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QUANTIFYING GREENHOUSE GAS EMISSIONS FROM DOMESTIC WASTEWATER IN AYODHYA NAGAR NIGAM AND ITS POTENTIAL REDUCTION VIA AEROBIC TREATMENT TECHNOLOGIES

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Abstract

The domestic wastewater sector stands as a significant anthropogenic source of greenhouse gas emissions, encompassing both direct emissions from biological processes and indirect emissions stemming from energy consumption in wastewater collection, treatment plants, and environmental discharge. In this study, we meticulously evaluate the current state of greenhouse gas emissions within the domestic wastewater sector in Ayodhya Nagar Nigam, India, and project emission scenarios up to 2031 using the IPCC (Intergovernmental Panel on Climate Change) calculation methodology. The estimations reveal direct methane emissions of 2.81 Gg/year (gigagram) and nitrous oxide emissions of 0.05 Gg/year, emphasizing the importance of efficient wastewater treatment strategies. Subsequently, we present four distinct scenarios showcasing varying levels of wastewater treatment efficiency and population accessibility. Our findings underscore that adopting an optimized aerobic centralized treatment plant, as outlined in scenario 4, leads to a significant reduction of peak emissions by 63.10% in 2031, demonstrating the effectiveness of technological advancements and strategic planning in mitigating greenhouse gas emissions. This research not only identifies critical emission patterns but also provides a forward-looking perspective, crucial for guiding sustainable urban development within the wastewater domain.

Key words: aerobic treatment plant, Ayodhya Nagar Nigam, domestic wastewater sector, emission scenarios, greenhouse gas emissions

Received: November, 2023; Revised final: July, 2024; Accepted: August, 2024; Published in final edited form: March, 2025

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