



UE22CS352B - Object Oriented Analysis & Design

Mini Project Report

Title : SMART WASTE MANAGEMENT SYSTEM

Submitted by:

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
FACULTY OF ENGINEERING
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(Established under Karnataka Act No. 16 of 2013)

PROBLEM STATEMENT:

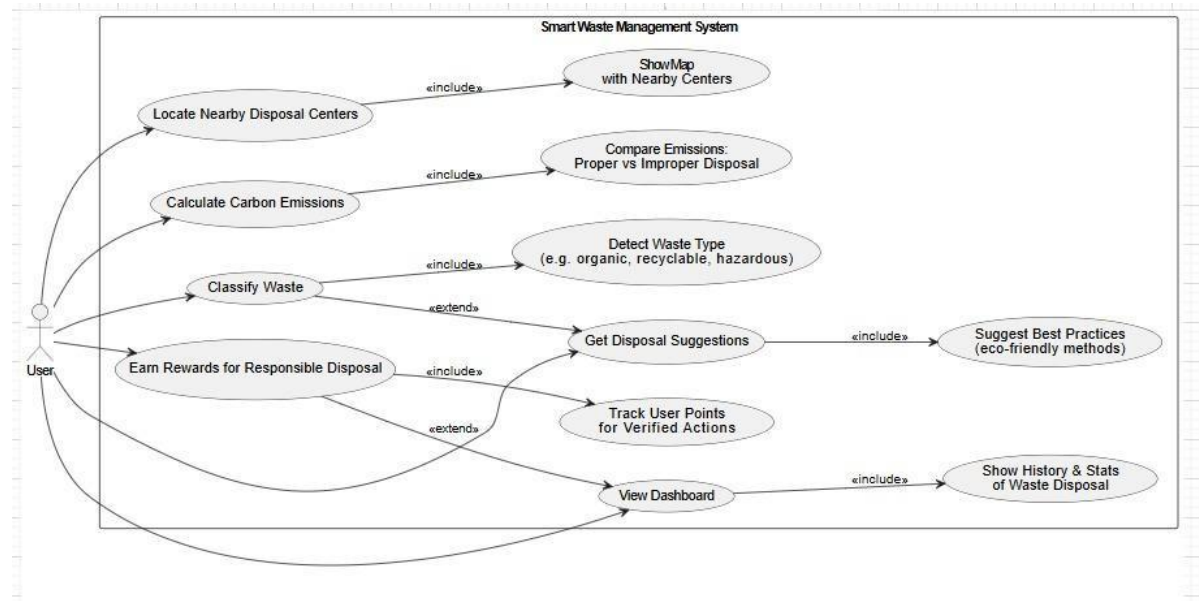
Improper waste disposal leads to environmental degradation and public health hazards. There is a lack of awareness, infrastructure, and incentives for proper waste segregation and disposal. This project aims to assist users in identifying, managing, and disposing of waste responsibly by leveraging technology, providing location-based services, and rewarding good practices.

KEY FEATURES:

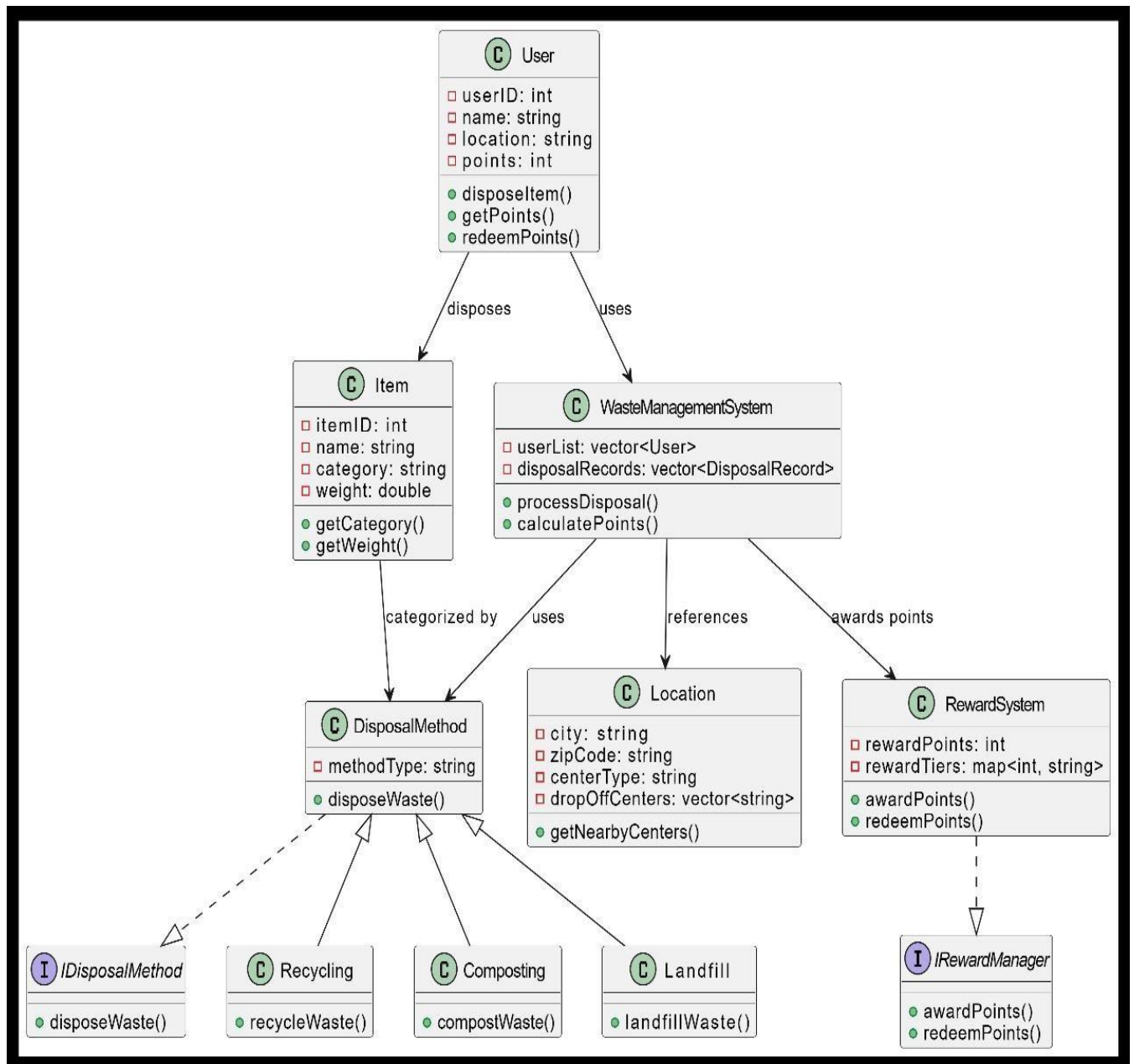
- Smart classification of waste into recyclable, organic, hazardous, or general.
- Suggestions for proper and eco-friendly disposal methods.
- Location-based discovery of nearby recycling and composting centers.
- Reward system granting points for verified responsible disposal.
- User dashboard to track personal disposal history and impact.
- Carbon Emission Calculator to estimate environmental benefit of proper waste management.

MODELS:

