6. Air Quality

Refer to Section 2.6 of the Guidance Note

6A. Present Situation

Indicator		Unit	Year of Data
Number of PM_{10} monitoring stations	9	No. of monitoring stations	2016
For each station provide the number of days per year PM_{10} exceeded 50 µg/m^3	55, 49, 32, 33, 28, 52, 52, 89, 49	Days	2016
For each station provide annual average PM_{10} concentration	41.0, 34.2, 33.5, 32.9, 30.2, 30.0, 29.6, 27.5, 27.3	µg/m^3	2016
Number of NO_2 monitoring stations	9	No. of monitoring stations	2016
For each station provide the number of hours with NO_2 concentrations higher than 120 ug/m^3	*	Hours	2016
For each station provide annual average NO_2 concentration	39.1, 25.0, 24.4, 22.1, 22.0, 21.1, 18.7, 17.4, 16.4	ug/m^3	2016
Number of $PM_{2.5}$ monitoring stations	5	No. of monitoring stations	2016
For each station provide the annual average $PM_{2.5}$ concentration	25,8; 32,6; 36,2; 30,5	ug/m^3	2016

** Data not available*

According to Czech legislation (the Air Protection Act):

** The limit value for the annual mean of PM_{10} is 40 µg/m^3;*

** The limit value for PM_{10} (daily mean) is 50 µg/m^3 (not to be exceeded more than 35 times during a year);*

**The limit value for $PM_{2.5}$ is 25 µg/m^3;*

** The limit value for the annual mean of NO_2 is 40 µg/m^3;*

**The limit value for hourly NO_2 is 200 µg/m^3 (not to be exceeded more than 18 times during a year).*

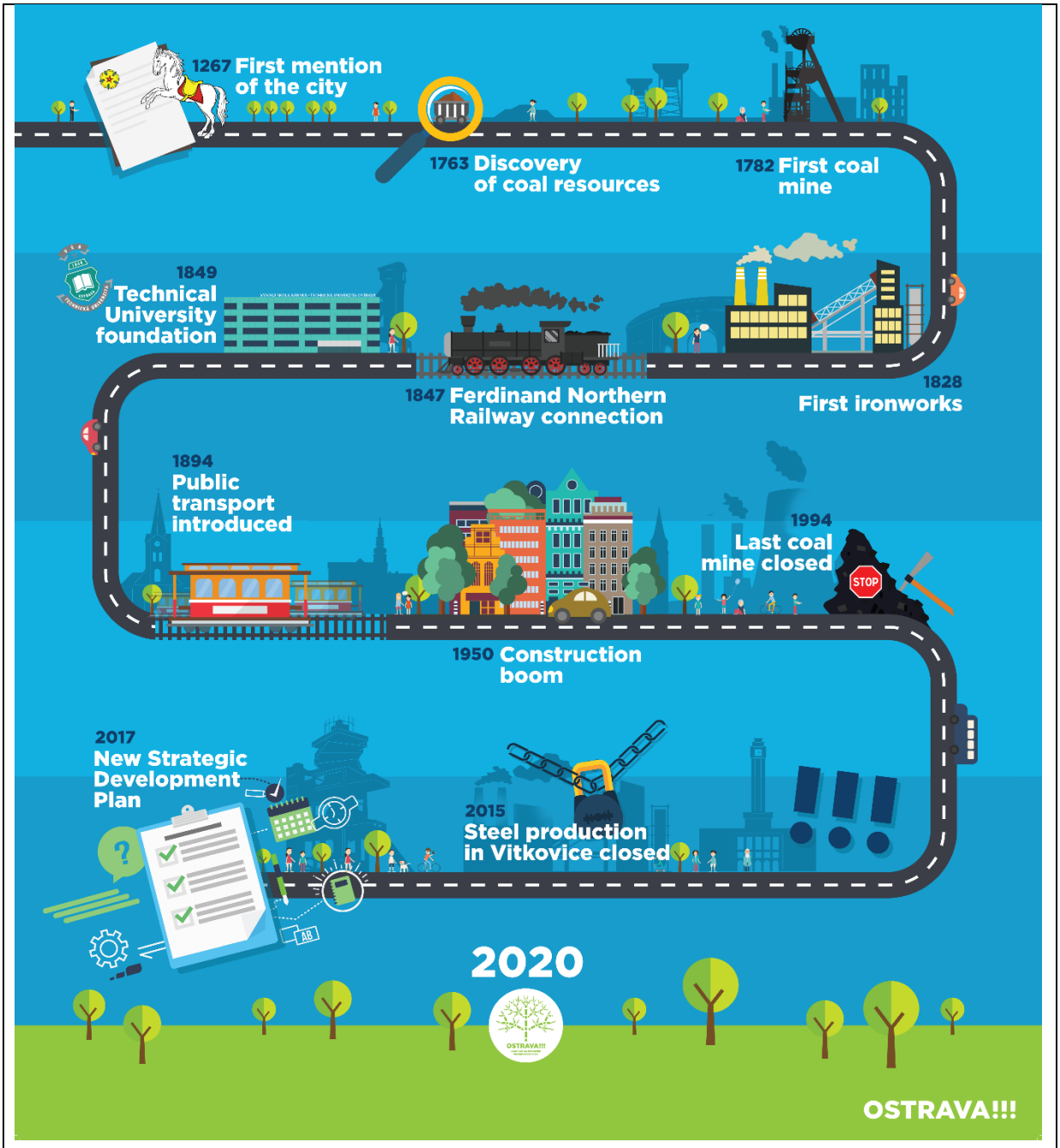

Image 1: Historical overview of industrial development in Ostrava influencing air quality

Although Ostrava has managed to significantly improve its air quality especially in recent years, it remains one of the city's biggest environmental problems. Air pollution usually originates from three main sources: emissions from industry and power generation, local sources (households), and transport. In Ostrava's case, a fourth major factor is cross-border pollution from the nearby industrial conurbation of Katowice (Poland).

In view of the seriousness of this issue, air quality is naturally a key priority for the City (both in terms of its legal powers in this area as set out in the Air Protection Act, and also via various other activities and initiatives). An analytical study has shown that the main sources of air pollution in Ostrava are stationary sources (metallurgical production and power generation), household sources,

