



# RAJKIYA ENGINEERING COLLEGE SONBHADRA

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**Problem Statement : Open Inovation**

**SMART BIN**





## SMART BIN

We build smart bins that make waste management effortless and eco-friendly.

# OVERVIEW



- ◆ INTRODUCTION
- ◆ PROBLEM
- ◆ SOLUTION
- ◆ FEATURES
- ◆ COMPONENTS USED
- ◆ GOOGLE TECHNOLOGIES USED IN SOLUTIONS
- ◆ ADVANTAGES OF SMART BIN
- ◆ APPLICATIONS OF SMART BIN
- ◆ WORKING MODEL
- ◆ BENEFITS TO COLLEGE
- ◆ FUTURE SCOPE
- ◆ CONCLUSION



# INTRODUCTION

This project presents a Smart Dustbin that uses sensors to detect waste levels and indicate when it is full. It includes ultrasonic and electronic components for accurate monitoring and automatic operation. A UV sterilization unit is added to maintain hygiene by reducing germs and keeping the dustbin clean.



# PROBLEMS

- Traditional dustbins overflow because there is no real-time monitoring.
- Overflowing bins cause bad smell, insects, and unhygienic surroundings.
- People mix dry and wet waste, making recycling difficult.
- Cleaners must manually check each bin, which wastes time and effort.
- Lack of automation increases workload and reduces efficiency.
- Poor waste management leads to pollution and environmental harm.

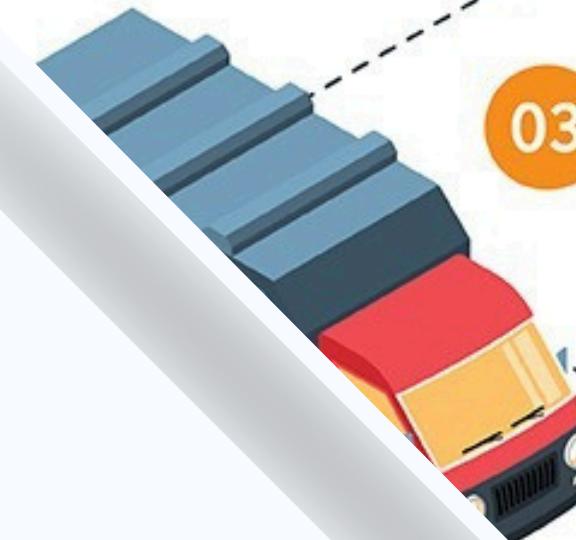


# SOLUTIONS

- Automated sorting and monitoring reduce manual
- Organised solution and segregation and timely disposal promote hygiene and sustainability.
- Smart Bin with sensors sends alerts when full to prevent overflow .
- Timely notifications and automatic lid closure maintain cleanliness.
- Separate compartments for dry and wet waste for easy recycling.
- Remote monitoring allows cleaners to empty only full bins.



