure compliance with the approved conceptual plans of the municipality.

In the case of a construction or measure to be carried out in the territorial area of two or more building authorities, the nearest jointly superior administrative authority shall carry out the procedure and issue the decision. That authority may provide for the proceedings to be conducted and the decision to be given by one of the building authorities within whose territorial area the construction or measure is to be carried out.

Fulfillment indicator

Preparation and approval of a new master plan.

Implementation and financing options

The application of the tool itself falls within the normal agenda of the municipality and does not incur additional costs (personnel costs of existing employees).

Timing

By the end of 2024.

Effect on air quality

It is a supporting measure that does not lead to a direct reduction of the emission load, but creates space for spatial regulation of air pollution sources in the territory.

Risks

Too strict and insensitive application of the instrument may lead to restrictions on the economic development of the area concerned.

Air protection interests may be overridden in the preparation of land use plans and zoning procedures at the expense of other interests.

Current status

Preparation of a new master plan.

Link to other instruments and measures

A.1 - Traffic at rest

A.2 - Development of public transport

A.3 - Implementation of the backbone network of capacity roads for car transport and other important transport structures

A.5 - Promotion of cycling

B.1 - Territorial energy concept

C.1 - Establishment of new vegetation elements

E.3 - Statement on the application for the issue and amendment of an integrated permit

E.4 - Statements in zoning, construction and building permit proceedings and in environmental impact assessments from the point of view of air protection

E.5 - Air protection in public procurement

E.3 Statement on the application for the issue and amendment of an integrated permit

Description

The integrated permit is a powerful preventive tool for air quality management and emission reduction, as it allows individual conditions, including individual emission limits, to be set for a source of pollution based on the local immission situation and other air protection requirements.

Cil / applications

The municipality in whose territory the facility is located is a party to the procedure for issuing or amending an integrated permit. The City of Brno, as a party to the proceedings, shall receive the forwarded application for the issue or amendment of an integrated permit, and shall at the same time ensure the publication of a brief non-technical summary and information on when and where the application can be consulted. The city, as a party to the proceedings, may send its comments on the application to the regional authority within 30 days of receipt of the application. In its comments, the participant may propose conditions for the operation of the facility.

In connection with the worsened air quality in the municipality, it is possible to require the operators of sources to meet stricter emission limits in order to comply with the air quality standards (however, the decision on setting stricter emission limits is up to the regional authority), given that the important institutes of integrated prevention include, in addition to the best available techniques, the so-called environmental quality standards, or the set of requirements set by specific, i.e. component legislation, which the environment must meet at a given time and place. In the context of issuing an integrated permit, the city is to require the establishment of such measures as are necessary to improve or at least maintain the quality of the environment.

In the area of interest, it is advisable to require, in particular, the reduction of emissions of particulate pollutants from both technological processes and the premises of the plant for plants subject to an integrated permit.

Required measures for sources according to Act No. 76/2002 Coll.:

- application of the procedures set out in the best available techniques reference documents (<http://www.ippc.cz>),
- reduction of dust from the premises by thorough cleaning of roads, planting of isolation greenery,
- modification of operating rules in accordance with the city's requirements

Fulfillment indicator

Number of comments issued on amendments to integrated permits.

Implementation and financing options

The application of the tool itself falls within the normal agenda of the municipality and does not incur additional costs (personnel costs of existing employees).

Timing

Ongoing performance.

Effect on air quality

There will be no increase in emission and immission burdens beyond the legal limits.

Risks

Over-ambitious, creating economic impacts that will not be commensurate with the effect of improved air quality.

Too low criteria, insufficient to meet the basic objectives - achieving the immission limits within the set deadlines.

Air protection considerations may be outweighed by other factors.

Current status

Under the current situation, the authorities concerned issue statements on applications for the issue and amendment of integrated permits on the basis of the existing legislation according to their possibilities and capacities.

Link to other instruments and measures

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E.4 Statements in zoning, construction and building permit proceedings and in environmental impact assessments from the point of view of air protection

Description

The power for the municipal authority of a municipality with extended competence (Brno City Council) to issue a binding opinion on the location, implementation and use of a stationary source construction not listed in Annex 2 to the Air Protection Act, as well as the participation of each municipality in the planning and construction procedure is an effective tool for ensuring and not deteriorating air quality beyond the scope of the applicable legislative regulations.

