

What about the air we breathe?



Annual Air Quality Assessment for 2023

Thanks to the City's efforts, air quality in Kraków is improving. The air quality assessment includes 12 pollutants, of which 10 met regulatory standards in 2023. However, nitrogen dioxide and benzo(a)pyrene were classified as Category C – zones exceeding permissible levels.



The permitted annual average concentration of nitrogen dioxide was exceeded over an area of 0.2 km² (**0.06% of the City's total area**).

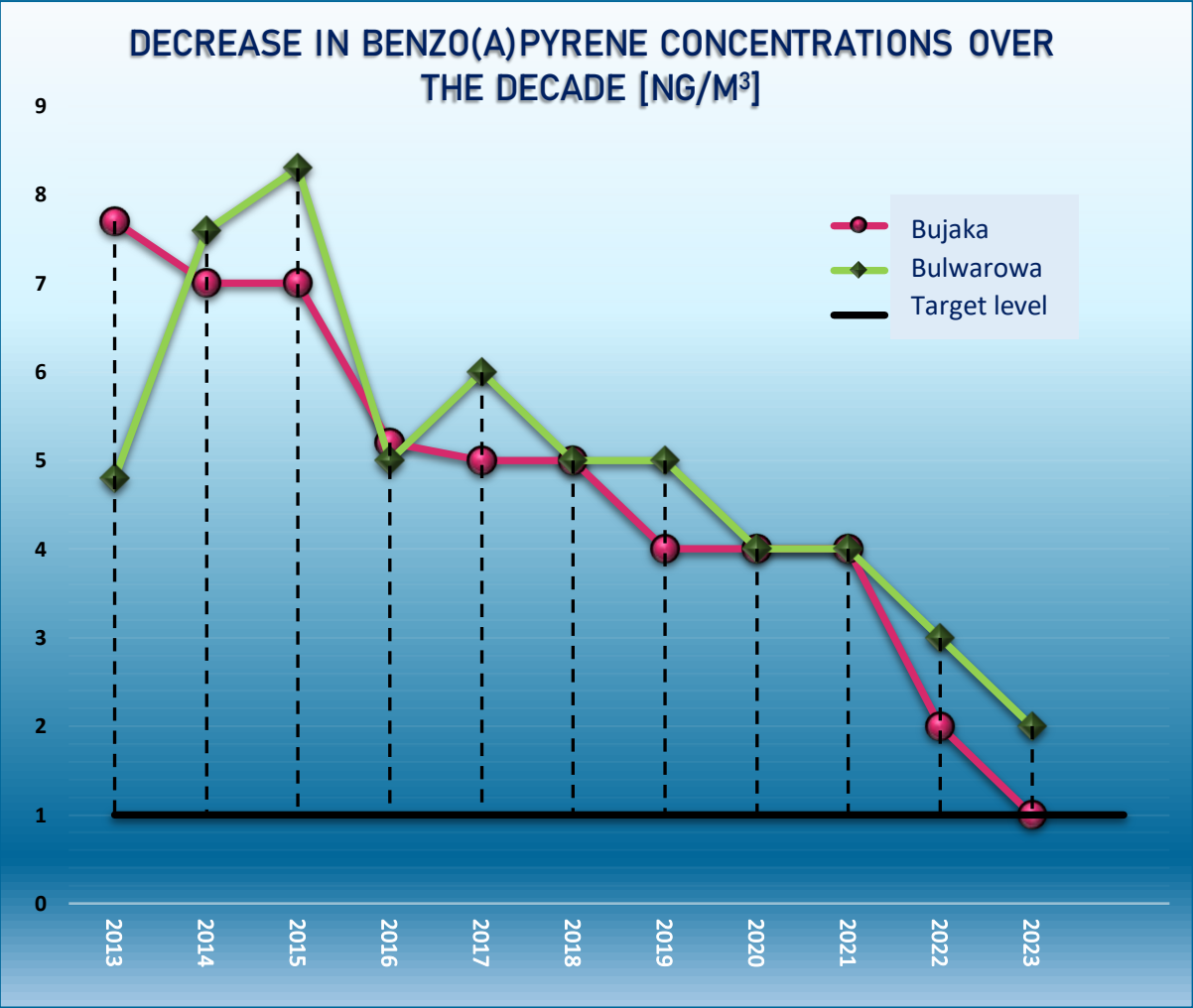
The permitted annual average concentrations of nitrogen dioxide are exceeded mainly in urban agglomerations with high traffic volumes. In Kraków, the problem occurs along the 1.6 km stretch of Aleja Krasińskiego, Aleja Mickiewicza, and Aleja Słowackiego.



