Project Report

Team ID	**PNT2022TMID34218**
Project Name	**Smart waste management system for metropolitan cities**
Team Lead	**AARTHI M L**
Team Member 1	**SREESHMA P**
Team Member 2	**SRUTHI K S**
Team Member 3	**SHYLA SREE R L**
Team Member 4	**SOBHA K S**

1. INTRODUCTION

1.1 Project Overview:

Our waste generation is constantly growing to form a global garbage crisis. Even though we indulge in creating a more sustainable and greener, we still fail to handle our waste generation and management. Combining technology support with a vision of social, economic and environmental sustainability is the best way out of this problem. It is done in the following manner. The smart bin system undergoes a thorough system check and battery level monitoring in order to function efficiently. If the battery level is found to be low, it has to be recharged immediately, else it can proceed to the next step. The threshold level levels of the bin are indicated my multiple sensors attached to bin. If the garbage exceeds the level, then an alert message is sent to the garbage collectors as well as to the municipality or area administration. The area in which garbage is found to overflow is allocated to respective garbage collectors in the form of messages through GSM system. Once the waste bin is emptied, an information update is sent to the municipality and server is updated. This is how the waste from bins can be efficiently handled and managed using technology which in turn keeps the environment clean and healthy.

1.2 Purpose:

We amalgamate technology along with waste management in order to effectively create a safe and a hygienic environment. Smart waste management is about using technology and data to create a more efficient waste industry. Based on IoT (Internet of Things) technology, smart waste management aims to optimize resource allocation, reduce running costs, and increase the sustainability of waste services. This makes it possible to plan more efficient routes for the trash collectors who empty the bins, but also lowers the chance of any bin being full for over a week. A good level of coordination exists between the garbage collectors and the information supplied via technology. This makes them well aware of the existing garbage level and instigate them whenever the bins reach the threshold level. They are sent with alert messages so that they can collect the garbage on time without littering the surrounding area. The fill patterns of specific containers can be identified by historical data and managed

accordingly in the long term. In addition to hardware solutions, mobile applications are used to overcome the challenges in the regular waste management system, such as keeping track of the drivers while they are operating on the field. Thus, smart waste management provides us with the most optimal way of managing the waste in an efficient manner using technology

2. LITERATURE SURVEY:

2.1 Existing problem:

Waste management has become an alarming challenge in local towns and cities across the world. Often the local area bins are overflowing and the municipalities are not aware of it. This affects the residents of that particular area in numerous ways starting from bad odour to unhygienic and unsafe surroundings. Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary areas contribute to contamination of drinking water and can cause infection and transmit diseases. Toxic components such as Persistent Organic Pollutants (POPs) pose particularly significant risks to human health and the environment as they accumulate through the food chain. Animals eating contaminated plants have higher doses of contaminants than if they were directly exposed. Precipitation or surface water seeping through waste will absorb hazardous components from landfills, agricultural areas, feedlots, etc. and carry them into surface and groundwater. Contaminated groundwater also poses a great health risk, as it is often used for drinking, bathing and recreation, as well as in agricultural and industrial activities. Landfills and waste transfer stations can attract various pests (insects, rodents, gulls, etc.) that look for food from waste. These pests can spread diseases through viruses and bacteria (i.e., salmonella and e-coli), which are a risk to human health.

2.2 References:

PAPER 1:

TITLE: IoT Based Waste Management for Smart City

AUTHOR NAME: Parkash Tambare, Prabu Venkatachalam

PUBLICATION YEAR: 2016 **DESCRIPTION:**

In the current situation, we frequently observe that the trash cans or dust cans that are located in public spaces in cities are overflowing due to an increase in the amount of waste produced each day. We are planning to construct “IoT Based Waste Management for Smart Cities” to prevent this from happening because it makes living conditions for people unsanitary and causes unpleasant odours in the surrounding area. There are numerous trash cans scattered throughout the city or on the campus that are part of the proposed system. Each trash can is equipped with a low-cost embedded device that tracks the level of the trash cans and an individual ID that will enable it to be tracked and identified.