Cil / applications

The Municipality of Brno as a party to the proceedings has the right to actively participate in the zoning, construction and approval proceedings. The municipality, as the administrative authority concerned, or the city, as a party to the proceedings, sends its comments and conditions in terms of air protection to these proceedings. In these comments, amongst other interests, the aspect of air protection and a healthy environment should be pursued. Within the scope of its competences, the city should require for new buildings or changes to existing buildings an assessment of the possibility of using CHP or alternative energy sources, including an assessment of the impact on air quality.

During the construction procedure, the city has the opportunity to define its requirements for measures to limit dust emissions from construction and similar activities (e.g. proper and functional "flooding" of buildings, transport of construction debris in pipes, or a suitable form of humidification of potential sources of dust, washing of vehicles before leaving the construction site). In addition, covering dusty loads with tarpaulins during transport may be recommended.

The siting of new potential emission sources must respect the fact that immission limits for health protection are exceeded in the area of interest. The city, as a party to the procedure, may submit an opinion proposing conditions for the implementation, operation and decommissioning of the air pollution source that will ensure its minimal impact on the quality of the environment. It is advisable to apply at least the emission control measures for the different types of industrial and agricultural production listed in the reference documents on best available techniques (<http://www.ippc.cz>).

For pollutants for which immission limits have been set, it must be assessed whether the location of the source will not deteriorate the air quality at the site to such an extent that there is a risk of exceeding one of the immission limits.

New building projects must be subject to an appropriate energy assessment, including an evaluation of the suitability (economic and environmental) of the installation of the heat source.

Recommended requirements in terms of air protection:

- reduction of secondary dust from sites and paved areas
- Increased traffic requirements during construction activities and construction and demolition work (clean the vehicle before entering the public road, flood dust loads, etc.).
- consistent maintenance and dust control on construction sites, car parks, industrial sites, clay pitches, etc,

Fulfillment indicator

Number of registered construction projects with potential impact on air quality.

Implementation and financing options

The application of the tool itself falls within the normal agenda of the municipality and does not incur additional costs (personnel costs of existing employees).

Timing

Ongoing performance.

Effect on air quality

Focus: T_{SP}, PM₁₀, and PM_{2,5}

Risks

The new Construction Act and related changes to other legislation will significantly limit the ability of cities and townships to permit unlisted stationary sources.

Current status

In the current situation, the authorities concerned issue statements in zoning, construction and building permit proceedings and in environmental impact assessments from the point of view of air protection on the basis of the competences imposed on them by the current legislation in force, according to their capabilities and capacities.

Link to other instruments and measures

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

B.5 - Reconstruction and modernisation of heat energy supply systems, their expansion

D.2 - Dust control from construction activities

E.2 - Spatial planning and territorial management, building permits

E.3 - Statement on the application for the issue and amendment of an integrated permit

E.5 - Air protection in public procurement

E.5 Air protection in public procurement

Description

The measure has three implementation levels. The first is the limitation of dust from construction activities, the second is the limitation of emissions from vehicles involved in the implementation of municipal contracts, especially construction (limitation of EURO 3 and below vehicles, except for some special vehicles) and the third is to ensure the health safety of bulk construction materials used in the implementation of public contracts of a construction nature, with a focus on the exclusion of asbestos content. The specific technical and organisational measures are laid down in the Methodological Guideline on setting conditions for limiting emissions from construction machinery and other construction activities of the Ministry of the Environment.

However, it is necessary to incorporate air protection conditions into the tender conditions for public procurement and contracts with selected construction contractors. It is also important to communicate with designers already at the stage of preparing project documentation, and subsequently with construction managers during the implementation of large buildings.

Cil / applications

Reduction of air pollution during the implementation of contracts of the Statutory City of Brno, municipal districts, municipal companies and contributory organizations and elimination of asbestos minerals in bulk building materials.

Fulfillment indicator

The measure has the character of an output fulfilled/not fulfilled. The success rate of the application of air quality protection conditions in public procurement and the number of public procurement contracts with established criteria will be monitored.

Implementation and financing options

The application of the tool itself falls within the normal agenda of the municipality and does not incur additional costs (personnel costs of existing employees).

Timing

Ongoing and sustained performance.

Effect on air quality

Focus: NO_x , PM₁₀ , PM_{2,5} , asbestos particles

By strictly monitoring the established organisational and technical measures for dust control from construction activities, compliance can be ensured, which will have an impact on the reduction of suspended particulate matter (PM) immissions₁₀ .

