High spatial resolution air quality assessment near the Paris Boulevard Périphérique (ring road)

SUEZ AIR & CLIMATE FRANCE

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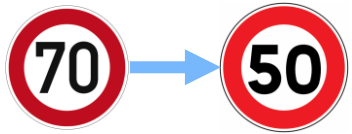
Background

As part of its policy to improve air quality, the City of Paris commissioned SUEZ Aria Technologies to analyze the effects of the transformation of the ring road:

- Reduced traffic speed



- Reserved car-sharing lane

Target: assess the impact of these 2 measures in terms of pollutant emission levels, their dispersion and their effects on populations living in the immediate vicinity of the ring road

Study methodology

Metrology

Implementation of an optimized measurement network

Analysis

Processing of data from the measurement network

Collection

Traffic data collection

Modeling Phase 1

Representation of the current situation (2025)

Modeling Phase 2

Reconstruction of the past situation (2024)

Target: evaluate the impact on air quality of the speed reduction and of the reserved lane on the Paris Boulevard Périphérique

Metrology

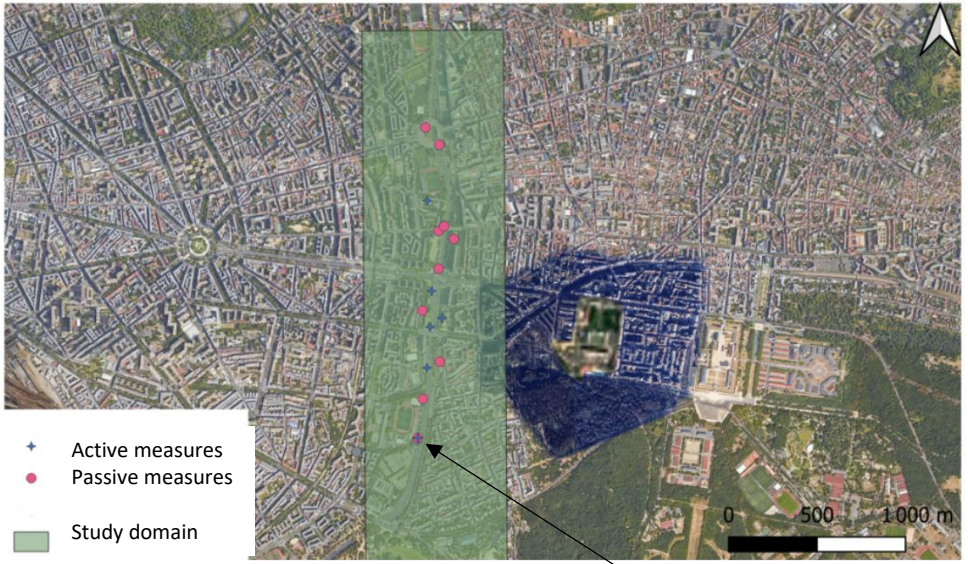
Implementation of the sampling strategy:

Planning 2025:

Mid-April	May	June	Mid-July

Pollutants measured:

- NO_2
- PM_{10}
- $PM_{2.5}$



Measurement types:

- Active measures at NEMO station (3 pollutants)

Allows continuous measurement of pollutant concentrations

- Passive measures on PASSAM device (only NO_2)

Allows to measure an average concentration over a period

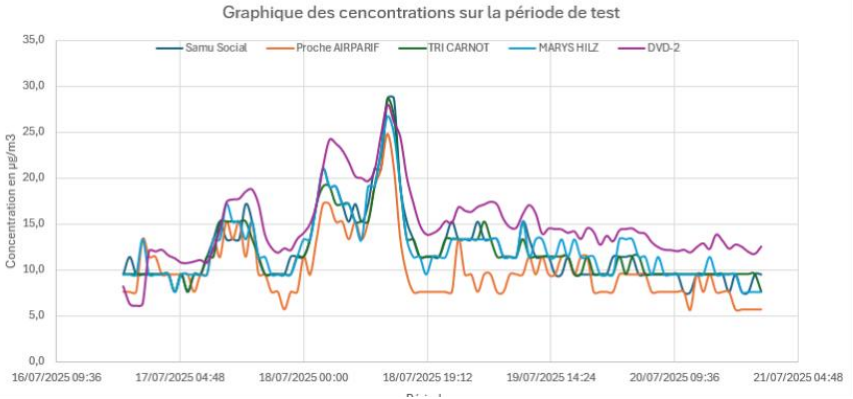
Permanent station of the regional monitoring network

