

# Enhancing Solid Food Waste Collection Practices: A Solution to Alleviate Inconvenience Faced by Panchayat Sweepers

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**ABSTRACT** — This study proposes an innovative approach to enhance solid food waste collection practices, specifically targeting the challenges encountered by Panchayat sweepers. This solution aims to streamline waste management processes. Through real-time monitoring and automated alerts, the system facilitates efficient waste collection while alleviating the inconvenience faced by sweepers. Leveraging IoT capabilities, the proposed framework enables data-driven decision-making and enhances overall operational effectiveness. By embracing technological advancements, this research contributes to sustainable waste management solutions at the grassroots level.

## I INTRODUCTION

In rural regions, solid food waste management often poses significant challenges for Panchayat sweepers, hindering their ability to maintain cleanliness and sanitation effectively. Outdated waste collection practices exacerbate the inconvenience faced by these frontline workers, leading to compromised hygiene standards and environmental concerns within local communities. However, by focusing on enhancing solid food waste collection practices, tailored solutions can be developed to address the specific needs of Panchayat areas, thereby offering a viable solution to alleviate the burden on sweepers and improve overall waste management efficiency.

The endeavor to enhance solid food waste collection practices encompasses various approaches, including the adoption of advanced technologies, community engagement initiatives, and streamlined operational procedures. By integrating IoT-enabled waste collection systems, implementing awareness campaigns, and optimizing waste collection routes, it becomes feasible to revolutionize waste management practices in Panchayat regions. Such enhancements not only empower sweepers with tools to perform their duties more efficiently but also foster a culture of responsible waste disposal among community members, ultimately leading to a cleaner and healthier living environment for all stakeholders involved.

## RELATED WORK

Roy, V. Shah and A. M. S. Zalzala [1] The management of solid waste is a critical challenge, particularly in urban areas where population density is high. One of the significant issues associated with solid waste management is the unpleasant odor emanating from waste collection sites and landfills. This project aims to develop an efficient solid waste smell removal system to address this problem.

Aarikka-Stenroos, L., Chiaroni, D., Kaipainen, J., & Urbinati, A [2] The food industry is a major contributor to the generation of waste and the depletion of natural resources. In order to address these challenges, the circular economy approach offers a promising framework for sustainable waste management in the food industry.

Abdel-Shafy, H. I., & Mansour, M. S. M. [3] Considering the geographical location and one of the very densely populated countries in the world, Bangladesh is very vulnerable to climate change and its adaptability. This paper has been designed with an attempt to inform the policy maker of Bangladesh regarding the potentiality of MSW as a renewable source of energy in Bangladesh. It deals with modern waste collection, management and incineration practices based on densely populated cities or towns like Bogura Municipality and Chattogram City Corporation. Waste to Energy (WtE) conversions not only reduce the land pressure problem in urban areas, but also generate electricity and heat to supply to the surrounding urban areas. The increase in generation of methane (CH<sub>4</sub>) from municipal solid wastes (MSW) alarms the world to take suitable initiative for the sustainable management of MSW, as it is stronger than carbon dioxide (CO<sub>2</sub>). By burning one mole of CH<sub>4</sub>, 890 kJ·mol<sup>-1</sup> heat is produced which is a major source of energy. This treatment technology is used in destruction of solid waste by controlled burning at high temperatures.

## PROBLEM IDENTIFICATION

### Outdated Collection Methods:

Many Panchayat areas still rely on manual waste collection methods, which are labor-intensive and inefficient. Sweepers often face challenges in managing large volumes of solid food waste, leading to delays and inefficiencies in waste collection.

### Health and Safety Risks:

Manual handling of solid food waste exposes sweepers to health and safety risks, including exposure to harmful gases emitted from decomposing waste. Lack of proper safety measures and protective equipment further exacerbates these risks, posing a threat to the well-being of sweepers and the community.

### Inadequate Infrastructure:

Insufficient infrastructure, such as lack of proper waste collection bins or transportation facilities, further complicates waste management efforts in Panchayat areas. This results in improper disposal of waste, leading to environmental pollution and health hazards for residents.

### Limited Monitoring and Control:

The absence of real-time monitoring and control mechanisms makes it challenging to track waste collection activities and respond promptly to issues such as overflowing bins or safety hazards. This lack of oversight hampers the effectiveness of waste management efforts and contributes to unsanitary conditions in Panchayat areas.

### Community Engagement:

There is often a lack of community involvement and awareness regarding proper waste disposal practices. Without active participation from residents, efforts to improve waste management and cleanliness in Panchayat areas are hindered, leading to persistent challenges in maintaining a clean and hygienic environment.

## II PROPOSED SYSTEM METHODOLOGY

The proposed solid food waste collection system incorporates several key components to enhance efficiency and functionality. A reliable power supply, whether from AC mains or rechargeable batteries, ensures continuous operation. Integrated with an ESP8266 module, the system gains Wi-Fi connectivity for seamless communication with an IoT platform.

This enables real-time transmission of data from the gas sensor, which detects harmful gases emitted from decomposing waste. When gas levels surpass predefined thresholds, a buzzer provides audible alerts, ensuring timely intervention to mitigate safety risks. Additionally, a fan system supports ventilation within the collection unit, preventing the buildup of noxious gases.

