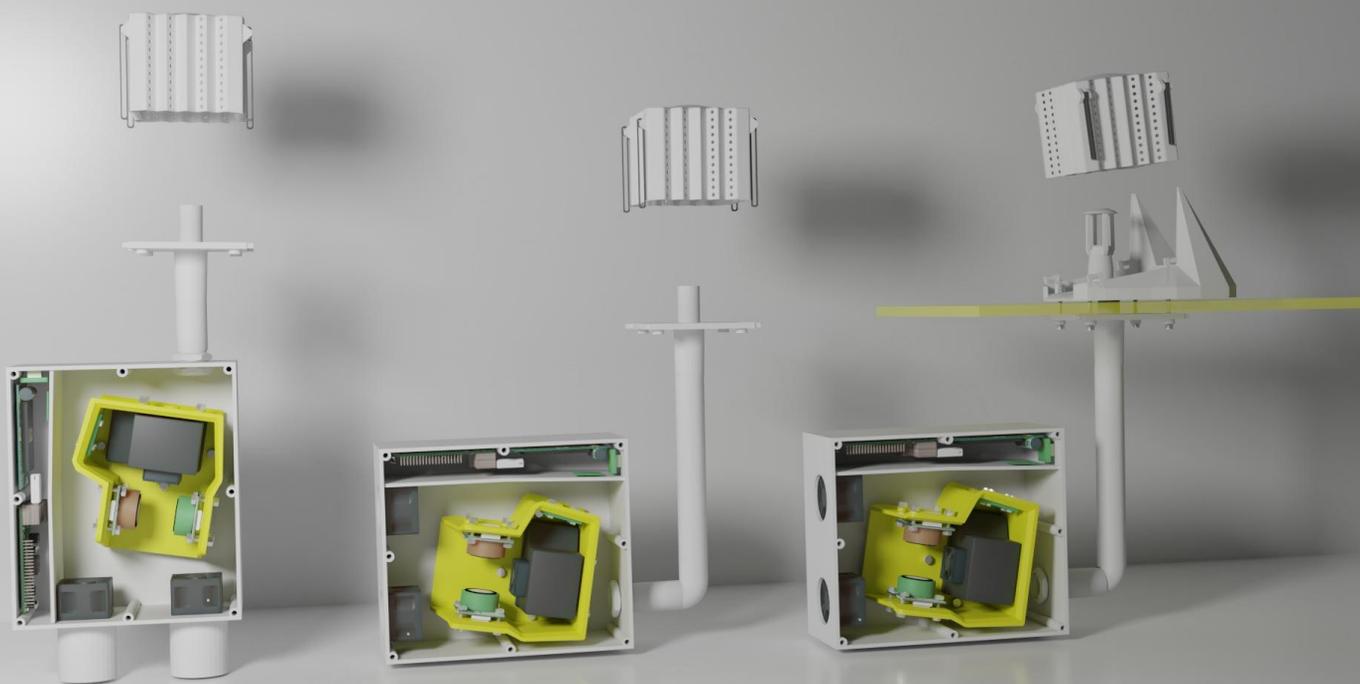


ExpoLIS

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

Newsletter 8

August 2022



Welcome to the eight edition of the ExpoLIS Newsletter!

This newsletter is based on the ExpoLIS project. This and the previous editions aimed 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

- 📖 Exposure to air pollutants in ground transport microenvironments: a book chapter
 - 📖 Source apportionment of children daily exposure to particulate matter
 - 📖 An information system for Air Quality monitoring using mobile sensor network
 - 📖 ExpoLIS in the VIDIS Summer School
 - 📖 ExpoLIS in the European Aerosol Conference 2022
-

Exposure to air pollutants in ground transport microenvironments: a book chapter

The aim of this chapter, developed in the scope of ExpoLIS project, is to identify the key factors affecting the exposure in TME.