Freight transport services for buildings are often provided by outdated equipment in poor technical condition with high emissions. These are very often used in areas with poor air quality. By anchoring the conditions for the use of equipment meeting higher emission standards already in public procurement, these sources of emissions will be eliminated in Brno.

Although the issue of asbestos particles in the air is not dealt with under Act No. 201/2012 Coll., on Air Protection, as amended, with regard to their possible occurrence in natural aggregates and their carcinogenic properties, it is necessary to exclude the use of aggregates containing asbestos. There are six asbestos minerals in natural aggregates (actinolite, anthophyllite, amosite, tremolite, crocokolite and chrysotile). The requirement not to use loose building materials containing any of these minerals will already be incorporated into the investment plans.

Risks

Air quality impacts will not be one of the evaluation indicators for the tender.

Current status

Progressive integration of air protection issues into public procurement procedures.

Link to other instruments and measures

D.2 - Dust control from construction activities

E.6 Register of unlisted sources of air pollution

Description

As it stands, the municipal authority of a municipality with extended competence issues a binding opinion pursuant to Section 11(3) of Act No.201/2012 Coll. on the location, implementation and use of a stationary source construction not listed in Annex 2 to this Act pursuant to another legal regulation (e.g. the Building Act). The municipal authority therefore has a basic overview of unlisted sources of air pollution located within its territorial jurisdiction. The new Building Act and its successor legislation significantly restricts the ability of cities and municipalities to permit unlisted stationary sources of air pollution. Therefore, there is a legitimate concern that municipalities will not have sufficient information on air pollution sources located within their territory. Therefore, there is also a concern about the proper and effective implementation of the obligation to control air pollution sources imposed on municipalities by the Air Protection Act.

Cil / applications

The aim of the measure is to create a register of unlisted sources of air pollution located in the territory of Brno. Such an inventory can serve for statistical purposes, where the analysis of the types of sources and information about their operation can help to target further measures to improve air quality in the city in the future.

At the same time, a complete and up-to-date list of unlisted sources of air pollution on the territory of the city is one of the necessary bases for effective planning of their control by the municipality with extended competence (Brno City Council). The control activity is one of the competences imposed on municipalities by the Air Protection Act. This competence will remain with the municipal authorities even after the entry into force of the new Construction Act, which will otherwise significantly limit the ability of towns and municipal districts to permit unlisted stationary sources. Awareness of air pollution sources is an indispensable basis for carrying out proper control activities.

In order to create a register of unlisted sources of air pollution located in the territory of the city, and especially in order to keep this register up-to-date after the new Building Act comes into force, it is necessary to establish cooperation with the building authorities that will issue building permits for these sources, or if the institute of a unified environmental opinion is established, to establish cooperation with this institute.

Fulfillment indicator

It is not possible to set a performance indicator for the measure, as the measure carries the risk of incomplete registration of unlisted sources of air pollution due to missing documents.

Implementation and financing options

The application of the tool itself falls within the municipality's agenda and does not incur additional costs (personnel costs of existing employees).

Timing

Ongoing performance.

Effect on air quality

This is a support measure that does not lead to a direct reduction of the emission burden, but creates room for a more efficient implementation of the air protection agenda. Keeping up-to-date and complete records of unlisted sources of air pollution will enable more effective planning of control activities, the results of which can contribute to the improvement of air quality in the city.

Risks

Administrative burden on staff beyond the obligations imposed on the municipality by the Air Protection Act.

The new Construction Act and related changes to other legislation significantly limit the ability of cities and townships to permit unlisted stationary sources. After the end of the issuance of binding opinions on the siting of unlisted sources of air pollution by the air protection authority (municipal authority of the municipality with extended competence), there may be a problem with the lack of information on the installation of new sources of air pollution.

Insufficient information on unlisted sources of air pollution that will/are permitted by another type of procedure.

Current status

In the current state, the Brno City Council keeps records of binding opinions on the location, implementation and use of the construction of an unnamed stationary source of air pollution. The list of issued binding opinions can be considered as a kind of database of unnamed sources of air pollution located in the territory of the city.

