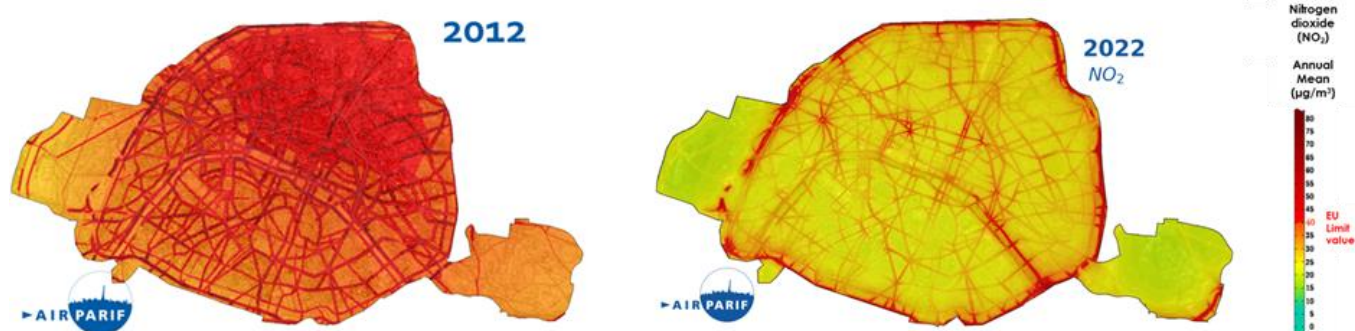


CONTEXT

Over the past two decades, air quality in the Île-de-France Region has improved significantly, with pollution levels cut by half, especially due to changes in road traffic. More specifically in Paris, over the past 10 years, the number of residents exposed to pollutant concentrations above limit values has fallen dramatically from nearly 1.8 million for nitrogen dioxide (NO₂) and 1.4 million for particulate matter (PM₁₀ and PM_{2.5}), to full compliance with standards for particulate matter and near-compliance for nitrogen dioxide, provided that current actions in place are maintained. In anticipation of stricter air quality regulations by 2030, driven by growing evidence of health impacts, and in the context of the 10th anniversary of the Paris Agreement on climate change, Airparif, in partnership with the City of Paris, conducted a study covering the period 2012–2022. The objective was to assess the contribution of public policies on road transport to improvements in air quality and reductions in greenhouse gas emissions. The study identifies and quantifies the relative impacts of three key factors: vehicle fleet modernisation, road traffic reduction, and evolutions of other pollution sources (heating, industry, etc.).



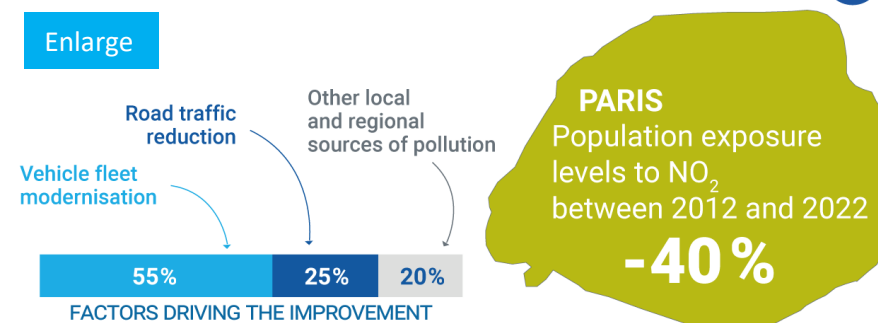
KEY FINDINGS ON AIR POLLUTION

Between 2012 and 2022, average pollution levels to which Parisians were exposed fell by 40% for nitrogen dioxide (NO₂).

This reduction is primarily attributable (55%) to the vehicle fleet modernisation, with the introduction of newer, less polluting vehicles, including electric vehicles. Many older diesel cars were replaced with petrol vehicles, which emit less nitrogen oxides. In 2012, only 27% of kilometers driven were by vehicles classified at least as Crit'Air 2; by 2022, this share had risen to 83%. The proportion of kilometers driven by Crit'Air E and Crit'Air 1 vehicles increased from 4% to 38%. This transition reflects both the availability of cleaner new vehicles on the market and policy measures that accelerated fleet renewal, particularly the establishment of the Low Emission Zone (LEZ) in Paris in 2017.

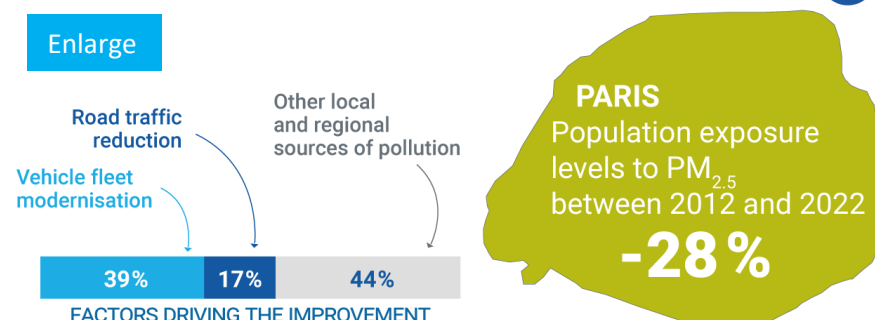
Policies aimed at reducing road traffic have also played a significant role, accounting for about one-quarter of the NO₂ reduction in Paris. This progress is particularly linked to the development of active mobility, public transport, driving restrictions on certain routes, and parking policies.

