PROJECT REPORT

SMART WASTE MANAGEMENT FOR METROPOLITAN CITIES

| Team ID	PNT2022TMID33244
Project Name	Project-SMART WASTE MANAGEMENT FOR METROPOLITAN CITIES.

INTRODUCTION

1.1 Project Overview

India is a fast rapid, growing urbanizing country, where people shifted their employment from agriculture to industrial service, oriented base. According to 2011 census in India around 31.2% population staying in urban areas. More than 377 million urban people are staying in town/cities. India is a very diverse country is divided into 29 states and 7 Union territories (UTs) .In India previously there are 3 megacities that are Greater Mumbai, Delhi, Kolkata where population found more than 10 million, 53 cities where population found more than 1 million and 415 cities where population found 100000 or more than that.

Therefore, this increasing urbanization, creating a load on civic infrastructure facilities housing water, sanitation, and solid waste management. Therefore, in this paper, discussing how this increasing urbanization creating a problem of solid waste in urban areas and because of that, it is difficult to handle the urban local bodies.

1.2 Purpose

The purpose of making the project is to establish,
- Neat and clean environment
- Benefits at affordable cost
- Disease free tomorrow
- Hygienic environment
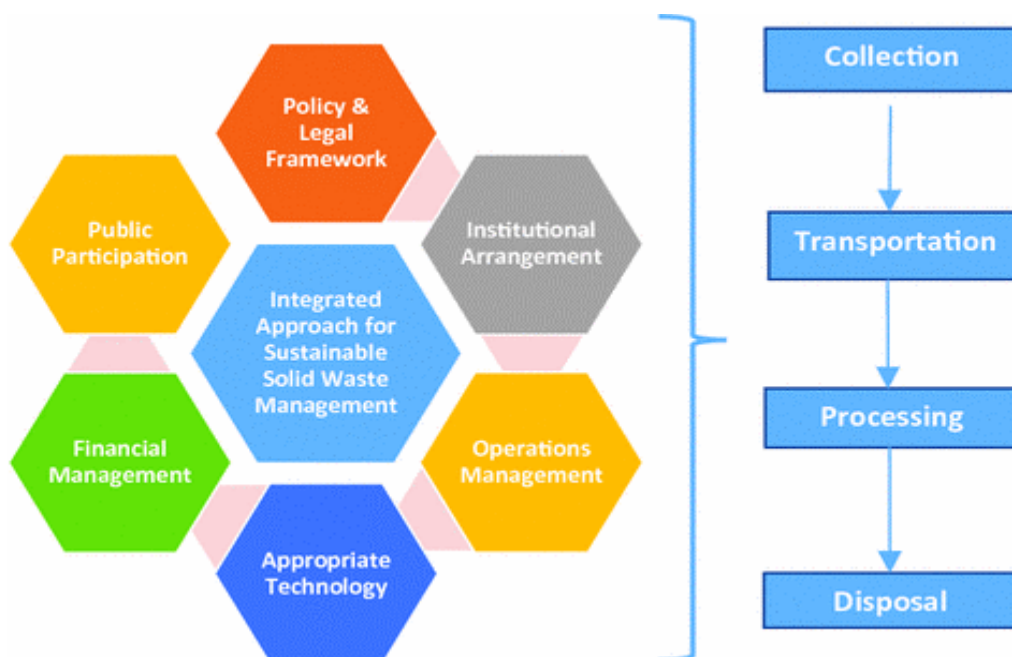
2.LITRATURE SURVEY:

2.1 Existing Problem

Therefore, this increasing urbanization, creating a load on civic infrastructure facilities housing water, sanitation, and solid waste management. Therefore, in this paper, discussing how this increasing urbanization creating a problem of solid waste in urban areas and because of that, it is difficult to handle the urban local bodies.

Government of India on October 2, 2014, launched a mission regarding cleanliness, Open defecation free India that is Swachh Bharat Mission in English it is called as Clean India Movement. The aim of this campaign to clean and make an open defecation free India by October 2, 2019, on the 150th Birth anniversary of Mahatma Gandhi. This campaign is moved all over India's school, colleges, academic Institution to do awareness of cleanliness in people.

