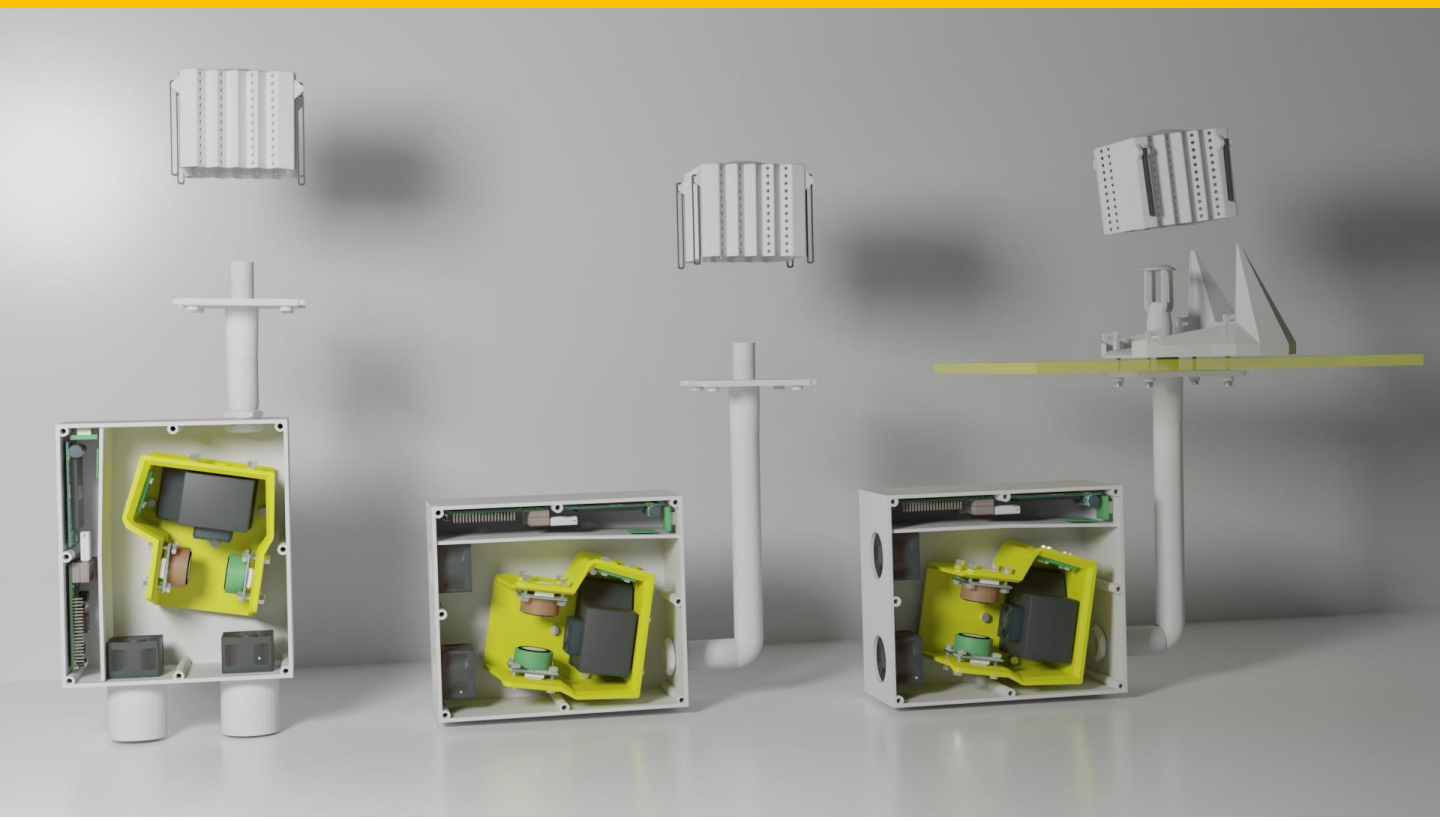
ExpoLIS

Assessment of Human Exposure to Air Pollution to Change the Way People Move in cities

Newsletter 6

August 2021



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Welcome to the sixth edition of the ExpoLIS Newsletter!

