



Review

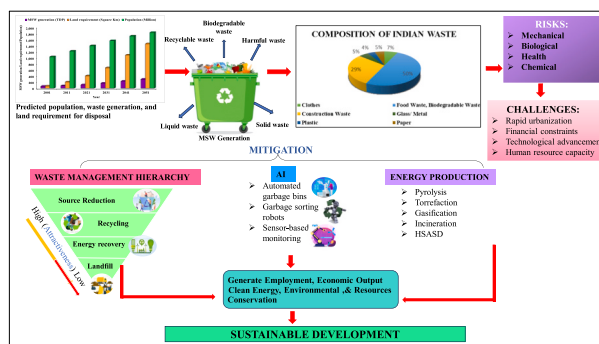
Tackling municipal solid waste crisis in India: Insights into cutting-edge technologies and risk assessment

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HIGHLIGHTS

- AI integration enhances MSW management.
- WTE-T offers landfill diversion, hindered by financial constraints.
- Challenges in MSWM in India
- Urbanization, development, and population growth drive rising waste in India

GRAPHICAL ABSTRACT



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ABSTRACT

Municipal Solid Waste (MSW) management is a pressing global concern, with increasing interest in Waste-to-Energy Technologies (WTE-T) to divert waste from landfills. However, WTE-T adoption is hindered by financial uncertainties. The economic benefits of MSW treatment and energy generation must be balanced against environmental impact. Integrating cutting-edge technologies like Artificial Intelligence (AI) can enhance MSW management strategies and facilitate WTE-T adoption. This review paper explores waste classification, generation, and disposal methods, emphasizing public awareness to reduce waste. It discusses AI's role in waste management, including route optimization, waste composition forecasting, and process parameter optimization for energy generation. Various energy production techniques from MSW, such as high-solids anaerobic digestion, torrefaction, plasma pyrolysis, incineration, gasification, biodegradation, and hydrothermal carbonization, are examined for their advantages and challenges. The paper emphasizes risk assessment in MSW management, covering chemical, mechanical, biological, and health-related risks, aiming to identify and mitigate potential adverse effects. Electronic waste (E-waste) impact on human health and the environment is thoroughly discussed, highlighting the release of hazardous substances and their contribution to air, soil, and water pollution. The paper advocates for circular economy (CE) principles and waste-to-energy solutions to achieve sustainable waste management. It also addresses complexities and constraints faced by developing nations and proposes strategies

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