Assessment of Heavy Metals and Organic Compounds in Water and Leachate from Aba-Eku Municipal Solid Waste Site in Ibadan, Oyo State, Nigeria.

Morolake Oluwatoyosi AFOLABI
LCU/PG/002246

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Certification

This is to certify that **Morolake Oluwatoyosi AFOLABI** with the matriculation number LCU/PG/002246, carried out this research work titled "**Assessment of Heavy Metals and Organic Compounds in Water and Leachate from Aba- Eku Municipal Solid Waste Site in Ibadan, Oyo State, Nigeria..**" in the Department of Biological Sciences, Faculty of Natural & Applied Sciences, Lead City University Ibadan, Oyo State, for the award of Master of Science Degree (MSc) in Environmental Management and Toxicology and this has not been previously submitted.

Dr. Omotayo Sindiku — **Date**
(Supervisor)

Dr. Felicia Adesina — **Date**
(Head of Department)

Dedication

This thesis is dedicated to Almighty God, to my husband and family.

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Even though the above-mentioned institutions and persons have assisted in the process of this research work, I alone stand responsible for the errors, if any, found in the work.

Abstract

Increase in waste generation, resulting from population growth, has led to a burden on global health. Physico-chemical, organic analysis, and leachate pollution index analysis were conducted on the water samples from Aba Eku dumpsite (latitudes 3°35'N and 4°10'N and longitudes 7°2'E and 7°40'E.). Relationships among various parameters were also analysed using correlation coefficients (r) and significance levels (p values). Water samples revealed high concentrations of physico-chemical parameters, heavy metals, also Polyaromatic hydrocarbons (PAHs), and phthalate esters were present. Notably, the dumpsite exhibited highest concentration of naphthalene among all the PAHs. These findings indicate that the landfill site is polluted with PAH and phthalate compounds. Significant relationships among parameters were observed, including a strong negative correlation between pH and both BOD ($r = -0.932$) and dissolved oxygen ($r = -0.912$). Total dissolved solids showed significant positive associations with chloride ($r = 0.977$, $p < 0.05$), total hardness ($r = 0.889$), sulphate ($r = 0.955$, $p < 0.05$), and phosphate ($r = 0.836$). BOD exhibited a strong positive correlation with dissolved oxygen ($r = 0.984$, $p < 0.05$) and NO-3 ($r = 0.742$), while chloride demonstrated significant positive correlations with total hardness ($r = 0.942$), sulphate ($r = 0.994$, $p < 0.01$), and phosphate ($r = 0.796$). Significant differences ($P < 0.001$) were found between leachate and 300m location, leachate and 600m location, as well as leachate and the river location. No significant differences ($P > 0.05$) were detected among other locations. Leachate pollution index (LPI) values of water samples around the dumpsite ranged from 5.558 to 7.683, indicating slight contamination from heavy metals. The pollution from the landfill site, and surface runoff, poses a significant risk to quality of both underground water and river. Urgent remediation, waste management strategies should be implemented to mitigate the pollution.

Keywords: Leachates, Heavy Metals, Leachate Pollution Index, Physicochemical Parameters.

Word Count: 300

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List of Acronyms

Abbreviation	Meaning
AAS	Atomic Absorption Spectroscopy
USEPA	United States Environmental Protection Agency
ANOVA	Analysis of Variance
GC	Gas Chromatography
GC-MS	Gas Chromatography Coupled to Mass Spectrometry
HPLC	High Performance Liquid Chromatography
PAHs	Polycyclic Aromatic Hydrocarbons
LPI	Leachate Pollution Index
MSW	Municipal Solid Waste
PAEs	Phthalate Esters
DEHP	Di (2-ethylhexyl) Phthalate
EPA	Environmental Protection Agency
USA	United States of America
APEs	Alkylphenol Polyethoxylates
PFCs	Perfluorinated Compounds
VOC	Volatile Organic Compounds
PCBs	Polychlorinated Biphenyls
POP	Persistent Organic Pollutants
DDT	Dichlorodiphenyltrichloroethane
PVC	Polyvinyl Chloride
PET	Polyethylene Terephthalate

OECD	Organization for Economic Cooperation and Development
EDCs	Endocrine Disruptive Chemical
SWM	Solid Waste Managements
BPA	Bis-Phenol