The target annual average concentration of benzo(a)pyrene was exceeded over an area of 56 km² (**17.1% of the City's total area**), mainly in Kraków's northern outskirts.



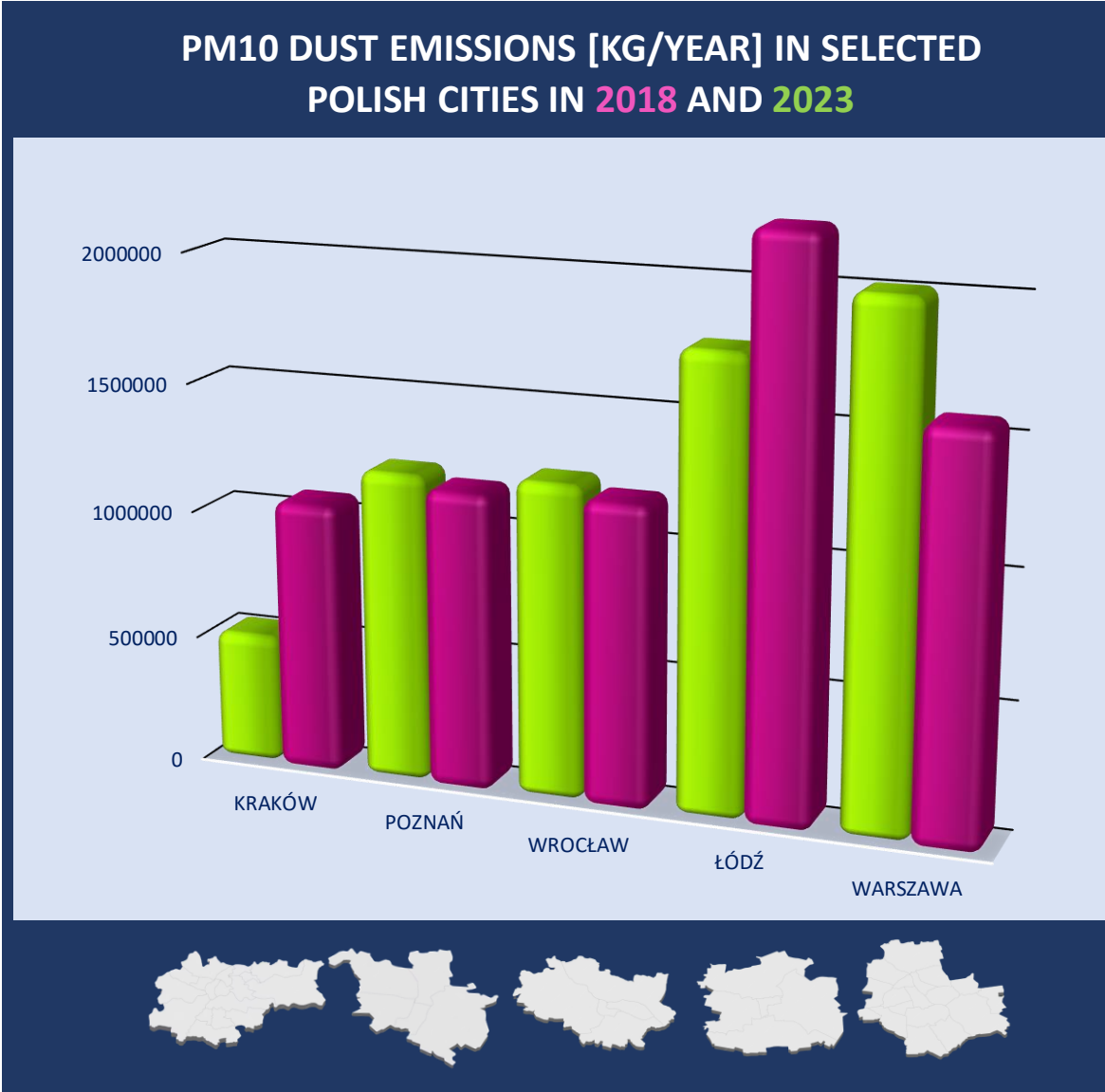
These exceedances are largely related to emissions from solid fuel combustion in the residential and municipal sector, a widespread problem in most of Poland. This is the case in Kraków despite the practically complete elimination of solid fuel combustion in the City.



