

Influence of Particle Size Distribution on Heavy Metal Geochemistry of Lagos Harbour, Nigeria

Awwal Bamanga^{1*}, Mike Fowler¹ and Graham Mills²

¹School of Earth and Environmental Sciences, University of Portsmouth, UK

²School of Pharmacy & Biomedical Science, University of Portsmouth, UK

The coastal zone of Lagos Harbour, Nigeria, is vulnerable due to the potentially contaminating consequences of human activities. This is particularly the case for the basin of Lagos Harbour due to restricted water circulation. The aim of this investigation was to determine the influence of sediment particle size distribution (PSD) on the heavy metal geochemistry of Lagos Harbour Area.

A total of twenty-six sampling sites were established across Lagos Harbour and Lagoon for the determination of the PSD of sediment samples using a Malvern Instruments MASTERSIZER 2000 laser diffractometer following the method according to British Standards (BS 1377-2, 1990). Heavy metal concentrations were determined using both the 1 M HCl extraction method and the *aqua-regia* method.

The particle size distributions (clay and silt) showed significant positive correlations ($p < 0.05$) with As, Cr and Cu, based on the 1 M HCl extraction method. Significant positive correlations ($p < 0.05$) were also obtained based on the *aqua-regia* method for all the elements.

The strong correlation between decreasing sediment size and increasing heavy metal concentration is well documented and suggests that adsorption is the main mechanism by which trace metals accumulate on particles, given that small particles have a higher surface area relative to their volume than large particles. It is also generally accepted that trace metals are mainly concentrated in the clay/silt sediment fraction, consisting of particles of grain sizes $< 63 \mu\text{m}$.

The study contributes to knowledge in respect to developing a basis for a more extensive investigation of heavy metals in the sediment of Lagos Harbour area. Due to the links demonstrated between particle size and metal contamination, it is vital that a comprehensive determination of the particle size distribution is conducted in Lagos harbour in order better to understand sediment driven pollution in the harbour and thereby develop tailored sediment quality guidelines.

Keywords: Particle Size, Heavy metals, Sediment pollution, Marine pollution, Lagos Harbour, Nigeria

Biography:

Currently, Awwal Bamanga is a Doctoral Candidate at the School of Earth and Environmental Sciences (SEES) University of Portsmouth, United Kingdom, working on marine pollution of harbour systems as a result of shipping, industrial and natural activities. He has more than fourteen years' experience in the monitoring and evaluation of pollution control and management in coastal marine ecosystems within the maritime industry. He possesses a range of skills in monitoring marine pollution through the identification and detection of chemical, biological and physical pollutants, analyzing and assessing the concentrations of these contaminants using advanced environmental equipment, and relating the findings to various sources including local environmental changes, shipping and industrial activities.