

**ANALYSIS OF BIOGAS ENERGY POTENTIAL FROM
MUNICIPAL SOLID WASTE IN PADANG CITY THROUGH
ANAEROBIC DIGESTION**

FINAL PROJECT

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of the requirements for completing the
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ABSTRACT

This study aimed to determine the potential energy content of municipal solid waste (MSW) in Padang City through anaerobic digestion (AD), a sustainable waste-to-energy technology. The increasing volume of municipal solid waste (MSW) in Padang City has created both environmental and energy challenges, emphasizing the need for sustainable waste-to-energy (WtE) solutions. A descriptive quantitative approach was employed by combining primary and secondary data. The research involved community surveys, laboratory analyses (proximate and ultimate), theoretical biogas and energy yield calculations, and the formulation of a preliminary implementation plan for the Limau Manis area. Survey results from 100 respondents showed that organic waste dominates local waste generation (38% organic and 43% mixed organic-plastic). While public support for WtE is high (99%), the lack of waste segregation (54% never segregate) and limited awareness of AD (68% unaware) remain major challenges. Theoretical calculations demonstrated that rubber waste produced the highest methane potential (4.23 mol CH₄/mol sample), followed by wood (2.23 mol CH₄/mol), paper (1.28 mol CH₄/mol), and food waste (0.09 mol CH₄/mol). When converted into electrical energy, Padang City's MSW has a projected potential of approximately 376.8 kWh/day by 2034, which could meet the electricity needs of about 113 households. These results strongly indicate that community-scale anaerobic digestion, supported by source segregation and public education, can serve as an effective strategy for renewable energy generation and sustainable waste management in Padang City.

Keywords: Anaerobic digestion, biogas potential, municipal solid waste, Padang City, waste-to-energy.