This newsletter is based on the ExpoLIS project. This and the future editions will aim to present the work that has been developed, the main outputs and dissemination activities.

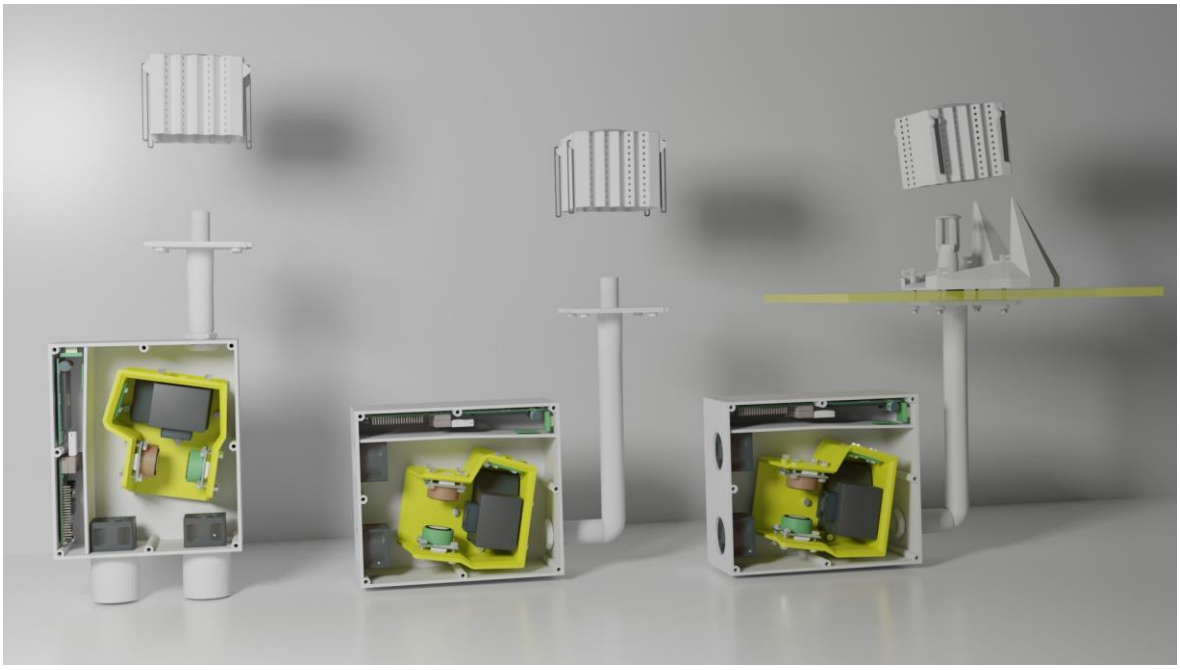
In 2018, two partners joined to propose a new project to the Portuguese Foundation for Science and Technology (FCT). In the last years there has been an improvement in Air Quality in urban areas due to the latest emission control strategies. However, the citizens are still exposed to levels of air pollution above the limits imposed by the legislation. The ExpoLIS project was created with the objective of developing a system that will characterize Air Quality, support air pollution improvement measures and ultimately decrease the citizens exposure to air pollutants.

IN THIS ISSUE

The ExpoLIS sensor node prototype: what has changed?

During the design process of the prototype it became clear that the sensor could not be installed on the top of the buses but instead on its interior with the inlet on the outside sampling outdoor air.