It should be noted that the classification of a zone is binary - being in category C does not mean that the whole of Kraków has poor air quality. Rather, it indicates the presence of areas where measures need to be introduced and implemented to improve air quality in relation to specific pollutants.

Kraków’s geographical location in a valley surrounded by hills and its low ventilation – due to a high number of windless days – exacerbates pollution dispersion.

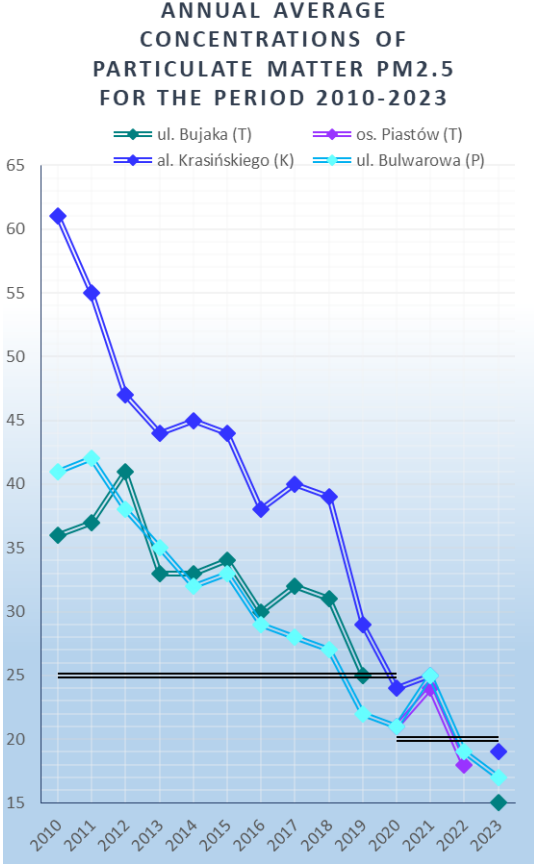
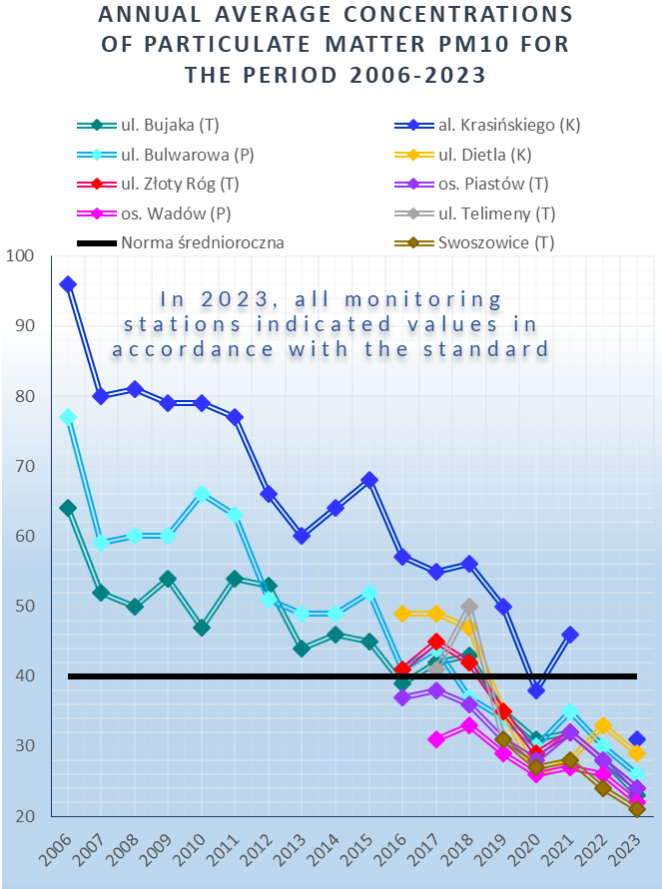
The data analysis shows a clear correlation between emission reductions and lower concentration levels in the air. Hence, when faced with unfavourable meteorological and local factors, efforts to minimise emissions to the extent possible are paramount.



