

VALENCIA LOCAL PLATFORM MONITORING REPORT

Presentation of the platform report

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General recall of the approach

Presentation of the GOUV'AIRNANCE project

Air pollution has devastating environmental and health especially direct. In 1997, the World Health Organization estimated that air pollution was 400 000 people worldwide each year. We observe an increase everywhere in respiratory disorders. Air pollution is also an aggravating factor of global warming on which the greatest scientists agree today that the cause is emissions of greenhouse gases from human activity. The development of photochemical processes, the main indicator is the ozone is especially important around the Mediterranean, particularly in connection with the sunshine.

GOUV'AIRNANCE aims to reduce urban air pollution in the Mediterranean by the establishment of means of measurements and an integrated territorial governance of air quality in four Mediterranean cities: Tripoli (Lebanon), Aqaba (Jordan), Valencia (Spain) and Marseille (France). The project purpose and for the better protection of populations, including the most sensitive (children, elderly, impaired breathing).

GOUV'AIRNANCE proposes an inclusive approach, multi-level and participatory management of air quality. The project's objective of reducing the health impact of air pollution in these cities, thanks to a better understanding of air quality in each area and information for citizens, including sensitive populations. The project also proposes to promote the integration of emission reduction measures as an essential dimension of sustainable urban planning documents.

Territorial Monitoring Committee

The Territorial Monitoring Committee aims to support the project management in the territory of Valencia. It is driven by a team of the Valencian Institute of Building (IVE) and Polibienestar Institute of the University of Valencia. It brings together experts from the concerned public and private sector air quality:

- Public Administration
- socio-economic actors
- productive sectors
- independent experts



Main needs identified in the Monitoring Committee

Reduction of environmental pollution.

Provide more information to the public about air pollution and its health effects

Promote individual and collective measures to prevent exposure sensitive activities.

Measures relating to public health surveillance of air pollution

The Local Platform

Goals

The pilot project is aimed at initiating a monitoring protocol for public buildings, particularly educational ones, and collecting data on air quality in high schools.

Air quality inside buildings depends on the type and amount of emissions of volatile pollutants which are produced indoor, but also on the exchange processes with the outdoor environment through the building elements, the use of the building dependencies and external environmental factors. Given the high variability of all factors mentioned over time, they must be studied through a procedure that provide a high temporal resolution.

Under these considerations, CEAM will perform air quality measures for certain pollutant compounds and atmospheric parameters, in order to analyze the air dynamics in educational buildings, to the extent and benefits described below.

The work presented meet the following objectives:

1. To evaluate exchange processes indoor / outdoor of potential contaminant species in one dependence of the building which will be previously selected (a classroom which is habitually used in the school);
2. To check the content and amount of concentrations of certain indoor pollutants particularly harmful to health (typically produced by emissions within the infrastructure itself).

Expected results

The result of measurement campaigns will be, after analyzing the measurements obtained, to give recommendations for actions in this type of building.

Main features

During each of the four individual campaigns pollutants will be measured continuously throughout the month-long with the automatic equipment provided, and average values will be stored every ten minutes.

For each campaign, the passive samplers will be placed in the same location as the automatic measurements for about a week.

To sum up:

- Automatic measurements of NOx
- Automatic measurements of CO2
- Automatic measurements of temperature and humidity
- Automatic measurements of wind speed
- Passive measures of benzene
- Passive measures of formaldehyde

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Continuous measurements will be made within a selected classrooms , at a point near the ceiling and the center of the room, for the exterior shot we proceeded to place a mast perpendicular to the wall of the building (about 150 cm) , so that the samples are practiced sufficiently removed from the building facade . Both preinstallations are shown in the photographs of the figure 1 below .



Figure 1: detail of the subassemblies installed in one of the schools, which shows the horizontal mast perpendicular to the wall of the building (left) and the sampling and the electric wire for sampling inside the classroom (right).

Implementation

Partners

IVE (Instituto Valenciano de la Edificación)

CEAM (Centro de Estudios Ambientales del Mediterráneo)

MONSOLAR

G-AGUA

Description of scheduled activities and tasks

The performances will be specified in four separate measurement campaigns, not simultaneous, for one month each, and all with the same instrumental deployment.