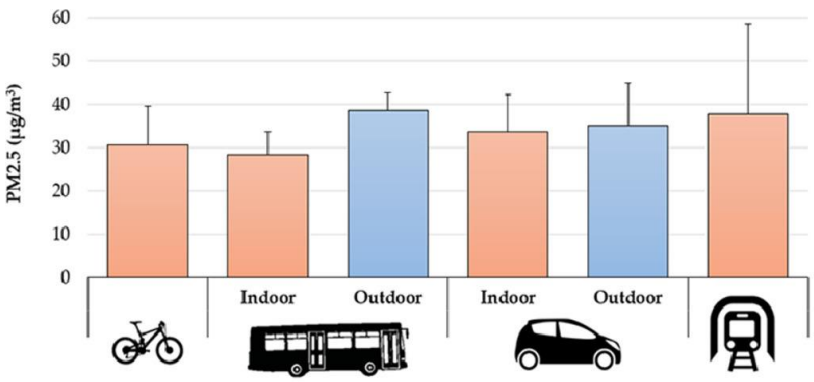
While the box with the sensors and electrical devices is on the interior of the bus, the air inlet, located on the outside, is equipped with a 3D printed sample collection device, design to prevent the entrance of water droplets and the disturbance caused by the wind and the movement of the vehicle.

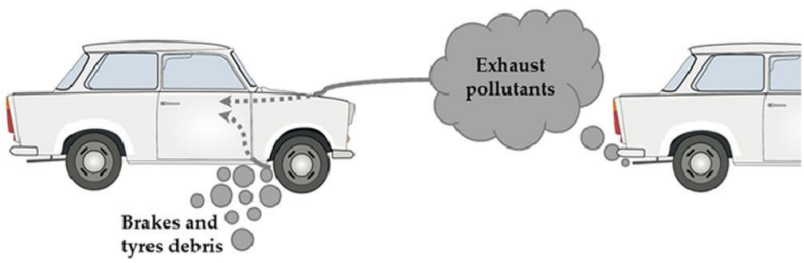


Interestingly, this shift in the requirements resulted in three variations that allow the user to install the sensor node not only in buses (as proposed), but also in cars or bicycles.

Chemical characterization of particulate matter in urban transport modes

Traffic is a main source of air pollutants in urban areas and consequently daily peak exposures tend to occur during commuting. Personal exposure to particulate matter (PM) was monitored while cycling and travelling by bus, car and metro along an assigned route in Lisbon (Portugal), focusing on PM2.5 and PM10 (PM with aerodynamic diameter <2.5 and 10 µm, respectively) mass concentrations and their chemical composition. In vehicles, the indoor-outdoor interplay was also evaluated. The PM2.5 mean concentrations were 28 ± 5, 31 ± 9, 34 ± 9 and 38 ± 21 µg m^{-3} for bus, bicycle, car and metro modes, respectively. Black carbon concentrations when travelling by car were 1.4 to 2.0 times higher than in the other transport modes due to the closer proximity to exhaust emissions. There are marked differences in PM chemical composition depending on transport mode. In particular, Fe was the most abundant component of metro PM, derived from abrasion of rail-wheel-brake interfaces. Enhanced concentrations of Zn and Cu in cars and buses were related with brake and tyre wear particles, which can penetrate into the vehicles. In the motorised transport modes, Fe, Zn, Cu, Ni and K were correlated, evidencing their common traffic-related source. On average, the highest inhaled dose of PM2.5 was observed while cycling (55 µg), and the lowest in car travels (17 µg). Cyclists inhaled higher doses of PM2.5 due to both higher inhalation rates and longer journey times, with a clear enrichment in mineral elements. The presented results evidence the importance of considering the transport mode in exposure assessment studies.





Read the complete article here:

https://doi.org/10.1016/j.jes.2020.07.008

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Meet the team

Vânia Martins

Vânia Martins is a researcher at Center for Nuclear Sciences and Technologies (C2TN) of the Instituto Superior Técnico (IST). Her research work is focused on the assessment of the population exposure to atmospheric aerosols in indoor and outdoor environments.

What will you find in the next issue?

- On the automated learning of air pollution prediction models from data collected by mobile sensor networks
- Air quality mapping and visualization: An affordable solution based on a vehicle-mounted sensor network
- A graphical tool for eliciting knowledge of air pollution sources
- ExpoLIS in the European Aerosol Conference 2021
- ExpoLIS in the 2021 European Night of Researchers
- Meet the team: Carolina Correia

Keep in touch!

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