The City’s efforts have led to a significant reduction in both concentrations and emissions of air pollutants. As for PM10 particulate matter, its emissions halved as compared to 2018. Among Poland’s largest cities, Kraków stands out in emission reduction.

The City has consistently implemented measures that gradually lower pollutant levels recorded by monitoring stations. Ongoing broad subsidy and support programmes have played a significant role.

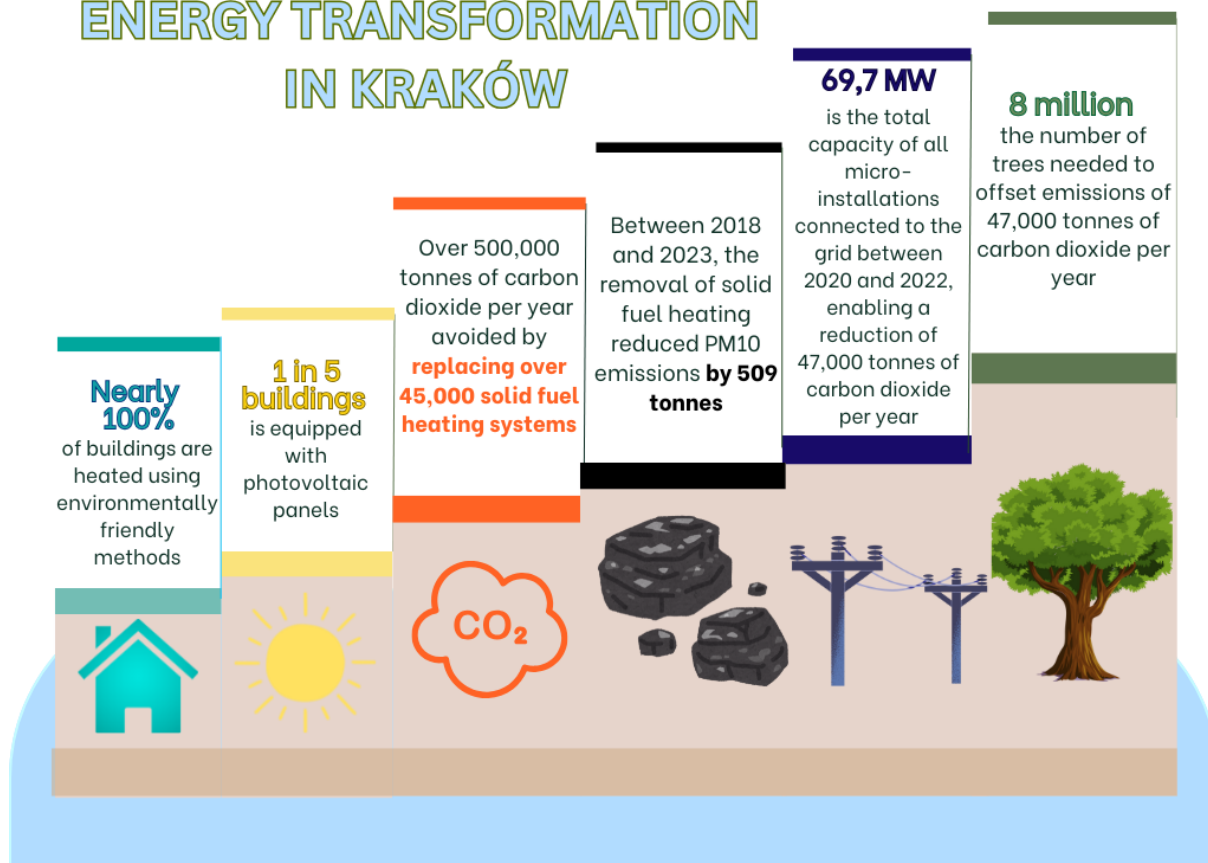
The success was largely driven by the active participation of residents, who, with a strong sense of responsibility and ecological awareness, replaced their heating equipment.



