

Smart Food Waste Management System with Real-Time NGO Notification and Donation Tracking

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Abstract - Food waste has emerged as one of the most pressing global challenges, contributing significantly to environmental pollution, greenhouse gas emissions, and the inefficient utilization of natural resources. At the same time, millions of people continue to experience food insecurity and hunger due to unequal food distribution. Existing food donation practices often rely on manual communication methods, making the donation process slow, inefficient, and difficult to monitor. This paper presents a Smart Food Waste Management System with Real-Time NGO Notification and Donation Tracking, a web-based platform designed to facilitate efficient redistribution of surplus food from donors to nearby Non-Governmental Organizations (NGOs). The proposed system enables donors to register and upload food donation details, while authenticated NGOs receive real-time notifications regarding available donations. NGOs can accept or reject requests based on their availability, and donors receive live status updates throughout the donation process. The system is developed using React.js for the frontend, Tailwind CSS for responsive user interfaces, Supabase for authentication and real-time database services, PostgreSQL as the backend database, and Power BI for analytics and visualization. The platform also includes an administrative dashboard for monitoring donations, managing users, and generating reports. The proposed solution improves transparency, minimizes food wastage, enhances communication between donors and NGOs, and promotes sustainable food redistribution. Experimental implementation demonstrates improved response time, better donation tracking, and efficient resource utilization compared to traditional food donation methods.

Keywords - Food Waste Management, NGO Notification, Donation Tracking, Real-Time Database, Web Application, SDG.

1. INTRODUCTION

Food wastage has become a major socio-economic and environmental issue across the world. According to global reports, nearly one-third of all food produced for human consumption is either wasted or lost during various stages of the supply chain. This wastage not only results in economic losses but also contributes significantly to greenhouse gas emissions, excessive water consumption, and depletion of natural resources.

Simultaneously, millions of people continue to face hunger, malnutrition, and food insecurity. A considerable amount of surplus food generated by restaurants,

hotels, supermarkets, event organizers, hostels, households, and catering services remains edible but is discarded due to the absence of an efficient redistribution mechanism. Although several NGOs actively collect surplus food and distribute it among underprivileged communities, the coordination process is often manual, involving phone calls, emails, or social media messages. These traditional methods frequently lead to delayed responses, poor communication, lack of accountability, and increased food spoilage.

To overcome these limitations, this research proposes a Smart Food Waste Management System with Real-Time NGO Notification and Donation Tracking. The system provides a centralized digital platform that efficiently connects food donors with nearby NGOs. Donors can register, upload food details, specify food quantity, expiry time, pickup location, and upload images of the food items. Based on

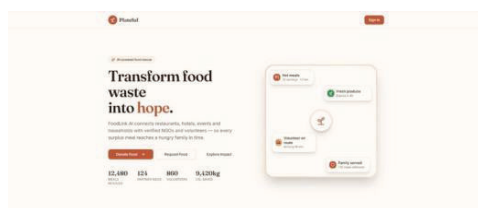


Figure 1. Home Page

the donor's location, nearby NGOs receive instant notifications regarding the available donation.

The platform enables NGOs to review donation requests and either accept or reject them. Once a request is accepted, the donor receives real-time updates regarding pickup status. The system also provides analytics dashboards that help administrators monitor donation trends, NGO participation, successful food deliveries, and system performance. The proposed solution contributes to Sustainable Development Goal (SDG) 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production) by reducing food wastage and improving food redistribution.

2. LITERATURE SURVEY

Food donation systems have evolved over the years through various technological approaches. Early systems primarily relied on manual coordination, where donors contacted NGOs via telephone or personal networks. Although simple, these methods suffered from delayed communication, poor record maintenance, and limited scalability.

With the growth of smartphones and internet technologies, several web-based and mobile food donation applications were introduced. These platforms allowed donors to register surplus food online and enabled NGOs to browse available donations. However, many of these applications lacked automated notification mechanisms, resulting in delayed responses and missed donation opportunities.

Recent research has focused on integrating cloud computing, GPS tracking, and real-time databases into food redistribution systems. Cloud-based architectures provide centralized data management and improve accessibility. GPS integration assists NGOs in locating nearby food donors, while real-

time databases facilitate instant synchronization of donation information across multiple users.

Despite these advancements, several challenges remain unresolved. Many existing systems do not provide automatic notification services to NGOs, real-time tracking of donation status, analytics dashboards for administrators, or efficient communication between stakeholders. Furthermore, limited transparency often discourages donor participation and reduces trust in the food redistribution process.

The proposed Smart Food Waste Management System addresses these research gaps by integrating real-time notification services, centralized donation management, live status tracking, cloud-based authentication, and analytical reporting into a single web application.

3. PROPOSED METHODOLOGY

The proposed system follows a modular architecture that separates different functionalities into independent components for improved scalability and maintainability.

A. Donor Module

The donor module enables individuals, restaurants, hotels, supermarkets, and organizations to register and authenticate themselves securely. Donors can submit food donation requests by entering food type, quantity, preparation time, expiry time, pickup location, and food images. After submission, donors can monitor the status of their donations through a real-time dashboard.

