urbsoil-lisbon: geochemical survey of lisbon urban soils: a baseline for future human health studies

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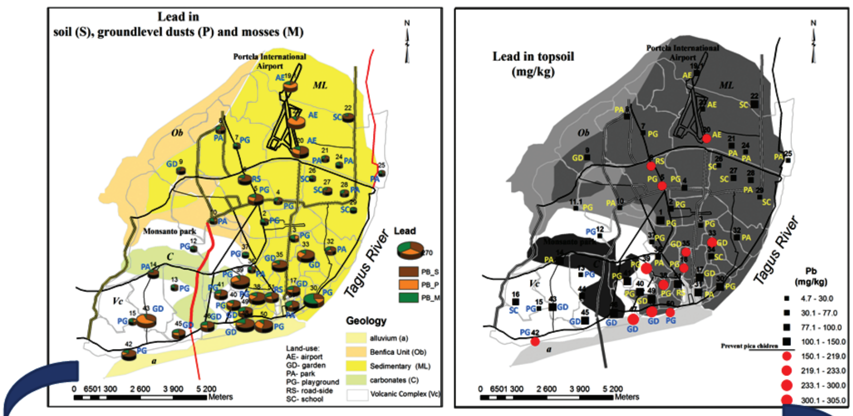

Soil with Pb above standard recommendations (<150 mg/kg)	Land-use	Contributor	Metal source	Probability of exposure through ingestion
Sample 5 – Campo Grande	Playground	Atmospheric dust	Brake wear	High
Sample 6 – Campo Grande	Road-side	Atmospheric dust	Brake wear	Medium
Sample 18 – Mártires da Pátria square	Playground	-	Traffic related	High
Sample 20 – Portela	Airport	Ground dust deposition	Traffic	Low
Sample 33 – Paiva Couceiro square	Garden	Soil (long residence time?)	Fueling Station	Medium
Sample 35 – Estefânia	Garden	Soil (long residence time?)	Traffic/brake wear	Low
Sample 38 – Principe Real square	Playground	Soil/atmospheric dust	Traffic/coal	High
Sample 39 – Amoreiras	Playground	Soil/dust deposition	Traffic/brake wear	High
Sample 42 – Belém	Playground	Soil (long residence time?)	Traffic/brake wear	High
Sample 48 – Santos	Garden	Soil/Atmospheric dust	Traffic/Brake wear	Medium
Sample 50-. D.Luis I square	Playground	Soil/dust deposition	Brake wear/railway	High

Urban soils are the 'recipients' of large amounts of potentially harmful elements (PHE) from a variety of sources including industrial waste, vehicle emissions, coal burning waste, and other activities. In areas where public gardens and parks are exposed to significant pollution levels, soil and ground-level dust may have toxic effects as a consequence of inhalation or ingestion by humans, particularly children, posing major health hazards. Exposure to PHE from contaminated urban soils normally has direct pathways as children pica behavior (deliberate soil intake), dust inhalation and dust adhering to hands that is transferred to the mouth and ingested (involuntary ingestion). The US EPA has recommended values of 100 mg day^{-1} to represent the mean soil intake for children aged 1 to 6. Elements such as arsenic, lead, chromium or thallium, are some of the most toxic and can even lead to death if ingested in large doses, or during long periods of time. Organic compounds as PAHs and PCBs are also potentially harmful to human health, yet any urban environment has increasing levels in such compounds.

Traditionally, soil cleanup criteria for site remediation have been set using concentration-based standards that often require remediation to background levels or to other specified levels that are considered administratively acceptable. However, such criteria do not take into account a number of site-specific factors that considerably modify exposure, and therefore the risk, posed by such PHE. Site-specific factors include several soil properties such as pH, grain size, mineralogy, cation exchange capacity (CEC) or organic matter.

The main purposes of this project are: environmental characterization of urban soils from Lisbon using biomonitors, soil and ground-level dust; identification of PHE and organic compounds that may represent risk to human health; identification of pollution sources; quantification of metal fractions in mobile forms, therefore with higher probability of being bioaccessible to humans; estimating bioaccessibility of Pb in soil and dust using in-vitro tests that reproduce the human gastrointestinal tract of a child; identify soil site specific factors that control metal mobility and Pb oral bioaccessibility; gather all the results in a GIS data platform.