Measures robustness

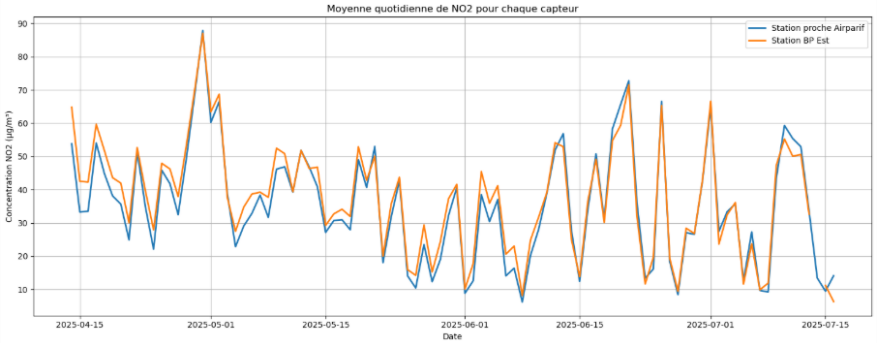
Two axes to validate the measurement

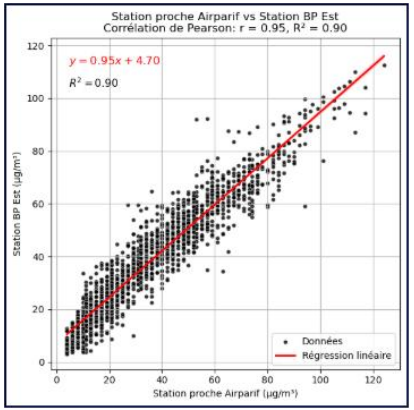
Inter-comparison

Compare on-site stations with each other



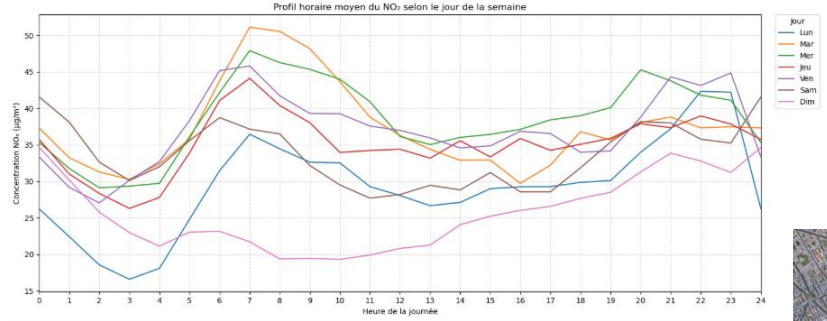
Reference station



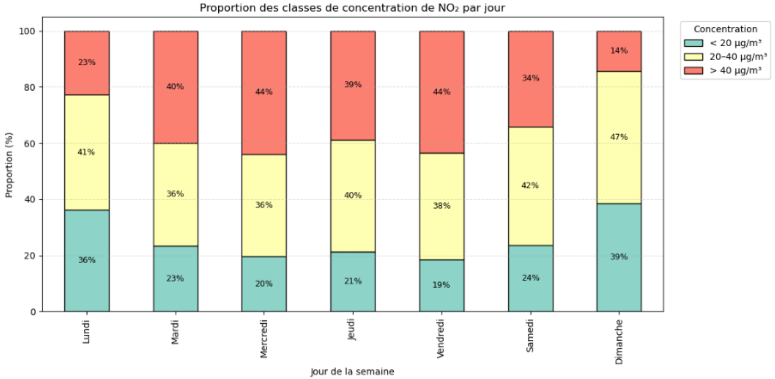


Results from data processing

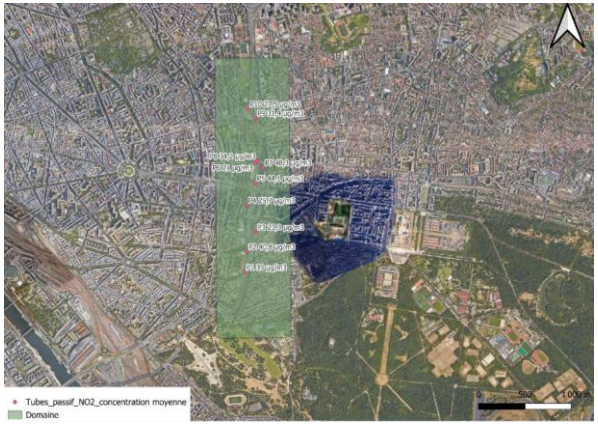
Detailed analysis of the days and hours representative of pollution peaks



