

# **SOIL CONTAMINATION IN COLOMBIAN PLAYGROUNDS: EFFECTS OF VEHICLES, CONSTRUCTION, AND TRAFFIC**

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## **ABSTRACT**

The presence of potentially hazardous elements (PHEs) in playground soils is generally associated with anthropogenic sources such as vehicle traffic, industries, construction sites, and biomass burning. Studies indicate that PHEs are harmful to human health and may even be carcinogenic. Therefore, the aim of this study was to evaluate the physicochemical, morphological, and mineralogical properties of soil samples from three public playgrounds located in the cities of Bogota, Medellin, and Barranquilla. Besides, the possible impacts caused by the aerodynamics of particles in Colombian cities were verified. The morphology, composition, and structure of the nanoparticles (NPs) (< 100 nm) present in these soils were evaluated by field emission scanning electron microscopy (FE-SEM) equipped with high-precision field emission (FE) and high-resolution transmission electron microscopy (HR-TEM). Soil samples were predominantly feldspar, quartz, and, to a lesser extent, clay minerals, carbonates, and hematites. The average content of PHEs was anthropogenically enriched in relation to the upper continental crust. As and Sn showed a large spatial variation, indicating the influence of local sources, such as vehicle traffic and industries. There is an inverse relationship between the total concentrations of some elements and their leachable fractions. The accumulation of traffic-derived PHEs has a negative impact on human health and the environment, which is alarming, especially for elements such as Pb, Sb, or As. Therefore, the presence of PHEs should receive greater attention from public health professionals, and limits should be set and exposures controlled. This study includes the construction of a baseline that provides basic information on pollution, its sources, and exposure routes for humans in the vicinity of Colombia's major cities, characterized by their increasing urbanization and industrialization.

## **KEYWORDS**

Potentially dangerous elements; Anthropogenic sources; Human health; Physicochemical properties; Bogotá, Medellín and Barranquilla