However, our efforts for clean air must continue.

The next challenges include reducing emissions from transport and transboundary sources from neighbouring municipalities. The City will focus on advancing the energy transition to renewable energy sources, improving energy efficiency in buildings, promoting low-carbon transport and electromobility, and mitigating transboundary emissions through active measures within the metropolitan area.

ENERGY TRANSFORMATION IN KRAKÓW



Why the fight for clean air isn't over?

New air quality standards – current measures are insufficient

The European Commission is strengthening air quality standards. The planned update to the Clean Air for Europe (CAFE) Directive aims to align the current regulations with the World Health Organization (WHO) guidelines.

According to the European Commission's plans under the revised Directive, Member States will have to ensure that they take all necessary measures to align air pollution levels in all zones and agglomerations with the new standards. Additionally, Member States must establish effective penalty systems for violations of national legislation adopted under the Directive. The European Commission plans for the new standards to come into force within five years, i.e. as of 2030.

The revised CAFE Directive proposes to tighten two standards for PM10 particulate matter. The first concerns the annual average concentration of this substance. The maximum allowable annual average concentration of PM10 in the air- will be reduced to 20 µg/m³, down from the current standard, which is twice as high at 40 µg/m³.

The standard for daily average concentrations of PM10 will also be revised, from 50 µg/m³ to 45 µg/m³. Additionally, the permissible frequency of exceedances will be reduced from 35 to 18 days per year.

For PM2.5 particulate matter, a new standard will be introduced, which has not previously existed in regulations – a daily concentration limit of 25 µg/m³. The annual average concentration standard for this substance is also tightened by being reduced by half, from 20 µg/m³ to 10 µg/m³.

Pollution	Reference period	EU and Poland currently	New CAFE Directive – 2030	WHO recommendations – 2050
Particulate matter PM10 [µg/m³]	Annual	40	20	15
	24-hour	50 (35 days)	45 (18 days)	45 (3-4) days
Particulate matter PM2.5 [µg/m³]	Annual	20	10	5
	24-hour	—	25 (18 days)	45 (3-4) days
Benzo(a)pyrene [ng/m³]	Annual	1	1	—
Nitrogen dioxide [µg/m³]	Annual	40	20	10
	24-hour	—	50 (18 days)	45 (3-4) days
	1-hour	200 (18 hour)	200 (1 hour)	—

It should be noted that the latest World Health Organization (WHO) guidelines from 2021 are more stringent than those outlined in the CAFE Directive.

