FREE TO BREATHE?

RANKING CLEAN AIR PROGRESS AND POLICY IN 40 EUROPEAN CITIES

FREE TO BREATHE

CleanCities

This report was written by Clean Cities, hosted by T&E. Clean Cities finds, connects and funds the people transforming our cities globally.

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AIR QUALITY AND TRANSPORT IN EUROPE'S CITIES: NOT THERE YET

Air pollution is Europe's biggest environmental health risk. Nine in 10 Europeans are exposed to levels above the World Health Organization (WHO) air quality guidelines. Cities are where the problem is most concentrated, with road transport being one of the main sources. Cities are also where many solutions lie, and city leaders decide how streets are used and can implement transport measures to improve air quality.

This report examines air pollution in Europe's major cities, how air quality has changed over the past decade, and what cities are doing to make the air cleaner. The ranking compares 40 European cities across four areas:

- **Current levels of air pollution:** Levels of nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$), two pollutants that harm health.
- **Indicative compliance with 2030 limits:** Whether cities would already meet the EU's new limits.
- **Change over time:** How much air quality has improved over the past decade.
- **Action on transport:** Whether the city has introduced low- or zero-emission zones, protected cycle lanes, electric buses and school streets, which are proven as some of the most effective measures to clean the air.

WHAT WE FOUND

Our research shows that Copenhagen, Greater Stockholm and Greater Helsinki are the only cities that achieved an A grade and the only ones (already) meeting all of the EU's upcoming 2030 legal limits for air pollution. Athens and Bucharest rank lowest, and all 11 cities graded E or F are in southern, central or eastern Europe, while the best performing cities are all in northern Europe. Detailed results can be found in Annex 2 or on the Clean Cities website.

None of the 40 cities meet the WHO guidelines for air quality, and only Greater Stockholm meets the annual guidelines for $PM_{2.5}$. This shows the air we breathe is not yet healthy in any of the tested cities. However, progress is happening. Over 10 years, nitrogen dioxide fell on average by more than a third and by more than a quarter for fine particulate matter. Copenhagen, Stockholm and Stuttgart almost halved nitrogen dioxide, while Kraków and Sofia more than halved fine particles.

Action pays off. Cities with stronger transport policies cut nitrogen dioxide the most. Of the 13 cities that cut annual NO_2 levels by more than 40%, 10 have a low-emission zone (LEZ). Many measures are recent, so their full benefits are still to come.

Geography matters, but it is not a barrier to progress. Coastal cities benefit from sea breezes that disperse pollution, yet cities with less favourable terrain can also improve air quality. Stuttgart, which sits in a basin where polluted air tends to get trapped, has introduced measures including a strict low emission zone, and its NO_2 levels have fallen by almost half.

Ambitious action does not have to be costly. Our research shows that cities with fewer resources have also made gains through low-cost measures, such as new cycle lanes and reallocating street space from cars to people through school streets. Inaction, by contrast, comes at a high price: air pollution reduces the EU's economic output by roughly 4% a year, around €600 billion annually, close to Sweden's entire GDP in 2025.

WHAT NEEDS TO BE DONE?

Cities should:

- **Introduce well-designed, enforced low- and zero-emission zones,** both proven tools for cutting air pollution from road transport rapidly.
- **Set a clear vision, timeline and pathway to zero-emission mobility** by the 2030s, with a strong focus on active mobility.
- **Deliver 100% electric bus fleets by the early 2030s,** in line with the EU's regulations encouraging the purchase of zero emission buses, in particular the Clean Vehicle Directive and the CO2 standards.
- **Roll out permanent school streets** at all suitable schools by 2030.
- **Make full use of the measures listed in Annex VIII** of the revised Ambient Air Quality Directive (AAQD), including zero-emission last-mile delivery, car sharing, differentiated parking fees and compact city planning.

National governments should:

- **Transpose the revised AAQD in full and on time,** involving cities and civil society, and aim to meet the 2030 limit values rather than rely on postponement.
- **Give cities the legal powers to introduce and enforce local measures** such as low- and zero-emission zones and school streets.
- **Provide dedicated funding for clean air,** directing EU funds toward vulnerable households and micro-enterprises.
- **Support cities in developing data strategies** that cover all relevant parts of transport and air quality and expand air quality monitoring.

The European Union should:

- **Enforce timely transposition of the AAQD and compliance with the 2030 limit values,** including against air quality plans that are not quantified, funded and time-bound.
- **Create a common, verifiable standard for projections** used to justify postponement deadlines in the upcoming Implementing Decision.
- **Make air quality a key performance target in Sustainable Urban Mobility Plans**, to ensure cities implement proven transport solutions.
- **Commit to further align the AAQD with WHO guidelines,** which are twice as strict as the 2030 limits for $PM_{2.5}$ and NO_2.

With just over three years until the new limits apply, several cities already show that cleaning the air is achievable. Cities need to step up, act now and take bold measures that will deliver healthier streets and healthier lives, and clean air for all.

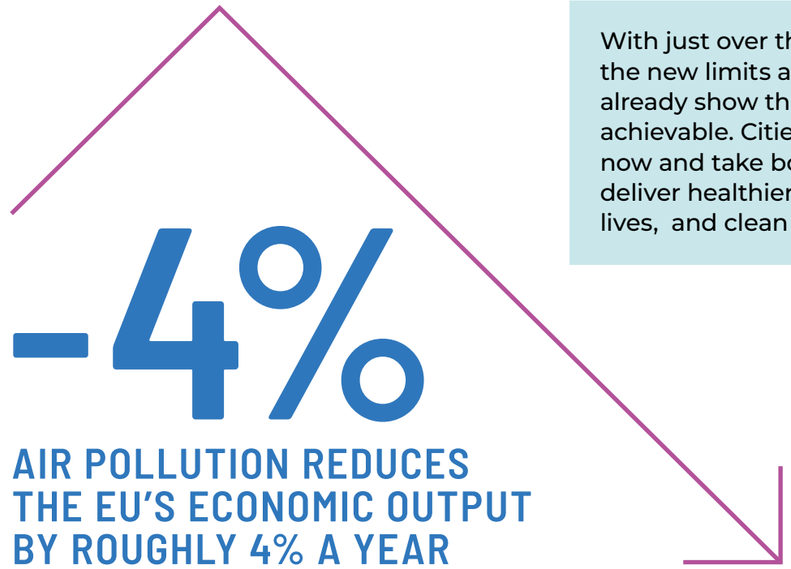


TABLE 1: OVERALL RESULTS

Rank	City name	Grade	Total score (out of 60)	Current AQ levels (out of 30)	Compliance (out of 10)	Relative change (out of 10)	Policies (out of 10)
1	**Copenhagen**	**A**	54.8	27.1	10.0	8.7	9.0
2	**Greater Stockholm**	**A**	50.8	29.8	10.0	6.1	5.0
3	**Greater Helsinki**	**A**	48.9	29.4	10.0	5.5	4.0
4	**Ghent**	**B**	42.0	22.5	5.0	7.5	7.0
5	**Brussels-Capital Region**	**B**	40.8	21.5	5.0	7.3	7.0
6	**Bilbao**	**B**	40.1	23.3	7.5	5.3	4.0
7	**Munich**	**B**	39.4	20.4	5.0	8.0	6.0
8	**Cologne**	**C**	38.9	20.8	5.0	7.1	6.0
9	**Vienna**	**C**	38.8	21.5	5.0	6.3	6.0
10	**Greater Amsterdam**	**C**	38.1	22.2	0.0	6.8	9.0
11	**Berlin**	**C**	36.1	21.1	2.5	7.5	5.0
11	**Hamburg**	**C**	36.1	20.2	5.0	6.8	4.0
13	**Greater Lisbon**	**C**	35.9	21.9	5.0	7.1	2.0
13	**Stuttgart**	**C**	35.9	20.5	2.5	7.9	5.0
15	**Oslo**	**C**	34.9	24.8	0.0	6.1	4.0
16	**Greater London**	**C**	34.1	20.0	0.0	7.2	7.0
17	**Valencia**	**C**	34.0	23.2	2.5	5.3	3.0
18	**Barcelona**	**C**	33.9	18.2	5.0	5.8	5.0
19	**Bratislava**	**C**	33.3	22.0	2.5	6.8	2.0
20	**Dublin**	**C**	33.2	23.6	5.0	2.7	2.0
21	**Antwerp**	**C**	33.1	18.9	0.0	6.1	8.0
22	**Florence**	D	32.5	18.5	5.0	5.0	4.0
23	**Lyon**	D	32.3	18.8	0.0	6.5	7.0
24	**Greater Paris**	D	30.8	17.6	0.0	7.2	6.0
25	**Marseille**	D	30.3	17.4	2.5	6.4	4.0
26	**Madrid**	D	29.9	19.3	2.5	4.2	4.0
27	**Bologna**	D	29.0	16.1	2.5	5.4	5.0
28	**Sofia**	D	28.9	19.0	0.0	6.9	3.0
29	**Ljubljana**	D	27.0	15.9	2.5	6.6	2.0
30	**Budapest**	E	25.6	18.0	0.0	5.6	2.0
31	**Prague**	E	24.2	17.8	0.0	5.4	1.0
32	**Rome**	E	24.0	14.7	0.0	5.3	4.0
33	**Warsaw**	E	23.4	12.9	0.0	5.5	5.0
34	**Wroclaw**	E	22.3	13.9	0.0	5.3	3.0
35	**Kraków**	E	21.7	10.4	0.0	7.3	4.0
36	**Greater Milan**	E	21.3	8.8	0.0	5.4	7.0
37	**Turin**	E	21.0	8.0	0.0	5.9	7.0
38	**Zagreb**	E	19.1	13.6	0.0	4.5	1.0
39	**Bucharest**	F	17.9	10.8	0.0	5.1	2.0
40	**Athens**	F	13.8	10.1	0.0	2.7	1.0

1.

INTRODUCTION



AIR POLLUTION: THE HEALTH CRISIS WE CANNOT SEE

According to the European Environmental Agency (EEA), nine in 10 Europeans are exposed to levels above the World Health Organization (WHO) air quality guidelines. Despite improvements in the past 20 years, air pollution remains the largest environmental health risk in Europe.