2.2 References

1. Municipal Solid Waste Collection Problems: A Literature Review, Jeroen Beliën, Liesje De Boeck, Jonas Van Ackere.
2. Nuortio, T., Kytojoki, J., Niska, H., Braysy, O.: Improved route planning and scheduling of waste collection and transport. Journal of Expert Systems with Applications 30(2), 223–232 (2006) CrossRef.
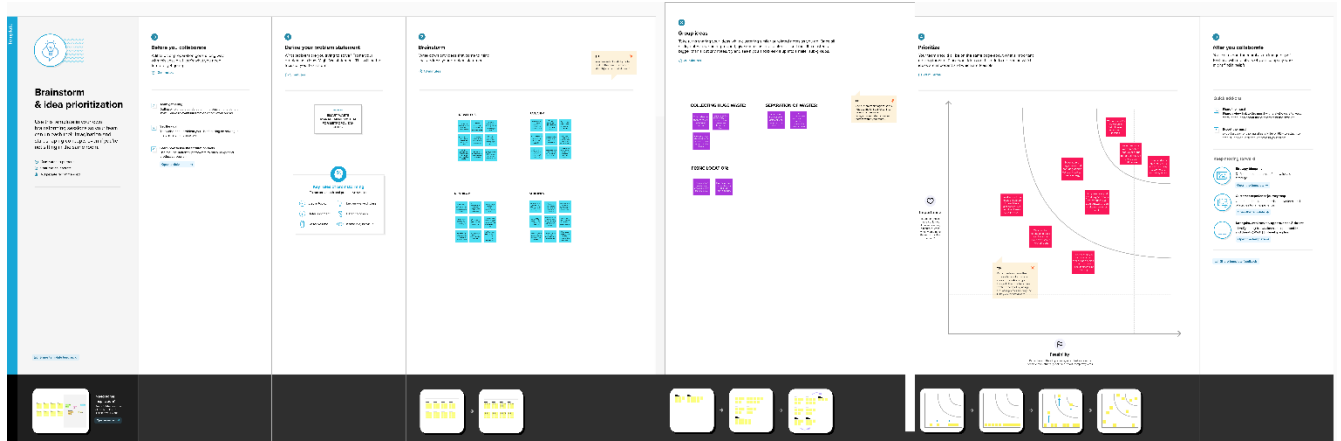
2.3 Problem Statement Definition

The problem statement is, "SMART WASTE MANAGEMENT FOR METROPLOITAN CITIES". The problem statement gets meaning when the proper solution has been proposed. It tells that all waste garbage's are need to get segregated in accordance with degradable and non- degradable waste in order to avoid unwanted land fills. Then in this method, we need to built a structure in a smart way with sensors and location tracking devices.

IDEATION AND PROPOSED SOLUTION:
3.1 Empathy Map Canvas
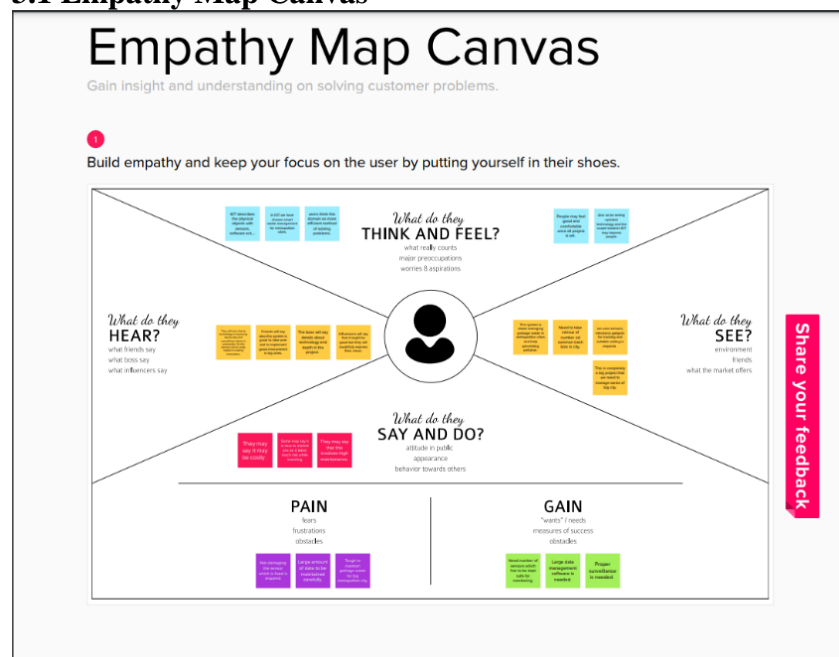
3.2 Ideation And Brainstorming

3.3 Proposed Solution

Proposed solution includes
- Problem Statement (Problem to be solved)
- Idea / Solution description
- Novelty / Uniqueness
- Social Impact / Customer Satisfaction
- Business Model (Revenue Model)
- Scalability of the Solution

3.4 Problem Solution Fit

Project Title: Smart waste management system For metropolitan cities.