and transport. However, under current legislation, powers to restrict emissions from large stationary sources are primarily held by national-level state authorities rather than regional/local bodies. The City's activities in this regard are thus largely limited to two of the above-mentioned sources: transport and local heating sources (the latter are especially relevant in outlying parts of the city).

Ostrava experiences fluctuations in mean annual concentrations from year to year, regardless of the overall decrease of emissions in the region. In the winter, household heating is a major source, and under certain meteorological conditions also cross-border pollution (in some locations, household heating emissions from Poland can account for up to 50% of total PM_{10} concentrations). In the summer, transport is the main source (except in locations with industrial sources).

The most significant pollutant is PM_{10} (or $PM_{2.5}$). Analysis has shown that during the period 2005–2017 the legal limit value for the annual mean (40 µg/m^{-3}) has often been exceeded. The highest annual mean PM_{10} concentrations have been measured in the eastern parts of Ostrava, in the western part the annual mean has remained below the legal limit. There has been a marked gradual reduction in annual mean concentrations in the city centre (Českobratrská; from 55 µg/m^{-3} to below the limit in 2014).

Location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ostrava- Českobratrská (hot spot)	54,9	54,1	42,9	43,1	43,8	50,5	43,6	42,4	40,3	37,3	33,7	34,2
Ostrava-Fifejdy	50,3	47,0	39,3	40,5	40,9	51,5	42,2	41,3	40,6	38,6	33,9	30,2
Ostrava-Mariánské Hory			41,5	41,3	35,7	40,2	47,5	42,6	38,7	37,1	31,5	27,5
Ostrava-Poruba/ČHMÚ	43,6	37,5	30,6	30,0	34,0	39,9	34,0	35,1	35,5	33,4	29,1	27,3
Ostrava-Přívoz	58,5	56,6	45,9	46,6	46,7	52,1	44,9	43,9	43,7	42,1	36,3	32,9
Ostrava-Poruba IV.	25,7		19,2	22,6	25,6	28,6	23,7					
Ostrava-Radvanice ZÚ		63,8		48,5	47,5	61,7	49,3	49,5		42,6	42,2	41,0
Ostrava-Zábřeh	48,8	43,6	37,1	37,2	40,2	51,2	40,9	40,9	45,7	42,2	31,8	29,6
Ostrava-Radvanice OZO									43,7	39,4	33,7	33,5
Ostrava-Poruba/DD												30,0

Table 1: Mean annual PM_{10} concentration, Ostrava (Popp B. et al., 2015, CHMI, 2017)

Not all station were in operation during the whole period.

