

# Air quality in the Paris region

SUMMARY 2022

# Summary

2022 : THE IMPROVEMENT OF THE AIR QUALITY CONTINUES	1
POLLUTANTS EXCEEDING AIR QUALITY STANDARDS AND RECOMMENDATIONS ON A RECURRING WAY	5
Dioxyde d'azote (NO <sub>2</sub> )	5
Particules PM <sub>10</sub> et PM <sub>2.5</sub>	9
Ozone (O <sub>3</sub> )	15
POLLUTANTS NOT EXCEEDING AIR QUALITY STANDARDS	18
Benzene (C <sub>6</sub> H <sub>6</sub> )	18
Other Monocyclic Aromatic Hydrocarbons (MAH)	18
Sulphur dioxide (SO <sub>2</sub> )	18
Carbon monoxide (CO)	18
Metals: lead, arsenic, cadmium and nickel	19
Polycyclic aromatic hydrocarbons (HAP)	19
Aldehydes	19
POLLUTION EPISODES	20

# 2022 : THE IMPROVEMENT OF THE AIR QUALITY CONTINUES

## Chronic Pollution

**Pollution levels recorded in 2022 slightly decreased across the region compared to 2021, except for ozone (O<sub>3</sub>).** This observation is essentially linked to the downward trend in emissions from the residential sector and road traffic and to dispersive weather conditions with generally mild temperatures in winter, which limited emissions from residential heating.

**The decrease in nitrogen dioxide (NO<sub>2</sub>) levels in the Paris agglomeration, observed in the recent years, continue in 2022.** This is consistent with the drop in nitrogen oxide emissions in the Ile-de-France region (road traffic, industries, heating ). Near road traffic, some axes pass below the annual limit value (set at 40 µg/m<sup>3</sup>), while the average NO<sub>2</sub> levels are always way above this threshold on the busiest axes (Boulevard Périphérique, A1 highway, ...). **In 2022, approximately 40,000 Ile-de-France residents are potentially exposed to the exceedance of the annual NO<sub>2</sub> limit value. In addition, almost all Ile-de-France residents are exposed to an air that does not comply with the annual and daily recommendations of the World Health Organization (WHO)** (respectively 10 µg/m<sup>3</sup> as an annual average and 25 µg/m<sup>3</sup> not to be exceeded more than 3 days per year).

Thanks to the significant downward trend in recent years, the annual and daily limit values for **PM<sub>10</sub> particles** (respectively 40 µg/m<sup>3</sup> as an annual average and 35 days maximum above 50 µg/m<sup>3</sup>) are respected. **No Ile-de-France resident is concerned by an exceedance of these limit values for PM<sub>10</sub> particles. On the other hand, nearly 90% of Ile-de-France residents are exposed to an exceedance of the WHO recommendations** (15 µg/m<sup>3</sup> as an annual average and 3 days maximum above 45 µg/m<sup>3</sup> for the daily average).

For **PM<sub>2.5</sub> fine particles**, the limit value and the target value are respected. On the other hand, **the annual mean levels are way above the WHO recommendations. In 2022, all Ile-de-France residents are concerned by the exceedance of the WHO recommendations** (5 µg/m<sup>3</sup> for the annual mean and 3 days maximum above 15 µg/m<sup>3</sup> for the daily mean).

For **ozone (O<sub>3</sub>)**, the quality objective relating to health protection is exceeded at any points in the region in 2022 (threshold of 120 µg/m<sup>3</sup> over a period of 8 hours, not to be exceeded during the year). **This is also the case for the threshold recommended by the WHO** (100 µg/m<sup>3</sup> not to be exceeded over a period of 8 hours). **Ozone is the only pollutant for which the annual trends show no improvement.**

**Despite the improvement in air quality, concentrations of NO<sub>2</sub>, fine particles and ozone far exceed WHO recommended air quality thresholds across the whole region.** These thresholds, based on the most recent scientific knowledge on the impact of air pollutants on health, are lower than the French and European regulatory limit values.

In this context, a revision of the European Ambient Air Directive is underway. The European Commission proposed in October 2022 a lowering of the regulatory limit values thresholds to bring them closer - without completely aligning them - with the WHO recommendations. From 2030, the limit value for fine particles could drop from 25 µg/m<sup>3</sup> to 10 µg/m<sup>3</sup> in annual mean, and for nitrogen dioxide from 40 µg/m<sup>3</sup> to 20 µg/m<sup>3</sup> in annual mean. In 2022, a large proportion of the inhabitants of Île-de-France breathe concentrations of nitrogen dioxide and fine particles that do not comply with this project of new regulatory limit values, i.e. nearly 8 million.

The map illustrating the situation in Île-de-France with regard to the different thresholds for the pollutants NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and O<sub>3</sub> is presented in Figure 1.