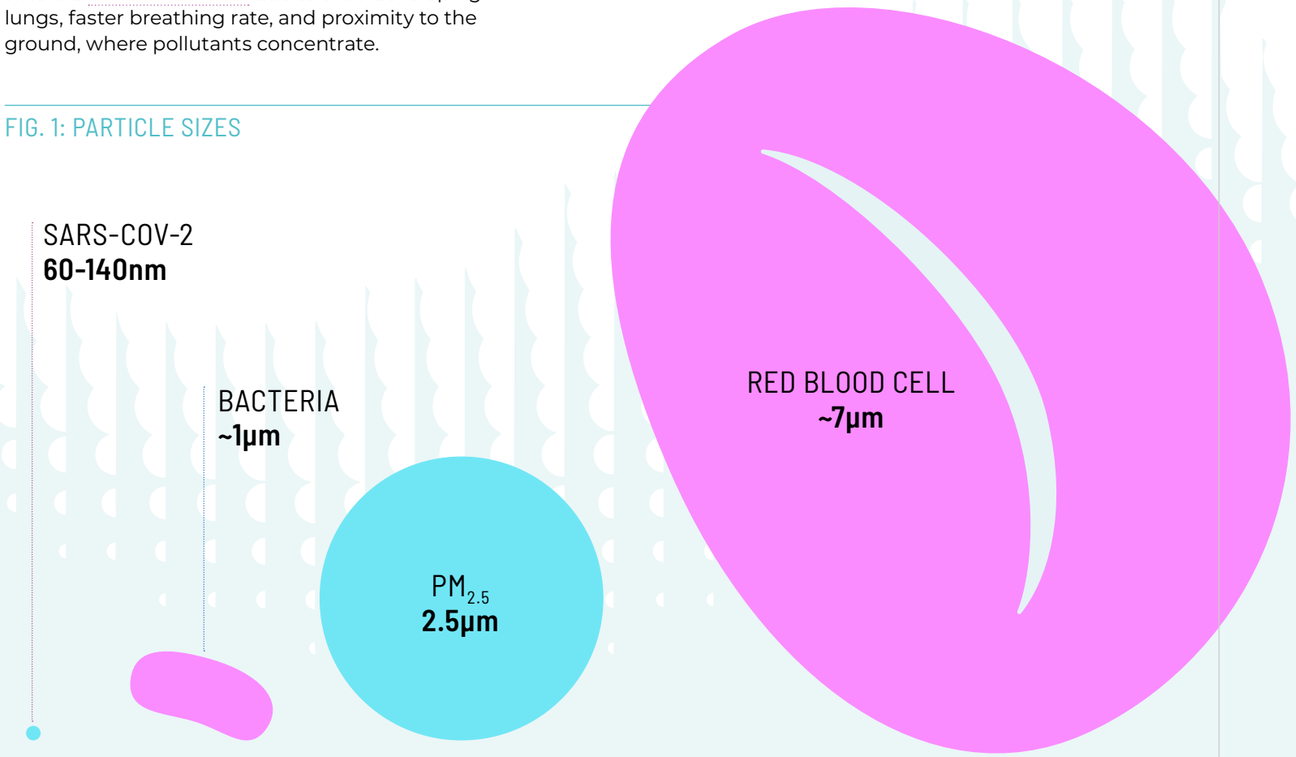
In 2023, more than 330,000 premature deaths in the European Economic Area were attributable to the **long-term exposure** to high levels of fine particulate matter, ozone and nitrogen dioxide, while recent research revealed that even **short-term exposure** to air pollution causes up to 140,000 deaths annually. This is all the more important given the disproportionate effect air pollution has on children, who are more vulnerable due to their developing lungs, faster breathing rate, and proximity to the ground, where pollutants concentrate.

From lungs to heart to brain

When we breathe polluted air, fine particles and gases settle deep in the lungs, where they trigger inflammation. The smallest particles can pass into the bloodstream and travel throughout the body, damaging blood vessels and causing them to narrow and stiffen over time. This can lead to lung disease, heart attacks, strokes and cancer.

For some conditions, such as asthma, the main impact is a loss of health and quality of life. For others, such as ischaemic heart disease and lung cancer, it is premature death. Air pollution is responsible for about one-third of deaths from stroke, chronic respiratory disease and lung cancer, and a quarter of deaths from heart attack.

FIG. 1: PARTICLE SIZES



The full extent of the harm is likely even greater, with emerging evidence suggesting that air pollution may also contribute to diabetes, reproductive health impairment and dementia.

What pollutes the air in cities?

Cities are often hotspots for poor air quality, due to traffic, heating and industry being concentrated in a small area. Burning fossil fuels produces some of the most harmful pollutants for human health: **nitrogen dioxide** (NO_2) and **fine particulate matter** ($PM_{2.5}$).

NO_2 belongs to a group of gases called nitrogen oxides (NO_x). These form when fuel burns at high temperatures, for example inside a vehicle engine, with diesel engines being a particularly large source. Road transport is the primary source of NO_x, causing around half of its emissions in cities.

Particulate matter (PM) consists of tiny particles suspended in the air. It is classified by size: PM_{10} refers to particles of up to 10 micrometres in diameter, and $PM_{2.5}$ to particles of up to 2.5 micrometres, small enough to penetrate deep into the lungs and bloodstream (see Figure 1). PM is released both in the form of exhaust emissions (from tailpipes) and non-exhaust emissions (through wear of brakes, tyres and road surfaces).

Residential heating (especially burning solid fuels) is the largest source of urban $PM_{2.5}$. Road transport is not far behind — in some cities, $PM_{2.5}$ originating from road transport can make up almost a third of the $PM_{2.5}$ urban background concentration levels, or 14% on average, but often much higher in heavy-traffic areas.



Source: Redrawn from Sotirios Papathanasiou: See The Air: Proof that Air Pollution Kills

What are safe levels of air pollution?

There is no safe level of air pollution: health effects have been observed even at very low concentrations. Health authorities do, however, recommend levels below which the risks are considerably reduced. The most authoritative are the World Health Organization's 2021 Air Quality Guidelines. They are not legally binding, but they reflect the latest scientific evidence on the health effects of air pollution.

In the EU, outdoor air quality is primarily regulated by the Ambient Air Quality Directive (AAQD). The standards set in 2008 were far weaker than the WHO's recommendations published in 2021, which played a central role in prompting a revision of the directive in 2024. The revised AAQD tightens the annual limits for $PM_{2.5}$ and NO_2, but they still allow concentrations twice as high as the WHO guidelines (see Figure 2).

Beyond stricter standards, the revised directive strengthens rules on air quality planning, monitoring and public information. It also gives citizens better access to justice and the right to compensation when illegal levels of air pollution have damaged their health. Member States must transpose the new rules into national law by December 2026 and meet the new limits by 2030. The directive also sets the goal of aligning EU standards fully with the WHO guidelines by 2050, with regular reviews of the latest science.

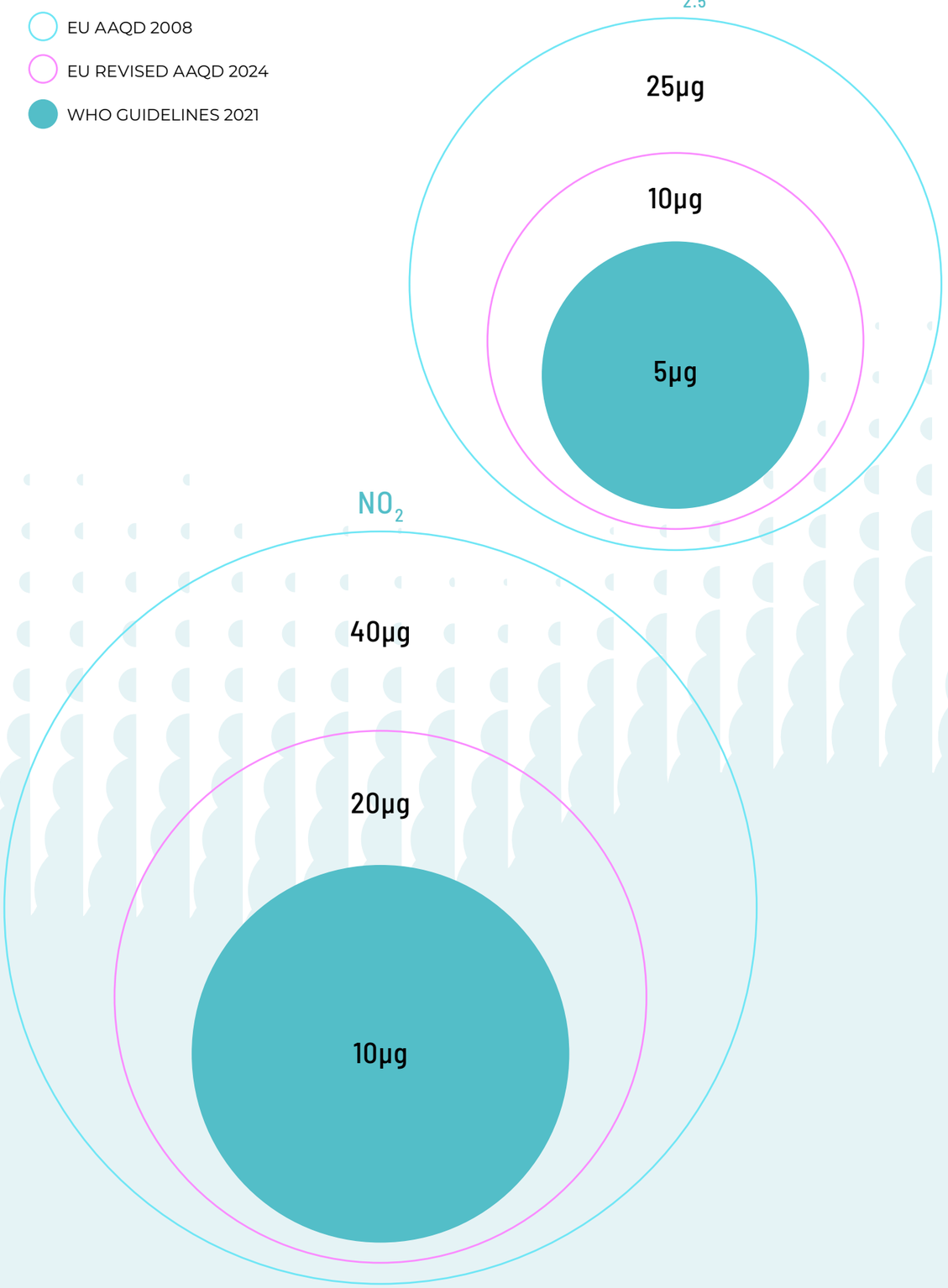
What about ozone and ultrafine particulate matter?

NO_2 and $PM_{2.5}$ are among the most prominent air pollutants caused by road traffic, but not the only ones. Ground-level ozone and ultrafine particles pose a significant risk to human health. Ground-level ozone is currently of particular concern in Southern Europe, where more intense UV light and anticyclones create ideal conditions for ozone to form. Ultrafine particles (smaller than 0.1 micrometres) bypass respiratory defences more easily, penetrating into the bloodstream and brain directly.