Project Design Phase-I Solution Fit Template

Team iD: PNT2022TMID33244

Define CS, fit into C

1. CUSTOMER SEGMENT(S) `CS`

Our target is Public.

Main purpose is to monitor the area and garbage bins

Customer satisfaction is increasingly become an essential needed for marketers and customer service representatives.

6. CUSTOMER CONSTRAINTS `CC`

Cost

Network issue

Spending power

Size of the bin and separation of various wastes.

5. AVAILABLE SOLUTIONS `AS`

Create an emergency readiness plan for network problem

Solar power usage for spending power problem

Review compliance guidelines

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS `J&P`

1. Waste disposal :

Perform regular audits on waste management & disposal.

2. Germs spreading:

Using Optical bio-sensor we can monitor how much amount of germs in the garbage can.

If the garbage has more bacteria or virus then alert message should send to the workers for immediate cleaning purpose.

9. PROBLEM ROOT CAUSE `RC`

1. Lack of waste disposal:
If any network issues occurred, then the message will not received by the workers, so the waste disposal get delayed.

2. Germs spreading:

If the system fails to work suddenly, there is a chance of spreading of germs.

Incase in waste without disposal can create a disease spread and bad odor over the area.

7. BEHAVIOUR `BE`

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Focus on J&P, tap into BE, understand RC

| 3. TRIGGERS   TR | 10. YOUR SOLUTION   SL | 8. CHANNELS of BEHAVIOUR   CH |

Showing demo of our product
    provide them with social proof
Create high quality product content

4. EMOTIONS: BEFORE / AFTER   EM

BEFORE:

    They may think it is new to market so it takes much risk while investing.
    And they think it involves high maintenance.

AFTER:

    People may feel good and comfortable once all project is set.
    And so be seeing updated technology and the scope towards IOT may impress people.

10. YOUR SOLUTION

Network issue:

    Create an emergency readiness plan

Spending power:

    solar power usage

Waste disposal:

    Perform regular audit on waste management & disposal

8. CHANNELS of BEHAVIOUR
ONLINE:

    It reaches the customers quickly.

    We cannot monitor in live

    Cannot know about it's efficiency in disaster time because of network issue

    OFFLINE:

    We can monitor in live

    It takes time to reach customers

4.REQUIREMENT ANALYSIS
4.1 Functional Requirement
- Expensive bins
- Implementing proper monitoring system
- Planning waste collection routes
- Separation of different kind of wastes

4.2 Non-Functional Requirements
- Usability
- Security
- Reliability
- Performance
- Availability
- Scalability

5. PROJECT DESIGN
5.1 Data Flow Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.
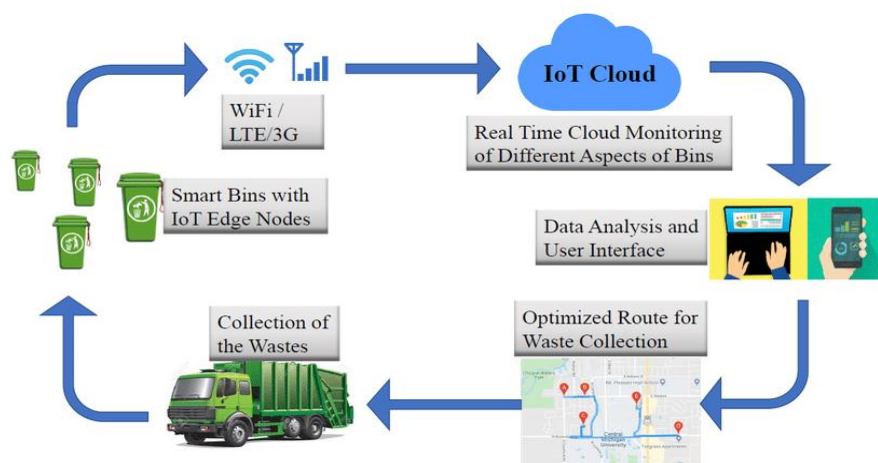
5.2 Solution And Technical Architecture