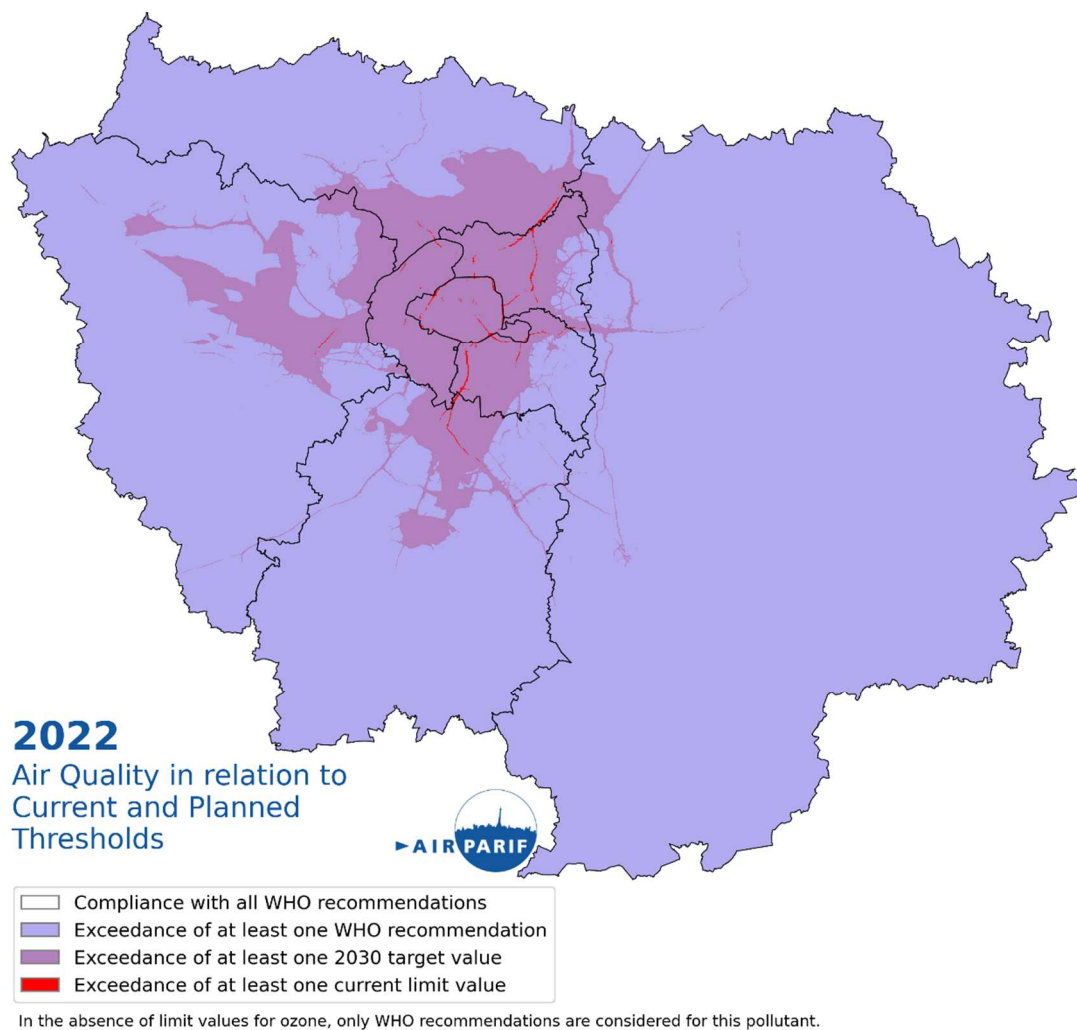


Figure 1 : Exceedances in 2022, in Île-de-France, of various thresholds for nitrogen dioxide (NO<sub>2</sub>), particles PM<sub>10</sub>, PM<sub>2.5</sub> and ozone (O<sub>3</sub>)

### Pollution episodes

**The number of pollution episodes is down** compared to previous years. Ten exceedances of the information threshold for PM<sub>10</sub> particles and O<sub>3</sub> were recorded (5 each), i.e. the lowest number of days of episodes in the last ten years, which can be explained both by a winter fairly mild, which limited the episodes of winter particulate pollution, and, despite the strong sunshine, somewhat atypical summer conditions, which limited the episodes of ozone pollution. Note that the procedure does not take into account fine particles (PM<sub>2.5</sub>) and the thresholds put forward in the notice of the National Air Council and ANSES.

The figure below summarizes the trends and the situation for the year 2022 with respect to regulatory standards and WHO recommendations.



# SUMMARY 2022



## EXCEEDANCES OF THE REGULATORY LIMIT VALUES (French and European)

Number of exposed Île-de-France residents



## EXCEEDANCES OF THE WHO RECOMMENDATIONS

Percentage of exposed Île-de-France residents



## EXCEEDANCES OF THE INFORMATION AND ALERT THRESHOLDS



# POLLUTANTS EXCEEDING AIR QUALITY STANDARDS AND RECOMMENDATIONS ON A RECURRING WAY

## Nitrogen Dioxide (NO<sub>2</sub>)

Despite a significant improvement in recent decades, the situation is still worrying in 2022, with a strong contrast depending on the location in Île-de-France.

Nevertheless, the levels are slightly lower than in 2021, both in the background and near road traffic. This reduction is mainly due to the downward trend in emissions, in particular those from traffic, with the renewal of the road fleet.

In 2022, continuing on from 2021, the number of Parisian and regional axes that record annual mean concentrations above the regulatory thresholds is decreasing, leading to a significant drop in the number of Ile-de-France residents potentially exposed to these exceedances.

For more information on the concentrations measured, the annual statistics are available at this address: <https://data-airparif-asso.opendata.arcgis.com/documents/stats-2022/explore>

### REGULATORY SITUATION IN 2022

Figure 2 illustrates the nitrogen dioxide (NO<sub>2</sub>) annual mean concentrations in Île-de-France in 2022, with a zoom for Paris and the inner suburbs.

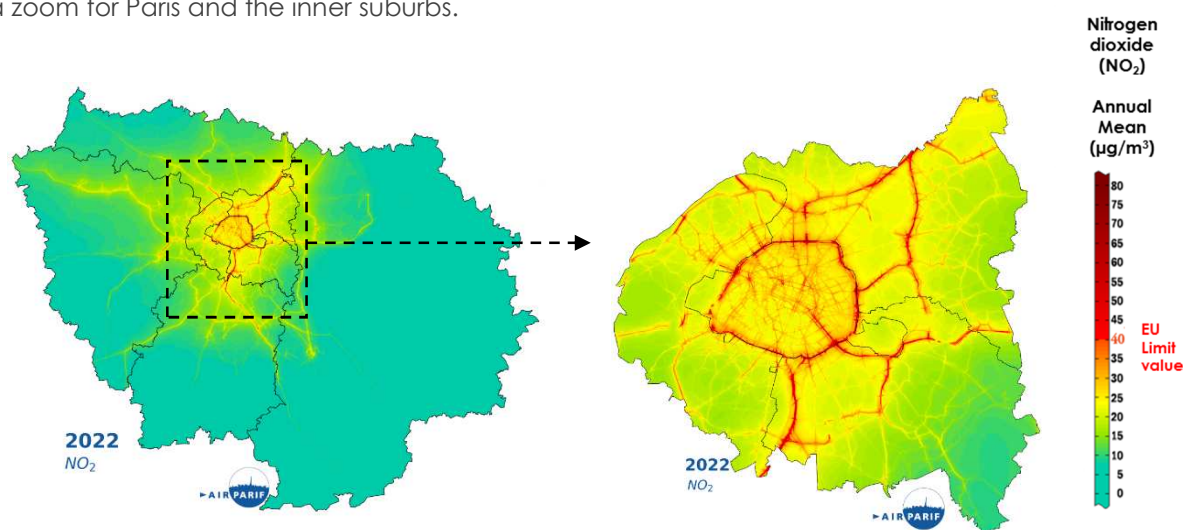


Figure 2: nitrogen dioxide (NO<sub>2</sub>) annual mean concentrations in 2022 in Île-de-France, with a zoom on Paris and the inner suburbs of Paris

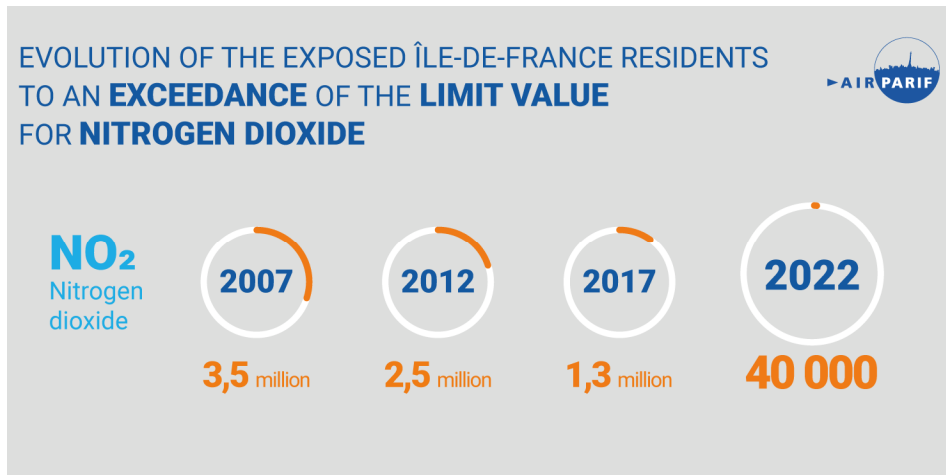
**The highest NO<sub>2</sub> concentrations are recorded in the Paris agglomeration and in the vicinity of major traffic roads** (highways, national roads and major departmental roads).