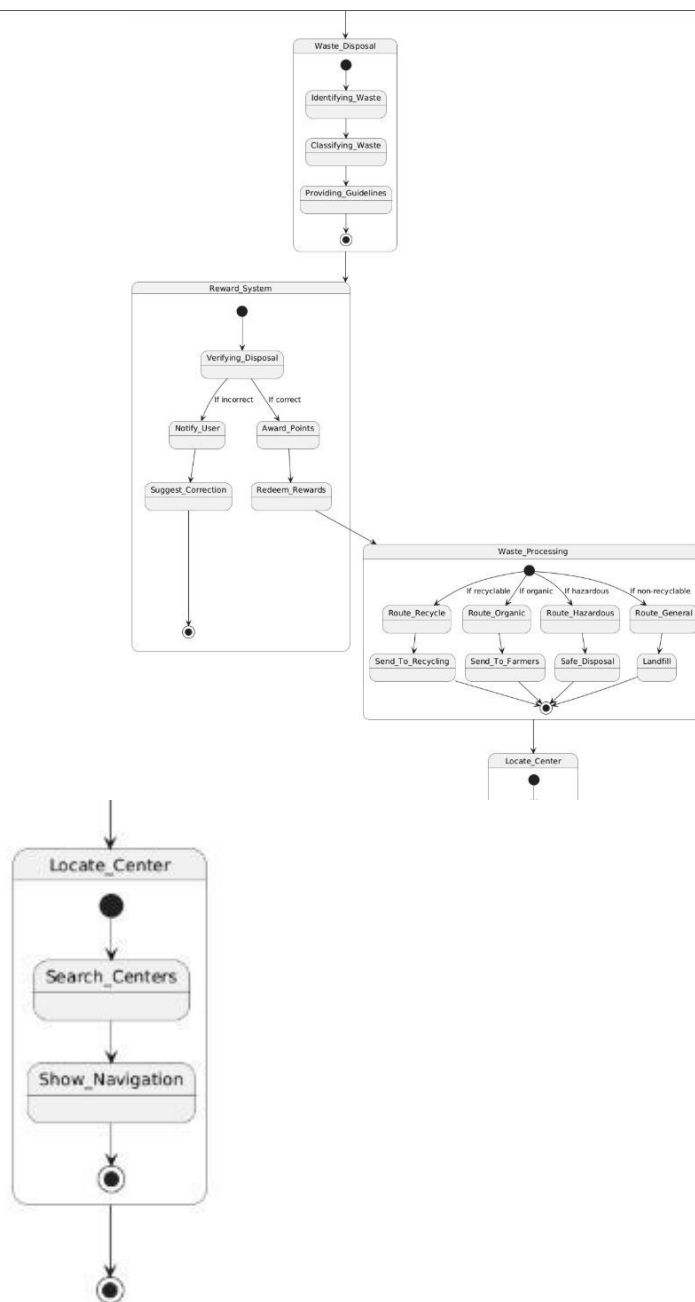
USE-CASE DIAGRAM:



CLASS DIAGRAM:



STATE DIAGRAM:

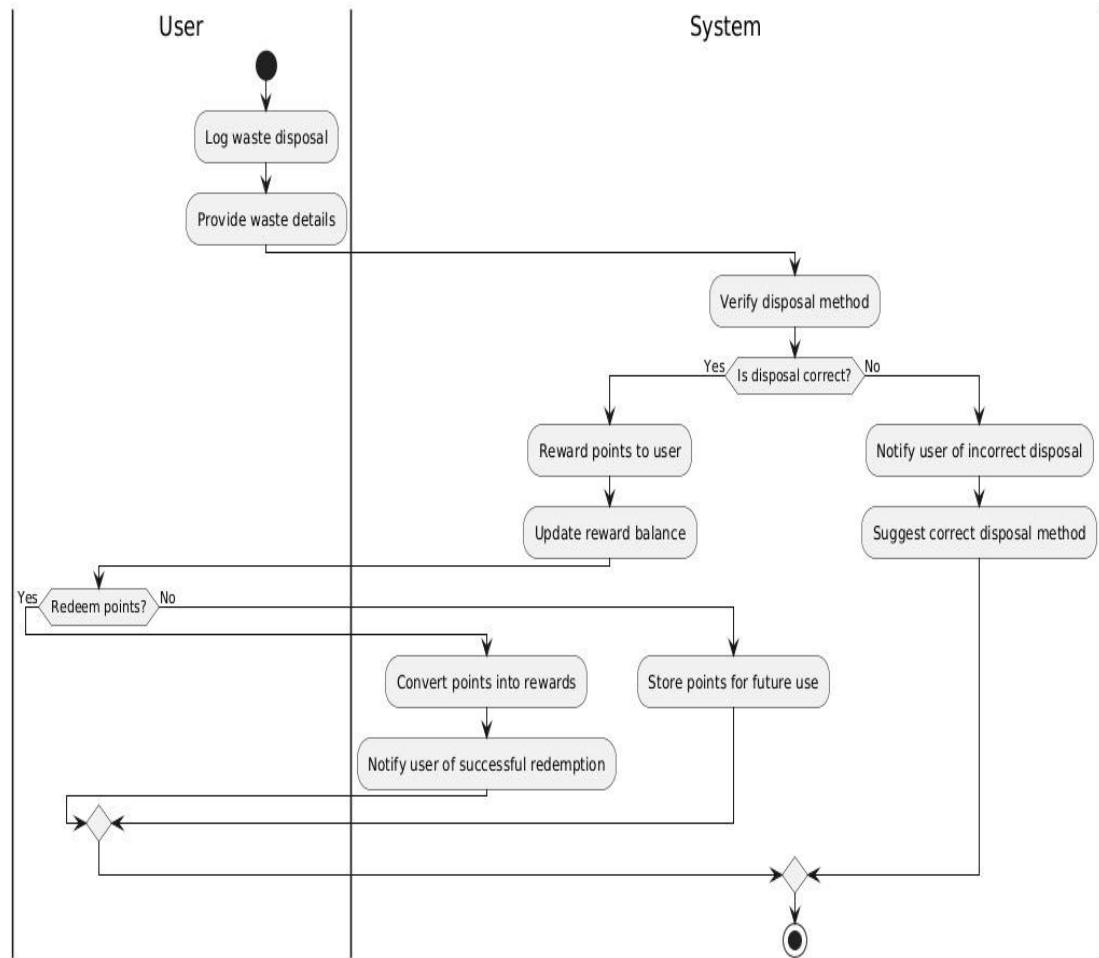


ACTIVITY DIAGRAM:

1. MAJOR USE-CASE:



2. MINOR USE-CASE:



Architecture Patterns, Design Principles & Design Patterns:

Architecture Pattern: Model–View–Controller (MVC)

Model:

- Represents data layer.
- E.g., WastePickup entity, connected via Spring Data JPA (WastePickupRepository).

View:

- UI elements (e.g., Thymeleaf templates) for data presentation and input capture.

Controller:

- Handles HTTP requests and maps them to services.
- E.g., WastePickupCreateController, WastePickupViewController.

Service Layer:

- Acts as intermediary applying business logic.

Design Principles:

1. Single Responsibility Principle (SRP)

Each controller handles one task (Create, Delete, Edit, View).

2. Open/Closed Principle (OCP)

FilteredWastePickupServiceImpl uses Factory Pattern to support easy extension.

3. Liskov Substitution Principle (LSP)

Interfaces ensure interchangeable service implementations.

4. Interface-Based Dependency

Abstractions are used for loose coupling and better testability.

Design Patterns:

1. Strategy Pattern

- Applied in FilteredWastePickupServiceImpl for dynamic filtering (e.g., by type, status).
- Supports future extension via FilterStrategy interface.

2. Factory Pattern

- FilterStrategyFactory selects appropriate strategy.
- Simplifies strategy object creation and promotes encapsulation.

3. Singleton Pattern

- Used in LoggerService for centralized logging.
- Ensures single instance with thread-safe access.

4. Observer Pattern

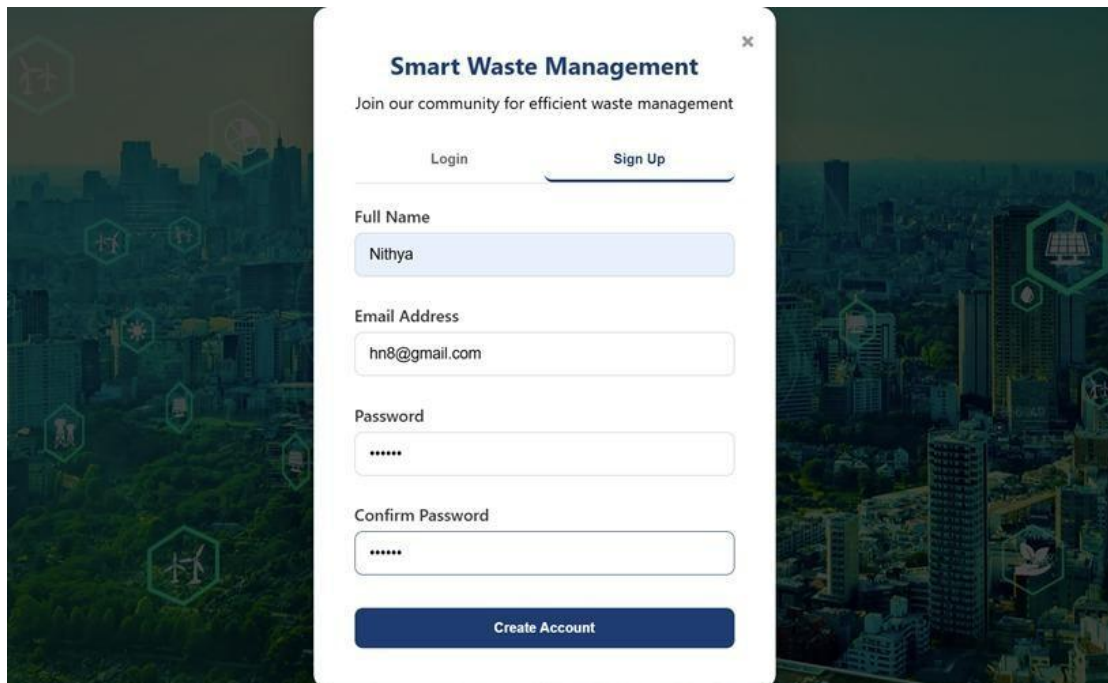
- Implemented in WastePickupNotifier.
- AdminObserver gets real-time updates when new waste pickups occur.