TECHNOLOGY ARCHITECTURE:

References:

https://c4model.com/
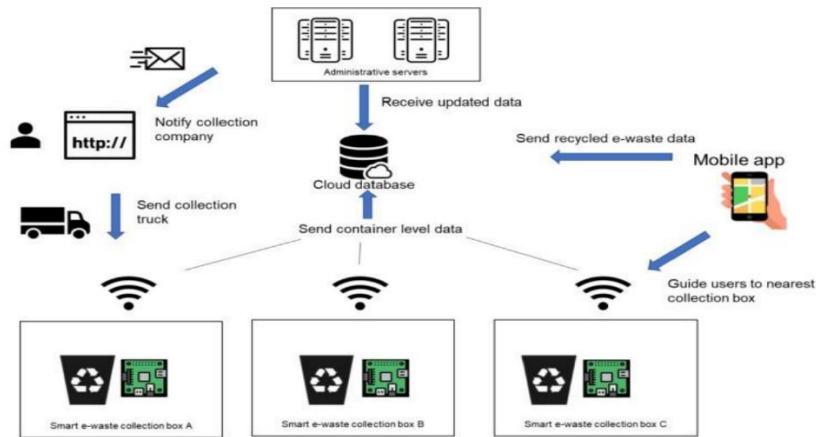
5.3 User Stories

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin (who manage web server)	Web server login	USN-1	As a admin, I have my user name and password foe every worker and co-workers to manage them.	I can manage web account and direct workers.	High	Sprint-1
Co-admin	Login	USN-2	As a co-admin, I'll manage other monitoring activities like garbage level monitoring, location accuracy, garbage separation and removal of waste within a scheduled time.	I can monitor garbage bins activities.	High	Sprint-2
Customer (Web user)	User	USN-3	Here comes the customer, he/she will have access to mobile apps or login webpages to view progress of bins and to report if any query found.	He/ she has the right to make a query if any.	High	Sprint-3
Customer Care Executive	Worker	USN-4	The customer care executive, will try to rectify the queries from customers by contacting co-admin. If case of any critical/ emergency situation query can be conveyed to higher authority.	I can attend calls and respond people by rectifying the problem.	High	Sprint-4
Truck driver	Worker	USN-5	Here, truck driver is a worker who has particular assignments that he has to report when and where the garbage has been picked according to the daily schedule. And should update the happenings in the given website (webpage login).	I can update my activities on site when the given task has been completed.	Moderate	Sprint-5

6. PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning and Estimation

Sprint planning and estimation is an important parameter which helps us too configure the overall project structure in a better way. Each and every milestone tells us the work to be done and what to do next, likewise the things can be achieved. So, planning things plays a major role "plan things to get things done".

6.2 Sprint Delivery Schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can download the application or can have a web account application.	1	High	Revathy S
Sprint-1	Registration	USN-2	As a user, I can register myself through application or website using login credentials.	3	High	Ranjani M
Sprint-1	Registration	USN-3	As a user, I will receive confirmation mail to confirm the user and his details.	4	High	Revathy S
Sprint-2	Login	USN-4	As a user, I can login into the application by entering user email and password.	5	High	Renuka P
Sprint-2	View	USN-5	As a user, I can view the garbage level near their area and report to clear the waste if not taken.	4	Medium	Renuka P
Sprint-2	View	USN-6	As a user, I can view garbage truck activities and can access customer care services	3	Low	Shalini S
Sprint-3	Actions	USN-7	As a user, I have the right to report the head office if service has not been properly provided.	5	High	Shalini S

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Actions	USN-8	As a user, I can track the truck and garbage service schemes.	4	High	Ranjani M
Sprint-3	Management	USN-9	As an admin, managemental process is mine. I can provide user services and monitor garbage and truck activities based on schedule.	5	High	Revathy S
Sprint-4	Testing	USN-10	As a tester, I can check whether the sensors are working properly.	4	Medium	Renuka P
Sprint-4	Testing	USN-11	As a tester, I check the processing systems like sensors, GPS, etc.,	4	Medium	Shalini S
Sprint-4	Testing	USN-12	As a tester, I can monitor the activities are happening according to schedule.	5	High	Revathy S