In the case of $PM_{2.5}$ the situation is even more serious. The annual legal limit (defined in 2011 as 25 µg/m^{-3}) has been exceeded at all air quality monitoring points in the city.

The annual limit for NO_2 was exceeded primarily in locations with heavy traffic, e.g. in the city centre (Českobratrská, hot spot). In 2014 the mean annual concentration at this location dropped below the legal limit (40 µg/m^{3}) for the first time.

Location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ostrava-Českobratrská (hot spot)	44,0	46,3	39,5	49,0	46,9	50,9	46,3	43,1	41,4	39,2	39,9	39,1
Ostrava-Fifejdy	27,9	28,3	25,1	25,8	24,5	28,1	26,0	25,1	24,2	23,2	23,3	22,0
Ostrava-Mariánské Hory	22,6	22,7	21,1	23,3	21,2	24,1	22,0	22,9	20,9	21,3	21,1	18,7
Ostrava-Poruba/ČHMÚ	24,7	22,4	20,2	18,5	17,9	19,5	20,2		19,2	18,5	18,7	16,4
Ostrava-Přívoz	31,3	32,3	28,2	30,4	29,4	30,9	29,4	28,6	26,9	27,6	27,0	25,0

Ostrava-Radvanice ZÚ	28,6	27,1	26,3	24,1	21,6	25,1	25,0	25,5	24,0	22,8	25,1	22,1
Ostrava-Zábřeh	28,3	27,5	24,4		25,7	28,3	25,2	25,7				21,1
Ostrava-Radvanice OZO									19,4	18,3	18,3	17,4
Ostrava-Poruba/DD												24,4

Table 2: Mean annual NO_2 concentration, Ostrava (Popp B. et al., 2015, CHMI, 2017)

A major problem in the entire urban area (and especially in neighbouring parts of Poland) is benzo(a)pyrene. For many years the legal limit (1 ng/m^{-3}) has been exceeded at all locations where concentrations of this pollutant are measured. The worst situation is in the east of the city (Radvanice); nevertheless, it is evident that the situation has improved significantly in the past two years of measurement.

The issue of cross-border air pollution has been addressed in depth by the project '**Air Silesia'**; the project is unique in terms of the scope of information analyzed and because it evaluates data from both sides of the border using the same methodology. The project has revealed several key facts affecting air pollution on both sides of borders, including location and sources in different meteorological conditions. Follow-up project AIR TRITIA solves cross border situation of air pollution in CZ, PL, SK (for more information see section "Future".)