The background levels decrease quickly getting away from the center of the agglomeration. In rural areas, they are 3 to 4 times lower than in Paris. The annual limit value (40 µg/m<sup>3</sup> in annual mean) is largely respected in background situations.

In the vicinity of certain main roads, the NO<sub>2</sub> levels can be more than twice as high as those recorded without the direct influence of these routes (in a background situation) and always well above the threshold of the annual limit value. These axes are mainly located in the Paris agglomeration.

From a regulatory point of view, in 2022, approximately 40,000 Ile-de-France residents are potentially exposed to air exceeding the annual limit value. They reside exclusively in the Greater Paris Metropolis. However, it is also in the agglomerated area that the improvements are the most significant.

The number of people potentially exposed is down in 2022 compared to 2021 (nearly 60,000 inhabitants). This is explained by the annual mean concentrations of many axes falling below the threshold of the limit value.



As for the hourly limit value (concentration greater than 200 µg/m<sup>3</sup> not to be exceeded more than 18 times during the year), it is respected everywhere in Île-de-France in 2022.

On the other hand, almost all Ile-de-France residents are exposed to an air that does not comply with the WHO annual and daily recommendations. Only the east of Seine-et-Marne (77) and the south of Essonne (91) comply with these recommendations.

Outlook:

As part of the ongoing revision of the Ambient Air Directive in connection with the evolution of the WHO recommendations, the European Commission proposed in October 2022 a lowering of the thresholds of the regulatory limit values to bring them closer - without completely align them - to the WHO recommendations. From 2030, the limit value for nitrogen dioxide could drop from 40 µg/m<sup>3</sup> to 20 µg/m<sup>3</sup> in annual mean.

The map presenting the situation in Île-de-France with regard to the different thresholds is presented in Figure 3. In 2022, 7 million inhabitants of Île-de-France, almost exclusively in the Greater Paris Metropolis, breathe NO<sub>2</sub> concentrations that do not comply with this project of a new regulatory limit value.



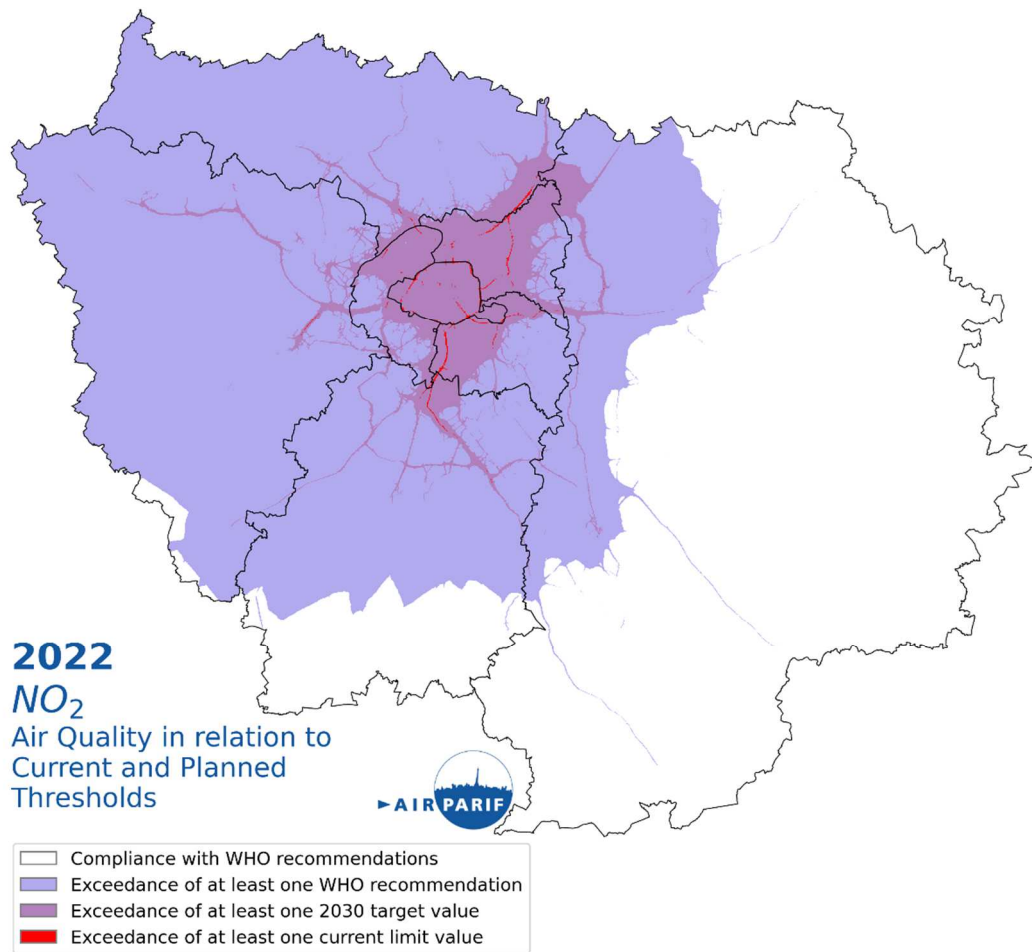


Figure 3 : Exceedances in 2022 in Île-de-France of the current and planned thresholds for nitrogen dioxide (NO<sub>2</sub>)

## In summary for nitrogen dioxide

Nitrogen dioxide (NO<sub>2</sub>), a pollutant mainly emitted by road traffic, remains problematic in Île-de-France with regard to the regulations in place.

In 2022, continuing on from 2021, the number of Parisian and regional axes that record annual mean concentrations above the regulatory threshold is decreasing, leading to a significant drop in the number of Ile-de-France residents potentially exposed to these exceedances of the annual limit value with approximately 40,000 Ile-de-France residents, all located in the dense heart of the conurbation. It is also in the dense heart of the agglomeration that the situation has proportionally improved the most.

However, almost all Ile-de-France residents are exposed to an air that does not comply with the WHO recommendations.

With regard to the thresholds for NO<sub>2</sub>, proposed as part of the draft revision of the directive on ambient air, 7 million Ile-de-France inhabitants breathe concentrations that do not currently comply with the draft limit value for 2030.

