

Design and Implementation of a Sustainable Drainage System Using Step Filter Technology for Wastewater Treatment in Maldad Village, Maharashtra

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Abstract: Maldad village in Maharashtra suffers from wastewater stagnation due to a blocked and overfilled sewer tank, resulting in severe hygiene and environmental concerns. This paper proposes a decentralised and sustainable wastewater treatment system using a step filter composed of natural filtration media such as boulders, gravel, cocopit, and sand. Designed for a village population of approximately 3,800, the system can treat around 150,000 litres/day of wastewater. The treated water is suitable for reuse in irrigation or safe percolation. The solution is cost-effective, low-maintenance, and replicable across rural India. Maldad village in Maharashtra faces severe wastewater management challenges due to an ageing and overloaded sewer system, leading to environmental pollution, health hazards, and reduced quality of life. This paper presents the design and implementation of a sustainable decentralised wastewater treatment system utilising step filter technology, which employs natural filtration media, including boulders, gravel, and coarse sand, arranged in successive layers to achieve effective contaminant removal. The system is designed to treat approximately 150,000 litres of wastewater per day, generated by a population of around 3,800 residents, with an average greywater generation rate of 40 litres per capita per day. The design focuses on maximising retention time and filtration efficiency, with a multi-stage filter bed ensuring substantial reductions in turbidity, biochemical oxygen demand (BOD), and odours.

Keywords: sustainable drainage, step filter, wastewater treatment, rural sanitation, decentralized system