6.3 Work With JIRA
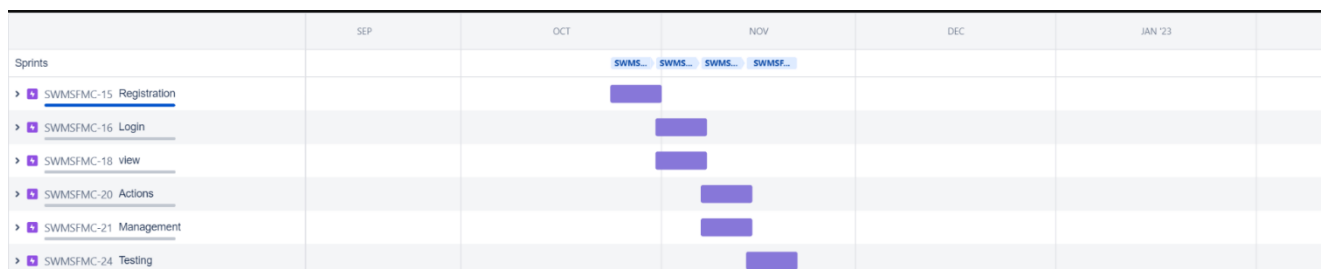
ADVANTAGES:

- Can create a clean and neat society.
- Can create disease free environment.
- Can be built in affordable cost.
- Can distinguish degradable and degradable waste easily.
- Web application will be helpful for people.

DISADVANTAGES:

- Sometimes the web services may get interrupted.
- Sensors cost are bit high.
- Bins should be kept safe all the time.

LITERATURE REVIEW

In the book of Waste of Nation and Garbage Growth in India Doron, Jeffery (2018) talking about how the garbage is increasing in urban cities according to time, place, and population. This book starts with the question that Why India is so filthy? Yes, really always this question comes in mind but after reading this book we understand why this question raises on the country like India.

solid waste management, local governance role, people's condition and NGO"s involvement of various metropolitan cities like Delhi, Mumbai, Moradabad, Pune, Kolkata, Chennai, etc. Then they talking about the technological solution about the solid waste management and its imperfection because of people are not capable to handle it also how because of lack of funding, management and limitations of local government there are issues happening in the implementation of SWM.
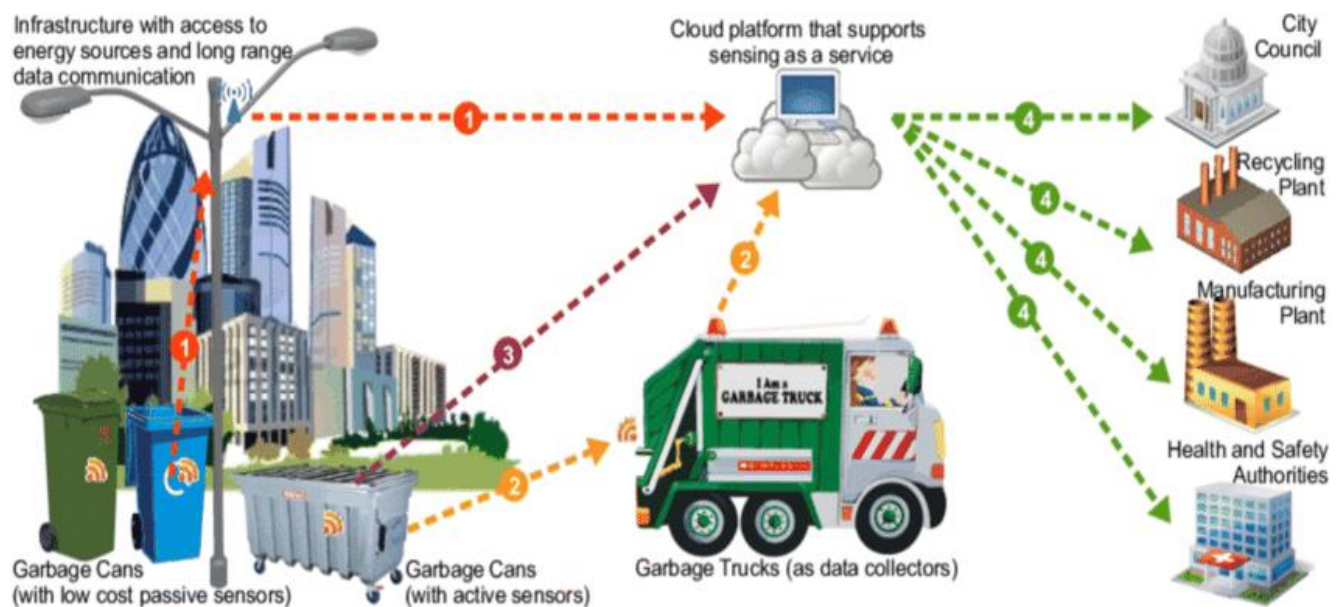
1.Smart Dustbin