However, both are much harder to measure at source: due to the nature of ozone's formation and dispersion, its levels say little about a city's own pollution sources or policies. Ultrafine particles, as pollutants of emerging concern, meanwhile, are newly required to be monitored but not yet regulated, so comparable data across cities is scarce. NO_2 and $PM_{2.5}$, by contrast, are measured consistently across Europe and are closely linked to local sources, such as traffic. This makes them the most reliable indicators for this ranking.

"AIR POLLUTION IS RESPONSIBLE FOR ABOUT A THIRD OF DEATHS FROM STROKE, CHRONIC RESPIRATORY DISEASE AND LUNG CANCER, AND A QUARTER OF DEATHS FROM HEART ATTACK."

FIG. 2: EU AND WHO LIMITS



WHY IS CITY ACTION SO RELEVANT FOR AIR QUALITY?

Air pollution poses a great health risk in cities for two main reasons — high population density (three-quarters of Europeans live in urban areas) as well as a concentration of polluting activities. Much of the NO_2 city residents breathe is emitted locally and can be tackled by cities. $PM_{2.5}$ travels long distances, so a large share comes from outside the city, but urban transport is still a main contributor. Cities usually decide how street space is used, where cars can drive and park, and how public transport is organised. Their dense populations offer ideal conditions for a shift to zero-emission mobility: walking, wheeling and cycling, public and shared transport, and electric vehicles.

Tackling domestic heating and, in port cities, shipping emissions is also crucial, but changing how people move around the city every day usually remains the most effective way for cities to improve air quality, especially for NO_2, of which traffic is the main source. Cities have proven tools to do this, all included in the Annex VIII of the AAQD: low- or zero-emission zones that phase out the use of the most polluting vehicles, parking management and road pricing, electric bus and municipal fleets, and street redesigns that give space back to people, such as school streets and low-traffic neighbourhoods.

"THERE IS NO SAFE LEVEL OF AIR POLLUTION: HEALTH EFFECTS HAVE BEEN OBSERVED EVEN AT VERY LOW CONCENTRATIONS."

2.

HOW WE RANKED CITIES



INDICATOR DEVELOPMENT

The research ranks 40 cities based on four indicators, as set out below. The methodology is described in full detail in Annex 3.

Three quantitative indicators were chosen to reflect:

- Current levels of NO_2 and $PM_{2.5}$,
- Compliance with the revised AAQD rules entering in force in 2030, and
- The relative change over the last 10 years

An additional fourth, qualitative indicator was selected to reflect cities' performance in four transport measures improving air quality. These include whether the city has introduced low- or zero-emission zones, protected cycle lanes, electric buses and school streets. Table 2 opposite provides more detail.

THE CHOICE OF POLICY MEASURES FOR INDICATOR 4

The fourth indicator is composed of four policy measures proven to improve air quality, ranging from easy-to-implement school streets to more complex, city-wide schemes such as low-emission zones. The measures chosen are not an exhaustive list of air-improving measures a city can take, rather, they are a selection from the measures listed in the Annex VIII of the AAQD. It should also be noted that not all of the measures have the same impact on air pollution. This section describes the reasoning behind their inclusion; the full methodology is further described in Annex 3.

- **LEZs** improve health outcomes linked to air pollution, with evidence most pronounced for cardiovascular diseases, but also lung development in children — with a recent study finding that the Ultra Low Emission Zone (ULEZ) allowed for London's children's lungs to catch up on the growth deficit they suffered compared to the control group. Furthermore, LEZs typically result in spillovers in air quality improvements in their neighbouring areas. Compared to LEZs, zero-emission zones (ZEZs) phase out all vehicles with internal combustion engines over time and only allow zero-emission vehicles to enter and circulate in the defined area.
- **Protected cycling infrastructure** and car restricting measures are some of the most important prerequisites of higher levels of urban cycling, resulting in polluting traffic replaced by zero-emission travel. A recent French study reports that a one-unit increase in cycle lane density in the municipality of residence or work increases the probability of bicycle commuting by approximately 21% and 15%, respectively.
- **Bus fleet electrification** cuts emissions from the exhaust tailpipe, particularly valuable in densely populated corridors where repeated acceleration, idling and braking typical for bus operations increases the exposure to pollutants. Almost half of new urban buses registered in the EU in 2024 were battery electric. Research shows that substantial air quality improvements can already be achieved with only 20-40% of the bus fleet electrified.
- **School streets** limit access for motorised traffic in front of schools, often during drop-off and pick-up hours. Besides improving road safety and quality of life, these measures enhance air quality around schools, particularly significant given children are one of the groups most impacted by poor air quality. Data from London shows temporary school streets reduced nitrogen dioxide by up to 23% during morning drop off. In permanent school streets in Paris, NO_2 levels dropped by up to 30%. Strong policies relating to school streets, such as a school street at every school, is critical for city-wide air quality improvements.

CITY SELECTION

Cities included in our research were chosen based on data availability, coverage and quality as well as regional and European significance; the full list is available in Annex 1. Capital and major urban centres were prioritised due to their high population density, maximising the relevance of the ranking for public health. Cities with insufficient monitoring stations or data coverage were excluded.

The territorial units used follow the city classification used by the European Environment Agency (EEA) in its Annual Air Quality Statistics, whereby most cities correspond to the municipality, while some reflect the Greater city area. This information can be found for all cities in Annex 1.

DATA SOURCES AND QUALITY

To make the ranking as transparent and comparable as possible, the three air quality indicators are based on the official Annual Air Quality statistics of the EEA. These are concentrations measured at monitoring stations reporting to the EEA, rather than modelled or population-weighted values. Although monitoring stations may miss pollution hotspots and do not directly measure population exposure, EEA data remain the most authoritative and comparable source for this ranking. In addition, the AAQD requires monitoring stations to be located in such a way as to capture air pollution hotspots.

The data cut-off date for this ranking is 2 October 2026. For all indicators, the latest data available at that date was used. In a few exceptional cases, individual yearly observations missing in some cities for Indicators 1 and 3 were estimated using the available yearly observations and a factor based on the ratio between the available and missing years across all other cities. Where the number of available monitoring stations was found to be less than two stations per year, this was flagged. Information on both can be found in Annex 2.

Data for the fourth indicator, which assesses city policies aimed at improving air quality, was drawn from publicly available sources, including reports by cities and public transport operators, reliable news coverage and local expert knowledge.

SCORING AND GRADING

For each of the four indicators, cities received a score from 0 (lowest) to 10 (highest) points. Because current pollution levels matter most for residents' health, the score for the first indicator was given triple weight (30 points), giving a maximum total of 60 points. The score was then converted into a percentage, with the maximum score corresponding to 100%.

Based on the overall score, cities are assigned a rank from 1 (highest score) to 40 (lowest score). In addition, grades from A (best score) to F (worst score) were assigned based on the percentage score received. The grades group cities with similar performance and overall results together while avoiding overinterpretation of marginal score differences that lead to different ranks.

TABLE 2: THE DESCRIPTION OF THE INDICATORS USED

Indicator	Metric	Description
Indicator 1: The current air quality levels in European cities	The three-year (2023-2025) city-wide mean of NO_2 and $PM_{2.5}$ ($\mu g/m^3$)	The averages are calculated using fixed measurement stations measuring air pollution on both traffic and background urban sites, in a 50-50 ratio to avoid the share of traffic stations biasing the comparison across cities.
Indicator 2: Indicative compliance with the 2030 AAQD rules* *applies to EU cities, London and Oslo are included for comparison only	Pass / Fail for NO_2 and $PM_{2.5}$ levels of the latest fully available year (2025) assessed against the respective AAQD 2030 annual and daily limits, as well as number of daily exceedances allowed.	Compliance is determined by the worst station in the city.
Indicator 3: Relative change of the city-level mean over the last 10 years	The percentage difference between the three-year mean from 2016-18 and three-year mean from 2023-25 of NO_2 and $PM_{2.5}$ ($\mu g/m^3$)	The change was calculated between three-year means from 2016-18 and 2023-25, using the same approach as for Indicator 1.
Indicator 4: The level of cities' initiative in reducing air pollution through proven road transport policies	A composite score on a scale of 0 to 10, based on the performance against four policies, described in more detail in the Annex.	A qualitative score for cities' performance in four key policies: low-/zero-emission zones (LEZ/ZEZ), bus fleet electrification, the provision of protected cycling infrastructure and school streets.

3.

THE RESULTS



OVERALL RESULTS AND INSIGHTS

This chapter summarises the results, interprets key findings and ranks the cities' performance per indicator in the accompanying tables. In addition to the total score, an overall grade (A-F), has been assigned to each city to avoid overinterpretation of marginal score differences. Detailed results can be found in Annex 2 or on the Clean Cities website.

- **Only three cities** (Copenhagen, Greater Helsinki and Greater Stockholm) **meet all four limits of the revised EU Ambient Air Quality Directive (AAQD)** assessed in this ranking: the daily (50 µg/m³) and annual (20 µg/m³) limits for NO_2 and the daily (25 µg/m³) and annual (10 µg/m³) limit for $PM_{2.5}$. No city fully meets the WHO guidelines and only Greater Stockholm meets the annual guideline for $PM_{2.5}$.
- **With just over three years left before the new standards apply,** over 90% of cities (37) fail at least one of the four AAQD limits, and 45% (18) fail all four.
- **Some cities still breach even today's limits.** Several stations, including in Athens and Paris, still record NO_2 levels above the current limit of 40 µg/m³ that was set in 2008.
- **A clear regional divide.** All three A-graded cities are in the Nordics, while all 11 cities graded E or F are in Southern and Central/Eastern Europe.
- **Rapid change is possible.** Several cities have cut pollution by more than a third over the past decade, and some have almost halved it, especially for NO_2. Copenhagen, Greater Stockholm, Stuttgart, Oslo and Greater London stand out for improvements on NO_2, while Kraków and Sofia made large cuts in $PM_{2.5}$, however, for the latter cities the reductions were primarily driven by actions on household heating rather than transport.
- **Ambitious policies pay off.** Cities with higher policy scores have achieved larger NO_2 reductions. Cities with large reductions are also those that invested in air-improving measures, like Stuttgart's LEZ (Umweltzone), Greater London's ULEZ, or Copenhagen's bus electrification. 10 out of 13 cities which cut NO_2 by more than 40% have introduced LEZs.
- **Some cities have stalled.** Athens stands out with the highest NO_2 levels and the slowest progress, with a reduction of under 10% in 10 years. NO_2 fell by less than 20% in Zagreb, Dublin and Sofia, and $PM_{2.5}$ in Madrid fell by just 3.6%.

"WITH JUST OVER THREE YEARS UNTIL THE NEW LIMITS APPLY, SEVERAL CITIES ALREADY SHOW THAT CLEANING THE AIR IS ACHIEVABLE."

What explains the differences?