# Particles $PM_{10}$ and $PM_{2.5}$

The year 2022 had globally favorable weather conditions for a good air quality, in particular mild winter temperatures that limited the use of residential heating.

**In 2022, the annual mean levels of  $PM_{10}$  and  $PM_{2.5}$  particles are globally similar to those of 2021 in the background and in a situation close to traffic.**

**With regard to the daily limit value, the number of days when the  $50 \mu\text{g}/\text{m}^3$  threshold is exceeded is lower than in 2021, both in the background and near traffic.**

Health studies based on mass concentrations clearly indicate that **there is no threshold below which particles are not harmful**. Any decrease in concentration therefore represents an **important issue in terms of public health**.

**The decline in mean levels observed over the past ten years seems to be running out of steam**. Many reasons can explain this, in particular the emissions linked to the abrasion of tires, brakes and roads which are not decreasing as well as the development of the use of biomass for heating. Particular vigilance will be maintained on the evolution of levels and their explanatory factors.

For more information on the concentrations measured, the annual statistics are available at this address: <https://data-airparif-asso.opendata.arcgis.com/documents/stats-2022/explore>

## $PM_{10}$ PARTICLES

### REGULATORY SITUATION IN 2022

#### Daily limit value (35 days above $50 \mu\text{g}/\text{m}^3$ maximum)

Figure 4 shows the map of the number of days exceeding the daily threshold of  $50 \mu\text{g}/\text{m}^3$  in Île-de-France, with a zoom on the Paris agglomeration for the year 2022.

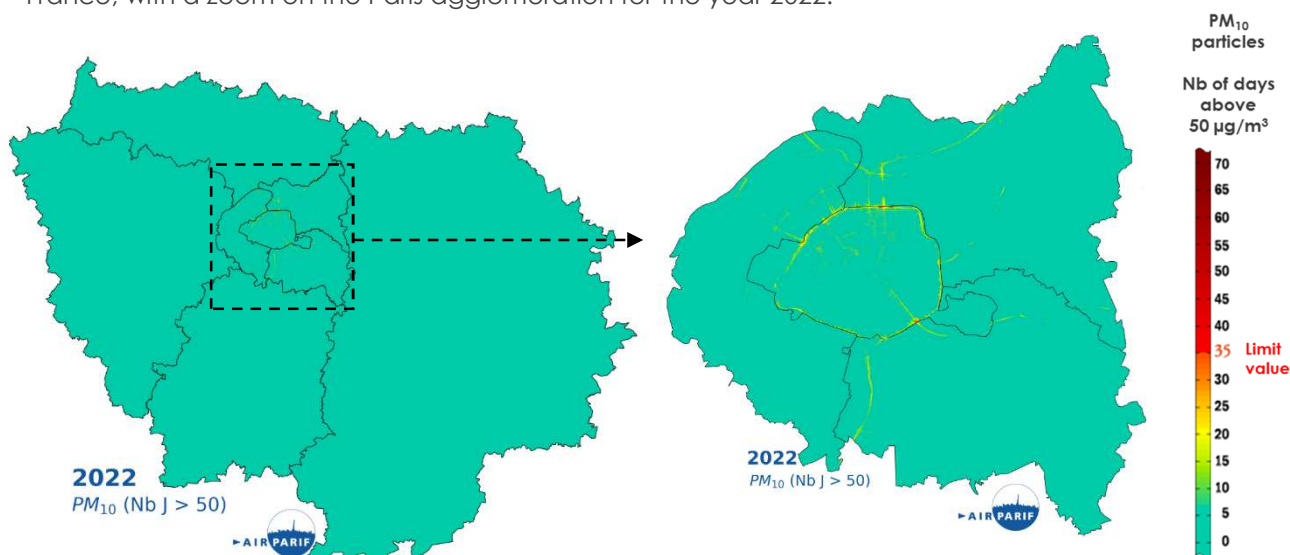
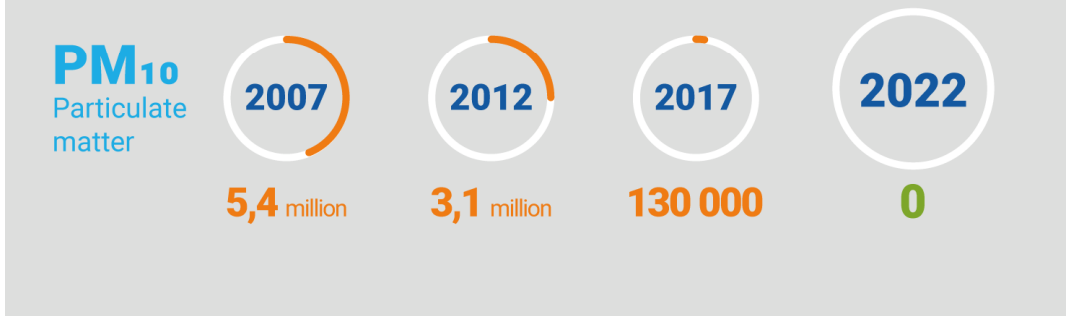


Figure 4 : number of days exceeding the daily threshold of  $50 \mu\text{g}/\text{m}^3$  for the  $PM_{10}$  in Île-de-France, with a zoom on the Paris agglomeration for the year 2022.

The number of days exceeding the daily threshold of  $50 \mu\text{g}/\text{m}^3$  for  $PM_{10}$  in 2022 is lower than in 2021.

**From a regulatory point of view, in 2022, no Ile-de-France resident is exposed to an exceedance of the daily limit value, compared to more than 40% in 2007. On the other hand, 60% of Ile-de-France residents remain exposed to air that does not comply with the WHO recommendation.**

## EVOLUTION OF THE EXPOSED ÎLE-DE-FRANCE RESIDENTS TO AN EXCEEDANCE OF THE DAILY LIMIT VALUE FOR PARTICULATE MATTER PM<sub>10</sub>



### Annual limit value (40 µg/m<sup>3</sup> in annual mean)

The maps in Figure 5 illustrate the annual mean concentrations of PM<sub>10</sub> particles in 2022 in Île-de-France, as well as a zoom on the inner suburbs of Paris.