PAPER 2:

AUTHOR NAME: Mohammad Aazam, Marc St-Hilaire, Chung-Horng Lung, Ioannis Lambadaris

PUBLICATION YEAR: 2016 **DESCRIPTION:**

Each bin in the Cloud SWAM system that Mohammad Aazam et al suggested has sensors that can detect the amount of waste inside. There are separate bins for organic, plastic/paper/bottle/glass, and metal waste. This way, each form of waste is already divided, and it is known how much and what kind of waste is collected thanks to the status. Different entities and stakeholders may benefit from the accessibility of cloud-stored data in different ways. Analysis and planning can begin as soon as garbage is collected and continue through recycling and import/export-related activities. Timely garbage collection is provided via the Cloud SWAM system. A timely and effective method of waste collection improves health, hygiene, and disposal.

PAPER 3:

TITLE: Arduino Microcontroller Based Smart Dustbins for Smart Cities

AUTHOR NAME: K. Suresh, S. Bhuvanesh and B. Krishna Devan

PUBLICATION YEAR: 2019 **DESCRIPTION:**

In this paper, a technique for cleaning up our surroundings and environment is described. The Indian government just began work on a smart city initiative, and in order for these towns to be smarter than they already are, the garbage collection and disposal system must be improved upon. Self-Monitoring Automated Route Trash (SMART) dustbins are intended for use in smart buildings such as colleges, hospitals, and bus stops, among other places. In this study, we have employed the PIR and Ultrasonic sensors to detect human presence, the Servomotor to open the dustbin lid, and the Ultrasonic sensor to detect the level of rubbish. Signals between two trash cans are transmitted using a communication module, and the GSM module sends the message to the operator.

PAPER 4:

AUTHOR NAME: Mohd Helmy Abd Wahab, Aeslina Abdul Kadir,

Mohd Razali Tomari and Mohamad Hairol Jabbar

PUBLICATION YEAR: 2014

DESCRIPTION:

Proposed a smart recycle bin that can handle the recycling of plastic, glass, paper, and aluminium cans. It generates a 3R card after automatically determining the value of the trash thrown away. The recycle system makes it possible to accumulate points for placing waste into designated recycle bins. By allowing the points to be redeemed for goods or services, such a system promotes recycling activities. The system keeps track of information on disposal procedures, materials disposed of, user identification, and points accrued by the user. To use the recycle bin, the user must tap his card to the designated RFID reader. Doors to recycling bins are opened, and rubbish is placed one by one.

PAPER 5:

TITLE: Waste Management Initiatives in India For Human Wellbeing

AUTHOR NAME: Dr. Raveesh Agarwal, Mona Chaudhary and Jayveer Singh

PUBLICATION YEAR: 2015 **DESCRIPTION:**

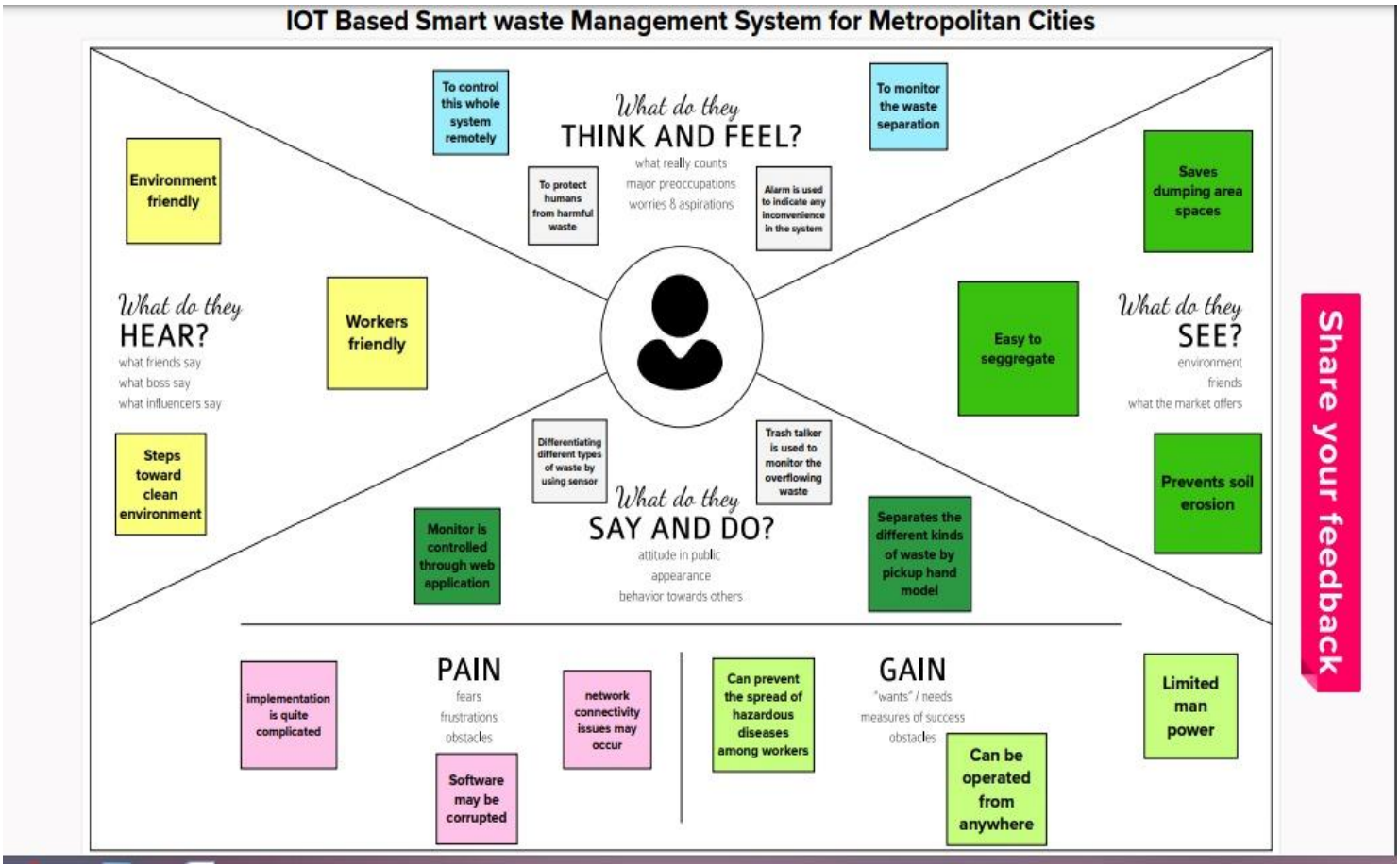
The objective of this paper is to examine the present methods used in India for the welfare of its people in different waste management efforts. The other goal is to offer advice on how to make Indian municipalities' trash disposal procedures better. On secondary research, this essay is founded. The system is improved by looking at the reports that have already been written about waste management and the suggestions made for improvement by planners, NGOs, consultants, government accountability organisations, and important business leaders. It provides in-depth understanding of the various waste management programmes in India and identifies areas where waste management might be improved for societal benefit. The essay makes an effort to comprehend the crucial part that our nation's official waste management sector plays in the waste management process.