02 Better Quality  
Of Service



03 Efficient Resource  
& Route Planning

## Smart Bin Solution



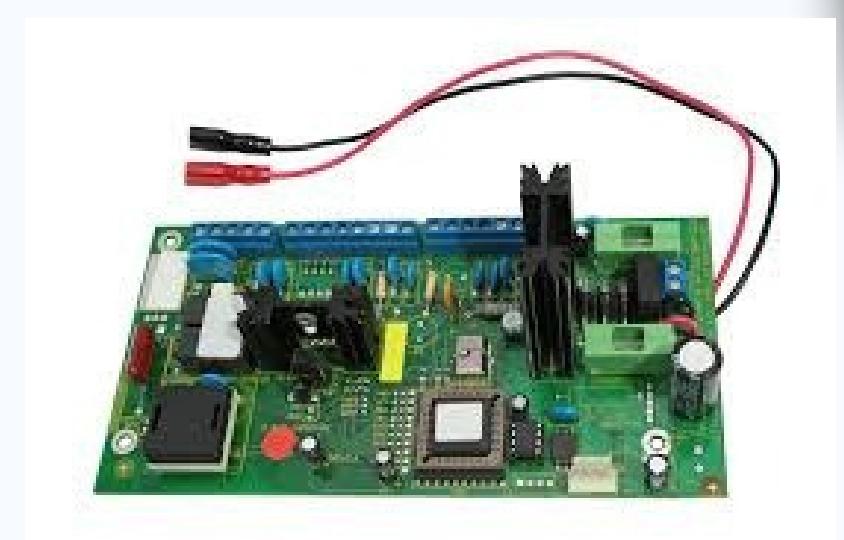
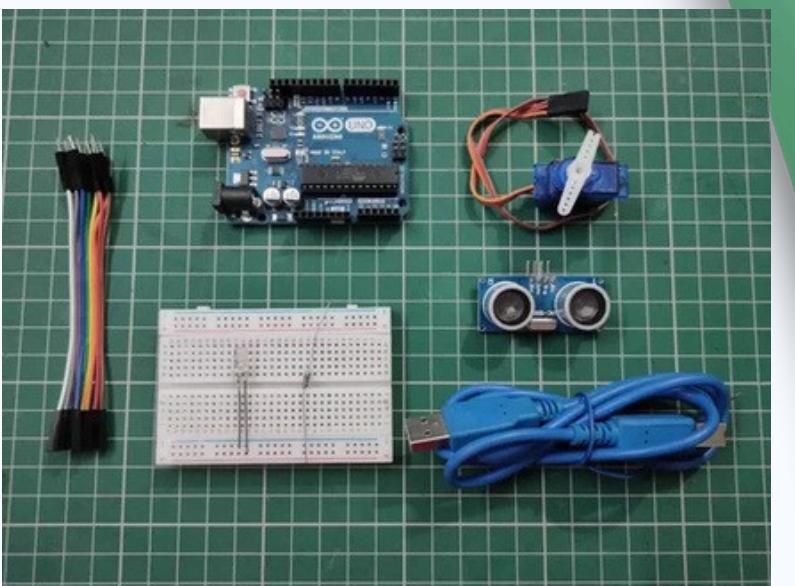
# FEATURES

- Notification alert on mobile when dustbin is full
- Real-time status of all dustbins on App/Panel.
- Automatic cleaning call before overflow.
- Eco-friendly design → Powered by solar energy
- Automatic lid opening with motion sensors
- Waste level detection using ultrasonic sensors
- Real-time fill-level alerts on mobile app
- Temperature & gas sensors for safety
- Segregation of dry and wet waste
- GPS tracking for bin location
- Solar-powered operation
- Auto-notification to cleaning staff
- Anti-odor system
- Durable, weather-resistant body



# COMPONENTS USED

1. ULTRASONIC SENSOR
2. IR SENSOR
3. UV-C LED/UV MODULE
4. ARDUINO/NODEMCU/ESP32
5. SERVO MOTOR
6. BUZZER/LED INDICATORS
7. WIRES, PCB BOARD, POWER SUPPLY