Municipality takes many measures to maintain the cleanliness of the city. One of which establishing dustbins in regular distance for the convenience of public to discard items and Cleaning this garbage is an important function of municipality which is directly related to health issues. We have design
ed a model for a „Smart Dustbin" which indicates directly that
the dustbin is filled to a certain level by the garbage and cleaning or emptying them is a matter of immediate concern.

The design of the smart dustbin includes the pneumatically automated compressor for compressing the garbage, electrical circuit to control the garbage compressor and a microcontroller which is used to intimate the central hub of the municipality.

2.Efficient garbage disposal management in metropolitan cities

To make things to work efficient, some innovation is needed. Likewise in our project we configured a smart bin system using sensors, location trackers by tracking bins in a distance, then tracking whether the bin lid is open or close. All these things are created by creating web application and, website using Node-RED.

Before that we went through a long process with IBM where we created IBM cloud, IBM Watson cloud, worked in Wokwi and python and finally Node-RED. As a first step of making project we made a location tracking system.
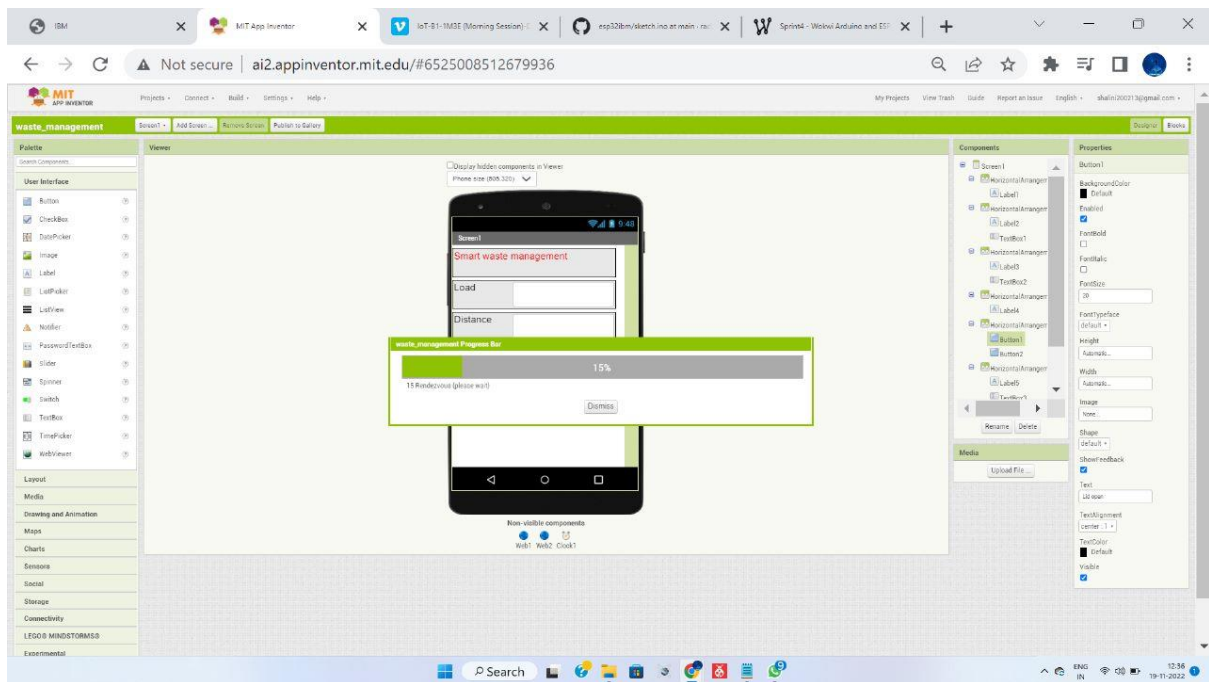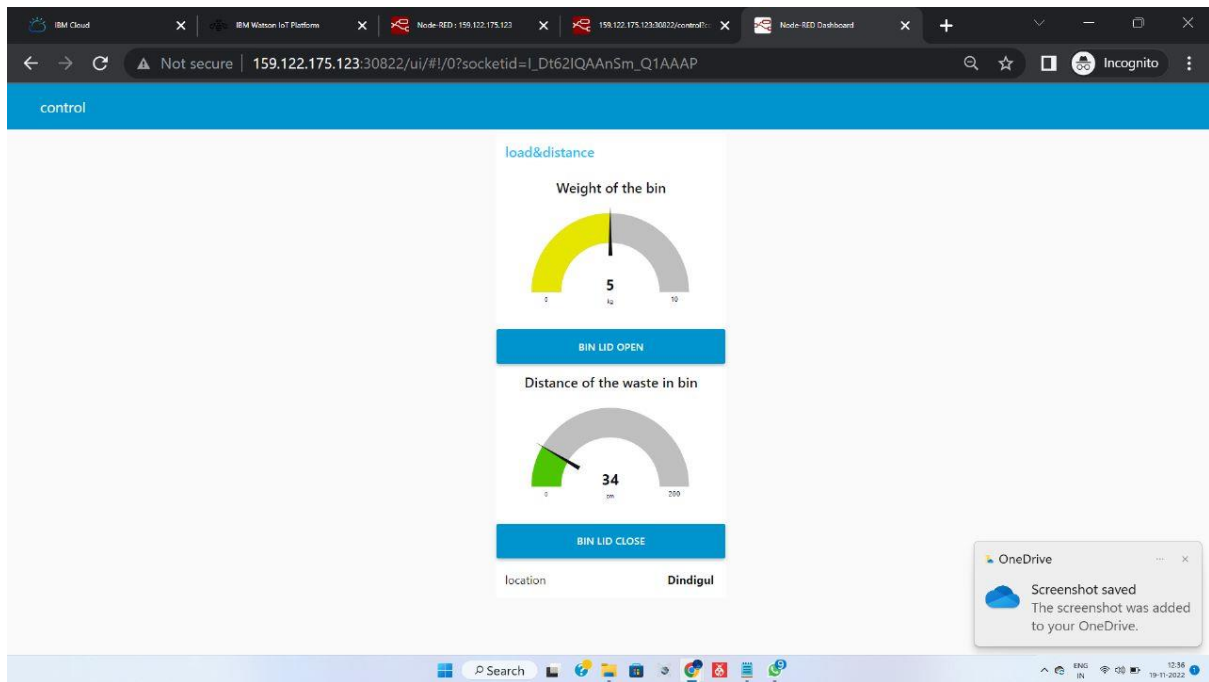
We have included world map, trackers, geo fencing, geofence triggered, format JSON, own tracks (installed as mobile