Geography matters. Coastal cities generally benefit from sea winds that disperse pollution, and cities without surrounding mountains are less prone to the temperature inversions that trap stagnant air near the ground. This is one of the reasons why even cities with cleaner fleets, but surrounded by hills, like Oslo, do not reach the air quality of better located cities such as Greater Stockholm.

But geography is not a barrier to progress. Even in unfavourable locations, the less pollution a city emits, the less can build up in the air. Transport is the main source of pollution, responsible for over 57% of NO_x emissions and 31% of PM emissions in the EU in 2023, so investing in zero-emission transport is one of the most effective ways for any city to improve its air quality.

Cleaner fleets are paying off. Apart from benefiting from their coastal location, the best-performing cities are steadily phasing out diesel. Battery electric vehicles (BEVs) make up 23% of passenger cars in Stockholm, 18% in Copenhagen and 14% in Helsinki. low-emission zones are among the strongest tools cities have to speed up this shift and protect residents from the most polluting vehicles. Stuttgart demonstrates what a well-designed LEZ can achieve: by introducing its zone in 2008 and progressively tightening it, the city cut NO_2 by almost half over the past decade.

Ambitious measures do not need to be costly. The strong correlation between a high BEV share and a high score in this ranking suggests that income plays a role in a city's capacity to fund clean air measures, for instance, by subsidising zero-emission options.

Limited resources, however, do not inhibit effective action. Among cities with the largest air quality gains, common measures include expanding cycling networks (even pop-up infrastructure) and reallocating road space, such as repurposing on-street car parking or delivering school streets; some of the most affordable interventions a city can invest in. Inaction is more costly: air pollution causes annual gross domestic product (GDP) losses of roughly 4% in the EU (the equivalent of annual Swedish GDP), and above 6% in eastern Europe and Italy.

Because air pollution itself depresses economic output, the risk of lower GDP from inaction is a reason cities should prioritise clean air measures rather than postpone them.

A lack of effective policies holds cities back. Two of the three cities with the weakest transport policy scores, Athens and Zagreb, are also the ones who have reduced NO_2 the least. With little time left, they are the cities where action is most urgently needed.

"RAPID CHANGE IS POSSIBLE. SEVERAL CITIES HAVE CUT POLLUTION BY MORE THAN A THIRD OVER THE PAST DECADE, AND SOME HAVE ALMOST HALVED IT, ESPECIALLY FOR NO_2."

TABLE 3: OVERALL RESULTS

Rank	City name	Grade	Total score (out of 60)	Current AQ levels (out of 30)	Compliance (out of 10)	Relative change (out of 10)	Policies (out of 10)
1	**Copenhagen**	**A**	54.8	27.1	10.0	8.7	9.0
2	**Greater Stockholm**	**A**	50.8	29.8	10.0	6.1	5.0
3	**Greater Helsinki**	**A**	48.9	29.4	10.0	5.5	4.0
4	**Ghent**	**B**	42.0	22.5	5.0	7.5	7.0
5	**Brussels-Capital Region**	**B**	40.8	21.5	5.0	7.3	7.0
6	**Bilbao**	**B**	40.1	23.3	7.5	5.3	4.0
7	**Munich**	**B**	39.4	20.4	5.0	8.0	6.0
8	**Cologne**	**C**	38.9	20.8	5.0	7.1	6.0
9	**Vienna**	**C**	38.8	21.5	5.0	6.3	6.0
10	**Greater Amsterdam**	**C**	38.1	22.2	0.0	6.8	9.0
11	**Berlin**	**C**	36.1	21.1	2.5	7.5	5.0
11	**Hamburg**	**C**	36.1	20.2	5.0	6.8	4.0
13	**Greater Lisbon**	**C**	35.9	21.9	5.0	7.1	2.0
13	**Stuttgart**	**C**	35.9	20.5	2.5	7.9	5.0
15	**Oslo**	**C**	34.9	24.8	0.0	6.1	4.0
16	**Greater London**	**C**	34.1	20.0	0.0	7.2	7.0
17	**Valencia**	**C**	34.0	23.2	2.5	5.3	3.0
18	**Barcelona**	**C**	33.9	18.2	5.0	5.8	5.0
19	**Bratislava**	**C**	33.3	22.0	2.5	6.8	2.0
20	**Dublin**	**C**	33.2	23.6	5.0	2.7	2.0
21	**Antwerp**	**C**	33.1	18.9	0.0	6.1	8.0
22	**Florence**	D	32.5	18.5	5.0	5.0	4.0
23	**Lyon**	D	32.3	18.8	0.0	6.5	7.0
24	**Greater Paris**	D	30.8	17.6	0.0	7.2	6.0
25	**Marseille**	D	30.3	17.4	2.5	6.4	4.0
26	**Madrid**	D	29.9	19.3	2.5	4.2	4.0
27	**Bologna**	D	29.0	16.1	2.5	5.4	5.0
28	**Sofia**	D	28.9	19.0	0.0	6.9	3.0
29	**Ljubljana**	D	27.0	15.9	2.5	6.6	2.0
30	**Budapest**	E	25.6	18.0	0.0	5.6	2.0
31	**Prague**	E	24.2	17.8	0.0	5.4	1.0
32	**Rome**	E	24.0	14.7	0.0	5.3	4.0
33	**Warsaw**	E	23.4	12.9	0.0	5.5	5.0
34	**Wroclaw**	E	22.3	13.9	0.0	5.3	3.0
35	**Kraków**	E	21.7	10.4	0.0	7.3	4.0
36	**Greater Milan**	E	21.3	8.8	0.0	5.4	7.0
37	**Turin**	E	21.0	8.0	0.0	5.9	7.0
38	**Zagreb**	E	19.1	13.6	0.0	4.5	1.0
39	**Bucharest**	F	17.9	10.8	0.0	5.1	2.0
40	**Athens**	F	13.8	10.1	0.0	2.7	1.0

INDICATOR 1: CURRENT LEVEL OF AIR POLLUTION

Nitrogen dioxide (NO_2)

NO_2 comes mainly from road transport, so its concentrations depend on how much traffic there is and how polluting the vehicles are. Cities can influence both, and regulating access for the most polluting vehicles has proven particularly effective, as the example of Paris before and after the 2015 introduction of low-emission zone illustrates (Figure 3).

Our results for NO_2 show:

- **Three-year mean NO_2 concentrations range from 10.5 to 37.6** micrograms per cubic metre (µg/m³), with a median of 23.4 µg/m³. This shows a significant difference between cities, demonstrating how much more remains to be done.
- **Not a single city meets the WHO's annual mean concentration limit for NO_2 guideline of 10 µg/m³.** The lowest levels of NO_2 are recorded in Greater Stockholm, Greater Helsinki and Copenhagen, and the highest in Athens, followed by Turin and Bucharest.
- **Two thirds of the cities (28 of 40) would exceed the 2030 EU limit** of 20 µg/m³ based on their three-year mean.
- Several stations across multiple cities, including in **Athens and Paris,** still record annual NO_2 concentrations **above the current EU limit of 40 µg/m³**, which has applied since 2010.

Particulate matter ($PM_{2.5}$)

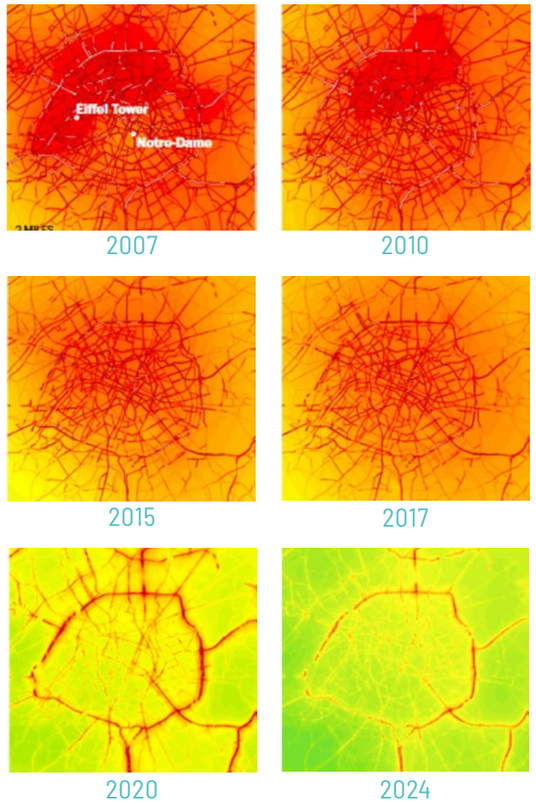
$PM_{2.5}$ levels are less directly linked to the vehicle fleet than NO_2, because several other factors play a major role, notably geography, weather and domestic heating, resulting in clear regional differences in Europe: the Po Valley region, Italy, and Central and Eastern Europe being the most affected. The health toll for the Po Valley population is severe: in the Milan metropolitan area, more than 5,000 deaths a year could be avoided if $PM_{2.5}$ levels met the WHO guideline.

Kraków, on the other hand, shows what determined action can achieve: its decarbonisation of domestic heating culminating in a 2019 ban on burning solid fuels is estimated to have averted at least 6,000 premature deaths and is associated with a sharp drop in asthma. However, transport and emissions from the neighbouring municipalities keep Kraków's pollution high. This shows that even where heating or geography dominate, tackling the $PM_{2.5}$ pollution from traffic remains essential.

Our results for $PM_{2.5}$ show:

- **Three-year mean $PM_{2.5}$ concentrations range from 4.7 to 19.5 µg/m³,** with a median of 10.4 µg/m³, just above the 2030 EU limit of 10 µg/m³.
- **More than 60% of the cities** (25 out of 40) **exceed this limit.**
- As with NO_2, the lowest levels are found in Greater Stockholm and Greater Helsinki. The highest concentrations are observed in Greater Milan, Turin and Kraków, almost **twice** the 2030 EU limit.