# GOOGLE TECHNOLOGIES USED

**Google TensorFlow/TensorFlow Lite:** Used for image-based waste classification

Helps identifying plastic, metal, paper, organic waste

**Google Cloud Platform(GCP):** used to store sensor data, usage logs

**Google Firebase:** Real time database for- Bin fill level, status, alerts

**Google Looker Studio:** used to create dashboards for daily waste collected, recycling percentage

**Google Map Platform:** used to track bin locations, optimize garbage collection routes, show full bins on live maps

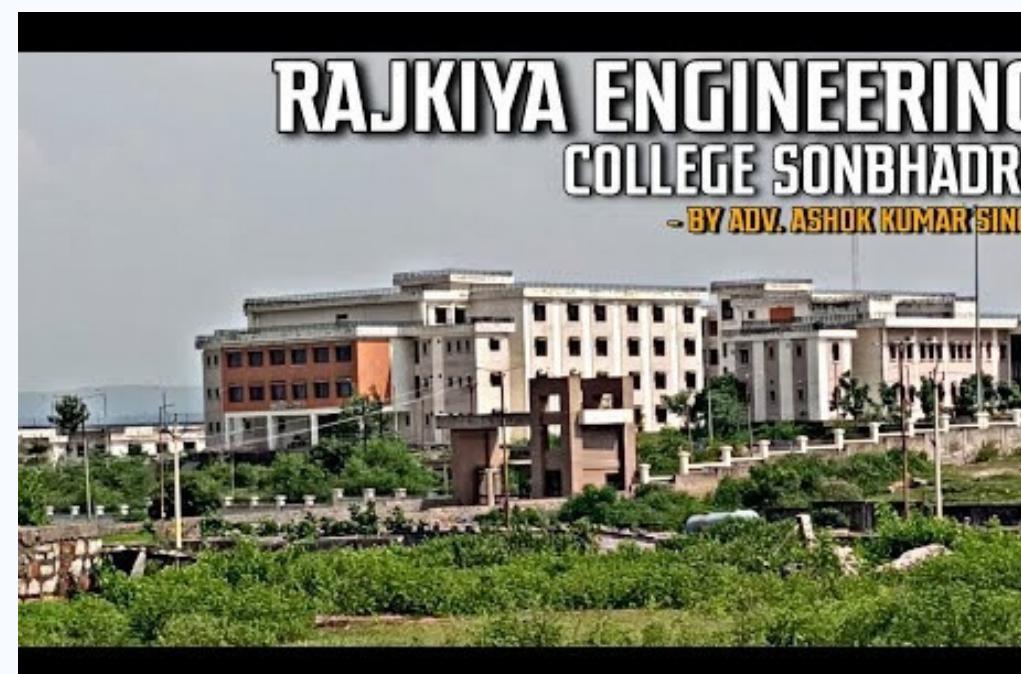
# **ADVANTAGES OF SMART DUSTBIN**

**"Automation reduces effort, enhances hygiene, and improves every space."**

1. Reduces human contact by providing touchless lid operation, improving safety and comfort.
2. Prevents overflow through automatic waste-level detection and timely alerts.
3. Maintains hygiene using a built-in UV sterilization system that kills germs and bacteria.
4. Improves waste management efficiency by ensuring timely cleaning and reducing manual checking.
5. Enhances cleanliness in homes, schools, offices, and public places with automated functions.
6. Energy-efficient and user-friendly, requiring minimal maintenance.



# APPLICATIONS OF SMART DUSTBIN



Homes & Apartments: For hygienic and touch-free daily waste disposal. Offices & Workplaces: Helps maintain a clean and professional environment.

## *Hospitals & Clinics: Ensures high hygiene*

standards by minimizing contact with waste. Schools & Colleges: Encourages students to follow clean and smart waste management practices. Shopping

## *Malls & Public Areas:*

Prevents overflowing bins and keeps crowded places clean. Hostels & Residential Buildings: Supports efficient waste management with timely alerts. Restaurants & Cafeterias: Maintains cleanliness in food-handling areas.

# WORKING MODEL(STEP BY STEP)

- 1.Waste is thrown → An ultrasonic sensor inside the dustbin measures the height/level of the waste.
- 2.Sensor Data → The sensor sends data to a microcontroller (such as Arduino/ESP32).
- 3.Data Analysis → The microcontroller checks how much (%) the dustbin is filled. If it is 70% full, the app will show a “Half Filled” status. If it is 100% full, a notification will be sent immediately.
- 4.Wireless Communication → The Wi-Fi/LoRa module sends the data to the cloud or directly to the mobile app.