Github link to codebase:

https://github.com/Nithyahn/OOAD_Project

SCREENSHOTS: UI

Sign Up:



A screenshot of a 'Smart Waste Management' sign-up form. The form is centered on a dark background with a city skyline and green hexagonal icons. The form has a title 'Smart Waste Management' and a subtitle 'Join our community for efficient waste management'. Below the subtitle are two tabs: 'Login' and 'Sign Up', with 'Sign Up' being the active tab. The form contains four input fields: 'Full Name' (with the text 'Nithya'), 'Email Address' (with the text 'hn8@gmail.com'), 'Password' (with masked characters '*****'), and 'Confirm Password' (with masked characters '*****'). At the bottom is a blue button labeled 'Create Account'.

Smart Waste Management

Join our community for efficient waste management

Login Sign Up

Full Name

Nithya

Email Address

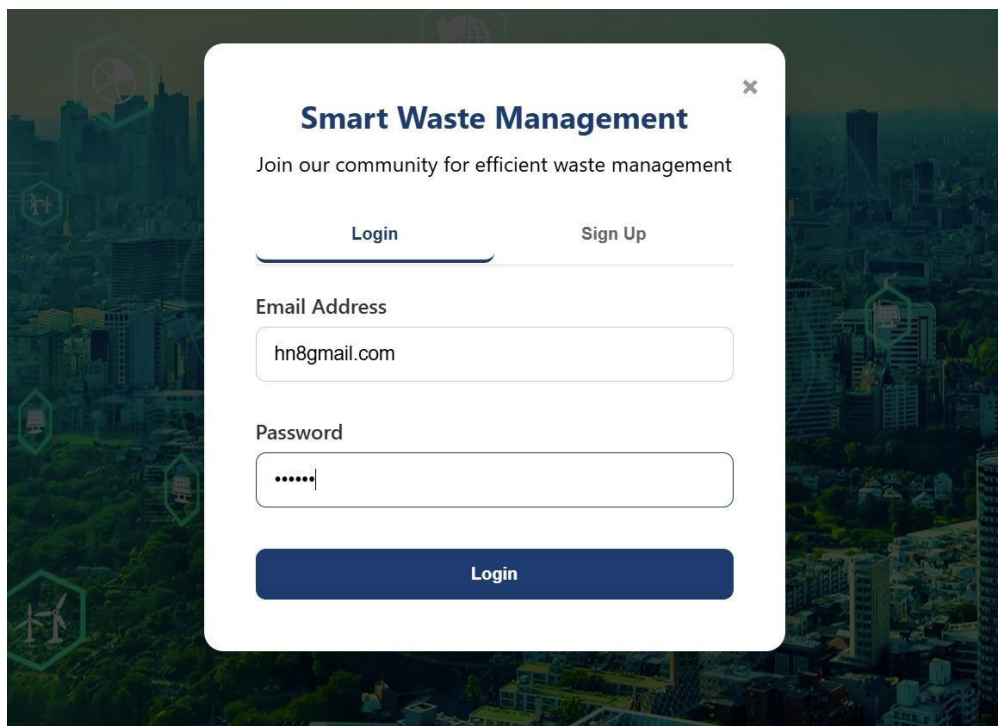
hn8@gmail.com

Password

Confirm Password

Create Account

Login :