EVOLUTION OF POPULATION EXPOSURE TO NITROGEN DIOXIDE (NO₂) IN PARIS BETWEEN 2012 AND 2022



The observed reduction from other pollution sources contributes around 20% to this improvement, driven by actions aimed at cutting atmospheric pollutant emissions across various sectors (residential and commercial heating, industry, energy production, etc.).

EVOLUTION OF POPULATION EXPOSURE TO FINE PARTICLES (PM_{2.5}) IN PARIS BETWEEN 2012 AND 2022



For fine particles (PM_{2.5}), air quality in Paris improved by 28% between 2012 and 2022. Due to the multiple sources of particulate matter, the hierarchy of contributions to this reduction differs from the one observed for NO₂. Among the local and regional factors studied, transport-related measures remain a major contributor, vehicle fleet modernisation accounting for 39% of the decrease in PM_{2.5} levels and road traffic reduction for 17%. Public policies targeting emissions from other sources of pollution contribute 44% to this improvement.

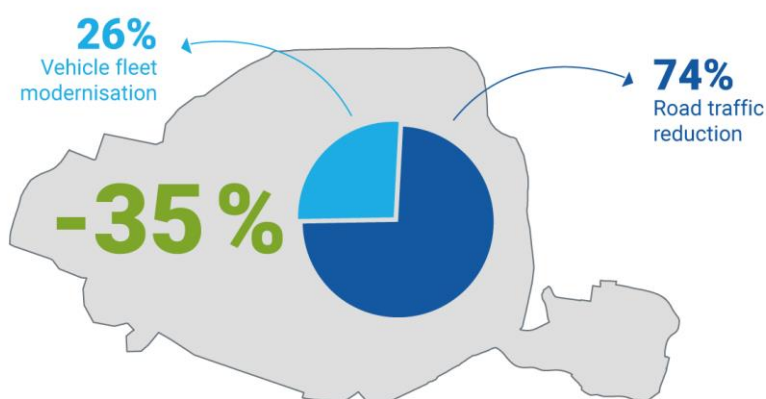
This study also highlights the benefits of **these improvements for residents in the most polluted areas, near major roads in Paris. Indeed, the 10% of residents most exposed experienced a greater improvement in air quality than the Parisian average**, with mean levels decreasing by 45% for NO₂ and 31% for PM_{2.5}.

KEY FINDINGS ON CARBON DIOXIDE (GHG)

Beyond air pollutants, the measures implemented also contribute to combating climate change. **Carbon dioxide (CO₂) emissions from road traffic decreased by 35% between 2012 and 2022.** This reduction is mainly attributable to actions aimed at reducing road traffic, which account for three-quarters of the gains. The vehicle fleet modernisation further reinforced this decrease, contributing the remaining one-quarter of the gains.

In the context of climate change, the road traffic reduction has been the main factor explaining the decrease in CO₂ emissions. For air pollution, it is the second most important factor, after the vehicle fleet modernisation. Changes in GHG emissions, which are directly linked to fuel consumption, are smaller than those for air pollutants (NO_x, particulate matter, etc.), whose emission reductions are further enhanced by technological improvements related to EURO standards. For example, a Crit'Air 2 diesel vehicle emits on average about 30% less CO₂ than an old diesel vehicle (Crit'Air 5), but around 95% less PM_{2.5} at the exhaust. Certain measures, such as the Low Emission Zone (LEZ), help accelerate the vehicle fleet modernisation in order to limit atmospheric pollutant emissions.

EVOLUTION OF CARBON DIOXIDE (CO₂) EMISSIONS FROM ROAD TRAFFIC IN PARIS BETWEEN 2012 AND 2022



Enlarge

UNDERSTANDING THE ESSENTIALS

The assessment of **the contributions of different factors** to air quality improvements was conducted as follows: air quality in 2022 was taken as the reference, with a spatial resolution of 50 meters. Various scenarios were then calculated by keeping the same weather conditions while changing the other parameters one by one. For example, one scenario used 2012 traffic flow levels, but the 2022 vehicle fleet, with all emissions from other sectors also set to 2022 levels. The contribution of each influencing parameter can thus be inferred from the results of each scenario.

Road traffic data for the period 2012–2022 were provided by the City of Paris. They show a significant reduction in traffic, with variability depending on the type of road. On average, road traffic decreased by 34% within central Paris, and by 7% on the Boulevard Périphérique (ring road) (source: City of Paris traffic loop counts along the entire Boulevard Périphérique)

The **vehicle fleet** is composed of the distribution of vehicles by type (private cars, public transport, etc.), by motorisation type (petrol, diesel, electric), and by Crit'Air classification. This fleet is based on local license plate surveys conducted by the City of Paris and the Greater Paris Metropolis.

Emissions from sectors other than road traffic are drawn from Airparif's 2022 Ile-de-France Air-Climate-Energy inventory.

The **average change in concentrations** between 2012 and 2022, and the impact of each factor studied, were determined by examining residential areas. Changes outside these areas, such as along major roads or in the Bois de Vincennes and Bois de Boulogne, are not taken into account. This analysis was carried out across the entire city of Paris.

PERSPECTIVES

Although the situation has improved significantly, air quality remains a major health concern in Paris. WHO recommendations are currently exceeded across the entire Parisian territory as well as throughout the Île-de-France region. The regulatory limit values to be met by 2030 would have affected 70% of Parisians for nitrogen dioxide. Levels of ultrafine particles in the air, particularly near major roads in Paris, also represent a present and future health concern.

THE FULL STUDY

Airparif, Amélioration de la qualité de l'air à Paris entre 2012 et 2022 : les facteurs explicatifs, August 2025, online [in French]