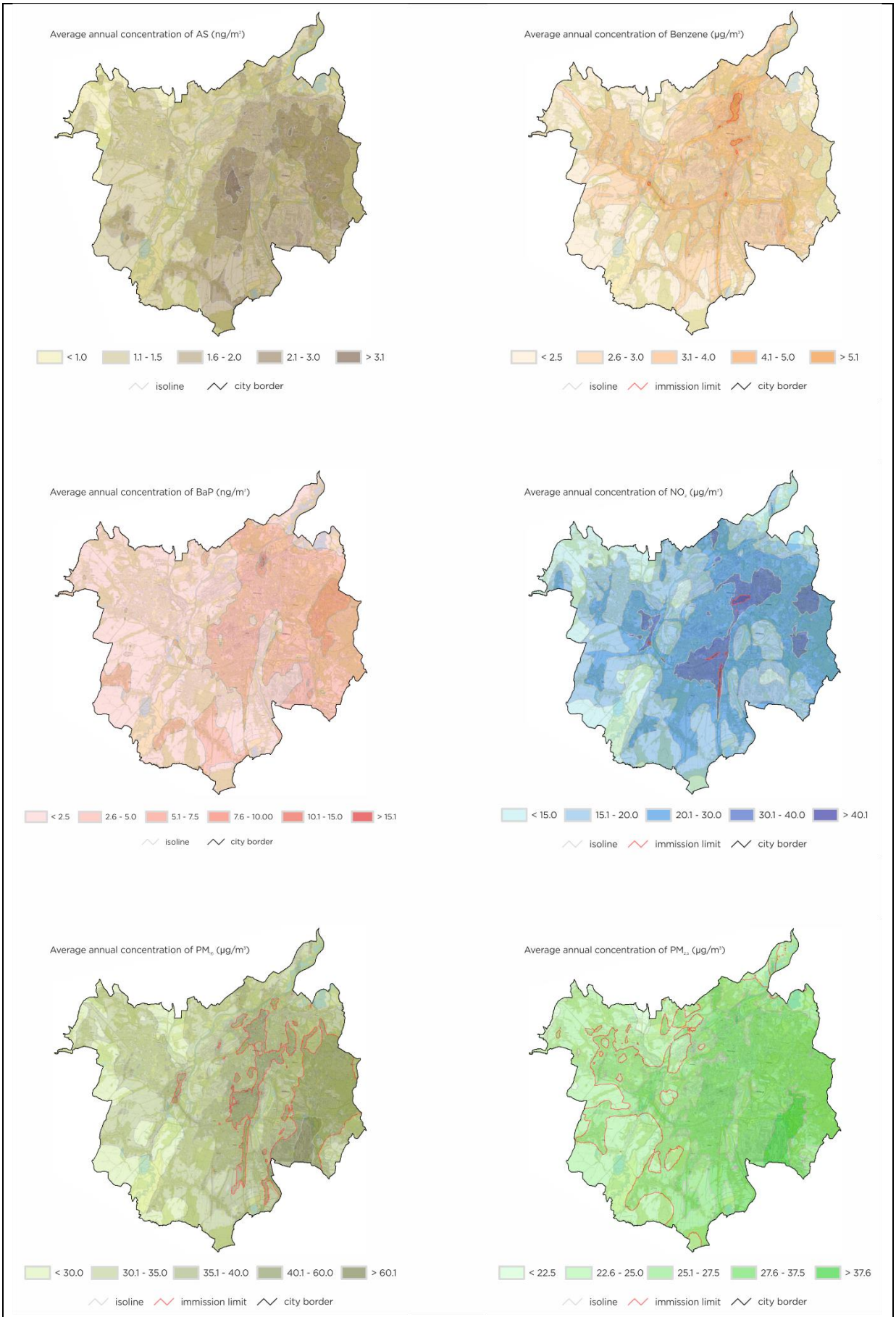

Figure 1: Map of average concentrations of main air polluters

6B. Past Performance

The City of Ostrava forms part of the Ostrava/Karviná/Frýdek-Místek conurbation, which was the subject of the Czech Environment Ministry's Air Quality Improvement Programme. The aim of the programme is to achieve the required air pollutant levels as soon as possible, and then to maintain and improve air quality throughout the conurbation. Currently the third update of the Action Plan (2017) is being implemented and include a.o.:

- Organizing air quality conferences featuring all major stakeholders (including NGOs) with the aim of arriving at joint solutions.
- In conjunction with the MRS and the Town of Třinec, Ostrava has signed a Joint Declaration on cooperation in planning the Smart City and Smart Region concept (2015). One focus of the Smart Cities initiative is on achieving **40 % reductions in CO_2 emissions by 2030**; this will also bring major reductions in other pollutants (via eco-friendly transport, energy efficiency improvements in buildings, energy savings and modern technologies).
- The City has signed a memorandum with Katowice (PL) setting out the two cities' joint intention to achieve air quality improvements in the Czech-Polish border region.
- The City contributes 230 EUR per child to a fund for children at risk due to air pollution (an increase of one-third in 2016). The money can be used for organized recreation programmes targeted at preschool and primary school children, including vacations, outdoor nature camps, etc. in healthy environments. Since its inception, this project has enabled approximately 15 000 children to participate in these activities.
- The City co-funds the operation of air quality monitoring stations and a mobile measuring vehicle.

Image 2: One of air quality monitoring stations and a mobile measuring vehicle

Measures related to greenery

The City spends a total 3,7 million EUR per year on maintenance of all public greenery (more details in Chapters 4 and 5 of the EGC application).

Measures to reduce transport-related emissions (more details in Chapter 3 of the EGC application)

Because transport is one of the major sources of air pollution in Ostrava, and because the City can influence it more than the other sources, one of the City's key priorities is promoting more eco-

friendly transport – by supporting public transport use, promoting pedestrian and cycle transport, reducing the attractiveness of private car transport, and a range of other measures described in the 'Sustainable Urban Mobility' section. Several of these measures were introduced by the City's SUMP in 2015. The most important measures are:

Road cleaning – This reduces secondary air pollution caused by vehicle traffic. The City exceeds the minimum legal requirements both in terms of quantity (more frequent and more extensive maintenance) and quality (purchase of new cleaning equipment). Class I–III roads are cleaned twice monthly and sprayed with water to reduce dust; local roads owned by the city are cleaned eight times a month. Since 2008 the City has invested over 769 000 EUR in this intensive cleaning, and in 2014–2016 it spent over 807 000 EUR on new road cleaning equipment.