Link to other instruments and measures

B.2 - Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources

B.3 - Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned

D.2 - Dust control from construction activities

E.1 - Effective control of compliance with the requirements imposed on operators of stationary sources by the Air Protection Act

E.2 - Spatial planning and territorial management, building permits

F Information and other tools and measures

F.1 Education and awareness

Description

Education and awareness are one of the most effective tools for environmental protection. If the public adopts certain environmentally friendly patterns of behaviour, this will reduce the need for external regulation and enforcement. Such behaviour can also be reflected in consumer attitudes and thus feed back into the environmental behaviour of the production sector (e.g. a preference for environmentally friendly products forces producers to produce, market and promote such products, which in turn reinforces positive consumer attitudes). It is also very important to make the public aware of the risks of air pollution to human health and to explain clearly why and what measures are being taken and enforced to protect the air.

Cil / applications

The basic approach to environmental education and awareness is to explain the state of the environment and the impact of certain activities on air quality in a clear and generally acceptable way. This applies in particular to the impact of traditional, cheaper or more convenient activities and their replacement by less popular alternatives.

The education and awareness-raising is intended to reach both the general public and professionals, focusing in particular on the following areas:

- passenger car transport in towns and villages,
- health risks arising from the use of unsuitable technologies for burning solid fuels or the burning of unauthorised fuels,
- energy savings,
- possible sources of funding for remedial action.

Assistance in applying for subsidies provided at a higher level (region, state): providing assistance in filling in the application for subsidies (e.g. from the OPEI or NZU) and implementing the measure. Specific focus on people for whom this step is a major barrier to receiving a subsidy. This activity is aimed at e.g. the implementation of green roofs, green infrastructure or e.g. the replacement and servicing of energy sources and boilers in households or in housing associations and homeowners' associations.

Dissemination of information about the subsidy titles provided, cooperation with the support intermediary. The method of information distribution is essentially the same as the previous step, with the possibility of directly reaching the households identified in the resource mapping. A campaign to educate children in kindergartens, primary and secondary schools, including their parents, about air quality and the potential health risks of pollutants in the air.

Fulfillment indicator

Frequency of awareness-raising events.

Implementation and financing options

The texts in the city newsletter and other information materials already published by the city should be used for education and awareness-raising.

Timing

Ongoing performance.

Effect on air quality

This is a support measure that does not lead to a direct reduction of the emission burden, but creates room for future emission reductions, especially from sources operated by the public.

Risks

Awareness-raising and educational activities will not be sufficient to convince the public of the need for additional air protection measures.

Current status

OŽP MMB regularly participates in selected events that are generally aimed at awareness and education (e.g. the Science Festival, etc.), organises or supports round tables on current topics related to air protection and other similar events. It is desirable to continue to support events of this kind, including with the active participation of the MMB, in the context of air protection awareness-raising.

Link to other instruments and measures

A.2 - Development of public transport

A.5 - Promotion of cycling

B.3 - Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned

D.1 - Incineration of garden materials

D.2 - Dust control from construction activities

F.2 - Voluntary agreements with resource operators, demonstration projects

F.2 Voluntary agreements with resource operators, demonstration projects

Description

Voluntary agreements can fulfil various functions (e.g. to ensure superior behaviour of resource operators, to replace legal regulation). It is in the interest of economic operators to present their air protection projects to the public. The development and implementation of a demonstration project is beneficial for all parties involved: the city, the implementer and the end users. The resulting effect of the project is a positive impact on air quality. Demonstration projects can be aimed at the business sector or at individuals, where the demonstration project is part of an environmental awareness campaign.

Cil / applications

The instrument of voluntary agreements is particularly suitable for obtaining up-to-date data on the amount of pollutants emitted by individual operators of listed air pollution sources. Another suitable area is the above-standard behaviour of operators (managers of production and industrial sites) in the area of cleaning of internal roads, planting of greenery. Last but not least, it is possible to obtain funds for the implementation of other actions to improve air quality through a voluntary agreement.

The presentation of the implementation of voluntary agreements with source operators and its demonstration projects for air quality improvement can also be seen from the perspective of education, where these agreements and projects can become an inspiration for other operators and organisations. An equally important aspect is informing the public not only about the state of air quality but also about the steps being taken to improve it. In the case of demonstration projects for improving air quality, the City of Brno and municipal organisations should also set an example, as they can use the examples of their projects to inspire the private sector.

Fulfillment indicator

Number of agreements and demonstration projects implemented and applied.

Implementation and financing options

The measure is not expected to impact the City's budget.

Timing

Ongoing performance.

Effect on air quality

This is a support measure. The effect on air quality will depend on the type of demonstration project or the content of the voluntary agreement. It is recommended to focus mainly on projects to reduce particulate matter (PM₁₀, PM_{2,5}) emissions.