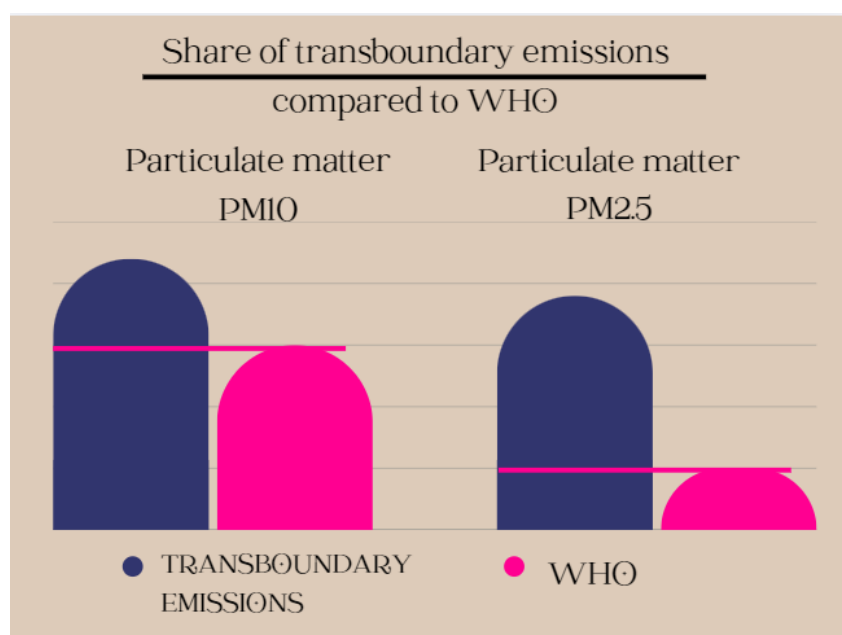
The European Commission’s plan to implement stricter standards highlights the need for more decisive actions to improve air quality, not only in the City and Małopolskie Voivodeship but also across the entire country. Failure to take appropriate steps to meet these standards is not only a breach of national law, but also of obligations binding on all EU Member States. The new European legislation aims to align with WHO standards, which are based on the latest scientific knowledge.

Reducing Kraków's emissions to zero is not enough to meet WHO standards

Although air quality in the Kraków agglomeration has significantly improved in recent years, our efforts for clean air must continue. The total reduction of particulate matter emissions has enabled compliance with national and EU standards but falls short of meeting World Health Organization (WHO) norms.

Recent studies by the WHO highlight the need for even greater reductions in air pollutant concentrations due to their harmful effects on human health and the environment. According to the new Air Protection Programme for Małopolskie Voivodeship, transboundary emissions of PM10 and PM2.5 in Kraków correspond to **144% and 370% of the WHO guidelines**, respectively. As indicated in the Programme, maintaining PM2.5 concentrations at such low levels throughout the year is currently only achievable in the Tatra region.


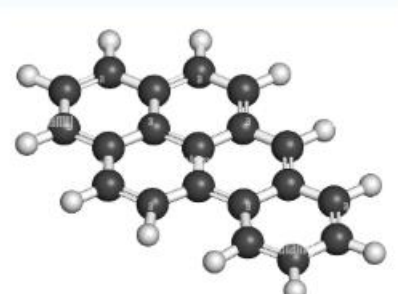
A complete reduction of particulate matter emissions within Kraków will not achieve the level recommended by the WHO, which is exceeded by the amount of transboundary inflow from outside the City. It should also be noted that concentrations in the voivodeship, including the Kraków agglomeration, are also influenced by the national situation. According to the Air Protection Programme, the largest transboundary emissions of particulate matter come from Śląskie Voivodeship. Therefore, it is crucial to take action on multiple regional levels, especially in cooperation with Śląskie Voivodeship, in order to effectively mitigate mutual impacts.