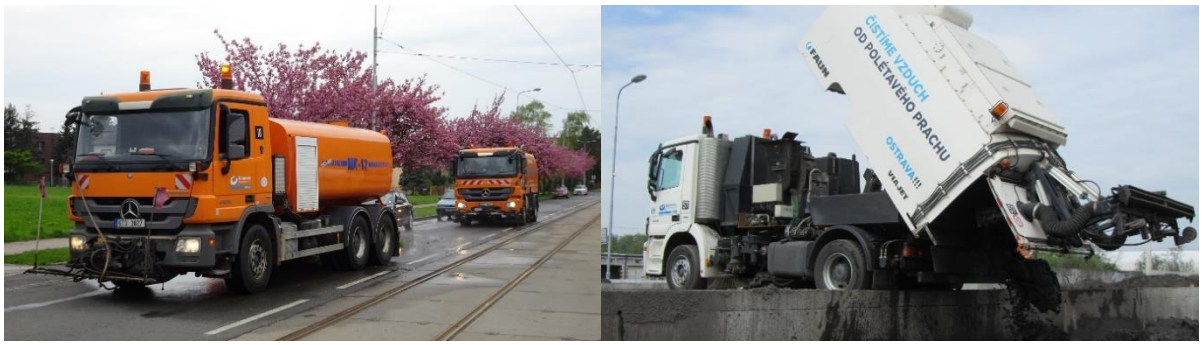

Image 3: Road cleaning vehicles

Support for public transport – The City's measures to increase the attractiveness of public transport and reduce its environmental impact are described in detail in Chapter 3 of the EGC application (replacement of diesel buses by modern CNG buses, plans to introduce zero- and low-emission vehicles – including electric buses and partially battery-powered trolleybuses – 96% of the fleet by 2025; user-friendly payment systems, increased safety etc.).

Measures to reduce energy consumption

These measures are described in detail in Chapters 1, 2 and 11. Their primary goal is to reduce greenhouse gas production, but reductions in energy consumption also contribute to reductions in emissions from energy production facilities.

Measures related to local heating sources

One of the City's main measures helping to reduce the impact of local heating sources on air quality is funding programme enabling households to replace obsolete boilers with modern low-emission boilers. Solid fuel boilers have been replaced by more modern systems (incl. gas boilers and heat pumps). In 2012–2015, a total of 266 boilers were replaced via this programme. In 2015 a new call for applications was announced; a total of 359 boilers have so far been replaced in Ostrava households as part of this call. The figure is not yet final, as the current call remains open until June 2018 (422 applications have been received to date). A total of 625 boilers have thus been replaced so far as part of all completed calls and the current call; this number may well increase in the future. Under the standard programme conditions, households have to cover 15% of the total costs; thanks to the funding from the City and the MSR, the cost is 100% covered – enabling even low-income

households to have eco-friendly boilers installed. The annual cost to the City is up to 384 600 EUR.

Image 4: Promotion of local heating programme

6C. Future Plans

The Action Plan for reducing air pollution (see above) includes a number of measures focusing on improvements in upcoming years. Some of these measures are described in detail as part of Chapters 1, 3, 4, 5 and 11 of the EGC application.

New greenery

Key projects in the category of new greenery plantings include the revitalization projects at the Benátky Forest Park and the Pustkovec valley (Chapters 4 and 5), but there are also numerous other projects (almost 20 in total) involving the creation of new greenery as a means of reducing air pollution.

Transport-related measures

The transport-related measures set out in the Action Plan for reducing air pollution are largely based on the City's Sustainable Urban Mobility Plan (SUMP), though the Action Plan lists specific projects to implement these measures. Although unpopular, it is essential to deter private car use, primarily by limiting parking and charging for it (while also improving the quality of parking provision). These measures include the construction of a multi-storey parking garage and new paid car parks; in addition, P+R facilities (primarily at the current and modernized public transport terminals) will enable drivers to leave their vehicles and switch to public transport.