FIG. 3: NO_2 CONCENTRATIONS IN PARIS OVER TIME



Source: Airparif

TABLE 4. CITIES RANKED ON THEIR THREE-YEAR MEAN CONCENTRATIONS OF NO_2 AND $PM_{2.5}$

Rank	City name	Score (out of 30)	NO_2 concentration (µg/m³)	$PM_{2.5}$ concentration (µg/m³)
1	Greater Stockholm	29.8	10.5	4.7
2	Greater Helsinki	29.4	10.7	5.4
3	Copenhagen	27.1	12.5	7.3
4	Oslo	24.8	17.0	7.3
5	Dublin	23.6	19.5	7.3
6	Bilbao	23.3	17.2	9.1
7	Valencia	23.2	14.6	11.0
8	Ghent	22.5	17.9	9.7
9	Greater Amsterdam	22.2	19.7	8.9
10	Bratislava	22.0	16.0	11.6
11	Greater Lisbon	21.9	23.2	7.0
12	Brussels-Capital Region	21.5	21.3	8.8
12	Vienna	21.5	19.5	10.1
14	Berlin	21.1	19.0	10.9
15	Cologne	20.8	21.6	9.6
16	Stuttgart	20.5	23.4	8.7
17	Munich	20.4	24.2	8.4
18	Hamburg	20.2	23.3	9.2
19	Greater London	20.0	23.4	9.4
20	Madrid	19.3	23.9	10.1
21	Sofia	19.0	22.7	11.2
22	Antwerp	18.9	24.4	10.2
23	Lyon	18.8	24.4	10.3
24	Florence	18.5	21.3	12.8
25	Barcelona	18.2	23.8	11.6
26	Budapest	18.0	23.7	11.8
27	Prague	17.8	21.7	13.5
28	Greater Paris	17.6	26.6	10.5
29	Marseille	17.4	27.4	10.2
30	Bologna	16.1	24.8	13.7
31	Ljubljana	15.9	24.9	13.9
32	Rome	14.7	29.4	12.4
33	Wrocław	13.9	26.0	15.8
34	Zagreb	13.6	30.8	13.0
35	Warsaw	12.9	28.8	15.3
36	Bucharest	10.8	32.2	15.8
37	Kraków	10.4	31.1	17.1
38	Athens	10.1	37.6	13.2
39	Greater Milan	8.8	30.5	19.5
40	Turin	8.0	33.4	18.7

INDICATOR 2: INDICATIVE COMPLIANCE WITH THE AAQD

The AAQD sets both annual and daily limits for NO_2 and $PM_{2.5}$, providing the four categories that make up this indicator. The daily limits may be exceeded on no more than 18 days per year, and a city is considered compliant only if all of its monitoring stations meet the given limit. Additionally, a limit is also set for NO_2 hourly exposure, but this is excluded from the ranking because daily and annual averages are less sensitive to short-term pollution peaks and are stronger predictors of health risk. Applying the 2030 limits to the current data, over 90% of cities (37 of 40) fail at least one of the four, and 45% (18) fail all four, with just over three years left before the new rules apply.

Only three of 40 major European cities would meet both daily and annual limits for NO_2 and $PM_{2.5}$ as defined in the revised AAQD today: Copenhagen, Greater Stockholm and Greater Helsinki. No city fully meets the WHO guidelines (the closest we have to 'safe' levels of air pollution) and only Greater Stockholm meets the guideline's annual limit for $PM_{2.5}$.

TABLE 5. NUMBER OF CITIES COMPLYING WITH THE AAQD DAILY AND ANNUAL LIMITS FOR NO_2 AND $PM_{2.5}$.

	NO_2	$PM_{2.5}$
Daily limits	14 cities	16 cities
Annual limits	4 cities	9 cities



TABLE 6. CITIES RANKED ON THEIR COMPLIANCE WITH THE AAQD'S 2030 LIMITS

Rank	City name	Score (out of 10)	NO2 - annual	NO2 - 24h	PM2.5 - annual	PM2.5 - 24h
1	Greater Stockholm	10.0	Pass	Pass	Pass	Pass
1	Greater Helsinki	10.0	Pass	Pass	Pass	Pass
1	Copenhagen	10.0	Pass	Pass	Pass	Pass
4	Bilbao	7.5	Fail	Pass	Pass	Pass
5	Dublin	5.0	Fail	Fail	Pass	Pass
5	Ghent	5.0	Pass	Pass	Fail	Fail
5	Greater Lisbon	5.0	Fail	Fail	Pass	Pass
5	Brussels-Capital Region	5.0	Fail	Fail	Pass	Pass
5	Vienna	5.0	Fail	Pass	Fail	Pass
5	Cologne	5.0	Fail	Pass	Fail	Pass
5	Munich	5.0	Fail	Fail	Pass	Pass
5	Hamburg	5.0	Fail	Fail	Pass	Pass
5	Florence	5.0	Fail	Pass	Fail	Pass
5	Barcelona	5.0	Fail	Pass	Fail	Pass
15	Valencia	2.5	Fail	Pass	Fail	Fail
15	Bratislava	2.5	Fail	Pass	Fail	Fail
15	Berlin	2.5	Fail	Pass	Fail	Fail
15	Stuttgart	2.5	Fail	Fail	Fail	Pass
15	Madrid	2.5	Fail	Fail	Fail	Pass
15	Marseille	2.5	Fail	Fail	Fail	Pass
15	Bologna	2.5	Fail	Pass	Fail	Fail
15	Ljubljana	2.5	Fail	Pass	Fail	Fail
23	Oslo	0.0	Fail	Fail	Fail	Fail
23	Greater Amsterdam	0.0	Fail	Fail	Fail	Fail
23	Greater London	0.0	Fail	Fail	Fail	Fail
23	Sofia	0.0	Fail	Fail	Fail	Fail
23	Antwerp	0.0	Fail	Fail	Fail	Fail
23	Lyon	0.0	Fail	Fail	Fail	Fail
23	Budapest	0.0	Fail	Fail	Fail	Fail
23	Prague	0.0	Fail	Fail	Fail	Fail
23	Greater Paris	0.0	Fail	Fail	Fail	Fail
23	Rome	0.0	Fail	Fail	Fail	Fail
23	Wrocław	0.0	Fail	Fail	Fail	Fail
23	Zagreb	0.0	Fail	Fail	Fail	Fail
23	Warsaw	0.0	Fail	Fail	Fail	Fail
23	Bucharest	0.0	Fail	Fail	Fail	Fail
23	Kraków	0.0	Fail	Fail	Fail	Fail
23	Athens	0.0	Fail	Fail	Fail	Fail
23	Greater Milan	0.0	Fail	Fail	Fail	Fail
23	Turin	0.0	Fail	Fail	Fail	Fail

INDICATOR 3: RELATIVE CHANGE OVER 10 YEARS

Tracking how much air pollution has fallen over the past decade shows what is achievable, and how far cities still need to go to comply with the revised directive by 2030. Europe's air has already improved substantially; between 2003 and 2023, emissions of nitrogen oxides (NO_x) more than halved. This is largely thanks to stricter vehicle emission standards, fleet renewal and local measures. Road transport emissions across Europe have fallen by 40% for NO_x and 34% for $PM_{2.5}$. Notably, many of the cities with the largest improvements have low-emission zones.

Changes in levels of NO_2

Our results show:

- **Average reduction across all cities: 35.1%,** broadly in line with the fall in road transport emissions across Europe.
- **The biggest reductions, of almost 50%, were observed in Copenhagen, Greater Stockholm and Stuttgart.** Stuttgart is a good example for the effectiveness of low-emission zones. The LEZ was introduced in 2008 and progressively tightened, banning diesel Euro 5 vehicles from entry already in 2019.
- **A further 10 cities cut NO_2 by more than 40%,** seven of them with a LEZ.
- **Progress has been slowest in Athens,** with a reduction of less than 10%, followed by Zagreb, Dublin and Sofia, all under 20%.

Changes in levels of $PM_{2.5}$

Changes in $PM_{2.5}$ are harder to attribute to road transport, as heating but also industrial and agricultural emissions, weather conditions and regional sources play an equally important role. Our results show:

- **The average reduction of $PM_{2.5}$ across all cities is 27.6%.**
- **Kraków and Sofia cut $PM_{2.5}$ by more than 50%,** and Lisbon and Copenhagen by more than 40%.
- **Madrid made the least progress,** cutting $PM_{2.5}$ by less than 4%.

Across both pollutants, Copenhagen made the most progress, followed by Munich and Stuttgart. The results demonstrate that **ambitious policies pay off.** Stuttgart's LEZ, London's Ultra Low Emission Zone and Copenhagen's combination of cycling-friendly urban planning and electrification have all delivered large reductions over the past decade.

Although Amsterdam has made substantial progress in reducing road transport emissions, other sources have led to a smaller fall in air pollution than in comparable cities. NO_2 reductions have been limited by emissions from shipping and aviation, and $PM_{2.5}$ reductions by emissions from industry and agriculture, largely originating outside the city region.

"BETWEEN 2003 AND 2023, EMISSIONS OF NITROGEN OXIDES IN THE EU MORE THAN HALVED. THIS IS LARGELY THANKS TO STRICTER VEHICLE EMISSION STANDARDS, FLEET RENEWAL AND LOCAL MEASURES."

TABLE 7. CITIES RANKED ON RELATIVE CHANGE OVER THE LAST 10 YEARS IN NO_2 AND $PM_{2.5}$ LEVELS

Rank	City	Score (out of 10)	NO_2 % change (2016-18 vs 2023-25)	$PM_{2.5}$ % change (2016-18 vs 2023-25)
1	Copenhagen	8.7	49.4	40.6
2	Munich	8.0	45.6	36.9
3	Stuttgart	7.9	47.9	33.4
4	Ghent	7.5	43.5	33.3
4	Berlin	7.5	42.2	34.7
6	Kraków	7.3	25.9	51.2
6	Brussels-Capital Region	7.3	41.4	33.4
8	Greater Paris	7.2	41.7	32.2
8	Greater London	7.2	46.3	27.1
10	Cologne	7.1	39.9	33.3
10	Greater Lisbon	7.1	28.3	45.8
12	Sofia	6.9	18.8	54.2
13	Hamburg	6.8	36.9	33.7
13	Greater Amsterdam	6.8	39.2	31.1
13	Bratislava	6.8	44.8	24.7
16	Ljubljana	6.6	35.1	32.7
17	Lyon	6.5	38.9	28.0
18	Marseille	6.4	38.4	27.4
19	Vienna	6.3	33.2	31.7
20	Antwerp	6.1	34.6	28.5
20	Oslo	6.1	46.3	15.6
20	Greater Stockholm	6.1	49.4	11.7
23	Turin	5.9	31.5	29.7
24	Barcelona	5.8	35.5	23.5
25	Budapest	5.6	29.9	27.6
26	Greater Helsinki	5.5	43.3	12.3
26	Warsaw	5.5	21.6	35.7
28	Greater Milan	5.4	33.1	22.3
28	Bologna	5.4	32.9	22.3
28	Prague	5.4	29.1	26.3
31	Wrocław	5.3	23.0	32.6
31	Valencia	5.3	41.4	12.0
31	Rome	5.3	35.1	18.7
31	Bilbao	5.3	40.0	13.3
35	Bucharest	5.1	27.5	25.3
36	Florence	5.0	37.2	13.5
37	Zagreb	4.5	11.9	35.7
38	Madrid	4.2	37.8	3.6
39	Athens	2.7	9.3	19.6
39	Dublin	2.7	17.1	10.1

INDICATOR 4: POLICY MEASURES

Four policy measures have been assessed across the 40 cities. These include whether the city has introduced low- or zero-emission zones, protected cycle lanes, electric buses and school streets. These measures were selected given they are proven to reduce air pollution from road transport, with LEZ/ZEZ being one of the most effective measures overall.

