Biomonitoring PM using transplanted lichens in an urban-industrial area of the Lisbon Metropolitan Area and integration with reference monitoring method

C. Gamelas[1,2], L. Abecasis L.[1], A. Justino[1], I. Dionísio[1], N. Canha[1,3], Z. Kertesz[4] and S. M. Almeida[1]

[1]Centro de Ciências e Tecnologias Nucleares, Instituto Superior Técnico, Universidade de Lisboa, Estrada Nacional 10, 2695-066 Bobadela, Portugal;

[2]ESTSetúbal/IPS and CINEA, IPS Campus, Polytechnic Institute of Setúbal, 2914-508 Setúbal, Portugal;

[3]CESAM—Centre for Environmental and Marine Studies, Department of Environment and Planning, University of Aveiro, 3810-193 Aveiro, Portugal;

[4]Laboratory for Heritage Science, Institute for Nuclear Research, H-4026 Debrecen, Hungary.

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Presenting author email: carla.gamelas@ctn.tecnico.ulisboa.pt

In Seixal, a densely populated urban-industrial area, with the influence of steelworks and crossed by highways, occasional settled dust events have increased the population's concerns regarding air pollution and the need to pinpoint the sources of these events has emerged among local authorities. The present study aimed to answer this problem by a biomonitoring approach using transplanted lichens, to assess the spatial distribution of PM air pollution (Abecasis, 2022).

The lichens *Flavoparmelia caperata* (L.) Hale were collected in a clean air rural area (Montargil) and exposed from 1 February to 17 June 2020, in a georeferenced grid with 77 cells of 650 m×620 m, between the coordinates −9.11, 38.65 and −9.05, 38.59. Exposed and unexposed lichens were analyzed for a total of 20 elements by micro-X-ray Fluorescence. The enrichment factors (EF) relative to soil, contamination factors (CF) and Spearman correlations between the elements, were assessed. The geospatial distribution of the elemental concentrations was mapped using ArcGIS 10.1 and the IDW (Inverse Distance Weighting) tool.

Using this approach, it was possible to identify hotspots of PM air pollution in the area and to identify the potential sources affecting the local air quality: (i) a soil source of natural origin (based on Al, Si, and Ti), (ii) a soil source of natural and anthropogenic origins (Fe and Mg), (iii) a source from the road traffic (Cu and Zn), (iv) a source of biomass burning (Br and K) and (v) a source from the local industry, namely steelworks (Co, Cr, Mn, Pb, and Zn) (Figure 1.).

Furthermore, the results have been compared and integrated with a parallel study (Gamelas, 2022), involving the assessment of PM concentrations by reference methods, the determination of the composition of PM2.5 sampled in filters and source apportionment by PMF.

The present study showed once more the potentialities of biomonitoring, used as a complementary approach to reference methodologies. This study provided the authorities with important information to design targeted mitigation measures to improve local air quality.

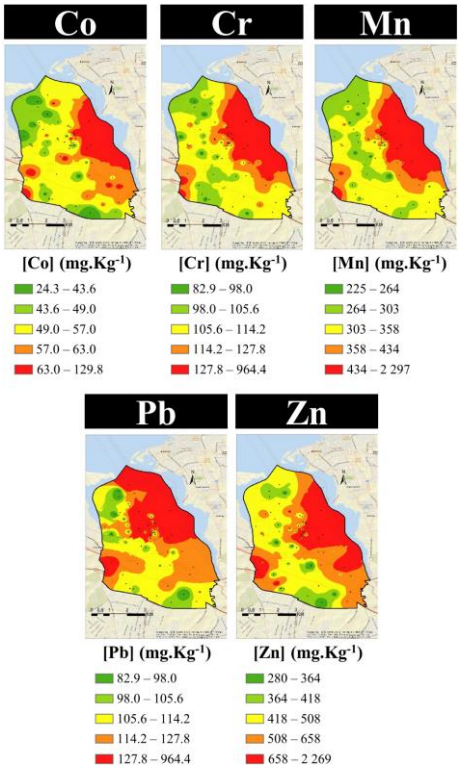

Figure 1. Spatial distribution of elements related with anthropogenic origin, namely industry.

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