Although commuters spend a small proportion of their time in vehicles, transport microenvironments (TME) are a significant contributor to their total daily air pollution exposure, thereby affecting the citizens' health and well-being. The vehicle interior is a specific environment of small volume, affected by traffic-related air pollutants, and by the emissions from a variety of building materials, some of them harmful to the human health. The aim of this chapter is to identify the key factors affecting the exposure in TME. It identifies the principal pollutants influencing the air quality inside vehicle cabins, discusses advantages and disadvantages of the main measuring and modelling approaches used to assess these pollutants, and presents control measures. It is difficult to compare and rank the exposures experienced in buses, cars, motorcycles, trams, trains, subways, cycling, or walking. The exposure varies considerably within and between the different modes of transport, due to disparities in the measurement protocols, vehicle characteristics, ventilation settings, road typology, atmospheric conditions, temporal variations, and user habits. Considering public health, efforts should be made to prioritize active travel, optimize vehicle ventilation and filtration, avoid heavily trafficked roads and rush hours, and maintain indoor cabin hygiene. The information in this chapter can contribute to develop transport and planning policies in urban areas.



Exposure to Air Pollutants in Ground Transport Microenvironments

S. M. Almeida and V. Martins

Contents

Introduction	2
Most Important In-Cabin Pollutants	3
Method to Assess the Exposure During Commuting	7
Measuring	7
Factors Affecting the Personal Exposure During Commuting	10
Transport Characteristics	11
Road and Traffic Conditions	15
Meteorological Variables	16
Individual Behavior	18
Impacts on Health	20
Measures to Reduce Exposure During Commuting	21
Optimizing Driving Behavior	21
Transition to Active Transportation	22
Healthier Routes Planning	23
Conclusions	24
Cross-References	25
References	25

Abstract

Although commuters spend a small proportion of their time in vehicles, transport microenvironments (TME) are a significant contributor to their total daily air pollution exposure, thereby affecting the citizens' health and well-being. The vehicle interior is a specific environment of small volume, affected by traffic-related air pollutants, and by the emissions from a variety of building materials, some of them harmful to the human health. The aim of this chapter is to identify the key factors affecting the exposure in TME. It identifies the principal pollutants influencing the air quality inside vehicle cabins, discusses advantages and

S. M. Almeida (✉) · V. Martins
Centro de Ciências e Tecnologias Nucleares, Instituto Superior Técnico, Bobadela, Portugal
e-mail: smarta@ctn.tecnico.ulisboa.pt; vania.martins@ctn.tecnico.ulisboa.pt

© Springer Nature Singapore Pte Ltd. 2022
Y. Zhang et al. (eds.), *Handbook of Indoor Air Quality*,
https://doi.org/10.1007/978-981-10-5155-5_75-1

1

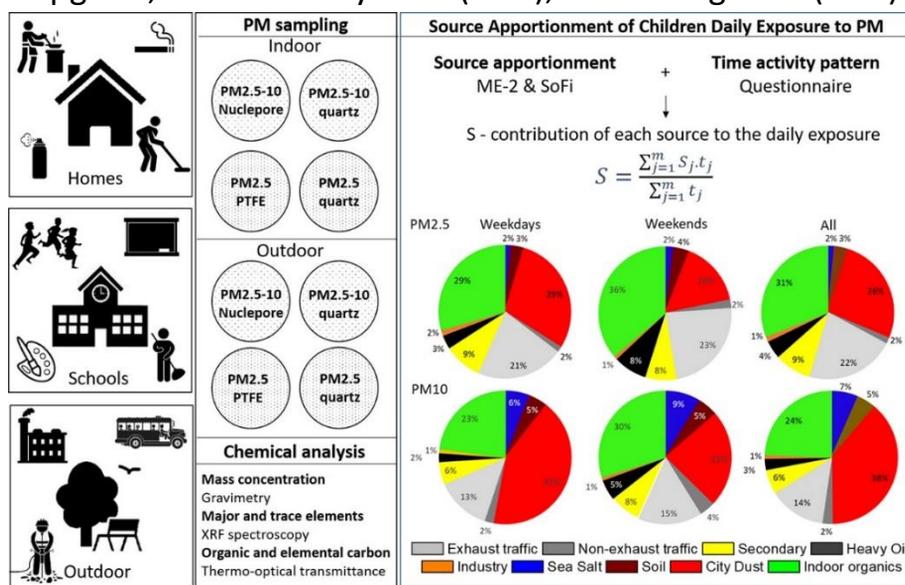
Read the complete chapter here:

https://doi.org/10.1007/978-981-10-5155-5_75-1

Source apportionment of children daily exposure to particulate matter

The present study, published in the scope of the ExpoLIS and LIFE Index-Air projects, aimed to investigate the sources of particulate pollution in indoor and outdoor environments, with focus on determining their contribution to the exposure of children to airborne particulate matter (PM). To this end, parallel indoor and outdoor measurements were carried out for a selection of 40 homes and 5 schools between September 2017 and October 2018. PM_{2.5} and PM_{2.5-10} samples were collected during five days in each microenvironment (ME) and analysed by X-Ray Fluorescence (XRF), for the determination of elements, and by a thermal-optical technique, for the measurement of organic and elemental carbon. The source apportionment analysis of the PM composition data, by means of the receptor model SoFi (Source Finder) 8 Pro, resulted in the identification of nine sources: exhaust and non-exhaust emissions from traffic, secondary particles, heavy oil combustion, industry, sea salt, soil, city dust, and an indoor source characterized by high levels of organic carbon. Integrated daily exposure to PM_{2.5} was on average 21 µg m⁻³. The organic matter, resulting from cleaning, cooking, smoking and biological material, was the major source contributing by 31% to the PM_{2.5} exposure. The source city dust, which was highly influenced by the resuspension of dust in classrooms, was the second main source (26%), followed by traffic (24%). The major sources affecting the integrated exposure to PM₁₀, which was on average 33 µg m⁻³, were the city dust (39%), indoor organics (24%) and traffic (16%).

This study provides important information for the design of measures to reduce the exposure of children to PM.

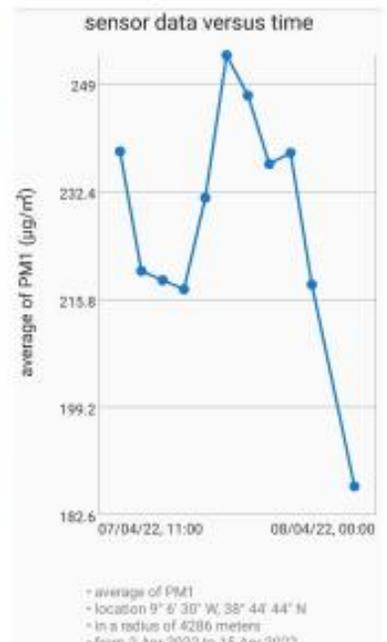


Read the complete article here:

<https://doi.org/10.1080/15567036.2021.1968076>

An information system for Air Quality monitoring using mobile sensor network

Engineering the information system that runs a heterogeneous mobile sensor network is a complex task. In this paper we present the solution that was developed in the context of the ExpOLIS project. Besides the software that needs to transfer, process, and store sensor data, we also developed a mobile application to increase awareness on air pollution, and a tool that allows scientists to subscribe to sensor data. We present the engineering solutions that form the backbone of the information system, and the structure and design of developing supporting tools. We discuss our choices regarding how sensor data are processed in order to make these data available for the common citizen. We mention possible future directions for the software that we have developed.



Read the complete article here:

<https://doi.org/10.5220/0011320400003271>

ExpoLIS in the VIDIS Summer School

08

VIDIS summer school happened in July 2022 in Borkovac, Serbia. It aimed to present innovative methods and tools in air quality and atmospheric aerosols monitoring, modelling and management.

Carolina Correia from the ExpoLIS team was there and she presented to the participants the project, preliminary results (with a work entitled “A vehicle-mounted sensing system: Air Quality monitoring in urban areas”) and shared ideas and knowledge with the other researchers attending the Summer School.



