



Geochemistry of urban sediments from small urban areas and potential impact on surface waters: a case study in Northern Portugal

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Urban sediments are an important source of contaminants in urban catchments with impact on river ecosystems. Surface runoff from impermeable surfaces transfers sediments and associated contaminants to water bodies affecting the quality of both water and sediment compartments. This study aims to evaluate the metal contents in urban sediments (road deposited sediments) in a small sized urban area, located in a rural mountainous region with no significant industrial units, or mining activities in the vicinity, and subsequently have an insight on the potential contribution to the metal loads transported by fluvial sediments in the streams from the surrounding drainage network.

The area under investigation locates in the northeast Portugal, in the Trás-os-Montes region (NE Portugal). Vila Real is a rural city, with 52781 inhabitants, and in the urban area there are dispersed parks with forest and gardens; locally and in the surroundings of the city there are agricultural terrains. The industry is concentrated, in general, in the industry park. Major pollutant activities can be considered the agriculture (pollution by sediments, metals and use of fertilizers) and urban activities such as atmospheric deposition, vehicular traffic, residential activities, soil erosion and industrial activities. According to the aim of the study, road deposited sediment samples were collected in urban and periurban areas as well as in public playgrounds and in the industrial area. The samples were decomposed with aqua regia, and the concentrations of As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn and V were obtained by ICP-AES.

The total concentrations of As, Cr, Cu, Fe, Mn, Ni, Pb, Zn and V, in road-deposited sediments, indicate relative enrichments in samples collected in the main streets and roads, showing spatial variability. The association of Cu, Pb and Zn is observed in samples collected in the streets with high traffic density and industrial activity; in general, higher relative contents of Fe and Mn are also found in these samples. Associations between V, Cr, Ni, Fe and Mn are found in samples collected near garden areas and in green parks.

Studies performed on river bottom sediments from the fluvial network in the catchment area shows a significant relative enrichment in the contents of metals, in the most mobile geochemical fractions, in samples collected in the reaches downstream the urban area of Vila Real, suggesting an important contribute from urban generated sediments and associated metals through runoff.