The system's IoT capabilities facilitate remote monitoring and analysis of sensor data, enabling proactive management. Meanwhile, an LCD display offers local visualization of gas levels, system status, and alerts, providing users with immediate feedback on environmental conditions. Together, these components form an integrated solution that not only addresses the challenges faced by Panchayat sweepers but also improves overall waste collection efficiency and safety.

### Gas Detection and Monitoring:

The gas sensor continuously monitors the air within the waste collection unit for the presence of harmful gases emitted from decomposing food waste, such as methane or volatile organic compounds (VOCs).

When the gas sensor detects gas levels exceeding predefined thresholds, it sends signals to the ESP8266 microcontroller indicating the presence of elevated gas concentrations.

### Alert Generation:

Upon receiving signals from the gas sensor, the microcontroller analyzes the data and determines if gas levels pose a safety hazard.

If hazardous gas levels are detected, the microcontroller activates the buzzer to generate audible alerts, notifying Panchayat sweepers or users of potential safety risks.

**Ventilation Control:**

In parallel with alert generation, the microcontroller controls the fan system to facilitate ventilation within the waste collection unit.

The fan helps to circulate air, preventing the accumulation of noxious gases and maintaining optimal air quality for sweepers and surrounding areas.

**Data Transmission and Visualization:**

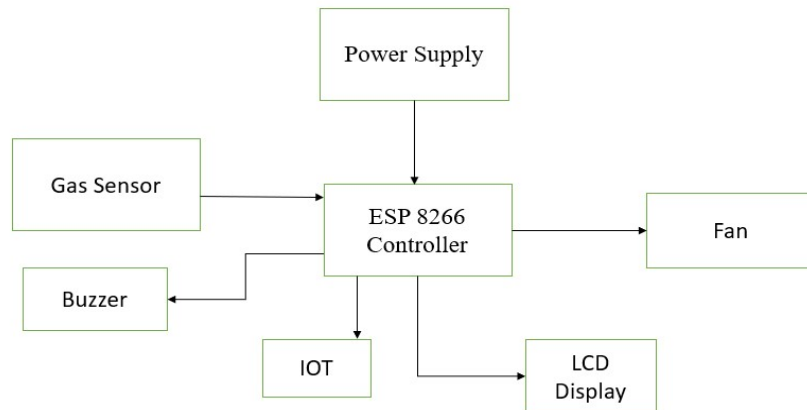
The microcontroller also facilitates communication with external systems, such as IoT platforms, to transmit data regarding gas levels, system status, and alerts in real-time.

Additionally, local visualization of critical information is provided through the LCD display, allowing sweepers or users to monitor gas levels and system status directly.

**Remote Monitoring and Management:**

External systems, such as IoT platforms, receive data transmitted from the system, enabling remote monitoring and management capabilities.

Through the IoT platform, stakeholders can visualize data, receive alerts, and take proactive measures to address safety hazards or optimize waste collection operations remotely.



**IV RESULTS AND DISCUSSIONS**

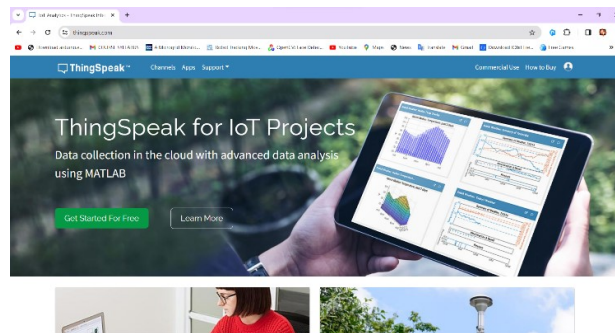


Fig 2a. Home Page

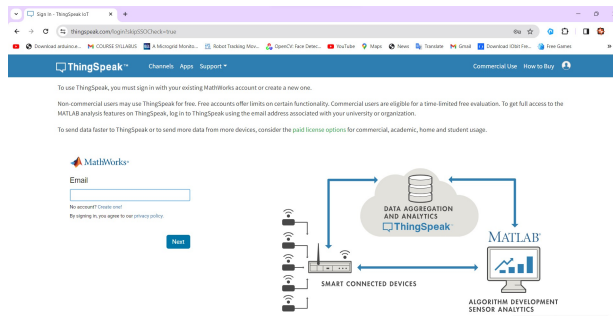


Fig 2b. Login Page

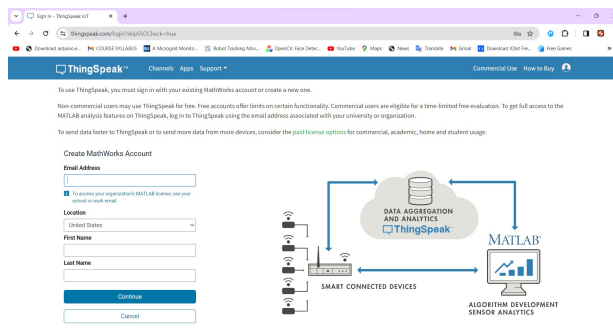


Fig 2c. Create Account

## CONCLUSION

In conclusion this paper underscores the critical role of a specialized platform for skilled labour recruitment in Tamil Nadu. The emphasis on a user friendly website acknowledges the evolving needs of the both labours and companies. by addressing current challenges in the recruitment landscape, the proposed system aims to significantly enhance the efficiency and effectiveness of the hiring process. The research contributes valuable insights to the field and sets the foundation for future advancements in the domain of skilled labour recruitment.

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