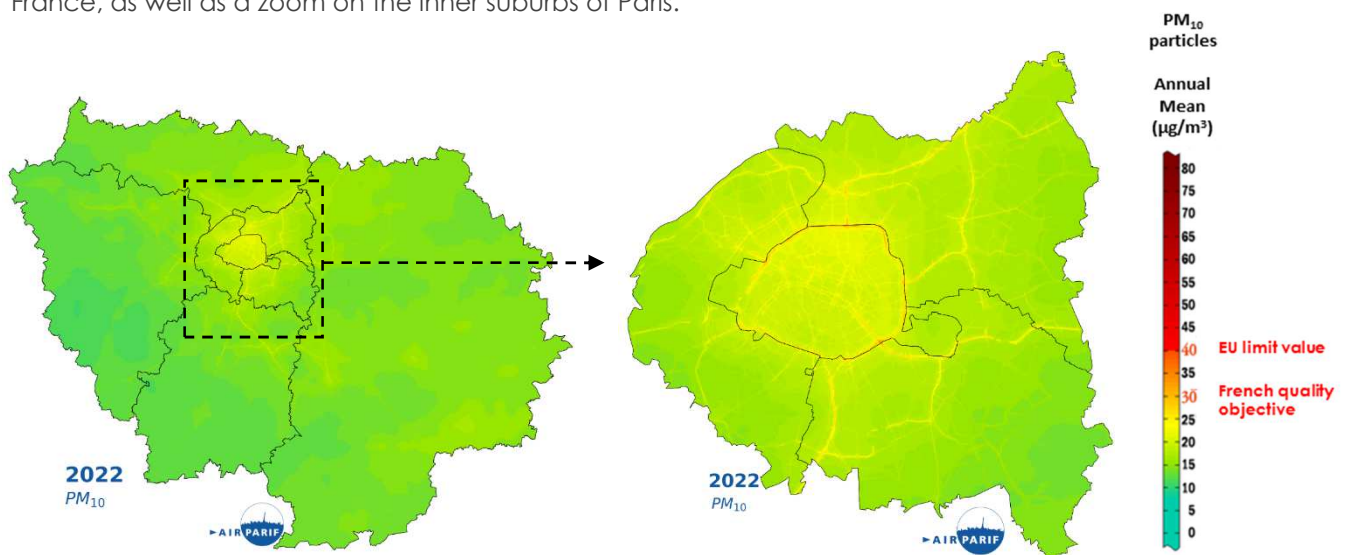


Figure 5: annual mean concentrations of PM<sub>10</sub> particles in 2022 in Île-de-France, as well as a zoom on the inner suburbs of Paris.

As every year, the highest mean concentrations are recorded in the vicinity of the main Parisian and regional roads. The mean levels there can be up to twice as high as those recorded in the background.

**The PM<sub>10</sub> mean levels in background situation recorded within the Ile-de-France sensitive area remain globally homogeneous**, with, however, slightly higher concentrations recorded in the north of Paris. A slight decrease is observed between the dense heart of the agglomeration and the periphery of Île-de-France. The variability of PM<sub>10</sub> is less important than for NO<sub>2</sub> due to a greater diversity of emission sources. The urban background mean levels measured in 2022 are globally similar to those of 2021.

**In 2022, with regard to the regulations, no Ile-de-France resident is exposed to an exceedance of the limit value.**

**However, more than 10 million Ile-de-France residents, i.e. around 90% of the regional population, are still exposed to an air that does not meet the annual WHO recommendations.** The most densely populated areas of each department are affected by these exceedances.

Outlook:

As part of the ongoing revision of the Ambient Air Directive in connection with the evolution of the WHO recommendations, the European Commission proposed in October 2022 a lowering of the thresholds of the regulatory limit values to bring them closer - without completely align them - to the WHO recommendations. From 2030, the limit value for PM<sub>10</sub> particles could drop from 40 µg/m<sup>3</sup> to 20 µg/m<sup>3</sup> in annual average.

The map presenting the situation in Île-de-France with regard to the different thresholds is presented in Figure 6. In 2022, 3 million Ile-de-France residents, mainly residing in the center of the Paris agglomeration, breathe PM<sub>10</sub> concentrations that do not comply with this project of a new regulatory limit value.

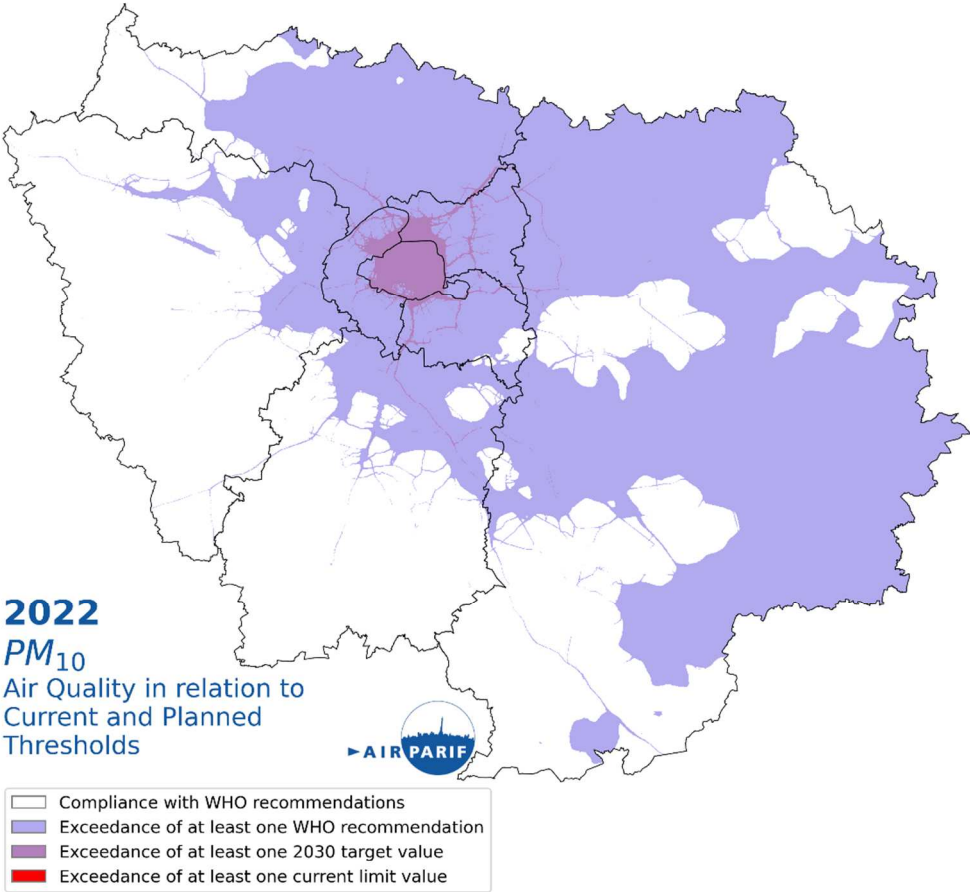


Figure 6 : Exceedances in 2022 in Île-de-France of the current and future thresholds for PM<sub>10</sub> particles

## PM<sub>2.5</sub> PARTICLES

### REGULATORY SITUATION IN 2022

The maps in Figure 7 illustrate the annual mean concentrations of PM<sub>2.5</sub> fine particles in 2022 in Île-de-France, as well as a zoom on the inner suburbs.