Cities with higher policy scores that implemented effective air quality measures have achieved larger reductions in NO_2 over the past decade (see Annex 2). This demonstrates that ambitious policies can lead to the desired results. It also highlights that these policies play an essential role in cities meeting the 2030 limits.

For some regions, the full impact of these policies is likely still to come: many measures, such as recently tightened low-emission zones, newly electrified bus fleets and new school streets were introduced only in recent years, and their effects will take time to show in the data. This also explains why policy scores, as set out in indicator 4, and current pollution levels, as set out in indicator 1, don't necessarily align. In addition, some regions with historically high levels of pollution have more work to do, with city leaders having to play catch up.

LEZ/ZEZ

- Greater Amsterdam is the only city in our sample with zero-emission zone for freight (ZEZ-F), earning it the highest score. 20 other Dutch cities implemented a ZEZ-F, while eight others committed to one. Copenhagen and Stockholm are in the process of establishing one, while other cities are working on similar plans.

- Nine cities have no LEZ at all: Athens, Bratislava, Budapest, Dublin, Hamburg, Ljubljana, Oslo, Prague and Zagreb. Helsinki has one for public buses and garbage trucks only.

Protected cycling infrastructure

- Only six cities have protected cycle lanes on more than 60% of their main roads: Greater Amsterdam, Antwerp, Copenhagen, Greater Helsinki, Munich and Greater Stockholm.

- In Athens, Bucharest, Prague, Rome and Sofia, less than 10% of main roads have protected cycling infrastructure.

Bus electrification

- Non-polluting bus fleets are encouraged in the EU: under the EU's CO_2 standards for heavy-duty vehicles, 90% of new urban buses sold must be zero-emission by 2030, rising to 100% by 2035. Alongside this target for manufacturers, the Clean Vehicles Directive sets national minimum targets for clean buses in public procurement, with at least half of those buses required to be zero-emission.

- In spring 2026, Copenhagen became the first EU capital with a fully electric bus fleet, while Oslo, outside the EU, has an almost fully electric bus fleet. Other leading cities are Greater Amsterdam (72%), Greater Helsinki (56%) and Turin (44%).

- On average, 27% of bus fleets in the cities studied are battery electric or trolley buses.

School streets

- Paris has consistently led the way on child-friendly streets, with school streets in front of more than a third of its primary schools. Greater London, Vienna, Turin and Antwerp follow, each with school streets at more than a fifth of their primary schools.

- 10 cities have a school street at one in 10 primary schools or more, but 10 of the 40 cities have none at all.

TABLE 8. CITIES RANKED ON THEIR AIR-IMPROVING POLICIES MEASURES

City name	Score (out of 10)	LEZ/ ZEZ (score out of 4)	Protected cycling infrastructure (score out of 2)	Bus electrification (score out of 2)	School streets (score out of 2)
Copenhagen	9	3	2	2	2
Greater Amsterdam	9	4	2	2	1
Antwerp	8	3	2	1	2
Brussels-Capital Region	7	3	1	1	2
Ghent	7	3	1	1	2
Greater London	7	3	0	2	2
Greater Milan	7	2	1	2	2
Lyon	7	3	1	1	2
Turin	7	2	1	2	2
Munich	6	2	2	1	1
Greater Paris	6	2	1	1	2
Cologne	6	2	1	2	1
Vienna	6	2	1	1	2
Stuttgart	5	3	1	1	0
Berlin	5	2	1	1	1
Greater Stockholm	5	2	2	1	0
Barcelona	5	2	1	1	1
Warsaw	5	2	1	1	1
Bologna	5	2	1	1	1
Kraków	4	2	1	1	0
Hamburg	4	0	1	2	1
Marseille	4	2	0	1	1
Oslo	4	0	1	2	1
Greater Helsinki	4	0	2	2	0
Rome	4	2	0	1	1
Bilbao	4	2	0	1	1
Florence	4	2	1	1	0
Madrid	4	2	0	1	1
Sofia	3	2	0	1	0
Wrocław	3	1	1	0	1
Valencia	3	2	1	0	0
Greater Lisbon	2	2	0	0	0
Bratislava	2	0	0	1	1
Ljubljana	2	0	1	1	0
Budapest	2	0	0	1	1
Bucharest	2	1	0	1	0
Dublin	2	0	1	1	0
Prague	1	0	0	0	1
Zagreb	1	0	0	1	0
Athens	1	0	0	1	0

4.

CONCLUSIONS AND POLICY RECOMMENDATIONS

OUR CONCLUSIONS

EUROPE'S AIR IS IMPROVING, BUT STILL FAR FROM HEALTHY

Air pollution remains the biggest environmental health threat in Europe, causing hundreds of thousands of premature deaths every year and placing heavy pressure on health systems, e.g. through heart and lung disease.

The EU's revised Ambient Air Quality Directive sets stricter binding limits for NO_2 and $PM_{2.5}$, but even these remain twice as high as the WHO's evidence-based guidelines, leaving the vast majority of Europe's city dwellers breathing harmful air. As cities are pollution hotspots, and hold many of the most effective levers, city action is one of the most powerful paths to cleaner air.

MOST CITIES STILL FALL SHORT, WITH A HIGH COST FOR PUBLIC HEALTH

Our ranking reveals large differences across the 40 cities. Copenhagen, Greater Helsinki and Greater Stockholm lead with an A grade, while Athens and Bucharest sit at the bottom with an F. 29 cities achieved a grade of D or better, but achieving a passing grade in our ranking is not the same as respecting the law.

Only Copenhagen, Greater Helsinki and Greater Stockholm meet all four 2030 limits, and no city fully meets the WHO guidelines. Over 90% of cities (37) fail at least one limit and 45% (18) fail all four, with barely three years left before the new standards apply. For millions of residents, this gap means continued exposure to pollution that damages health.

CITY ACTION CAN ACCELERATE PROGRESS

Major reductions in NO_2 and $PM_{2.5}$ over the last decade in cities like Stuttgart, Copenhagen, or London point to the success of decisive interventions, such as strict low-emission zones, investments in safe cycling infrastructure or bus electrification.

The best performing city in this ranking, Copenhagen, completed the switch to a fully electric bus fleet in 2026, has a well-functioning LEZ with a prospect for a ZEZ, while nine of the 40 cities in our sample have no LEZs at all. Our results show that this gap matters: cities with stronger transport policies achieved larger NO_2 reductions over the past decade, while those with the weakest policies made the least progress and remain furthest from the 2030 limits. Accelerating targeted transport policies is therefore one of the most effective ways for cities to secure clean, breathable air.

POLICY RECOMMENDATIONS

Based on the findings of this research, Clean Cities proposes the following policy recommendations:

CITIES:

- **Low- and zero-emission zones:** Well-designed and enforced zones are the most effective measure we considered. A proven tool for clean air, they achieve quick cuts in pollutants. Low-emission zones going beyond Euro 5 restrictions on diesel vehicles are more beneficial, and increasing the ambition further to zero-emission zones would be most advantageous for reducing the health risk posed by air pollution.

- **More support for active mobility:** Cities must have a clear vision, timeline and pathway for fully transitioning to all forms of zero-emission mobility by the 2030s, with a strong focus on active mobility. Investing in protected cycling infrastructure, walkability, or greenery providing shade during heatwaves are essential steps to encourage active travel and reduce car dependence.

- **Deliver a 100% electric bus fleet by the early 2030s:** Because buses run long distances in dense urban areas, electrifying diesel bus fleets can substantially cut roadside NO_x and $PM_{2.5}$ exposure. Research indicates that a critical share of the vehicle fleet needs to be electrified for it to have a meaningful impact on air quality. Copenhagen and Oslo are showing 100% bus fleet electrification is not a distant goal, while Zaragoza, Turin or the newest data from Germany make clear that bus electrification is not reserved to Nordic capitals.

- **School streets for every school:** Launch a city-wide school streets programme to equip all suitable schools with permanent school streets by 2030, protecting those most vulnerable to polluted air.

- **Leverage other local measures indicated in the AAQD:** Cities should fully utilise the measures outlined in Annex VIII of the AAQD to curb urban pollution.. Other key actions include establishing zero-emission 'last-mile' delivery arrangements, promoting car sharing and carpooling, applying differentiated parking fees, and planning for compact cities.

NATIONAL GOVERNMENTS:

- **Transpose the revised AAQD in full and on time.** Involve cities, the public and civil society in both the transposition and the preparation of air quality plans and roadmaps. Assign clear responsibilities between national and local authorities, and work with cities so that every measure in a roadmap is quantified, funded and time-bound. Aim to meet the 2030 limit values rather than relying on postponement.

- **Give cities the legal powers to act.** Cities are expected to deliver on national and EU air quality obligations, yet they sometimes lack the powers to do so. Adapt national laws so that cities can introduce and enforce the measures that suit their local context, such as low- and zero-emission zones or school streets.

- **Equip cities with dedicated funding for clean air.** To achieve zero-emission mobility and meet stricter AAQD limits, cities need targeted financial support. National governments must combine all available instruments to back urban authorities. Importantly, governments must deploy EU funding (from their national Social Climate Plans and National and Regional Partnership Plans). Directing these funds toward vulnerable households and micro-enterprises by expanding public transport, active travel, and shared mobility options ensures the transition is both adequately financed and socially fair.

- **Measure the right data and monitor progress.** Support cities in developing data strategies that cover all relevant parts of transport and air quality, so they can measure where they stand and track their progress. Expand air quality monitoring networks to capture pollution where people live, walk and go to school.

EUROPEAN UNION:

- **Enforce timely transposition and compliance with the 2030 limit values.** The Commission must ensure Member States transpose the AAQD on time and comply with the 2030 limit values. It should use its enforcement powers where Member States' air quality plans and roadmaps are not quantified, funded and time-bound.

- **Create a common, verifiable standard for projections that justify postponement.** In its upcoming AAQD Implementing Decision, the European Commission should set one stringent EU-wide standard for the projections that Member States may use to justify postponing an air quality deadline. It should give priority to measures that are effective in protecting public health and give all Member States the same background assumptions, clear rules for building and testing their forecasts.

- **Make air quality a key performance target in Sustainable Urban Mobility Plans.** By 2027, major transport hub cities must adopt Sustainable Urban Mobility Plans (SUMPs) or risk losing access to EU funding for infrastructure projects. The European Commission should use this opportunity to ensure that SUMPs are linked to measures that reduce air pollution and put cities in compliance with new EU air quality rules.

- **Commit to further align the AAQD with WHO guidelines.** WHO health-based guidelines for annual limits of key pollutants like $PM_{2.5}$ and NO_2 are twice as strict as the new 2030 AAQD limits. The Commission must therefore commit to further legislative work toward full alignment.