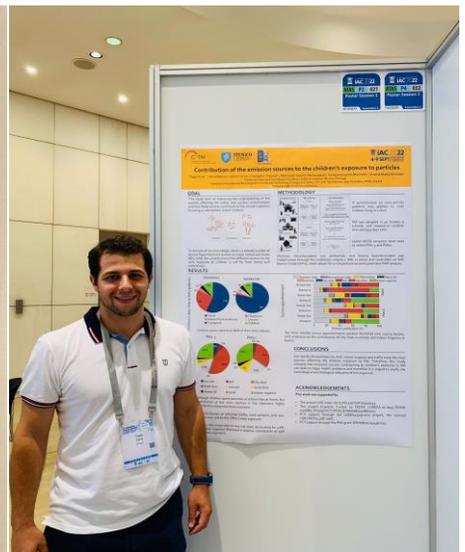
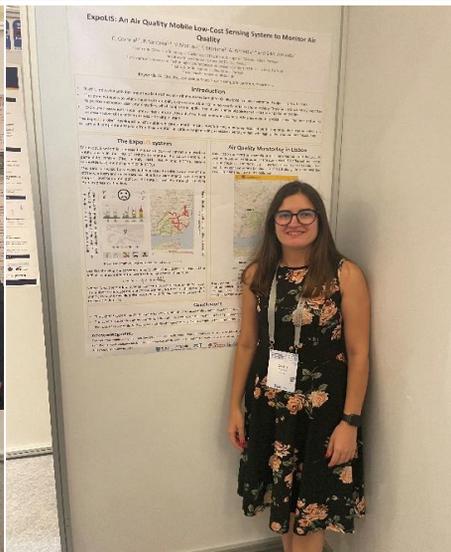
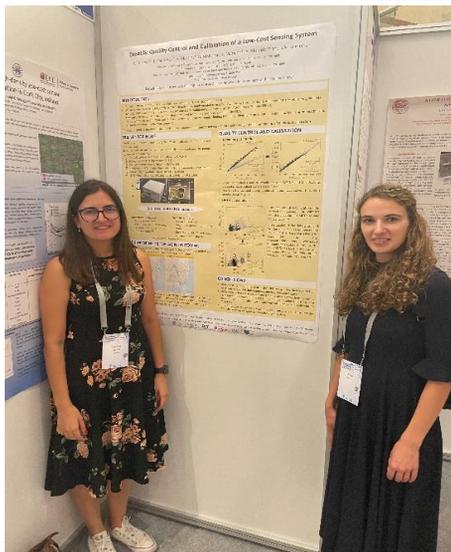
ExpoLIS in the European Aerosol Conference 2022

The International Aerosol Conference 2022 was an conference that brought together researchers from all around the world that are developing their work on the aerosol research field.

The International Aerosol Conference 2022 brought together researchers from all around the world that are developing their work on the aerosol research field.

The ExpoLIS project was present at this conference:

- Carolina Correia presented two posters entitled “ExpoLIS: Quality control and calibration of low cost sensing system” and “ExpoLIS: An Air Quality mobile low cost sensing system to monitor air quality”.
- Vânia Martins made an oral presentation entitled “Factors affecting personal exposure to aerosol particles in transport microenvironments”.
- Tiago Faria presented the poster “Contribution of the emission sources to the children’s exposure to particles”.



Keep in touch!



<http://expolis.ctn.tecnico.ulisboa.pt/>



expolis@ctn.tecnico.ulisboa.pt



<https://www.facebook.com/Expolis-106833807364835/>



<https://www.linkedin.com/groups/8851054/>



<https://twitter.com/LisExpo>

Expolis project is funded by FEDER, through Programa Operacional Regional de Lisboa (LISBOA-01-0145-FEDER-032088), and by national funds (OE), through FCT - Portuguese Foundation for Science and Technology (PTDC/EAM-AMB/32088/2017)