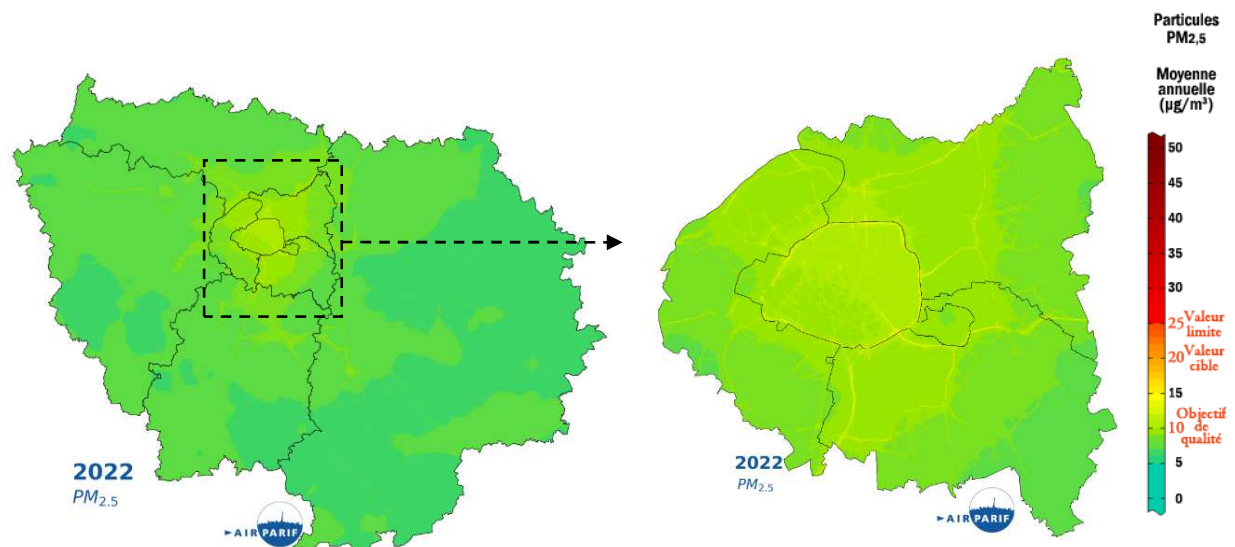


Figure 7: annual mean concentrations of PM<sub>2.5</sub> fine particles in 2022 in Île-de-France, and a zoom on the inner suburbs.

From a regulatory point of view, as for PM<sub>10</sub> and as in recent years, **the average background levels of PM<sub>2.5</sub> recorded within the Paris agglomeration remain globally homogeneous.**

As for several years now, **the annual PM<sub>2.5</sub> limit value is respected in Île-de-France in 2022, as is the target value.**

**On the other hand, the annual and daily WHO recommendations are exceeded for the entire Île-de-France region in 2022.**

Outlook:

As part of the ongoing revision of the Ambient Air Directive in connection with the evolution of the WHO recommendations, the European Commission proposed in October 2022 a lowering of the thresholds of the regulatory limit values to bring them closer - without completely align them - to the WHO recommendations. From 2030, the limit value for PM<sub>2.5</sub> particles would drop from 25 µg/m<sup>3</sup> to 10 µg/m<sup>3</sup> in annual mean.

The map presenting the situation in Île-de-France regarding the different thresholds is presented in Figure 8. In 2022, nearly 8 million Ile-de-France residents breathe PM<sub>2.5</sub> concentrations that do not comply with this project of a new regulatory limit value.

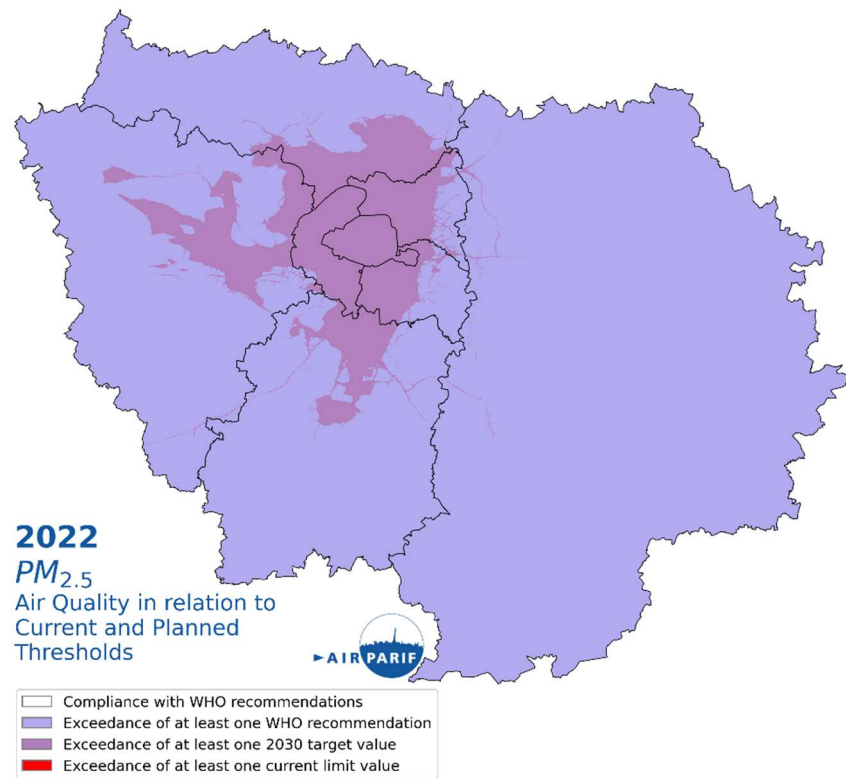


Figure 8 : Exceedances in 2022 in Île-de-France of the current and future thresholds for PM<sub>2.5</sub> particles

## Summary for $PM_{10}$ and $PM_{2.5}$ particles

The downward trend in particle levels ( $PM_{10}$  and  $PM_{2.5}$ ) observed in recent years continues both in the background and near traffic.

For  $PM_{10}$ , from a regulatory point of view, no Ile-de-France resident is exposed to an exceedance of the daily limit value

On the other hand, nearly 90% of Ile-de-France residents are concerned by an exceedance of the WHO recommendations.

For  $PM_{2.5}$ , the limit value ( $25 \mu\text{g}/\text{m}^3$ ) and the target value ( $20 \mu\text{g}/\text{m}^3$ ) are respected in Île-de-France.

With regard to the thresholds of the new directive project, for  $PM_{2.5}$ , nearly 8 million Ile-de-France residents breathe concentrations that do not currently comply with the limit value proposed for 2030.

Moreover, all Ile-de-France residents remain exposed to an air that does not comply with the WHO annual and daily recommendations.

### Outlook:

With regard to the thresholds for particles proposed in the context of the revision of the directive project on ambient air, 3 million Ile-de-France residents for  $PM_{10}$  and nearly 8 million for  $PM_{2.5}$  breathe concentrations that do not currently meet the project of a new limit value for 2030.



