INDICATOR SHEET

1. Indicator Name			
a) Average annual NO_2 concentration b) 99.8th percentile of NO_2 for each hour			
Update Date:	07-11-2024	Version:	v.2.

2. Scope	
Main Scope	Environment and environment
Sub-Scope	Air quality

3. Definition

a) **Average annual NO_2 concentration:**
The indicator shows the average annual concentration of nitrogen dioxide (NO_2) in micrograms per cubic meter (µg/m³) in ambient air.

b) **99.8th percentile of NO_2 for each hour:**
This indicator shows the NO_2 concentration value for each hour that has exceeded only 0.2% of the time during the year. That is, 99.8% of the hours of the year, the concentration of NO_2 has been below this value. This indicator is useful for identifying peaks in NO_2 pollution which, despite being punctual, can have a significant impact on health.

4. Calculation formula

Not applicable, as the indicator is based on modelling data

5. Reading

a) **Average annual NO_2 concentration:**
This indicator makes it possible to compare NO_2 levels between different municipalities or areas in the province of Girona. The information facilitates the analysis of temporal trends and the identification of areas with higher concentrations of NO_2, which may pose a health risk.
In September 2021, the World Health Organization (WHO) published guidelines recommending that average annual NO2 levels should not exceed 10 µg/m³.

The annual average NO_2 provides an overview of air quality throughout the year. However, it does not reflect the occasional variations in NO_2 levels.

b) **99.8th percentile of NO_2 for each hour:**
The 99.8th percentile complements the information of the annual average, as it allows the identification of pollution peaks that may go unnoticed in the annual average.

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The legislative reference values established by Directive 2008/50/EC and RD 102/2011 on NO_2 indicate that the legislated hourly limit value (vlh) – average value for each hour – legislated is 200 µg/m³ of NO_2 which may not be exceeded more than 18 times per year for the protection of human health

The 99.8th percentile of NO2 for each hour is also known as the 19th highest hourly value and represents the highest NO2 concentration that has been exceeded in 18 hours of the year, given that if we consider that a year has 8760 hours, 0.2% of the hours is equivalent to 17.52 hours (0.2/100). And rounding to the nearest integer, we get 18 hours.
Therefore, the 99.8th percentile represents the NO2 concentration that has been exceeded in 18 hours of the year, which coincides with the definition of the 19th highest hourly value.
In conclusion:
The 99.8th percentile and the 19th highest hourly value are two different ways of expressing the same concept: the NO2 concentration that has been exceeded in 18 hours of the year.

For a complete assessment of air quality in relation to NO_2, it is recommended to analyze the annual mean and the 99.8th percentile together

Example: .
A municipality may have a low annual average of NO_2, but a high 99.8th percentile. This indicates that, although air quality is generally good throughout the year, there are punctual pollution peaks that must be considered and appropriate measures taken.

6. Temporality

Annual

7. Source

Department of Climate Action, Food and Rural Agenda (Directorate General for Environmental Quality and Climate Change)

8. Limitations

Geographic ☐	Temporary ☐	Statistical secrecy ☐

Description of limitations
The data are based on air prediction models, which may have a certain margin of uncertainty.

9. SDG

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11.6 (reduce the negative environmental impact per capita of cities, paying special attention to air quality)

10. Comments and observations

Nitrogen dioxide (NO_2) is from a group of highly reactive gases known as nitrogen oxides (NO_x). Other nitrogen oxides include nitrous acid and nitric acid. NO_2 is used as an indicator of the largest group of nitrogen oxides.

Nitrogen dioxide (NO_2) is an air pollutant that comes mainly from the combustion of fossil fuels, such as motor vehicles and industrial facilities.

Exposure to this gas can have negative health effects, especially on the respiratory tract. Information on NO_2 levels can be used for public health decision-making and for planning measures to improve air quality.

For the years 2015 and 2016, the forecast model used was ARAMIS (Regional Air-Quality Modelling Integrated System), which is an air quality modelling system developed by MaiR (Mesoscale and Microscale Atmospheric Modelling and Research Group), a group of researchers from the Department of Astronomy and Meteorology of the University of Barcelona.
For the years 2017, onwards, the forecast model used is CALIOPE (Operational Air Quality for Spain), from the Department of Computer Sciences of the Barcelona Supercomputing Center (BSC), which offers the hourly air quality forecast (24 hours and 48 hours) for Catalonia in a resolution of 4x4 Km and 1x1 Km.

These forecast models contain an emissions model that is carried out according to data provided by the Directorate General for Environmental Quality and Climate Change, among others.
https://mediambient.gencat.cat/ca/05_ambits_dactuacio/atmosfera/qualitat_de_laire/avaluacio/analisi-anual-dels-models-de-qualitat-de-laire/