Risks

The agreements will be formal and will not be honoured by the parties.

Link to other instruments and measures

F.1 - Education and awareness

F.3 Updating the website

Description

The website brnenskeovzdusi.cz is one of the means of informing the public about the air quality in Brno. It is necessary to continuously work with this portal and to update it in order to provide up-to-date information.

Cil / applications

Providing up-to-date and clear information about the air condition in Brno and the possibilities of protecting your own health in a modern and attractive way.

Fulfillment indicator

Website up-to-dateness.

Implementation and financing options

Funding from the OŽP budget.

Timing

Ongoing performance.

Effect on air quality

Providing information about air, the effects on human health and the causes of air quality deterioration builds public awareness of social responsibility in this area and thus acts as a preventive measure against sources of air pollution. In addition, the impacts on human health are reduced through awareness and compliance with the recommendations.

Risks

Risk-free measures.

Current status

The website has been up and running since 2017. The computing environment has evolved over the years and so has the air sector and there is a need to continuously update this platform.

Link to other instruments and measures

F.1 - Education and awareness

F.4 Operation and renewal of air quality monitoring

Description

The basic measure at this point is the renewal of the existing monitoring technology at the individual AIM measuring stations. In addition, the proposed measure includes intensified use of the existing mobile air quality measurement vehicle for continuous measurements (when the mobile vehicle will not be used by a municipality). The mobile vehicle will be placed in a suitable location in cooperation with the Czech National Institute of Health and Environmental Protection (CHMI), which will benefit the Air Quality Information System (AQIS). Possibly use for possible measurement campaigns. The selection of the locations of the measuring stations and the measuring vehicle can be based not only on the official monitoring carried out by the CHMI, but also on the results of measuring campaigns carried out within the framework of research and other projects on the territory of Brno or its parts. In doing so, it is recommended to take into account the location of existing sources of air pollution in the area, as well as planned construction and development of the area. When specifying the location, it is advisable to establish cooperation with the municipality concerned.

Cil / applications

Renewal of existing measuring equipment. Utilization of a mobile air quality monitoring vehicle for continuous measurements when not in use by municipal districts.

Fulfillment indicator

The amount of renewed measuring technology. Number of measurement weeks per year.

Implementation and financing options

Subsidy programmes of the SFŽP in the case of measuring technology.

Timing

Ongoing performance.

Effect on air quality

This is a supporting measure that does not lead to a direct reduction of the emission burden, but leads to a more detailed view of the air quality in the Brno agglomeration.

Risks

Lack of funding for AIM renewal.

Current status

There are 11 air quality monitoring stations in Brno, 9 of which are operated in automatic monitoring mode. The City of Brno operates 5 stations and a mobile measuring vehicle, which is intended for the needs of the city districts. For most of the year the mobile vehicle is not operated, in 2022 it was used for about 5 weeks. For the rest of the year it measures at ul. Drčkova in Brno-Líšně. All stations and the mobile wagon are equipped with suspended particulate matter analysers, PM₁₀, PM_{2,5} and PM₁ and NO_x analysers.

Link to other instruments and measures

F.1 - Education and awareness

F.3 - Updating the website

4.4. Application of tools and measures

The Action Plan is prepared for the territory of the city of Brno. Most of the proposed measures concern the whole territory of Brno. However, some of the proposed measures are primarily targeted only for a selected part of the city. Therefore, the table below shows, for clarity, the areas targeted by the individual measures or where they should be applied as a priority.

Individual measures can be implemented by the state administration, local government or municipal organisations, at the city or district level. The competence to implement measures is determined by their nature. The action plan also includes measures that do not have a direct effect on improving air quality, but create conditions for subsequent emission reductions. These are mainly administrative, support or awareness-raising measures. The emission reductions themselves are the result of changes in private sector or public behaviour as a result of the measures implemented.