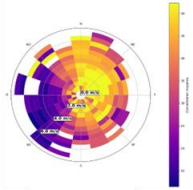
Proportions of concentration classes per day

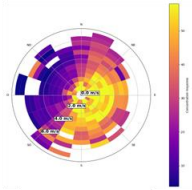


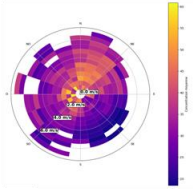
Concentration mapping

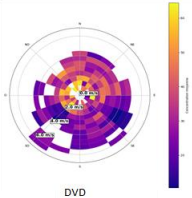


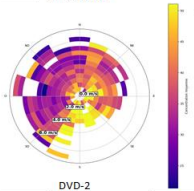
Pollution roses by sector

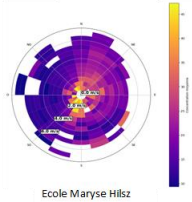










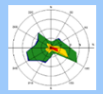


3D modelling

2 scenarios:
Current situation 2025:
Speed limit at 50 km/h
Reserved car-sharing lane
Previous situation 2024:
Speed limit at 70 km/h

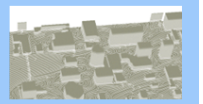
Estimation of emissions from road traffic
AirAdvanced Map TREFIC software, COPERT V methodology

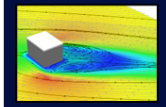
Weather data
Meteomatics extracted at the reference station



Site data
Topography, land use

3D model of buildings



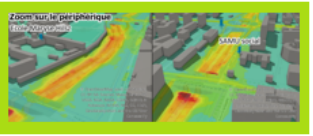


3D modelling of the wind flow with consideration of buildings (micro SWIFT)

AirAdvanced Map PMSS software

3D modelling of pollutant transport and diffusion (micro SPRAY)

Exploitation of the results
Graphs of concentrations at receptors
2D and 3D concentration maps



