

# BinGo: Real-Time Waste Collection and Recycling Tracking Mobile Application

## ABSTRACT

Rapid urbanization and continuous population growth have resulted in a significant increase in municipal solid waste generation, creating serious challenges for efficient waste collection and recycling. Conventional waste management systems are primarily based on fixed schedules and manual supervision, which often lead to delayed collection, inefficient resource utilization, lack of transparency, and limited citizen participation. These shortcomings contribute to improper waste disposal, environmental pollution, and reduced quality of urban living. To address these challenges, this project proposes **BinGo**, a **Real-Time Waste Collection and Recycling Tracking Mobile Application** designed to modernize and optimize municipal waste management operations.

**BinGo** is developed as a mobile-based solution that enables citizens to actively participate in waste management through a user-friendly interface. Using the application, users can request waste pickup services by providing location details and selecting the type of waste, such as organic, recyclable, or electronic waste. Once a request is submitted, the system allows users to track the assigned waste collection vehicle in real time using GPS-based location tracking. Continuous status updates ensure transparency and keep users informed throughout the collection process, thereby reducing uncertainty and improving user satisfaction.

The system is designed to support multiple user roles, including citizens, waste collection workers, and administrators. Administrators are provided with a centralized dashboard that enables them to monitor incoming pickup requests, assign tasks to available workers, track operational performance, and generate analytical reports for decision-making. Waste collection workers can access their assigned tasks through the mobile application, update the status of pickups, and share live location data during active collection. To encourage environmentally responsible behavior, **BinGo** incorporates a reward-based mechanism that incentivizes users to participate in recycling initiatives and adopt sustainable waste disposal practices.

From a technical perspective, the backend of the **BinGo** application is implemented using **FastAPI**, a modern Python-based framework known for its high performance, scalability, and ease of development. FastAPI facilitates the creation of secure and efficient RESTful APIs that handle user authentication, request management, and real-time communication.

**PostgreSQL** is used as the database management system due to its robustness, reliability, and support for complex relational data. The mobile application is developed using **React**

**Native with Expo**, enabling cross-platform compatibility and rapid development of an intuitive user interface. Real-time features such as live location tracking and instant status updates are supported through WebSocket-based communication. The entire development process is managed using **Git and GitHub**, ensuring proper version control, maintainability, and adherence to professional software development practices.

The proposed system is economically feasible as it utilizes open-source technologies and free or low-cost cloud infrastructure. Operational feasibility is achieved through an intuitive design that requires minimal training for users, workers, and administrators. Additionally, **BinGo** adheres to ethical and legal considerations by implementing secure authentication mechanisms, controlled access to location data, and responsible handling of user information.

In conclusion, **BinGo** provides a practical, scalable, and technology-driven solution to the limitations of traditional waste management systems. By integrating real-time tracking, role-based access control, and data-driven insights, the application enhances operational efficiency, promotes transparency, and encourages active citizen participation. This project demonstrates the effective application of modern mobile and web technologies to solve a real-world problem and serves as a suitable and impactful **6th semester mini project** with strong potential for real-world deployment and future enhancements.