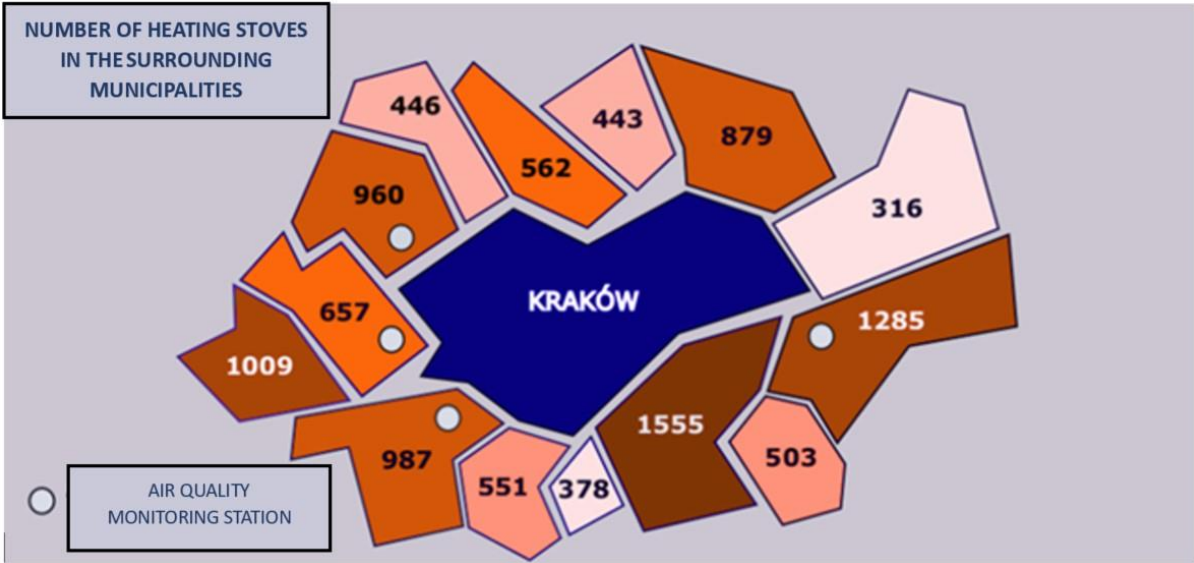
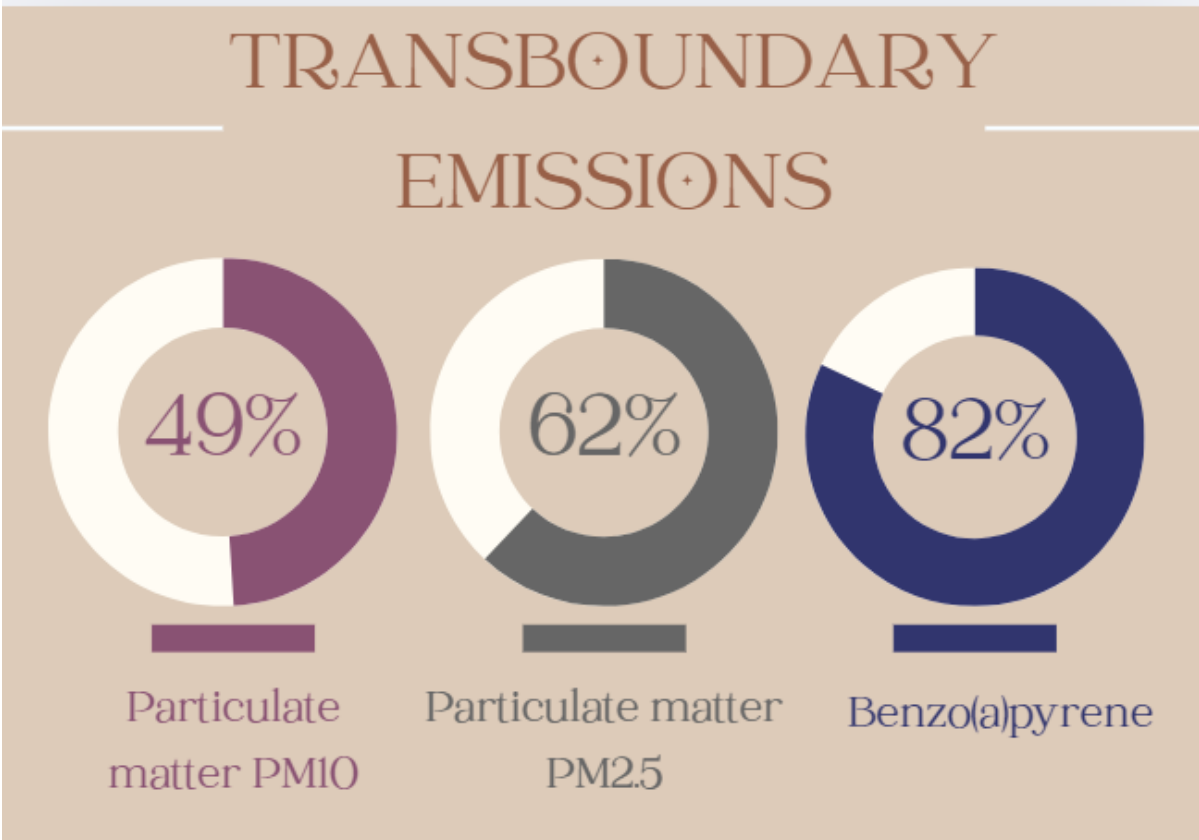
Transboundary emissions as the greatest challenge for Kraków

According to the new Air Protection Programme, Kraków accounts for only half of the PM10 concentration, 38% of the PM2.5 concentration, and less than 20% of the benzo(a)pyrene concentration – the remainder comes from transboundary emissions (based on 2021 data).