Input assumptions

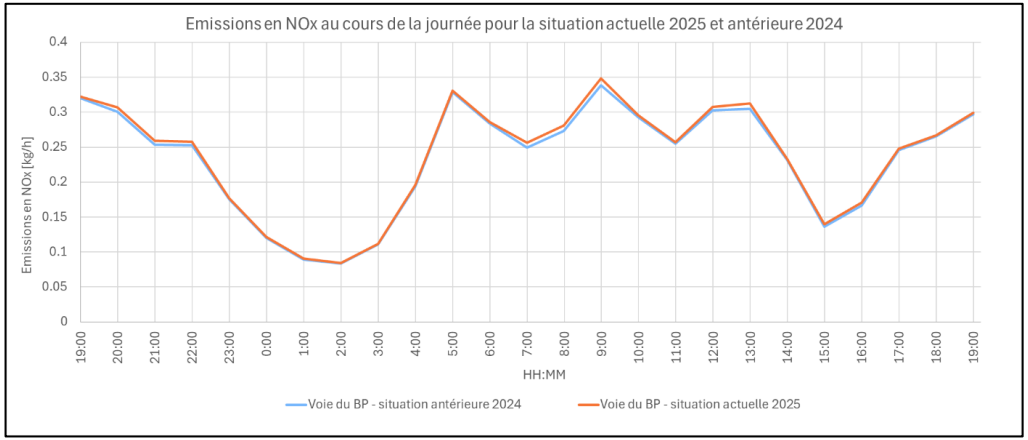
Modelled day: Wednesday, June 11, 2025

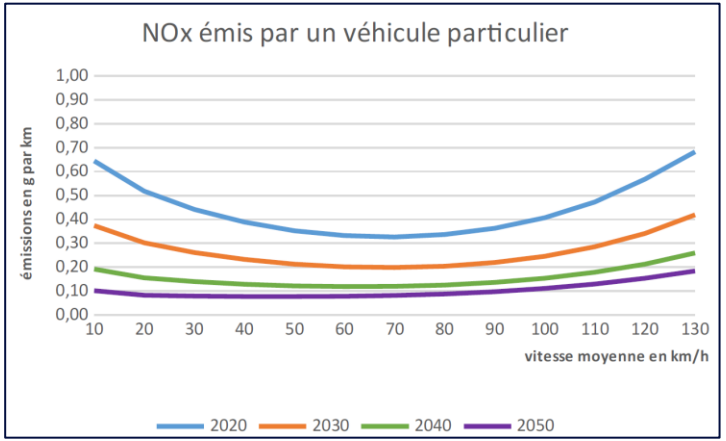
Input data	Current situation 2025: Speed limit at 50 km/h Reserved car-sharing lane	Previous situation 2024: Speed limit at 70 km/h
Traffic flow	Average hourly number of vehicles from counts on the Boulevard Périphérique[1]	**5% increase at each hour** (decrease in vehicle flow of around 5% on average in June 2025 compared to June 2024[2])
Speed	Average hourly speeds from counts on the Boulevard Périphérique[1]	**20% increase at each hour** (speed reduction of about 20% on average in June 2025 compared to June 2024[2])
Weather	Meteomatics extraction on 11/06/2025 at the reference station of the domain	
Background pollution	Background pollution measured on 11/06/2025 at the reference station "Les Halles“ (Paris city center)	
Ratio NO_2/NOx	Hourly ratios calculated from NOx and NO_2 measurements at the reference station of the domain on 11/06/2025	

[1]City of Paris Opendata Database

[2]Boulevard Périphérique barometer, Paris Region Institute, data from Autoroutes Trafic

Modelling results: NOx emissions





Source : Cerema, 2021

Average of +1.5% in 2025 compared to 2024

increases of between 0.6% and 2.9% over the period

The impact of the speed limit reduction and the reserved car-sharing lane on atmospheric NOx emissions can therefore be considered negligible.

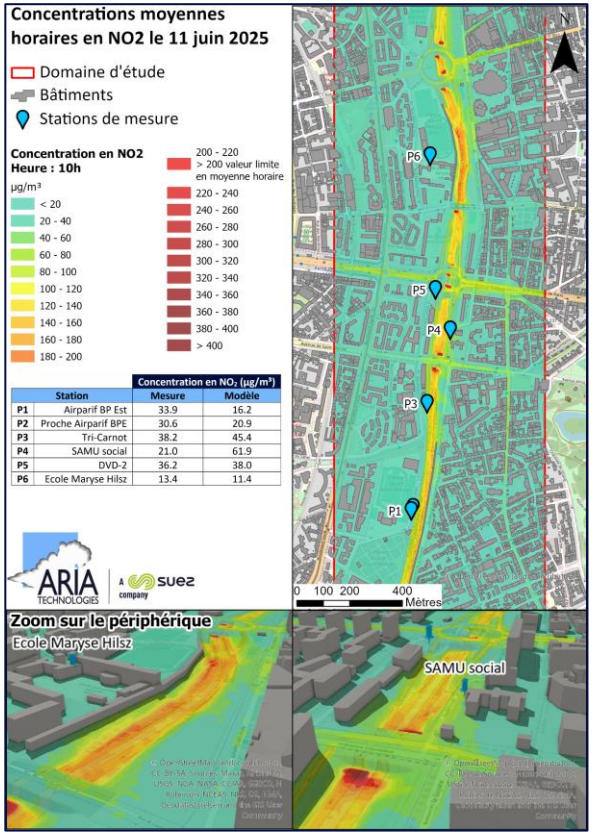
Modelling results: model/measurement comparison

Good model-measurement calibration:
DVD-2 station
Maryse Hilsz School station
Espace Tri-Carno station

Model-measurement deviations over part of the day:
Airparif BP East station
Near Airparif BPE station
Samu Social station
Suggests the absence of systematic bias in modelling

The model remains broadly consistent with the measures.

