Polycyclic aromatic hydrocarbons in soils and street dust from Lisbon urban area

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Polycyclic Aromatic Hydrocarbons (PAHs) are by-products resulting primarily from the incomplete combustion or pyrolysis of organic material, and thus their origin could be either natural or anthropogenic. Yet, anthropogenic activities (e.g. traffic, industry, domestic heating or incineration processes) are major sources of these compounds. The environmental significance of PAHs is due to their carcinogenic, mutagenic or endocrine disrupting properties. In addition, they can be highly persistent in the environment, accumulating in soils and through the food chain. Hence, it is very important to assess their potential hazard risk, the first step being the measurement of the levels in the environment. In this context, street dusts are especially important regarding both human health exposure (through inhalation, ingestion or dermal contact) and the ecosystems (e.g. transport through runoff into riverine and coastal environments).

The aim of this work was to assess the levels of PAHs in soils and street dusts from the Lisbon urban area, characterize their spatial distribution, and identify sources and potential risks. In order to achieve these aims, topsoils and street dusts were collected from 50 sites. Soils were sieved to <2 mm and street dust to <0.5 mm. The sixteen EPA PAHs were determined by GC-MS after Soxhlet extraction.

There was considerable variation in the results both for soils and street dusts, with some hotspots observed, but in the majority of sites concentrations were below 1000 μg kg^{-1}. Soil and dust median concentrations were similar (around 700 μg kg^{-1}), and the same was observed for mean concentrations (around 3,500 μg kg^{-1}). Nevertheless, when looking at each site, concentrations in soils and street dusts were not always related.

The identification of contaminants sources, which is a critical step in risk assessment and management, was made using multivariate statistics, compound profiles and isomers ratios. Some limitations were identified and source identification was not very clear in some cases. Nevertheless, traffic seems to be the most important source of PAHs in the Lisbon urban area. Profiles and isomer ratios differ for the

two matrixes, reflecting the different origin of dusts (soil-derived and anthropogenic material, as well as particles released into the atmosphere due to natural sources and anthropogenic activities).

A risk assessment framework was designed and areas of potential risk for the environment and human health were identified using GIS tools.

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