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LANDGEM'S ASSESSMENT OF LANDFILL GASES AND POTENTIAL ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE IN KENDARI, INDONESIA

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Abstract

This study presents a quantitative modelling-based analysis to project waste generation, landfill gas (LFG) emissions, and energy recovery potential from the Puuwatu Landfill in Kendari City for the period 2002–2050. Projections employed the IPCC 2006 First-Order Decay (FOD) method and LandGEM v3.03, using linear population interpolation and a fixed waste generation rate of 0.865 kg/capita/day. The population is projected to increase from 222,156 (2002) to 449,940 (2024), with annual waste generation rising from 70,140 to 142,057 tonnes. The average waste collection coverage reached 67.13%, resulting in 95,363 tonnes delivered to the landfill in 2024. Waste composition was predominantly biodegradable (86.23% in 2023), though slightly reduced from 90.1% in 2017, indicating a rising non-biodegradable fraction. LFG accumulation is estimated at 400,351.05 Mg, dominated by methane emissions of 2,182.41 Mg/year. Simulation using four parameter sets (k, L_0) highlights the significance of local data for accurate modelling. Methane energy recovery potential is estimated at 1,100,833 MJ. These findings emphasize the strategic role of LFG in urban energy transition and renewable energy policy development. Further research should explore spatial-dynamic modelling and economic feasibility of LFG management.

Key words: energy recovery, landfill, landGEM, methane, waste to energy

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