The secondary schools have been selected by IVE on the basis of proximity to pollution hotspots (vehicles and freight traffic): one in the city center (Luis Vives school) and the other one near the port (Balears school).

According to the stated objectives, and to evaluate the exchange processes inside / outside of potential contaminant species present in parts of the building, will be implemented two separate sampling points, one of them within the same (according to the site selected), and one on the outside, close enough to justify the comparisons between the two.

In each of the two points are monitored, continuously (with ten-minute resolution) the following parameters:

→ concentrations of nitrogen oxides (NO and NO₂), as examples of compounds characteristic pollutants from industrial emissions and anthropogenic (external tracer), and one of the main compounds of urban pollution;

→ CO₂ concentrations, as an exponent of indoor emissions associated with the presence of human agglomerations (inner liner), and while not a pollutant with health effects, is commonly associated with the measure of comfort;

→ temperature and air humidity, as elements of thermodynamic characterization of the air mass, usually cause and effect of management (passive and forced) mass and energy exchange in the building.

Additionally, each campaign is performed (four in total) measuring ambient concentrations of benzene and formaldehyde in three points inside the building, one of which is necessarily placed next to the previous measurements by passive dosimetry techniques, with a exposure of five to seven days. This will provide for each campaign a value (at each point) average ambient concentration for as long as they remain in place, typically pollutant compounds produced by emissions within the infrastructure itself (furniture, paintings, etc.). It will ensure that the three points are located in different areas of the building, either by use or by the characteristics, in order to highlight significant differences interpretable. Each of the two points will be provided for both species redundant sensors in order to minimize the risk of accidental loss of measurements, while reducing the uncertainty thereof.

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Equipment and material

The equipment to measure continuously consists of:

- Two monitors NOx rapid response, by chemiluminescence ultraviolet, Dasibi 2108 model , and specifications : range measures 0-2000 ppb , 0.5 % accuracy , maximum sample flow 1.1 liter / min ;
- One monitor CO2 model LI -840 LICOR, operable in the concentration ranges of 0 to 3000 ppm , (although configurable in the range from 0 to 30000ppm) maximum flow of 1 l / min; 2 analog outputs and RS232 digital output (it has no internal pump) ;
- One system of data acquisition model CR1000 Campbell Scientific, with the following main features: individually programmable differential channels with a voltage range of + -5 volts. 8 TTL digital lines . Four excitation channels , 2 pulse counters , a team has been increased functionality by incorporating a device NL115 (in order to put the datalogger in a local network) and a AM16/32 (multiplexer to add more channels , 16 4-wire or 32-2 wire) ;
- two thermohygrographs for measuring temperature and humidity, one of them with sunscreen outdoors for outdoor measurements .

The measurement with passive meters will include:

- samples once per campaign in each school, simultaneously in four different positions : one external (coincident with the continuous sampling), two within the same classroom, in different locations (one of them also in the same decision point that monitors samples) and finally another in a common area (a corridor) ;
- two pollutants will be measured at each point, benzene and formaldehyde, with duplicate elements in each measure ;
- the passive measures will be exposed for about four / five days (Monday to Friday) , preferably to measure during periods of occupation of the classroom (ruling out maintenance during weekends) ;
- uptake of benzene is carried out using cartridge 15 cm stainless steel , filled with 300 mg Tenax TA 60/80 mesh, with plugs diffusers stainless (previously filled with new TENAX TA and conditioned for 15 min at 300 ° C to avoid the possible existence of interfering VOCs). After sampling, the analysis of the samples will be done by gas chromatography with a thermal desorption ;
- passive sampling of aldehydes and ketones is made by Radiello commercial cartridges (blue diffuser body , supplied by Supelco, RAD1201) loaded with stainless steel tubes filled with Florisil © derivatized with 2,4- dinitrophenylhydrazine (supplied by Supelco, RAD165), for analysis by liquid chromatography .

