

Assessing Water Quality from Roof Rainwater Harvesting Systems Aimed for Potable Use: A Case Study in the Eastern Cape Province, Nomlacu Rural Area, South Africa

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Abstract

Globally, water scarcity is on the rise. South Africa has a semi-arid to arid climate, and lack of water resources is resulting in physical water scarcity. Eastern Cape is the second most affected and under-served province with 26.1% of its population having no access to tap water. Winnie Madikizela Mandela Local Municipality of Nomlacu currently has 73.6% municipal water supply backlog. South Africa's primary source of water is surface water which is of questionable quality. This gives Rooftop Rainwater Harvesting (RRWH) systems as a water resource, great opportunity to potentially alleviate water scarcity. RRWH collects rainwater runoff from impermeable roof surfaces, using temporal or permanent facilities such as buckets and storage tanks respectively. This study aims to assess water quality obtained from a rainwater harvesting system for potable use in Nomlacu, South Africa. Water samples were collected from houses with zinc metal and tile roofs in accordance to the South African National Standard (SANS 241-1:2015 Edition 2) for drinking water. According to the results obtained, Aluminium, Colour, Conductivity @25°C, Iron, Odour, pH, Lead, Suspended Solids, Total Dissolved Solids @105°C from both roof types remained under allowable limits. Several studies found steel roofs to present good water quality pertaining Colour and Turbidity. However, in this study, Turbidity and E.coli produced non-compliant results (0.8 – 2.6 NTU) and (4 - >2420 MPN /100mL) respectively. Although within limits, Aluminium, Colour, and Zinc present higher values on zinc metal roof compared to tiled roofing material. This is due to the high radiation and good heat conducting capacity of the metal. Results also showed higher pH levels on tiled roofs (7.15 – 7.25) compared to zinc roofs (6.27 – 6.8), which is in line with the nature of concrete. Usually, the roof can clean itself through first flush runoff, however, manually cleaning the roof before it starts raining and after dry season is recommended. Trimming overhanging tree branches may minimize bird droppings and leaves landing onto the roof. Once the water is collected, it is imperative that disinfection solutions such as chlorine tablets be used and that water is boiled before consumption.

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Keywords: Water scarcity, Water quality, Rooftop Rainwater Harvesting