Tab. 19 Proposal for the application of the measures of the Action Plan of the City of Brno by the city districts

Measure code	Name of the measure	Territorial validity ¹⁾	Competence to fulfil ²⁾
A.1.a	Resident parking (OPS)	Municipalities Brno-north, Brno-central, Černovice, Jundrov, Komín, Královo Pole, Medlánky, Nový Lískovec, Žabovřesky, Židenice	SMB/MMB and their organisations
A.1.b	Parking lots, P+R systems	City of Brno (suitable locations in terms of transport services)	SMB/MMB and their organisations
A.1.c	Development of a network of charging stations for electric vehicles and construction of filling stations for hydrogen cars	City of Brno	SMB/MMB and their organisations, private sector
A.2.a	Construction and reconstruction of tram and trolleybus lines	Bohunice, Bystrc, Brno-jih, Brno-sever, Brno-střed, Komín, Královo Pole, Líšeň, Maloměřice and Obřany, Nový Lískovec, Řečkovice and Mokrý Hora, Starý Lískovec, Žabovřesky, Žebětín, Židenice	SMB/MMB and their organisations
A.2.b	Construction and development of public transport interchanges and related infrastructure	City of Brno (suitable locations in terms of transport services)	SMB/MMB and their organisations
A.2.c	Economic support (subsidies) for the operation of public transport	City of Brno	SMB/MMB and their organisations
A.2.d	Environmentally friendly public transport - promoting the introduction and use of alternatively powered vehicles	City of Brno	SMB/MMB and their organisations
A.2.e	Ensuring a high standard of public transport quality	City of Brno	SMB/MMB and their organisations
A.2.f	Promotion of public transport as one of the possible alternatives to car transport	City of Brno	SMB/MMB and their organisations, city districts
A.3.a	Complete completion of the Brno Grand Ring Road (VMO) and related roads	Bohunice, Bosonohy, Brno-jih, Brno-sever, Brno-střed, Bystrc, Černovice, Chřlice, Ivanovice, Kníničky, Slatina, Starý Lískovec, Vinohrady, Žabovřesky, Židenice	SMB and its organisations, higher levels of public administration
A.3.b	Implementation of other significant transport constructions in the territory of the city of Brno	Bystrc, Komín, Židenice	SMB/MMB and their organisations
A.4	Troubleshoot spot problems on communication networks	City of Brno	SMB/MMB and their organisations
A.5	Promotion of cycling	City of Brno	SMB/MMB and their organisations, city districts

Measure code	Name of the measure	Territorial validity ¹⁾	Competence to fulfil ²⁾
A.6	Cleaning and maintenance ZÁKOS	City of Brno	SMB/MMB and their organisations, city districts
A.7	Reduction of emissions from the operation of MMB vehicles and SMB organisations	City of Brno	SMB/MMB and their organisations, city districts
B.1	Territorial energy concept	City of Brno	SMB/MMB and their organisations
B.2	Support for the conversion of heating systems in households - installation and use of new environmentally friendly and/or renewable sources	City of Brno	SMB/MMB and their organisations
B.3	Increase operators' awareness of the impact of solid fuel combustion on air quality, the importance of proper maintenance and operation of sources and the choice of fuel to be burned	City of Brno	SMB/MMB and their organisations, city districts
B.4	Reducing energy consumption of buildings managed or owned by MMB, SMB and its organisations, development of energy management systems	City of Brno	SMB/MMB and their organisations, city districts
B.5	Reconstruction and modernisation of heat energy supply systems, their expansion	Municipal district Brno - centre, Bohunice, Starý Lískovec	SMB and its organisations
C.1	Establishment of new vegetation elements	City of Brno	SMB/MMB and their organisations, city districts
C.2	Ensuring adequate space for the root ball of trees	City of Brno	SMB/MMB and their organisations, city districts
C.3	Motivational programmes of the Statutory City of Brno aimed at the development of greenery in the city	City of Brno	SMB/MMB and their organisations
D.1	Incineration of garden materials	City of Brno	SMB/MMB and their organisations, city districts
D.2	Dust control from construction activities	City of Brno	SMB/MMB and their organisations, city districts
E.1	Effective control of compliance with the requirements imposed on operators of stationary sources by the Air Protection Act	City of Brno	MMB
E.2	Spatial planning and territorial management, building permits	City of Brno	SMB/MMB and their organisations, city districts
E.3	Statement on the application for the issue and amendment of an integrated permit	City of Brno	SMB/MMB, city districts
E.4	Statements in zoning, construction and building permit proceedings and in environmental impact assessments from the point of view of air protection	City of Brno	SMB/MMB and their organisations, city districts
E.5	Air protection in public procurement	City of Brno	SMB/MMB and their organisations, city districts
E.6	Records of unlisted sources of air pollution	City of Brno	SMB/MMB and their organisations

Measure code	Name of the measure	Territorial validity ¹⁾	Competence to fulfil ²⁾
F.1	Education and awareness	City of Brno	SMB/MMB and their organisations, city districts
F.2	Voluntary agreements with resource operators, demonstration projects	City of Brno	SMB/MMB and their organisations, city districts
F.3	Updating the website	City of Brno	MMB
F.4	Operation and renewal of air quality monitoring	City of Brno	MMB

¹⁾ area of application - the area targeted by the measure or the area where the measure should preferably be applied

²⁾ the competence to implement the SMB can be delegated to individual municipal organisations. The competences established for a certain level of public administration (SMB, MMB) may be delegated to lower levels of public administration (city districts, building authorities, etc.) in justified cases.

