

## Self Sustaining Integrated Raw Water Treatment and Greywater Recycling for Ground Water Recharge

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**Abstract**

Due to increased urbanization and rising levels of climate change, groundwater aquifer recharge rates have been drastically reduced, making sustainable water resource management imperative. This research study investigates the effectiveness of a sustainable, low-energy water system addressing hard water source treatments as well as greywater reuse from domestic settings, targeting groundwater aquifer recharge. The research uses a natural filtration unit concept involving powder of Moringa oleifera seed, coconut shell charcoal, crushed material of earthen pot, as well as gravel/sand of varying grades. The use of Moringa oleifera acts as a natural source of water coagulation, while crushed earthen pots help in easy ion transfer, reducing calcium and magnesium levels. Findings of this study suggest that water hardness, previously at a maximum of 580 mg/L, is now reduced to 275 mg/L, rendering water safe for domestic use. Final greywater, treated using a perforated filter unit, showed significant levels of organic matter degradation, bringing down Biological Oxygen Demand (BOD) levels from 200 mg/L to 45 mg/L, as well as Chemical Oxygen Demand (COD) levels of 310 mg/L, now at 245 mg/L. The combined technology proves effective in embracing a water circle by finding innovative technological applications, first in treating hard water source water for domestic consumption, followed by applying greywater reuse strategies that make water safe again for groundwater aquifer recharge.