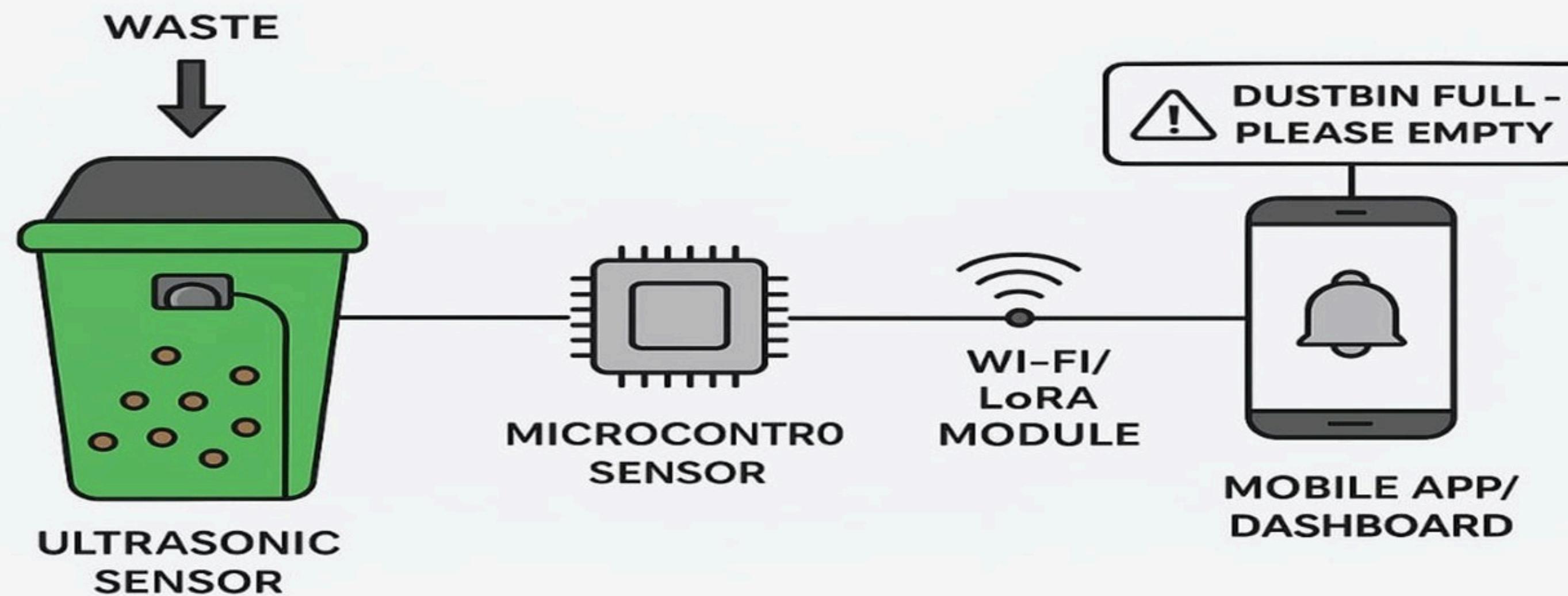
- 5.Mobile App/Dashboard → Cleaning staff can see in real-time which dustbin is filled.
- 6.(Optional) Solar Panel → Charges the dustbin's battery to make it eco-friendly

# Benefits To College

- **Smart Campus Image**  
→ **Visitors will see a modern & eco-friendly campus.**
- **Clean Environment**  
→ **No overflow, no bad smell, hygienic surroundings.**
- **Cost Saving**  
→ **Reduces unnecessary cleaning trips.**
- **NAAC/Accreditation points**  
→ **Adds value to college rankings.**



# SMART GREEN DUSTBIN



# FUTURE SCOPE

- Can be used not only in colleges but also in hostels, hospitals, hotels, malls, and railway stations.
- Data analytics can help understand waste patterns to improve recycling & disposal systems.
- Can be scaled as a startup (B2B model) for commercial use.



## SMART DUSK

(Auto open / clos



Automatic



Silent Mod



Upgraded



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# CONCLUSION

This project successfully demonstrates how automation and sensor-based technology can transform a simple dustbin into a smarter and more efficient waste management system. By using ultrasonic sensors, servo motors, and a microcontroller, the Smart Dustbin provides touchless operation and alerts when the bin is full, reducing manual effort and preventing unhygienic conditions.

Additionally, the integration of a UV sterilization unit adds an extra layer of cleanliness by killing germs and maintaining a sanitary environment inside the dustbin. Overall, the project highlights how modern technology can promote cleaner living, improve hygiene, and support smarter waste management solutions for homes, institutions, and public spaces.



# THANK YOU