5. Completion and specification of the AP measures by the districts

During the preparation of the Action Plan, the individual districts had the opportunity to make suggestions for the addition of measures to the Action Plan or suggestions for the specific application of individual measures. The proposals were examined by the Municipality of Brno from the point of view of the possibility of their implementation, integration into the Action Plan and compliance with the measures and visions of the Municipality of Brno in the field of air protection, as well as compliance with the proposals of other districts. Relevant proposals for modification of the Action Plan that resulted from discussions with municipal districts and municipal organisations were incorporated directly into the draft part of the AP (chap. 4).

Other topics were also discussed during the roundtables with municipalities. An important topic in relation to the planting of new trees in the long term is also the potential placement of micro-collectors for the combined lines of technical networks. Such a measure, however, requires a set of necessary legislative or regulatory instruments resulting, for example, from the statutory protection zones of these networks. Another factor is the budgetary complexity and the actual management and maintenance of such measures in potential street revitalisations.

6. Timetable for the implementation of the Brno Agglomeration PZKO 2020+

On 24 November 2020, the Ministry of the Environment of the Czech Republic issued, in accordance with Section 9 of Act No. 201/2012 Coll., on Air Protection, as amended, an updated Air Quality Improvement Programme for the Brno agglomeration CZ06A, which is supplemented by the document Supporting Measures to the updated AQAPs for the period 2020+. Pursuant to Section 9(4) of the Air Protection Act, the Statutory City of Brno is obliged to prepare a timetable for the implementation of the measures within 12 months from the date of publication of the AQAP in the Bulletin of the Ministry of the Environment, which it shall publish in a manner allowing remote access. The time plan was approved by the Brno City Council on 27 November 2021 and contains 3 measures related to local heating installations. Two of them are based directly on the PIP and the last one is the implementation of measures from the supporting measures. The full text of the timetable for the implementation of the Brno Agglomeration 2020+ is given below. The full text of the timetable for the implementation of the Brno Agglomeration CEMP, update 2020 is given in the annexed part of the action plan (Příloha č. 1).

Sources

- Act No. 201/2012 Coll., on Air Protection, as amended; Decree No. 415/2012 Coll., on the permissible level of pollution and its detection and on the implementation of some other provisions of the Act on Air Protection, as amended
- Programme for improving air quality in the Brno agglomeration - CZ06A, update 2020
- Action Plan for Air Quality Improvement Brno, 2020
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- important city projects - What will Brno be? (cobude.brno.cz)
- Brno Mobility Plan (brnoinmotion.cz)
- Projects of Teplárny Brno, a.s. (www.teplarny.cz)
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List of possible abbreviations

APA	Action plan	Investment Department	
BKOM	Brněnské komunikace a.s.	OP	Spaid parking area
CNG	Compressed Natural Gas	OŽ	Environment Department
CZT	Central heat supply	PM	flying dust (particulate matter)
Czech	Hydrometeorological Institute	PZKO	Air quality improvement programme
DPMB	Transport Company of the City of Brno, a.s.	RMBRN	Brno City Council
EnMS	Energy management	Directorate of	Roads and Motorways
IAD	Individual car transport	SFŽ	State Environmental Fund
ILimit	limit	SMB	Statutory City of Brno
ISKO	Air Quality Information System	SÚSS	Road management and maintenance
South Moravian Region		TB	Teplárny Brno, a.s.
Municipal district		POP	sLight pollutants
Public transport		VMO	Velký okruž
MMB	Magistrate of the City of Brno	VZMB	Public green space of Brno, contributory organisation
MÚK	multi-level junction	BASIC	COMMUNICATION SYSTEM
Ministry of the Environment		Z	Health Institute
Department of Transport			

Action Plan for Improving Air Quality Brno - 2023

Annex part