Modelling results: NO_2 concentrations

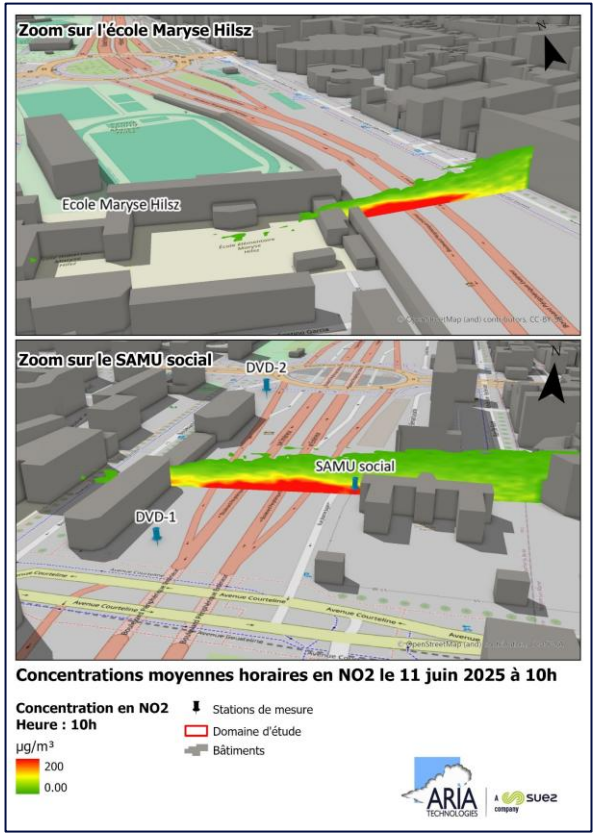


French limit value on hourly average : 200 µg/m³
(not to exceed 18 hours per year)

Compliance with the limit value
Exception at the exit of tunnels

Highest concentrations on the Périphérique road
Concentrations decrease rapidly with distance

Building Screen Effect



Conclusion & outlook

Numerous technical constraints

→ Metrology: incident on measuring stations, numerous unplanned site trips

→ Modelling: many sources of uncertainty (weather data, car fleet, ...)

Methodology that made it possible to provide a response to the initial problem

→ No significant effects due to changes in public policy

→ Deliverables in line with "high" expectations of the City of Paris

Methodology to characterize the impact of road traffic from the Boulevard Périphérique

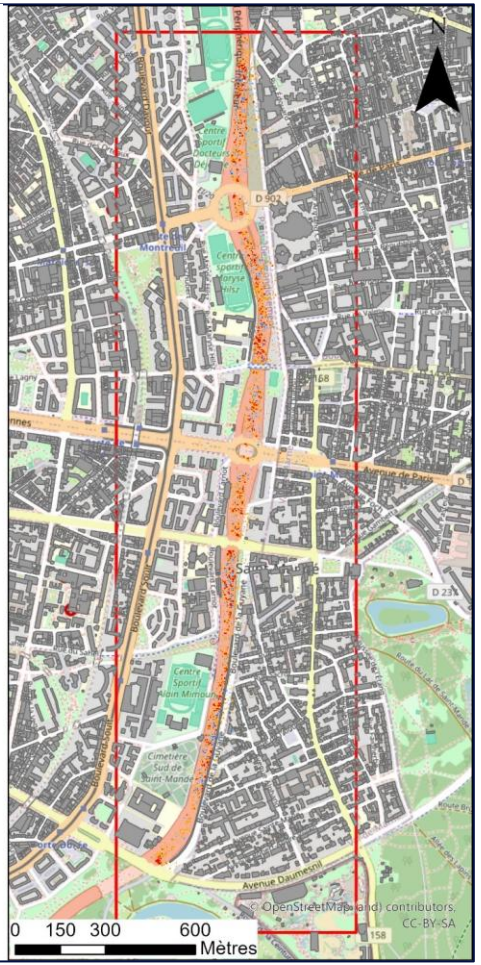
→ Reproducible on a larger scale and over a longer period

Differences in NO_2 concentrations on 11 June at 10 am

Study domain
Buildings

Differences between previous situation (2024) and current situation (2025)

Decreases of more than 10 µg/m³
Decreases of between 5 and 10 µg/m³
Negligible differences in concentrations (interval ± 5 µg/m³)
Increases of between 5 and 10 µg/m³
Increases of more than 10 µg/m³



The speed reduction to 50 km/h and the reserved car-sharing lane were deployed without inducing significant variations in NO_2 concentrations.

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Conclusion & outlook

Thank you