app) and webhookrelay. By making all these we have done location tracking as a first step. And we have done these thing as first step of web application. Accommodating that much big metropolitan city is tough because we need to plan the locations of the bin and so proper location tracking system is required. As the next step we can connect load at the end by making the system more efficient.
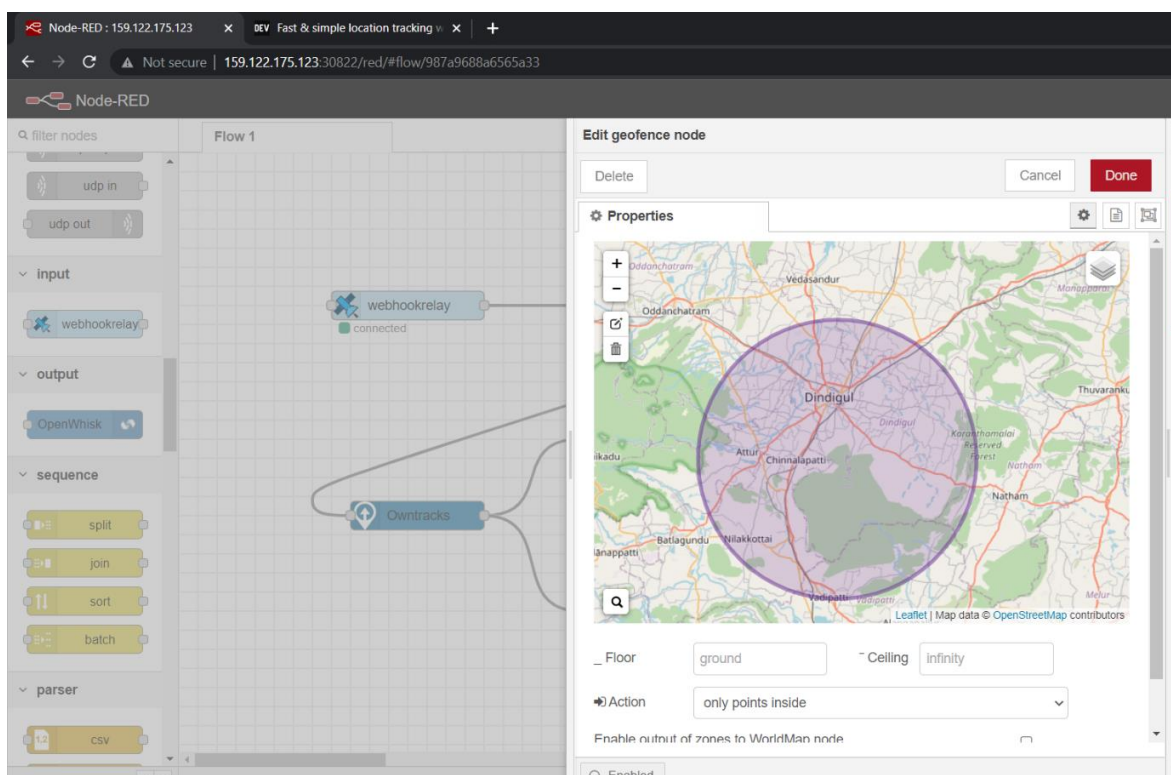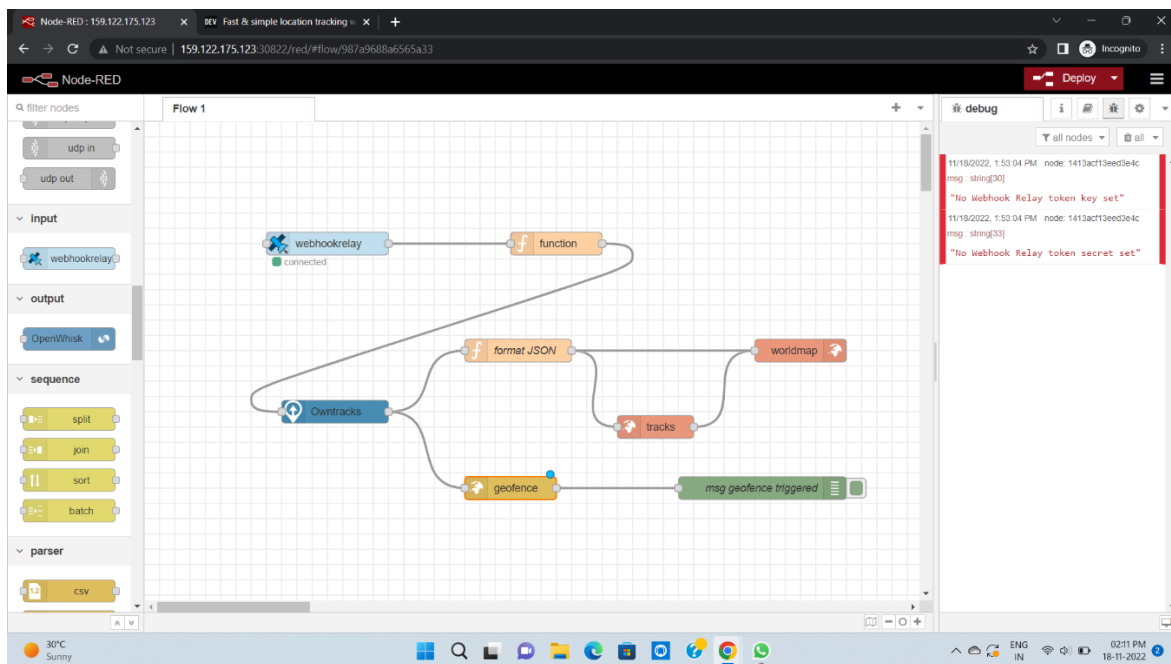
Connecting Things To MIT With Load:

CONCLUTION:

Thus, the output using MIT app has been shown above. Hence, the smart waste management system for metropolitan cities project has been successfully done. With this project we can make our city " clean , hygienic and disease free environment".