# Ozone (O<sub>3</sub>)

**In 2022, the number of days of exceedance of the regulatory thresholds measured at the monitoring stations was higher than in 2021 due to a hot and sunny summer marked by several heat waves. The target value was met, but the quality objectives and WHO recommendations were exceeded in Île-de-France, as in previous years. Ozone is the only regulated pollutant that is increasing in annual mean concentration. Although not relevant for monitoring health effects, this indicator is monitored in terms of impacts on climate change, as ozone is also a greenhouse gas.**

For more information on the concentrations measured, the annual statistics are available at this address: <https://data-airparif-asso.opendata.arcgis.com/documents/stats-2022/explore>

## REGULATORY SITUATION IN 2022

Ozone is a secondary pollutant whose levels are highly influenced by weather conditions, particularly in spring and summer. Strong sunlight and high temperatures are conducive to the formation of ozone by chemical reactions, from nitrogen oxides (emitted mainly by road traffic) and volatile organic compounds. The year 2022 has seen an intense summer with in particular 3 heat waves; this results in higher ozone levels than those recorded last year.

### Health protection

Given the strong interannual fluctuations linked to meteorological conditions, **the number of days of exceedance to the quality objective relating to health protection** (threshold of 120 µg/m<sup>3</sup> over 8 hours not to be exceeded in the year ) **can considerably vary over time**. It is therefore analyzed with regard to summer weather, and in particular the presence of long-lasting hot and sunny periods.

Due to insolation and relatively high temperatures between June and September, **the year 2022 recorded an increase in the number of days exceeding the quality objective compared to 2021, which had experienced a particularly gloomy summer**. This increase, however, depends entirely on the prevailing weather conditions of the year, in particular summer conditions.

**Peri-urban and rural areas are generally more affected than the heart of the Paris agglomeration**, a phenomenon due to the "ozone sink effect", characteristic of large metropolises in the center of which the sources of nitrogen oxides (NO<sub>x</sub>) are concentrated, such as road traffic and residential heating which, by reaction with ozone, consume it. In 2022, the most affected area is located in the south-west of the region (Figure 9).

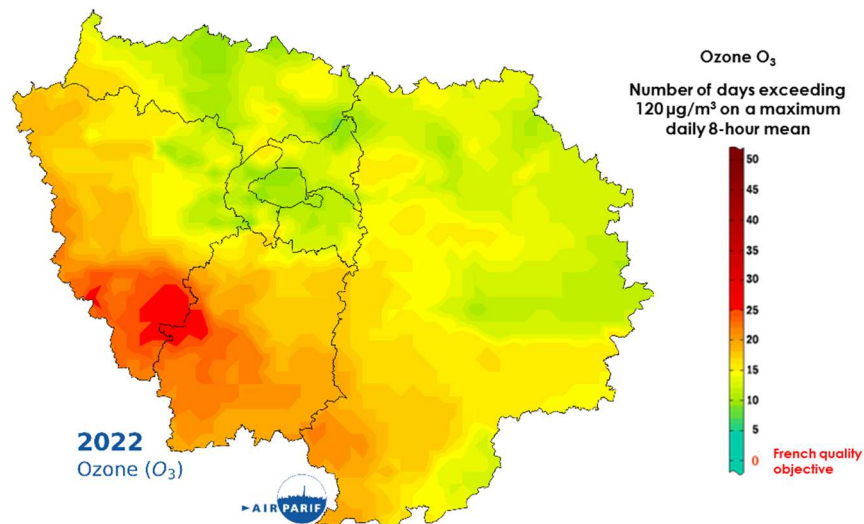


Figure 9 : number of days of exceedance to the quality objective for ozone (O<sub>3</sub>) (threshold of 120 µg/m<sup>3</sup> over 8 hours) in Île-de-France in 2022

From a regulatory point of view, **the target value relating to health protection over the period 2020-2022** (120 µg/m<sup>3</sup> for the daily maximum of the mean over 8 hours not to be exceeded more than 25 days and averaged over 3 years) **is respected in the Ile-de-France region.**

On the other hand, with regard to **the threshold recommended by the WHO** (100 µg/m<sup>3</sup> not to be exceeded over a period of 8 hours), **it is exceeded at all points in the region as every year.**

### Vegetation protection

Numerous scientific studies have shown the harmful effects of ozone on vegetation, due to its strong oxidizing power. It can be natural vegetation (in particular, forests and areas of ecological interest), but also crops (especially cereals). Wheat, for example, has been the subject of numerous studies showing yield reductions associated with high levels of ozone during the growth period.

As a result, the regulations include **quality objectives and target values based on periods of full vegetation and cultivation in spring and early summer.** Thus, the AOT 40 represents an accumulation of concentrations exceeding a certain threshold (80 µg/m<sup>3</sup>) over the entire vegetative period (May-July). It is expressed in µg.m<sup>-3</sup>.h<sup>-1</sup>. In 2022, the ozone levels constituting the AOT40 were higher than those recorded in 2021.

The situation of the AOT regarding the **threshold of the target value** (set at 18,000 µg.m<sup>-3</sup>.h<sup>-1</sup>) is judged on average over a period of 5 years. Therefore, the mean value fluctuates less from year to year. **In 2022, the target value is respected everywhere in Île-de-France, as in recent years.**

Conversely, **the French quality objective for the vegetation protection** (set at 6,000 µg.m<sup>-3</sup>.h<sup>-1</sup> from May to July, equivalent to the European long-term objective) **has been exceeded in Île-de-France every year.**

For more information on ozone, a specific note is available at this address:

[www.airparif.asso.fr/sites/default/files/pdf/Dossier-ozone.pdf](http://www.airparif.asso.fr/sites/default/files/pdf/Dossier-ozone.pdf)

## Summary for Ozone

Ozone (O<sub>3</sub>), a secondary air pollutant and greenhouse gas, remains a chronic recurring problem in Île-de-France.

From a regulatory point of view:

Exceedances of thresholds are very dependent on summer weather conditions and increase with high temperatures and sunshine.

In 2022, the target values relating to the health and vegetation protection are respected. The quality objectives relating to the health and vegetation protection are exceeded in the region.

On the other hand, 100% of Ile-de-France residents are concerned by an exceedance of the value recommended by the WHO (set at 100 µg/m<sup>3</sup> over 8 hours), as every year.

Trends are contrasted between chronic pollution and pollution episodes. On one hand, ozone is the only pollutant for which an upward trend is measured for annual average concentrations, as in the entire northern hemisphere. On the other hand, the extreme values recorded during episodes under equivalent conditions are lower than 20 years ago, probably due to regulations put in place to reduce emissions of its precursors, especially NO<sub>2</sub> and VOC.