A screenshot of a 'Smart Waste Management' login form. The form is centered on a dark background with a city skyline and green hexagonal icons. The form has a title 'Smart Waste Management' and a subtitle 'Join our community for efficient waste management'. Below the subtitle are two tabs: 'Login' and 'Sign Up', with 'Login' being the active tab. The form contains two input fields: 'Email Address' (with the text 'hn8gmail.com') and 'Password' (with masked characters '*****'). At the bottom is a blue button labeled 'Login'.

Smart Waste Management

Join our community for efficient waste management

Login Sign Up

Email Address

hn8gmail.com

Password

Login

Home :



The image shows the home page of the 'Smart Waste Management' application. The header is dark blue with the title 'Smart Waste Management' and navigation links: 'Home', 'Request Pickup', 'About', 'Carbon Calculator', and 'Logout'. The main content area has a green and blue cityscape background with various icons. A white box contains a welcome message and a description of the platform's mission. Below this, a 'Request a Waste Pickup' form is visible, with 'Waste Type' set to 'Plastic' and 'Pickup Location' as an empty text field. A 'Find Nearby Centers' button is at the bottom of the form.

Smart Waste Management Home Request Pickup About Carbon Calculator Logout

Welcome to Smart Waste Management

This platform helps users request waste pickup, find recycling centers nearby, and track their past requests. Our mission is to create cleaner communities by promoting efficient waste handling and recycling.

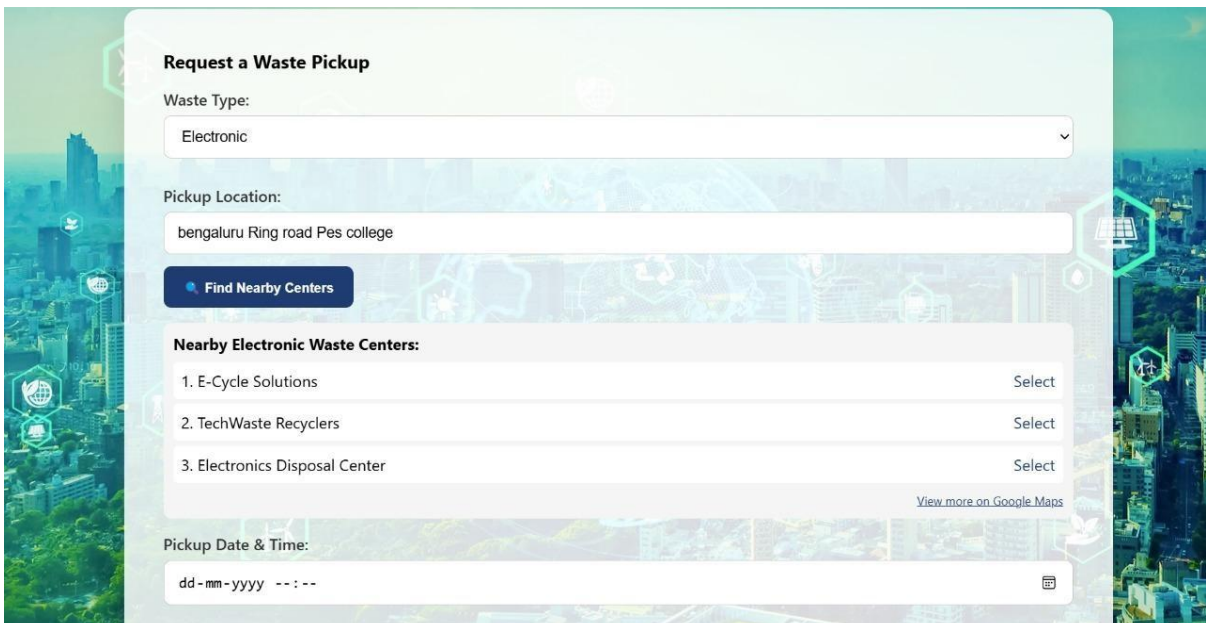
Request a Waste Pickup

Waste Type:
Plastic

Pickup Location:

[Find Nearby Centers](#)

Request waste Pickup



The image shows the 'Request a Waste Pickup' form in detail. The 'Waste Type' dropdown is set to 'Electronic'. The 'Pickup Location' text field contains 'bengaluru Ring road Pes college'. Below the form is a 'Find Nearby Centers' button. A section titled 'Nearby Electronic Waste Centers:' lists three options: 'E-Cycle Solutions', 'TechWaste Recyclers', and 'Electronics Disposal Center', each with a 'Select' button. A link 'View more on Google Maps' is at the bottom right of this section. The 'Pickup Date & Time' field is empty, showing the format 'dd-mm-yyyy --:--' and a calendar icon.

Request a Waste Pickup

Waste Type:
Electronic

Pickup Location:
bengaluru Ring road Pes college

[Find Nearby Centers](#)

Nearby Electronic Waste Centers:

1. E-Cycle Solutions	Select
2. TechWaste Recyclers	Select
3. Electronics Disposal Center	Select

[View more on Google Maps](#)

Pickup Date & Time:
dd-mm-yyyy --:--

Pickup Location :

Pickup Location:

E-Cycle Solutions

[Find Nearby Centers](#)

Pickup Date & Time:

25-04-2025 08:17

Status:

Pending

User Name:

NithyaHN

[Request Pickup](#)

Waste Pickup completed :

All Waste Pickup Requests					
Waste Type	Pickup Location	Pickup Date & Time	Status	User Name	Actions
Electronic	bengaluru RR PES college	22/4/2025, 8:53:00 pm	Completed	Nithya	Edit Delete
Hazardous	bengaluru RR PES college	22/4/2025, 8:54:00 pm	Completed	Nithya	Edit Delete
Organic	Green Earth Composting Center	22/4/2025, 9:06:00 pm	Completed	Nithya	Edit Delete
Electronic	E-Cycle Solutions	22/4/2025, 9:07:00 pm	Completed	Nithya	Edit Delete
Hazardous	ChemSafe Disposal Center	22/4/2025, 9:09:00 pm	Completed	Nithya	Edit Delete
Electronic	TechWaste Recyclers	23/4/2025, 2:41:00 pm	Completed	Nithya	Edit Delete
Electronic	E-Cycle Solutions	25/4/2025, 8:17:00 am	Pending	NithyaHN	Edit Delete

Reward System :

Your Rewards & Environmental Impact

Your Account Balance: ₹24

Waste Management Points

- 20 Green Points earned from waste pickups
- 0 Eco Tokens for E-Waste pickups
- 0 Bonus Stars for consistent scheduling

Keep recycling and reach **50 points** to unlock discount coupons and special recognition badges!

Your Carbon Impact

Total CO₂ Savings: **8.00 kg**

Goal: 100 kg CO₂ saved

Every kg of CO₂ you save helps combat climate change.
[Calculate your impact now!](#)

Carbon Emission Calculator

Calculate the carbon footprint of your waste and see how much CO₂ you're saving through proper waste management.

Pickup Completed!

You earned:

- +10 points
- +₹12 added to your account
- +4.0 kg CO₂ saved

Carbon emission Calculator :

Carbon Emission Calculator

Calculate the carbon footprint of your waste and see how much CO₂ you're saving through proper waste management.

Waste Type:

Weight (kg):

Disposal Method:

Transportation Distance (km):

Estimated Carbon Impact

For 1 kg of electronic waste using recycling:

CO₂ Emissions: **0.51 kg**

CO₂ Savings vs Landfill: **3.50 kg**

[Save to History](#)

[Calculate Carbon Impact](#)

Your Carbon Savings History

Date	Type	Method	Weight (kg)	CO ₂ Saved (kg)
25/4/2025	electronic	recycling	1	3.50
25/4/2025	electronic	recycling	2	7.00
25/4/2025	organic	landfill	2	0.00
25/4/2025	plastic	incineration	1	0.70

localhost:9090 says
Are you sure you want to delete this pickup request?