The installation of the equipment will be made according to the following scheme of Figure 2 (with the options listed and will be resolved in the time of assembly):

- two double samplers with Teflon tube about 4 mm will allow the sampling of indoor and outdoor air, according to the assembly described;
- forced aspiration, alternating every 5 minutes by a solenoid valve, the air flows from inside and outside and so on;

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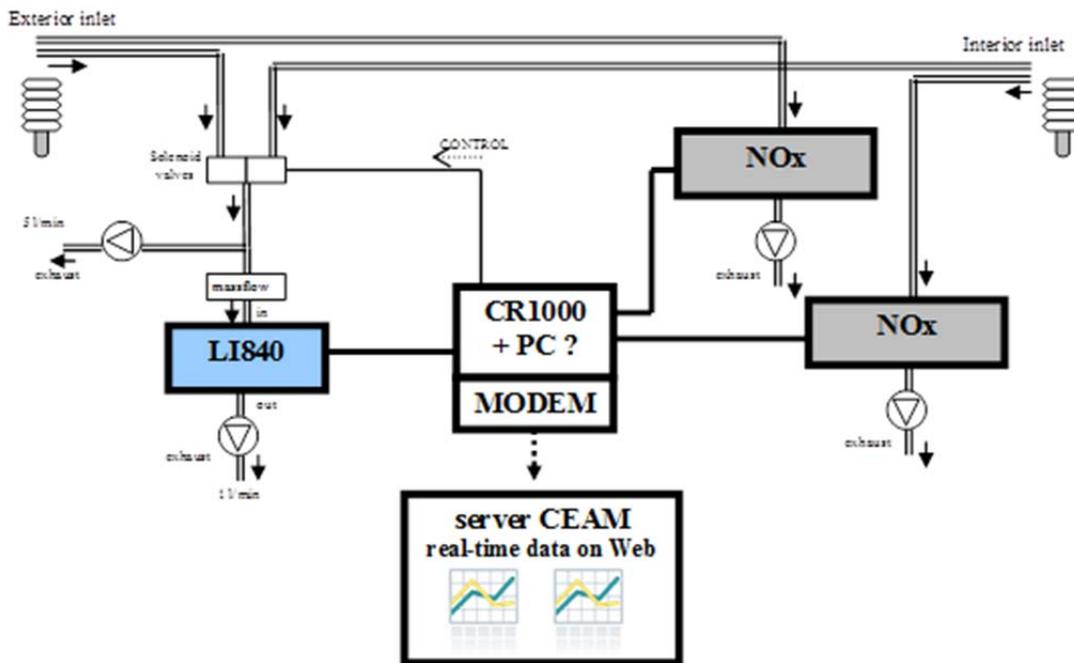


Figure 2: outline of the various components of the continuous sampling system and its interrelationship together.

- CO2 monitor (and, presumably one of the monitors NOx) will measure systematically at the said current measured, so that the same equipment provides measurements of the concentrations inside and outside the building;
- the second monitor NOx (and the first if it is not incorporated into the alternating sequence) will stay in one measuring pathway, acting as a possible reserve team;
- a datalogger will intelligently perform the activation of the solenoid, as well as reading and storing measures, the system ensures that monitors logs are successful within the period that corresponds (in / out), with the necessary safety margin for cleaning lines;
- measures of temperature, humidity and wind speed will be sampled and stored in the same recording equipment, ensuring concurrency and consistency of all of them on the same time basis;
- the own data acquisition system, connected to a wifi element, will allow access at all times to measures via the Internet, for which a procedure of discharge and a real-time display of the values will be enabled.

Implementation schedule

Measurements schedule

The periods of planned measures, within the period 2013-2014 school and climatic difference between them, are the following:

- October 21: start of measurements, first campaign in school A;
- November / December 2013: first campaign in school B;
- January/February / March 2014: second campaign in school B;
- February / March /April / May 2014: second campaign in school A.

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Provisional budget

The budget of the works is explicated below for the different equipment and for each campaign:

Measurement Type (per campaign)	Budget (€)	VAT (21%)	Total (€)
Automatic measurements of NOx in two points (interior and exterior).	2 050,00	430,50	2 480,50
Automatic measurements of CO2 at the same points.	850,00	178,50	1 028,50
Automatic measurements of temperature and humidity at the same points.	No cost	No cost	No cost
Passive measures of benzene at three points (doubles).	474,00	99,54	573,54
Passive measures of formaldehyde at three points (doubles).	435,00	91,35	526,35
Total for individual campaign	3 809,00	799,89	4 608,89
Total four campaigns	15 236,00	3 199,56	18 435,56