Benzo(a)pyrene, a highly carcinogenic substance, accounts for a particularly high proportion of incoming emissions, a pollutant heavily dependent on local sources of fuel combustion, which have been eliminated in Kraków thanks to the enormous efforts of the City's inhabitants. However, with transboundary emissions accounting for approximately 82% of its concentration, reducing local emissions alone will not achieve the target levels. Therefore, action are needed mainly at regional and national level. According to the 2023 Annual Air Quality Assessment for Małopolskie Voivodeship, benzo(a)pyrene exceedances were predominantly occurred along Kraków's northern border. In the northern area adjacent to the Kraków agglomeration, there are no monitoring stations, and air quality assessments rely on mathematical modelling.

<p><i>Carcinogenic</i></p>  <p><i>Strongly linked to local fuel combustion sources</i></p>	<p><i>Benzo(a)pyrene</i></p>  <p><i>Transboundary emissions account for 82% of benzo(a)pyrene concentrations in Kraków</i></p>
---	--

Meanwhile, according to the 2023 Air Protection Programme (POP), the residential and municipal sector in Małopolska accounts for 99% of benzo(a)pyrene emissions, 93% of PM2.5 emissions, and 84% of PM10 emissions.



* Data from the Central Register of Building Emissions (CEEB) for 2023

Raising awareness among residents and regional authorities about the issue can be achieved through monitoring stations, which are currently lacking...

Monitoring stations are a fundamental tool for environmental governance, enabling the identification of risks related to air pollution. They provide crucial information about air quality and its changes over time.

In Kraków, there are eight reference monitoring stations operating as part of the State Environmental Monitoring system.

Out of these eight stations, five were funded from the City's budget.

Of the 14 municipalities around Kraków, only four have air quality monitoring stations, with only three stations measuring PM10 particulate matter and two measuring benzo(a)pyrene, while none of these stations measure PM2.5.

Knowledge about actual air pollution levels enhances environmental awareness. The results of direct measurements have a strong impact on local communities. They provide municipalities with immediate data that can drive more intensive action and greater resident engagement.

Summary



10 out of 12 pollutants met normative values in 2023 in Kraków



The permitted annual average concentration of nitrogen dioxide was exceeded over an area of 0.2 km² (**0.06% of the City's total area**).



The target annual average concentration of benzo(a)pyrene was exceeded over an area of 56 km² (**17.1% of the City's total area**), **mainly in Kraków's northern outskirts**.



Of Poland's five largest cities by population, **Kraków emits the least PM10 particulate matter**



100% of buildings in Kraków are heated using environmentally friendly methods, and one in five has installed photovoltaics



New, stricter air quality standards as early as 2030 under updated CAFE Directive



Failure to take appropriate steps to meet these standards is not only a breach of local law, but also of obligations binding on all EU Member States.



In Kraków, transboundary emissions account for **half** of the PM10 concentration, **62%** of the PM2.5 concentration, and as much as **82%** of the benzo(a)pyrene concentration.



A complete reduction of particulate matter emissions within Kraków is not enough to meet the level recommended by the WHO. Adequate concentrations can be achieved by reducing incoming emissions from outside the city.



Of the 14 municipalities around Kraków, only four have air quality monitoring stations, with only three stations measuring PM10 particulate matter and two measuring benzo(a)pyrene, while **none of these stations measure PM2.5.**

There are eight air quality monitoring stations in



It is essential to intensively reduce transboundary emissions by actively influencing the metropolitan area to accelerate the implementation of anti-smog resolutions for the Małopolska region.