The construction of bypasses to channel traffic away from residential areas will not reduce total

emissions (reductions in local emissions due to reduced congestion and better traffic flow are offset by the increased ease of private car use due to the better road network, reduced journey times etc.). However, such projects significantly reduce concentrations of pollutants in heavily populated areas, especially in the vicinity of the busiest roads. The two most important projects of this type (with the largest potential impact on reducing pollutant concentrations in residential areas) are the westward extension of Rudná Rd. and the Northern Link Road project; these are described in Chapter 7 of the EGC application (noise and emissions reduction are two main targets).

For more information on public transport-related measures (low-emission vehicles, new tram routes, telematic systems, bikesharing and others), see chapter 3.

The next phase of the household boiler replacement programme

Applications for the replacement of obsolete household boilers can still be submitted (until 30 June 2018). Based on the number of boilers replaced as part of previous calls (625) and the number of applications from the latest call (428), the total number is 1053; this is the number of boilers that are currently set to be replaced by 31 December 2019 (when the latest call ends). Out of the total number of solid fuel boilers in detached houses in Ostrava (2429), at least 1053 boilers will thus be replaced by 31 December 2019. The success rate will therefore be at least 43% (based on data in 9/2017).

Measures to reduce energy consumption

These measures are part of the City's SECAP (being finalized in 2017). As their primary goal is to achieve greenhouse gas reductions, they are described in Chapter 11 of the EGC application.

Other measures

An important measure which (due to current legislation) has not yet been used in the Czech Republic is the creation of low-emission zones with restrictions on ICE (internal combustion engine) vehicles. In order to introduce such a zone, it is essential to provide alternative means of transport and access. The first step towards such a zone will be a study (launched this year).

SmogAlarm is a smartphone app which quickly and simply informs users of the current air quality situation, enabling them to plan their activities (limiting physical activity or time spent outdoors). The app was developed by the NGO 'Clean Skies' with funding from the City of Ostrava. SmogAlarm also provides air pollution data in a user-friendly format, enabling users to compare trends or locations. SmogAlarm was launched in November 2011, and since then around 50 000 people have downloaded it.

Based on cooperation of cities (Ostrava, Opava, Rybnik, Opole, Žilina), universities, research centres and other partners from Czech/Slovak/Polish border regions, **project AIR TRITIA** aims to increase air quality management capacities of public sector bodies through the development of a unified spatial information database, introducing new management and pollution prediction tools and air quality strategies. Key project outputs are: common strategy, addressing identified air quality problems in so-called TRITIA region and proposing concrete measures plus 5 individual strategies for each part of TRITIA region addressing specific problems. Two crucial tools will be also developed and implemented: AQMS (Air Quality Management System) and PWS (Predictive Warning system). For more information, see References.

6D. References

EGC Ostrava: https://egc.ostrava.cz/

City initiative on air protection: https://www.ostrava.cz/cs/o-meste/zivotni-prostredi/ovzdusi/iniciativy-mesta-ostravy-1/iniciativy-mesta-ostravy

Short-term development program to improve air quality:

https://www.ostrava.cz/cs/o-meste/zivotni-prostredi/ovzdusi/dokumenty-a-materialy-tykajici-se-ochrany-ovzdusi-1/kratkodoby-program-ke-zlepseni-kvality-ovzdusi-iii-aktualizace

Analysis of air quality in Ostrava and related legislation in Air Protection:

http://docplayer.cz/2467340-Analyza-kvality-ovzdusi-na-uzemi-mesta-ostravy-a-legislativa-v-ochrane-ovzdusi-2008-2009.html

Local heating programme: https://dycham.ostrava.cz/kotlikove-dotace

Smogalarm Application for iOS and Android: http://www.smogalarm.cz/

Smogalarm Application (PR):

https://www.ostrava.cz/cs/o-meste/aktualne/ostrava-podporila-aplikaci-smogalarm

Air Silesia: http://www.air-silesia.eu

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Czech Hydrometeorological Institute/Air Pollution and Atmospheric Deposition in Data: http://portal.chmi.cz/files/portal/docs/uoco/isko/tab_roc/tab_roc_EN.htmlhttps://play.google.com/store/apps/details?id=cz.ubik.smogalarm&hl=cs

PM10 Daily Mean Concentration in Europe:

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