# POLLUTANTS NOT EXCEEDING AIR QUALITY STANDARDS

**Other pollutants monitored in Île-de-France meet air quality standards and show downward trends. This is the case for benzene, sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), metals (Lead, Arsenic, Nickel, Cadmium), other monocyclic aromatic hydrocarbons (MAH), polycyclic aromatic hydrocarbons (PAHs) and aldehydes.**

For more information on the measured concentrations of these pollutants, the annual statistics are available at this address:

<https://data-airparif-asso.opendata.arcgis.com/documents/airparif-asso::stats-2022/explore>

## Benzene (C<sub>6</sub>H<sub>6</sub>)

The downward trend of recent years continues and the concentrations measured are the lowest in history. **The annual limit value (set at 5 µg/m<sup>3</sup>) has been respected everywhere in Île-de-France since 2006. Respected in the background, the French quality objective (set at 2 µg/m<sup>3</sup>) can however be very punctually exceeded along certain Parisian traffic lanes.**

No Île-de-France resident is exposed to an exceedance of the quality objective for benzene.

## Other Monocyclic Aromatic Hydrocarbons (MAH)

In addition to benzene, four HAMs are routinely measured by Airparif: toluene, ethylbenzene, m+p-xylene and o-xylene. Like benzene, these four compounds are mainly emitted by road traffic. There is no regulation in ambient air for these compounds. The WHO nevertheless recommends not to exceed 4,800 µg/m<sup>3</sup> in daily mean concentrations for xylenes, 260 µg/m<sup>3</sup> on weekly mean for toluene and 22,000 µg/m<sup>3</sup> in annual mean for ethylbenzene. These recommendations are all largely respected in 2022.

## Sulphur dioxide (SO<sub>2</sub>)

In 2022, the SO<sub>2</sub> annual mean concentrations are once again very low (1 µg/m<sup>3</sup>) and are therefore well below the quality objective (set at 50 µg/m<sup>3</sup> in annual mean).

## Carbon monoxide (CO)

In 2022, the CO measurement is not representative due to a great lack of data. However, given the measurements valid over the year and the results of previous years, the limit value for health protection (set at 10 mg/m<sup>3</sup> over a period of 8 hours) would be largely respected.

## Metals: lead, arsenic, cadmium and nickel

Two fixed measurement sites are located near industrial sites emitting regulated metals, in Limay (78) and Bagneaux-sur-Loing (77). In order to have a reference in the heart of the agglomeration, a point of measurement of metals (Pb, As, Cd and Ni) is also located in Paris. This site provides a point of comparison far from any specific source.

The levels measured for these metals are all way below the target values.

## Polycyclic aromatic hydrocarbons (HAP)

The European target value (set at 1 ng/m<sup>3</sup> in annual mean) is largely respected at all Airparif measurement sites.

## Aldehydes

There are no standards in ambient air. However, ANSES recommends a guide value in indoor air of 10 µg/m<sup>3</sup> for long-term exposure. The levels of aldehydes recorded in ambient air are significantly lower than the levels generally recorded in indoor air.

# POLLUTION EPISODES

## Regional information and alert procedure

The number and occurrence of pollution episodes are closely linked to particular meteorological conditions which will concentrate emissions and pollution. It is therefore difficult to speak of a “trend”. A year with more “anticyclonic” periods can lead to more pollution episodes.

In 2022, **regulatory thresholds were exceeded 10 times. These exceedances concerned PM<sub>10</sub> particles and ozone (5 exceedances each). This number of days is the lowest in the last 10 years.**

This can be explained both by a fairly mild winter, which limited the episodes of winter particulate pollution, and somewhat atypical summer conditions, despite the strong sunshine, which limited the episodes of ozone pollution.

It should be noted that PM<sub>2.5</sub> fine particles are not currently taken into account in the information and alert procedures in the event of a pollution episode.

Date	Exceeded threshold	Pollutant
14/01/2022	Information	Particles PM <sub>10</sub>
15/01/2022	Information	Particles PM <sub>10</sub>
24/03/2022	Information	Particles PM <sub>10</sub>
25/03/2022	Information	Particles PM <sub>10</sub>
26/03/2022	Information	Particles PM <sub>10</sub>
15/06/2022	Information	Ozone
16/06/2022	Information	Ozone
17/06/2022	Information	Ozone
18/07/2022	Information	Ozone
25/08/2022	Information	Ozone

Figure 10 illustrates the number of exceedances of information and alert thresholds from 2012 to 2022, all pollutants combined (NO<sub>2</sub>, O<sub>3</sub>, PM<sub>10</sub>, SO<sub>2</sub>).

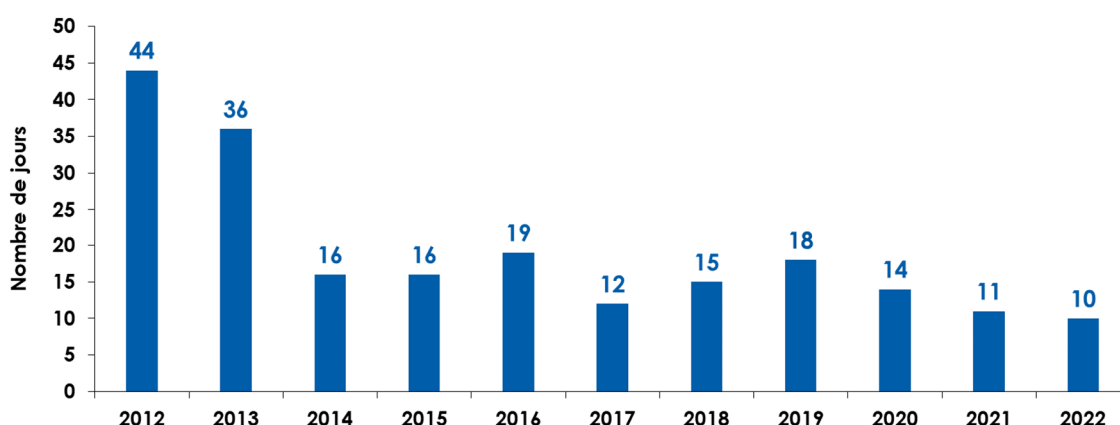


Figure 10 : number of information and alert thresholds exceeded in Île-de-France from 2012 to 2022, all pollutants combined

PM<sub>10</sub> :

Although the winter was generally mild, occasional cold weather conditions with little dispersion during January resulted in 2 days exceeding the PM<sub>10</sub> information threshold (set at 50 µg/m<sup>3</sup> in daily mean) on January 14 and 15, 2022. This mixed episode is linked to the accumulation of particles emitted by local primary sources, in particular the combustion of biomass, which is added to the presence of secondary inorganic aerosols.

Due to spring conditions favorable to the formation of secondary inorganic aerosols, 3 exceedances of the information threshold were observed in March.

Ozone :

During the summer of 2022, 3 heat waves followed one another in June, July and August and led to 5 exceedances of the ozone information threshold (set at 180 µg/m<sup>3</sup> in hourly mean). This number of episode days is relatively low compared to the extreme temperatures measured in Île-de-France. This observation is explained by the fact that during very hot days, the air masses mainly came from the west, which limited the import of pollutants essential to the formation of ozone. In addition, on some days, the temperatures were very high, up to 40 celsius degrees, but the presence of clouds limited the formation of high concentrations of ozone.