

Trace metal concentrations in forest and lawn soils of Paris region (France) along a gradient of urban pressure

Foti Ludovic

FOTI, L., Institute of Ecology and Environmental Sciences (IEES), Department of Community Diversity and Ecosystem Functioning (DCFE), Pierre et Marie Curie (UPMC), Paris, France

Urban soils differ greatly from natural ones as they are located in areas of intense anthropogenic activity (e.g. pollution, physical disturbance, surface transformation). Urban soils are a crucial component of urban ecosystems, especially in public green spaces, and contribute to many ecosystem services from the mitigation of urban heat island to recreational services. In the last decade, the study of urban soils has emerged as an important frontier in environmental research, at least because of their impact on the quality of life of urban populations, because of the services they deliver and because they are more and more recognized as a valuable resource. One of the key issues is the pollution of urban soils because they receive a variety of deposits from local (vehicle emissions, industrial discharges, domestic heating, waste incineration and other anthropogenic activities) and from remote sources (through atmospheric transport). Typical contaminants include persistent toxic substances, such as trace metals (TMs) that have drawn wide attention due to their long persistence in the environment, their tendency to bioaccumulate in the food chain and their toxicity for humans and other organisms. Concentrations, spatial distributions, dynamics, impacts and sources of TMs (e.g. industry or fossil fuels combustion) have attracted a global interest in urban soils and are the subject of ongoing research (e.g. ecotoxicological urban ecology). Some studies have already documented soil pollution with TMs at both the town and regional scales. So far, several monitoring programs (e.g. National Network for the long term Monitoring of Forest Ecosystem, Regional Monitoring Quality of Soil in France) and studies have been carried out on a national scale to measure the ranges of TM concentrations and natural background values in French soils. These studies have focused on French agricultural and forest soils and have not tackled urban soils. No study has described TM concentrations and subsequent risks in soils of Paris and Paris region (Île-de-France). Our study aims at filling this knowledge gap, focusing on contamination and pollution by TMs in lawns and forests that constitute the main types of vegetation in urban areas of Paris region.

Considering the rationale described above, the aims of the present study were (i) to examine the concentration of eight selected TMs (As, Cd, Cr, Cu, Fe, Ni, Pb, Zn) in soils of two land-uses (public lawns and woods) along an urban pressure gradient in Paris region, (ii) to distinguish origins and sources of contamination or pollution, (iii) to evaluate the individual and overall TM contamination degree as well as the individual and overall TM pollution degree, (iiii) to use soil characteristics to better understand soil origins and histories along the urban pressure gradient and the relationship between these characteristics and TM concentrations. Ultimately, this study provides a baseline TM assessment for the long-term monitoring of the evolution of TM soil contents in urban area of the Paris region.