

Urbanisation impacts on groundwater nitrification and human health: A case study of Owerri, south east Nigeria

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Introduction

Nitrate is considered as one of the most common contaminants of groundwater resources often associated with environmental degradation due to urbanisation^{1,2}. Poor implementation of land use policies and improper waste management have become major threat to groundwater quality in the study area.

Experimental approach and Discussion

This study presents the quantification and categorical mapping of nitrate concentration in groundwater. An extensive field sampling campaign, that generated chemical datasets for 345 domestic wells and urban garden top soils (< 15 cm depth), was carried out between 2015 and 2017. Groundwater Samples were analysed for ions and DOC using ion chromatography and a Shimadzu TOC-V-CPN series analyser. Time series measurement of nitrate and ammonium concentrations also was conducted for selected groundwater wells across the wet and dry seasons, using a portable Palin test (model 7500) instrument. Soil organic matter was assessed by Loss on ignition. Results reveal nitrate as a critical contaminant in groundwater, with concentrations in ca. 13% of wells being above the WHO threshold of 50 µg/mL, providing evidence to link urbanisation to elevated groundwater nitrate and DOC. Soil organic matter also contributed to the elevated nitrate in groundwater. Health risk assessment shows that children are significantly more vulnerable to contaminant exposure. The study recommends review of Nigerian policies for groundwater governance, to avert water-related diseases especially infantile Methemoglobinemia.

[1] Lapworth et al. (2017), Hydrogeology Journal, **25**(4) 1093 – 1116 [2]. Matiatos (2014), Science of the Total Environment, **476**, 577 – 590.