ANNEXES

ANNEX 1

TABLE 9. CITIES INCLUDED IN THE CITY RANKING

City name	Administrative unit	Country
Antwerp	Municipality	Belgium
Athens	Municipality	Greece
Barcelona	Municipality	Spain
Berlin	Municipality	Germany
Bilbao	Municipality	Spain
Bologna	Municipality	Italy
Bratislava	Municipality	Slovakia
Brussels-Capital Region	Greater city/Region	Belgium
Bucharest	Municipality	Romania
Budapest	Municipality	Hungary
Cologne	Municipality	Germany
Copenhagen	Municipality	Denmark
Dublin	Municipality	Ireland
Florence	Municipality	Italy
Ghent	Municipality	Belgium
Greater Amsterdam	Greater city	Netherlands
Greater Helsinki	Greater city	Finland
Greater Lisbon	Greater city	Portugal
Greater London	Greater City	United Kingdom
Greater Milan	Greater city	Italy
Greater Paris	Greater city	France
Greater Stockholm	Greater city	Sweden
Hamburg	Municipality	Germany
Kraków	Municipality	Poland
Ljubljana	Municipality	Slovenia
Lyon	Municipality	France
Madrid	Municipality	Spain
Marseille	Municipality	France
Munich	Municipality	Germany
Oslo	Municipality	Norway
Prague	Municipality	Czechia
Rome	Municipality	Italy
Sofia	Municipality	Bulgaria
Stuttgart	Municipality	Germany
Turin	Municipality	Italy
Valencia	Municipality	Spain
Vienna	Municipality	Austria
Warsaw	Municipality	Poland
Wrocław	Municipality	Poland
Zagreb	Municipality	Croatia

ANNEX 2

TABLE 10. RESULTS AND SCORES PER SUB-INDICATOR FOR INDICATOR 4 (POLICY MEASURES)

City name	Total points (out of 10)	LEZ/ZEZ (qualitative assessment, score out of 4)	Share of electric buses (% of total fleet)	Score (out of 2)	Share of main roads with protected cycling infrastructure	Score (out of 2)	Share of primary schools with a school street	Score (out of 2)
Copenhagen	9	3	100%	2	73%	2	11%	2
Greater Amsterdam	9	4	72%	2	66%	2	7%	1
Antwerp	8	3	26%	1	80%	2	20%	2
Brussels-Capital Region	7	3	11%	1	39%	1	13%	2
Ghent	7	3	26%	1	40%	1	12%	2
Greater London	7	3	33%	2	12%	0	27%	2
Greater Milan	7	2	31%	2	26%	1	16%	2
Lyon	7	3	12%	1	29%	1	15%	2
Turin	7	2	44%	2	30%	1	24%	2
Cologne	6	2	39%	2	53%	1	5%	1
Greater Paris	6	2	20%	1	27%	1	34%	2
Munich	6	2	24%	1	71%	2	1%	1
Vienna	6	2	19%	1	31%	1	26%	2
Barcelona	5	2	22%	1	32%	1	5%	1
Berlin	5	2	18%	1	44%	1	1%	1
Bologna	5	2	20%	1	25%	1	9%	1
Greater Stockholm	5	2	20%	1	62%	2	0%	0
Stuttgart	5	3	11%	1	22%	1	0%	0
Warsaw	5	2	13%	1	45%	1	3%	1
Bilbao	4	2	18%	1	13%	0	7%	1
Florence	4	2	10%	1	26%	1	0%	0
Greater Helsinki	4	0	56%	2	71%	2	0%	0
Hamburg	4	0	37%	2	48%	1	1%	1
Kraków	4	2	23%	1	37%	1	0%	0
Madrid	4	2	20%	1	18%	0	1%	1
Marseille	4	2	20%	1	15%	0	5%	1
Oslo	4	0	100%	2	29%	1	5%	1
Rome	4	2	24%	1	8%	0	3%	1
Sofia	3	2	26%	1	6%	0	0%	0
Valencia	3	2	10%	0	37%	1	1%	0
Wroclaw	3	1	9%	0	52%	1	2%	1
Bratislava	2	0	29%	1	16%	0	2%	1
Bucharest	2	1	29%	1	7%	0	0%	0
Budapest	2	0	13%	1	16%	0	1%	1
Dublin	2	0	11%	1	24%	1	0%	0
Greater Lisbon	2	2	6%	0	10%	0	0%	0
Ljubljana	2	0	15%	1	37%	1	2%	0
Athens	1	0	25%	1	2%	0	0%	0
Prague	1	0	5%	0	9%	0	3%	1
Zagreb	1	0	21%	1	14%	0	0%	0

Low numbers of monitoring stations and estimated annual values

For nine cities, the number of monitoring stations included for at least one of the three indicators and for at least one pollutant are less than two per year (n = 11). The city pollutant pairs and the affected indicator pairs are listed in the table below.

TABLE 11. CITY-POLLUTANT PAIRS WITH LOW NUMBER OF MONITORING STATIONS

City	Pollutant	Indicators affected
Bologna	$PM_{2.5}$	Indicator 2
Budapest	$PM_{2.5}$	Indicator 1, 2, 3
Cologne	$PM_{2.5}$	Indicator 3
Florence	$PM_{2.5}$	Indicator 1, 2, 3
Ghent	$PM_{2.5}$	Indicator 2
Ghent	NO_2	Indicator 2
Kraków	$PM_{2.5}$	Indicator 2
Ljubljana	NO_2	Indicator 2, 3
Sofia	$PM_{2.5}$	Indicator 1, 2, 3
Zagreb	$PM_{2.5}$	Indicator 1, 2, 3
Zagreb	NO_2	Indicator 2

In a few exceptional cases (n = 9), the air pollutant concentration for one pollutant in one of three years used for Indicator 1 and 3 had to be imputed due to data coverage and availability issues. The missing year is estimated by multiplying the average of the two available years with a factor of the mean concentration of the missing year in the other cities, divided by their mean concentration across the two years available in the affected cities:

Missing year estimate = city's mean of the two available years × [mean of the other cities in the missing year ÷ mean of the other cities across the two available years]

The affected city-pollutant pairs, station types and years are listed in the table below.

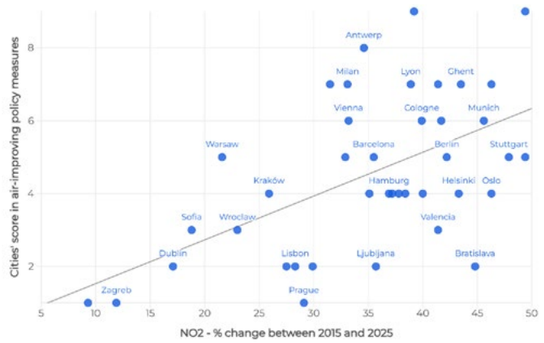
TABLE 12. IMPUTED OBSERVATIONS BY CITY, POLLUTANT, STATION TYPE AND YEAR

City	Pollutant	Station type	Year estimated
Bucharest	NO_2	Background, Traffic	2016
Bucharest	$PM_{2.5}$	Background	2016
Copenhagen	$PM_{2.5}$	Background	2023
Florence	$PM_{2.5}$	Traffic	2025
Greater Lisbon	$PM_{2.5}$	Traffic	2017
Marseille	$PM_{2.5}$	Background	2016
Oslo	NO_2	Background	2018
Oslo	$PM_{2.5}$	Background	2018
Sofia	$PM_{2.5}$	Background	2018

Correlation between cities' score on policy measures and relative change in NO_2

A Spearman rank correlation of the 39 cities' (Ljubljana's score has been excluded as it is based on an estimate) score on policy measures (indicator 4) and the relative reduction in NO_2 between 2016-18 and 2023-25 (from indicator 3) shows a moderate positive association ($\rho = 0.50$, $p = 0.001$). Cities with stronger policy measures tended to see larger reductions in NO_2. While this association itself does not establish causation and other factors affected reductions over time as well, this is consistent with the evidence that such measures reduce NO_2 from road transport, the main source in most urban areas in Europe.

TABLE 13. PLOT OF THE CORRELATION BETWEEN CITIES' RELATIVE REDUCTION IN NO_2 AND THEIR POLICY SCORE



ANNEX 3: METHODOLOGY

Definition of indicators and metrics used

A total of four indicators were developed for the city ranking, three of which reflect observed air quality, namely the current levels of NO_2 and $PM_{2.5}$ at city level, the city's performance against the revised AAQD limits and improvement over the last 10 years. A fourth indicator assesses the implementation of four local transport measures reducing air pollution.

Scoring and grading

For each indicator, cities were assigned a score between 0 (worst) and 10 (best) based on their performance. The scoring approach for each indicator is documented in the table below, as are the maximum points attributed to each indicator for the overall score.

The overall results are presented both as percentages and using a school grading system, with A representing the best performance and F the worst. The grade bands are determined by the score achieved compared to the total possible score:

TABLE 14: GRADING SCALE APPLIED TO THE OVERALL RESULTS

Grade	Score (out of 100%)
A	**≥ 80%**
B	**≥ 65%**
C	**≥ 55%**
D	**≥ 45%**
E	**≥ 30%**
F	**< 30%**

TABLE 15: OVERVIEW OF THE METRIC AND SCORING APPROACH FOR THE FOUR INDICATORS

Indicator	Metric	Scoring
1 - The current air quality levels in European cities	The three-year (2023-2025) city-wide average of NO_2 and $PM_{2.5}$ (µg/m³)	Linear scale from 0 (worst) to 10 points (best). Current (2008) AAQD annual concentration limit or higher = 0 points WHO 2021 guideline annual concentration or below = 10 points
2 - Compliance with the 2030 AAQD rules	Pass / Fail for each of the four limits, i.e. annual and daily limits for NO_2 and $PM_{2.5}$, taking into account the concentration limits and the number of permitted daily exceedances, using the latest fully available year, 2025	For each of the four limits: Pass = 2.5 points, Fail = 0 points Overall score is the sum of the scores for each limit (0-10 points)
3 - Relative change of the city-level mean over the last 10 years	The percentage difference between the three-year mean from 2016-18 and three-year mean from 2023-25 of NO_2 and $PM_{2.5}$ (µg/m³)	Linear scale from 0 (worst) to 10 points (best). No reduction achieved = 0 points Largest change achieved = 10 points
4 - The level of cities' initiative in reducing air pollution through proven road transport policy measures	A composite score on a scale of 0 to 10, based on the performance against four policy measures, whose definitions and scoring criteria are described in more detail further below	0 - 2 points for three of the four transport measures (bus fleet electrification, the provision of protected cycling infrastructure and school streets.) 0 - 4 points for Low / Zero-Emission Zones The maximum overall score (10 points) is the sum of the four sub-scores

DATA SOURCES AND DATA QUALITY

The data cut-off date for this ranking is 2 October 2026. For all Indicators, the latest data available at that date was used. Subsequent updates or revisions to the underlying sources are not reflected in the ranking.

