

Evaluating Environmental Quality Around Meat-Processing Facilities in Port Harcourt: Implications for Sustainable Urban Environmental Management

Ayomikun Dada¹, Dr. Numbere, A.O.², Prof. Gbarakoro, T.N³, Emoyoma, Oghenovoh Udi⁴

¹ *Institute of Natural Resources and Environmental Management, University of Port Harcourt, Nigeria*

^{2,3} *Dr. Numbere, A.O. - Department of Animal and Environmental Biology, University of Port Harcourt, Nigeria*

³ *African Center for Public Health and Toxicological Research, University of Port Harcourt*

Abstract

Pollution and environmental contamination are recognised as pervasive threats to global health and wellbeing. Globally, the pollution burden contributes approximately 35% to mortality while disproportionately affecting the quality of life of populations in low- and middle-income countries, including Nigeria. Abattoirs and other food processing facilities represent significant but often overlooked sources of heavy metal contamination. Hence, this study assessed soil pollution using Contamination Factor (CF), Degree of Contamination (Cd), Pollution Load Index (PLI), and Geo-accumulation Index (Igeo) in three major abattoirs (Rumuokoro, Mile 3, and Choba) in Port Harcourt, Nigeria. Three soil samples (500g) per site were collected between 0-15cm monthly from each abattoir and a residential control site between July and December 2025. Samples were digested with HNO₃ and analysed for Cadmium (Cd), Chromium (Cr), Lead (Pb), Nickel (Ni), and Copper (Cu) using atomic absorption spectrophotometry. Lead CF values ranged from 0.282–0.567 at the abattoirs compared with 0.029 at the control site. Cadmium showed the highest contamination, with CF values of 1.735–3.766 versus 0.613 at the control. Chromium (0.076–0.107), nickel (0.625–0.949), and copper (0.512–2.081) exhibited variable contamination levels. Degrees of contamination were 6.660, 12.897, and 3.234 for Rumuokoro, Mile 3, and Choba, respectively, compared with 1.304 at the control site. Pollution load indices were 0.750, 0.994, and 0.482 for Rumuokoro, Mile 3, and Choba, respectively, and 0.157 for the control. Most metals indicated low to moderate contamination; however, cadmium exhibited moderate contamination at Rumuokoro and very high contamination at Mile 3. Overall contamination was very low at Rumuokoro and the control site, moderate at Choba, and very high at Mile 3. Cadmium contamination at Mile 3 poses a potential occupational and public health risk, highlighting the need for stronger regulatory enforcement, occupational health protection programmes, and soil remediation strategies.

Keywords: Heavy metal contamination, Abattoir soil pollution, Contamination Factor, Pollution Load Index, Geo-accumulation Index