What is displayed

at the CITI-SENSE visualisation portal

The web page <http://srv.dunavnet.eu/new/citisense/OutdoorDataPortal> demonstrates possible ways to display information about measured and perceived air quality, developed in the CITI-SENSE[[1]](#footnote-1) project, [www.citi-sense.eu](http://www.citi-sense.eu). This information can complement information provided by the authorities under the requirements of European air quality legislation.

The web page is a result of a co-creation process involving many actors. In addition to the project team, hundreds of volunteers across Europe have tested our methods and solutions, and provided invaluable input.

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# Information on the map

On the map, we display color-coded markers for air quality related information (see Layers), generated by project activities in the project locations. The information box on the upper right hand side provides a legend and contains a pop-up window with a description of the Air Pollution Indicator score that we use for indicating the air quality.

Upon pointing on a selected marker, the user will see information about what parameters are available. By clicking on a selected marker for a sensor device, the user will receive technical information about the device (device identifier, type, status, location and position, measured parameters, the latest level of the selected parameter), and the measurement time in UTC (Coordinated Universal Time) with local time correction. Upon clicking on any blue information button, the user will see information about the Air Pollution Indicator (APIN) score. By clicking the button Measurement graph, the user will see the APIN values for the last 24 hours (the graph is interactive, positioning of a pointer on the graph will provide exact time and value). The time step for the graphs for the static sensor devices is one hour, for the mobile devices is one minute.

# The left-hand side menu

## Location

The choice of location reflects the case studies for outdoor air quality in CITI-SENSE. The case studies are active in the following eight cities: Barcelona, Belgrade, Edinburgh, Haifa, Ljubljana, Oslo, Ostrava and Vienna. A pre-defined geographical scope has been chosen for each urban area. Data collected outside this area will not be displayed (with the exception of user perceptions).

## Time period

Only the latest available information is displayed for each type of assessment. All information is time-stamped in UTC.

The availability of the last information varies between the Layers:

For Static Sensors, the last available measurement depends on when the last valid measurement was made available by the data provider to the CITI-SENSE platform. If no data is available in the last 24 hours, the sensor icon will be displayed with transparent colour reflecting the last measurement.

For Mobile sensors, the last available measurement depends on if the device is switched on. If the last measurement is not from today the sensor icon will be displayed with transparent colour.

A perception marker and user comments are shown for all measurements provided within the last 30 days.

The air quality map is displayed for the last hour for which a valid map was produced. The validity of the map depends on the properties of the underlying data; the map is only created if defined criteria are met, and may represent a past situation.

## Layers

The layers represent the different air quality assessment methods:

* Air quality monitoring data from **static** air quality monitoring platforms provided by GEOTECH and DunavNet, with electrochemical sensors (provided by AlphaSense) monitoring particulate matter in two size fractions (PM2,5 and PM10), nitrogen dioxide (NO2), nitrogen monoxide (NO), carbon monoxide (CO), ozone (O3).
* Air quality monitoring data from **mobile** sensor devices provided by Ateknea, in combination with a mobile phone. The sensor units are equipped with electrochemical sensors (provided by AlphaSense) for NO2, O3 and NO, and also provide information about accelerometry.
* Individual personal **perception** of air quality provided using the CityAir app developed by NILU. The app is available from the AppStore and from iTunes, and can be used wherever the mobile phone can determine its location.
* User **comments**. These are related to the individual perceptions and are collected using the CityAir app.
* The **air quality map** created by NILU. This map is developed using a combination of statistical and deterministic air quality modelling methods, with the use of the static sensor input.

Interpretation of the air quality monitoring information provided by devices using the electrochemical sensors needs to take into account the capabilities of these monitoring methods. Typically, monitoring of air quality has a defined monitoring objective that then defines what technologies are suitable for monitoring. The most ubiquitous air quality monitoring is the so-called “compliance monitoring”, which in the EU is required to assess compliance with air quality legislation set up to protect human health and the environment. Such monitoring requires that the technologies used provide results that are similar irrespective of where and when the technologies are deployed, and with parameters that ensure e.g., replicability and precision of the measurements. In CITI-SENSE, we are investigating the capabilities of the sensor devices. These technologies are relatively new, and their properties are not well known. Work is progressing both in CITI-SENSE and world-wide to improve these monitoring methods, and to gather information about their properties. While the technologies are showing great promise, at the moment, it is challenging to communicate their results alongside the established compliance monitoring systems.

In CITI-SENSE, we have decided to provide an “Air Pollution Indication” or APIN score. The definition of this score, with a link to underlying information, can be activated by clicking on the blue information button. The score is based on a definition on a common air quality indicator CAQI, but the differences in monitoring methods restrict comparability with such indicators. There are strict requirements for technologies and quality assurance and control for compliance monitoring that is the basis for the common air quality indicator determination, in contrast to minimal quality assurance and control requirements and unclear properties of the sensor based technologies that are the basis for the APIN. For this reason, one should be cautious when comparing the APIN results over time and in space.

## Filters

For air quality, the default display shows the results of the APIN score. However, it is possible to see scores for individual pollutants (the menu is not specific for the chosen layer). The score is defined based on the same cut-off values of pollutant concentrations as for the established common air quality indicator.

## Individual user track

This button is reserved for use by the volunteers in the special study using the portable devices, and requires a personal log-in information.

## City APIN

This button leads to a summary graph that shows number of static sensor readings for each value of APIN (1-5), based on measurements from the last available hour.

## City perception

This button leads to a summary graph that shows number of perception markers in the city for each perception colour (green, yellow, orange and red), during the current day.

## Give your opinion

Upon clicking on this button, the user will be directed to an evaluation questionnaire that takes about five minutes to complete. The project team will be grateful for any feedback on this web page!

1. CITI-SENSE is a collaborative project co-funded by the European Union's Seventh Framework Programme for Research, Technological Development and Innovation, grant agreement no 308524, active in the period October 2012-Spetember 2016. CITI-SENSE is a collaboration of 29 partners from Europe, Asia and Australia. [↑](#footnote-ref-1)