The three air quality Indicators are all based on the official Annual Air Quality statistics of the EEA, the most authoritative source of comparable measured air pollutant concentrations across the EU. It compiles concentrations measured at monitoring stations and reported by member states, a requirement under the AAQD.

Monitoring station data was filtered with EEA's data coverage flag to only include values that meet the data coverage requirements.

As described, for Indicators 1 and 3 we use city-year pairs to calculate the three-year means. For nine of these city-year pairs (1.88% of all pairs), data was missing. Their values were estimated using the ratio of the missing year's values to the two-year reference mean across all other cities with complete data for those years, which was applied to the city's own reference-year mean.

In two cases (Ljubljana for NO_2 and Budapest for $PM_{2.5}$) no data was available for the baseline years, so the relative change over the past 10 years (Indicator 3) could not be calculated. In these cases, the average reduction across the remaining 39 cities with valid data was used instead.

Cities with less than two observations (monitoring stations) per year are flagged as 'Low n'. However, all air quality zones in which the cities sit do fulfil the minimum number of stations required by the AAQD.

Data for Indicator 4, which assesses city policies aimed at improving air quality, was drawn from publicly available sources, including reports by cities and public transport operators, reliable news coverage and local expert knowledge.

ADDITIONAL INFORMATION, CAVEATS AND LIMITATIONS

General caveats and limitations

NO_2 and $PM_{2.5}$ concentrations are measured, not modelled — this means only certain areas are covered, and some pollution hotspots might be missed. However, the revised AAQD requires monitoring stations to be located in such a way as to capture locations with the highest concentrations, i.e. hotspots. Even though actual pollution may sometimes still be higher than the measured values, the EEA data remains the most authoritative and comparable air pollution data source available.

Data is not population-weighted but a city-level average of monitoring stations within the city area, as the primary focus of this ranking is on air pollution levels and compliance with the revised AAQD limits. A population-weighted approach can be used to assess the health impact from exposure to poor air quality, such as done by the EEA's air quality ranking, or ISGlobal's ranking of cities.

The 2025 EEA data is still undergoing a process of official verification. The figures have been verified for outliers but final figures might differ slightly.

The ranking contains a mix of municipalities and some Greater City areas, as documented in Annex 1.

Indicator 1 and 3

Only traffic and background stations were included. Industrial stations and stations with unknown type were excluded due to the risk of potentially biasing city comparison given the unequal distribution of the latter and this city ranking's focus on road transport-related air pollution.

In terms of assessment method, only fixed measurement stations were included (excluding indicative measurements, modelling and objective estimation).

To prevent the number of traffic stations from influencing the city-level average, particularly for NO_2, the latter was calculated as the mean of two means: the mean of all traffic stations and the mean of all background stations.

Indicator 2

Compliance is tested for each station, hence city-wide compliance is determined by the performance of the worst-performing station within the city area.

The method applied is not fully identical to the AAQD compliance assessment, as the compliance process includes certain exemptions and allowances, which have not been considered in this ranking. In addition, a small number of stations included in the city ranking are reported to the EEA but are not used to officially assess compliance with the AAQD.

Cities with larger monitoring networks are more likely to display an exceedance as each individual monitoring station introduces more observations to assess for compliance.

Greater London and Oslo are not bound directly by the EU's policies, but were included for comparative purposes. Norway reports data to the EEA. To obtain data from Greater London, the Department for Environment, Food and Rural Affairs' (DEFRA) Automatic Urban and Rural Network (AURN) network is used, in line with pre-Brexit practice.

Indicator 4

The four sub-Indicators building the policy measures Indicator were chosen from the indicative list of measures in Annex VIII (B) of the AAQD, which outlines urban planning and traffic management strategies that authorities can implement to limit transport emissions.

These Indicators are qualitative and desk-research based. They primarily measure whether a measure exists, offering limited nuance about its quality, ambition, or effectiveness.

The Indicators correlate with the rate of improvement rather than current pollution levels. A city may score well while still having poor air quality, or score poorly despite relatively clean air.

Indicator 4: Sub-Indicator definitions and scoring criteria

Low- and zero-emission zones

- Low- and zero-emission zones were scored on a five-point scale from 0 to 4. They carry more weight than the other policies in this Indicator because of their proven effectiveness in reducing air pollution, and because they are a strong signal of a city's overall commitment to clean air. Points were awarded as follows:
  - 0 points: No low-emission zone (LEZ).
  - 1 point: A formal commitment to introduce a zone, but no implementation yet.
  - 2 points: An existing LEZ which does not fulfil the requirements for a 3-point score
  - 3 points: Requires a LEZ meeting the following five criteria: 1) Euro 5 standards or higher for diesel cars, 2) No blanket exemptions for residents, 3) LEZ area covers at least 10% of the city, 4) Zone is operational 12/12 months, at least 12 hours a day, 5) Zone is effectively enforced
  - 4 points: A zero-emission zone.
- By combining vehicle standards with the zone's spatial and temporal coverage and enforcement, this scoring distinguishes between policy intentions on paper and effective, city-wide emission controls.

Protected cycling infrastructure

- Protected cycling infrastructure was defined as a share of main roads with protected (featuring physical traffic separation) cycling infrastructure in the total main road network.
- The purpose of this Indicator is to count the coverage of protected cycling infrastructure alongside roads where physical separation is recommended, i.e. typically on main roads with speeds above 30 km/h and significant traffic levels.
- The metric therefore excludes cycling infrastructure not alongside roads as well as motorways or other roads on which cycling is not permitted.
- Scoring thresholds were set at 0 points for <20% coverage, 1 point for ≥ 20 and < 60% coverage, and 2 points for ≥ 60% coverage, distinguishing low-coverage cities from those with→

systematically protected main-road networks. The average main road protected cycling infrastructure coverage is around 33%.

Bus electrification

- The following types of buses are counted as ‘electric’: battery electric buses, fuel cell electric buses and trolleybuses. Diesel-electric or other hybrid buses were not included.

- Bus fleet electrification levels were assigned scores (0 points for <10% share, 1 point for ≥ 10 to < 30% share, and 2 points for ≥ 30% share) reflecting both empirical threshold effects and sample distribution.

- Research shows that air quality improvements can be achieved starting with 20-40% of the bus fleet electrified.

- Across our 40-city sample, ranging from 5% to 100%, 27% electrification is the average. Consequently, scores of 0, 1, and 2 distinguish between isolated adoption, early-stage but wider deployment, and above-average fleet electrification.

School streets

- School streets are defined as temporary or permanent closures of roads adjacent to primary schools to motorised traffic.

- Cities were assigned 0 points for negligible presence (fewer than two school streets), 1 point for early-stage rollout (2 or more school streets and less than 10% of all primary schools, supported by an emerging municipal strategy), and 2 points for structural integration, defined as coverage reaching at least 10% of primary schools (1 in 10).

- This framework captures the progression from ad-hoc trials to city-wide policy integration, designed to, inter alia, improve local air quality.

Contacts

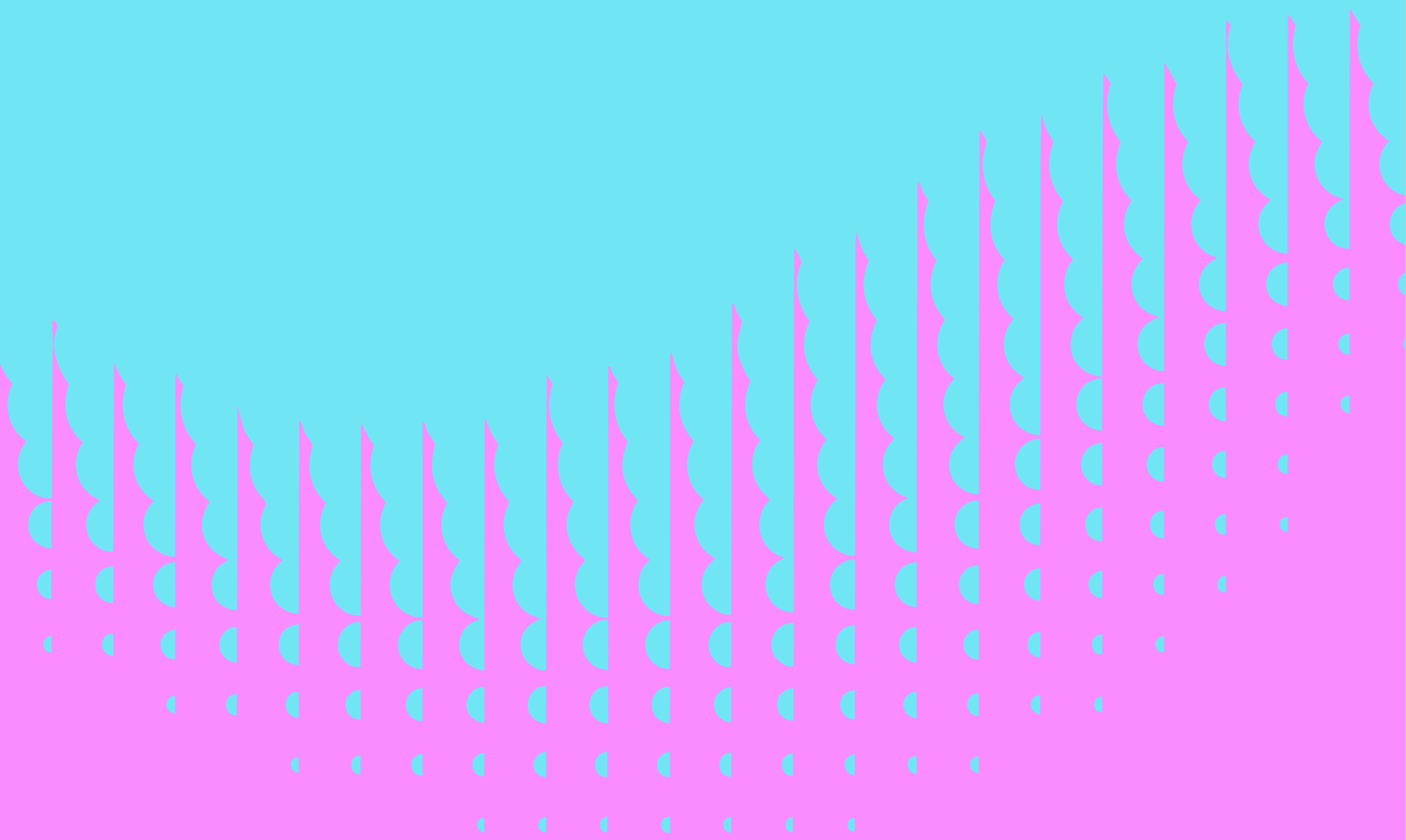
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