OK

Cancel

Waste Type	Pickup Location	Pickup Date & Time	Status	User Name	Actions
Electronic	bengaluru RR PES college	22/4/2025, 8:53:00 pm	Completed	Nithya	Edit Delete
Hazardous	bengaluru RR PES college	22/4/2025, 8:54:00 pm	Completed	Nithya	Edit Delete
Organic	Green Earth Composting Center	22/4/2025, 9:06:00 pm	Completed	Nithya	Edit Delete
Electronic	E-Cycle Solutions	22/4/2025, 9:07:00 pm	Completed	Nithya	Edit Delete
Hazardous	ChemSafe Disposal Center	22/4/2025, 9:09:00 pm	Completed	Nithya	Edit Delete
Electronic	TechWaste Recyclers	23/4/2025, 2:41:00 pm	Completed	Nithya	Edit Delete
Electronic	E-Cycle Solutions	25/4/2025, 8:17:00 am	Completed	NithyaHN	Edit Delete
Electronic	TechWaste Recyclers	25/4/2025, 8:19:00 am	Completed	Nithya	Edit Delete

Edit WastePickup :

localhost:9090 says
Edit functionality would be implemented here

Waste Type	Pickup Location			User Name	Actions
Electronic	bengaluru RR PES college	22/4/2025, 8:53:00 pm	Completed	Nithya	Edit Delete
Hazardous	bengaluru RR PES college	22/4/2025, 8:54:00 pm	Completed	Nithya	Edit Delete
Organic	Green Earth Composting Center	22/4/2025, 9:06:00 pm	Completed	Nithya	Edit Delete
Electronic	E-Cycle Solutions	22/4/2025, 9:07:00 pm	Completed	Nithya	Edit Delete
Hazardous	ChemSafe Disposal Center	22/4/2025, 9:09:00 pm	Completed	Nithya	Edit Delete
Electronic	TechWaste Recyclers	23/4/2025, 2:41:00 pm	Completed	Nithya	Edit Delete
Electronic	E-Cycle Solutions	25/4/2025, 8:17:00 am	Completed	NithyaHN	Edit Delete
Electronic	TechWaste Recyclers	25/4/2025, 8:19:00 am	Completed	Nithya	Edit Delete

Data storing in the mysql Database :

```
mysql> show tables;
+-----+
| Tables_in_wastepickupdb |
+-----+
| waste_pickup             |
| waste_pickup_user        |
+-----+
2 rows in set (0.01 sec)

mysql> select * from waste_pickup
-> ^Z^C
mysql> select * from waste_pickup;
+-----+-----+-----+-----+-----+-----+
| id | pickup_date_time | pickup_location | status | user_name | waste_type |
+-----+-----+-----+-----+-----+-----+
| 10 | 2025-03-07 06:00:00.000000 | Bengaluru electronic city | Completed | Nithya HN CS400 | Organic |
| 11 | 2025-03-12 09:53:00.000000 | bengaluru PES college | Pending | NithyaHN | Organic |
| 13 | 2025-04-19 22:53:00.000000 | mysore | Pending | NithyaHN | Electronic |
| 14 | 2025-04-18 19:31:00.000000 | bengaluru | Scheduled | Ni | Electronic |
| 16 | 2025-04-03 20:40:00.000000 | bengaluru PES college | Pending | kakjas | Hazardous |
| 17 | 2025-05-05 10:29:00.000000 | bengaluru PES college | Scheduled | pavpo | Organic |
| 18 | 2025-04-22 19:20:00.000000 | bengaluru RR PES college | Pending | ni | Organic |
| 19 | 2025-04-22 20:00:00.000000 | bengaluru RR PES college | Pending | Nithya | Plastic |
+-----+-----+-----+-----+-----+-----+
8 rows in set (0.00 sec)

mysql>
```

Individual contributions of team members:

NAME	MODULE WORKED ON
NITHYA H.N.	View, Liskov and Factory pattern
PALLAVI. M. PATIL	Model, Open/closed principle and Strategy pattern
PAVITRA. M. GABIGOL	Model ,Interface Dependency principle and Singleton pattern
POOJA ANGADI	Controller, SRP and absorber pattern