B. NGO Module

Registered NGOs receive automatic notifications whenever a nearby donation is posted. NGO representatives can review donation details and either accept or reject

The donation details are stored in the Supabase PostgreSQL database. The notification engine identifies eligible NGOs and sends real-time alerts. NGOs respond by accepting or rejecting the request, after which the donor receives status updates. Finally, the administrator monitors all system activities through an analytical dashboard.

[illegible]

The administrator manages users, verifies NGO registrations, monitors donation activities, generates reports, and views analytical dashboards. The admin also resolves user complaints and ensures smooth operation of the platform.

The notification module is one of the core components of the proposed system. It continuously monitors newly created donation requests and instantly notifies nearby NGOs using Supabase Realtime services. Donors receive immediate updates whenever an NGO accepts, rejects, or completes the donation process.

5. IMPLEMENTATION

The proposed system is implemented using modern web technologies, described below.

- React.js
- Tailwind CSS
- HTML5
- JavaScript

- Supabase
- PostgreSQL
- Supabase Authentication
- Supabase Realtime Database

- Power BI

6. SYSTEM WORKFLOW

- The donor registers and logs into the system.
- Food donation details are submitted with quantity, expiry time, images, and pickup location.

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- Donation information is stored securely in the cloud database.
- Nearby NGOs automatically receive real-time notifications.
- NGOs review the donation and either accept or reject the request.
- The donor receives immediate updates regarding NGO actions.
- The NGO collects the food and updates the delivery status.
- The administrator monitors donations and generates analytical reports.

The application provides secure authentication, responsive interfaces, cloud-based data storage, and real-time synchronization across all users.

7. RESULTS AND DISCUSSION

The Smart Food Waste Management System was successfully developed and tested under multiple donation scenarios. The application demonstrated efficient communication between donors and NGOs through instant notifications. The use of Supabase Realtime significantly reduced response delays compared to conventional manual methods.

The donor dashboard successfully tracked every stage of the donation process, providing complete transparency. NGOs efficiently managed donation requests through a dedicated dashboard that displayed pending, accepted, rejected, and completed donations. Power BI dashboards generated visual reports illustrating donation statistics, monthly donation trends, successful deliveries, NGO participation, and donor activity.

The implementation achieved the following outcomes:

- Successful donor registration and authentication.
- Real-time NGO notification system.

- Live donation status tracking.
- Improved communication between donors and NGOs.
- Secure cloud database management.
- Interactive analytics dashboard.
- Reduced food wastage through faster donation processing.

Overall, the proposed system offers a practical, scalable, and sustainable solution for food redistribution.

8. FUTURE ENHANCEMENTS

- Artificial Intelligence for predicting food freshness and spoilage.
- Machine Learning algorithms for NGO recommendation.
- GPS-based route optimization for faster food collection.
- Android and iOS mobile applications.
- QR-code based donation verification.
- IoT sensors for monitoring food temperature.
- Integration with Government Food Banks.
- SMS and WhatsApp notification services.
- Blockchain-based donation transparency.
- Predictive analytics for food demand forecasting.

9. SCREENSHOTS

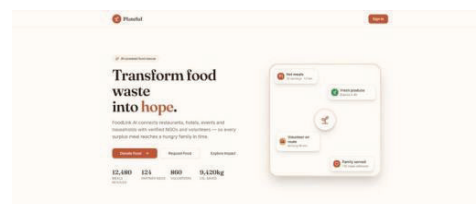


Figure 4. Roles

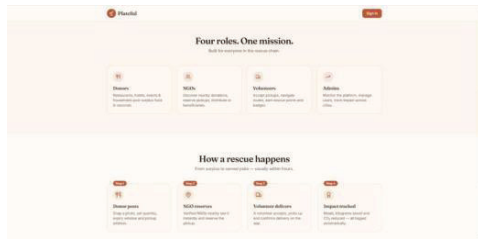


Figure 5. Dashboard

New donation

Title
 e.g. Wedding buffet leftovers

Description
 What's in it, allergens, packaging...

Food type: Cooked meals Quantity: 10 Unit: servings

Pickup address

City: Pickup before: 14-06-2026 21:30

Photo (optional)
 Choose image

Post donation

Figure 6. Donation Page



Figure 7. Donation Statistics

Welcome
 Sign in or create an account to start rescuing food.

Sign in Create account

I am a...

Donor: Share surplus food
 NGO: Receive & distribute
 Volunteer: Pick up & deliver

Full name: Organization:

Email: Phone:

Address / City:

Password:

Create account

OR

Continue with Google

Figure 8. Welcome Page

10. CONCLUSION

The Smart Food Waste Management System with Real-Time NGO Notification and Donation Tracking provides a comprehensive digital solution for reducing food wastage and improving food redistribution. By integrating cloud computing, real-time databases, secure authentication, automated notifications, and analytical dashboards, the proposed system significantly enhances transparency, accountability, and operational efficiency.

The implementation demonstrates that modern web technologies can effectively bridge the communication gap between food donors and NGOs while ensuring timely food collection and distribution. The system not only contributes to reducing environmental pollution caused by food waste but also supports social welfare by helping surplus food reach people in need.

Future enhancements involving Artificial Intelligence, Machine Learning, IoT, and mobile technologies can further improve the scalability and effectiveness of the platform, making it a valuable contribution toward sustainable development and hunger reduction.

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