2.3 Problem Statement Definition:

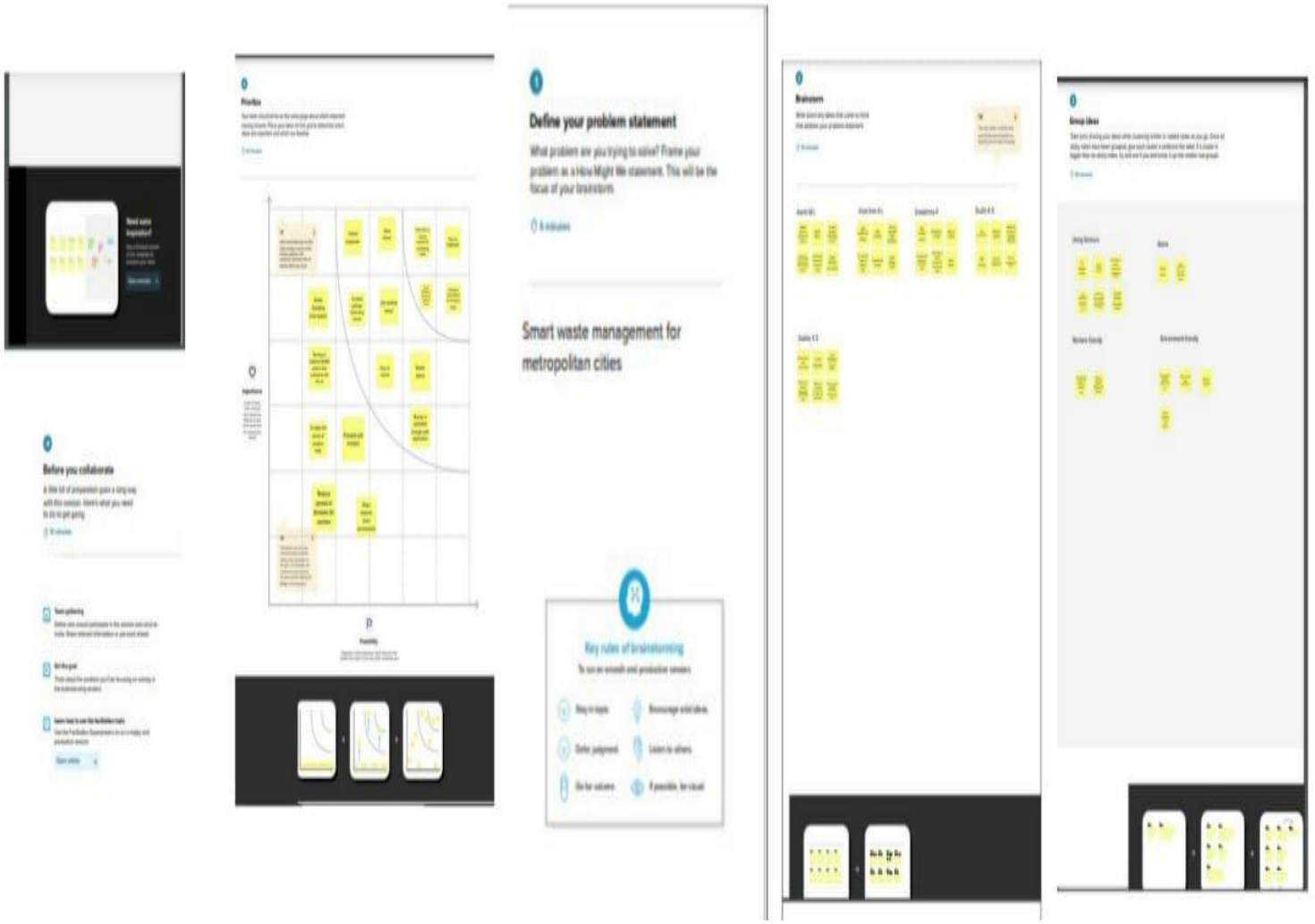
Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Council	Monitor the waste in my city	I have not much effective system for monitoring	Because of high cost	unhygienic
PS-2	Council	Manage the waste in my city	I have not much effective system for managing	Because of more time consuming	unsafe

3.IDEATION & PROPOSED SOLUTION:

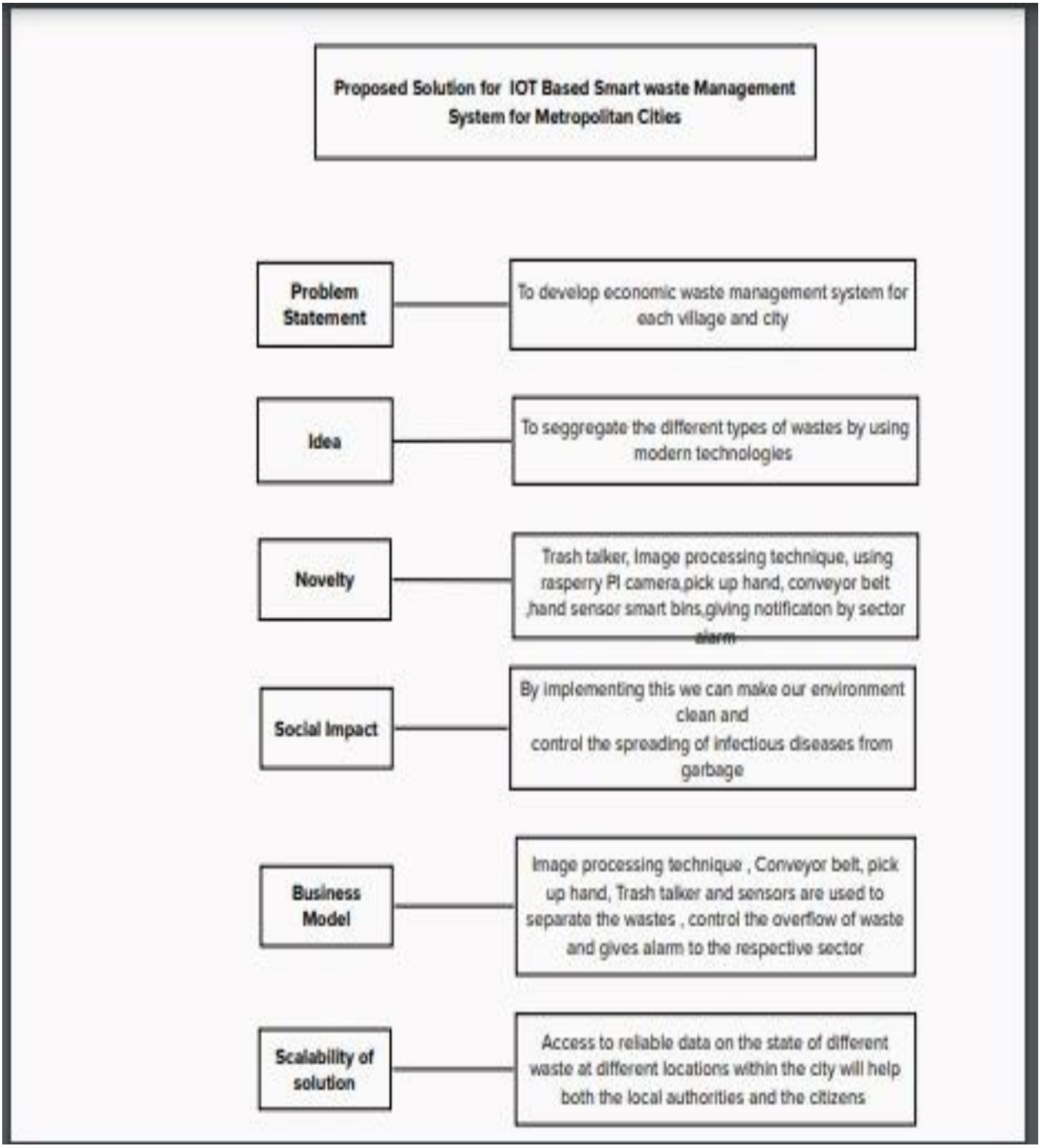
2.4 Empathy map canvas:



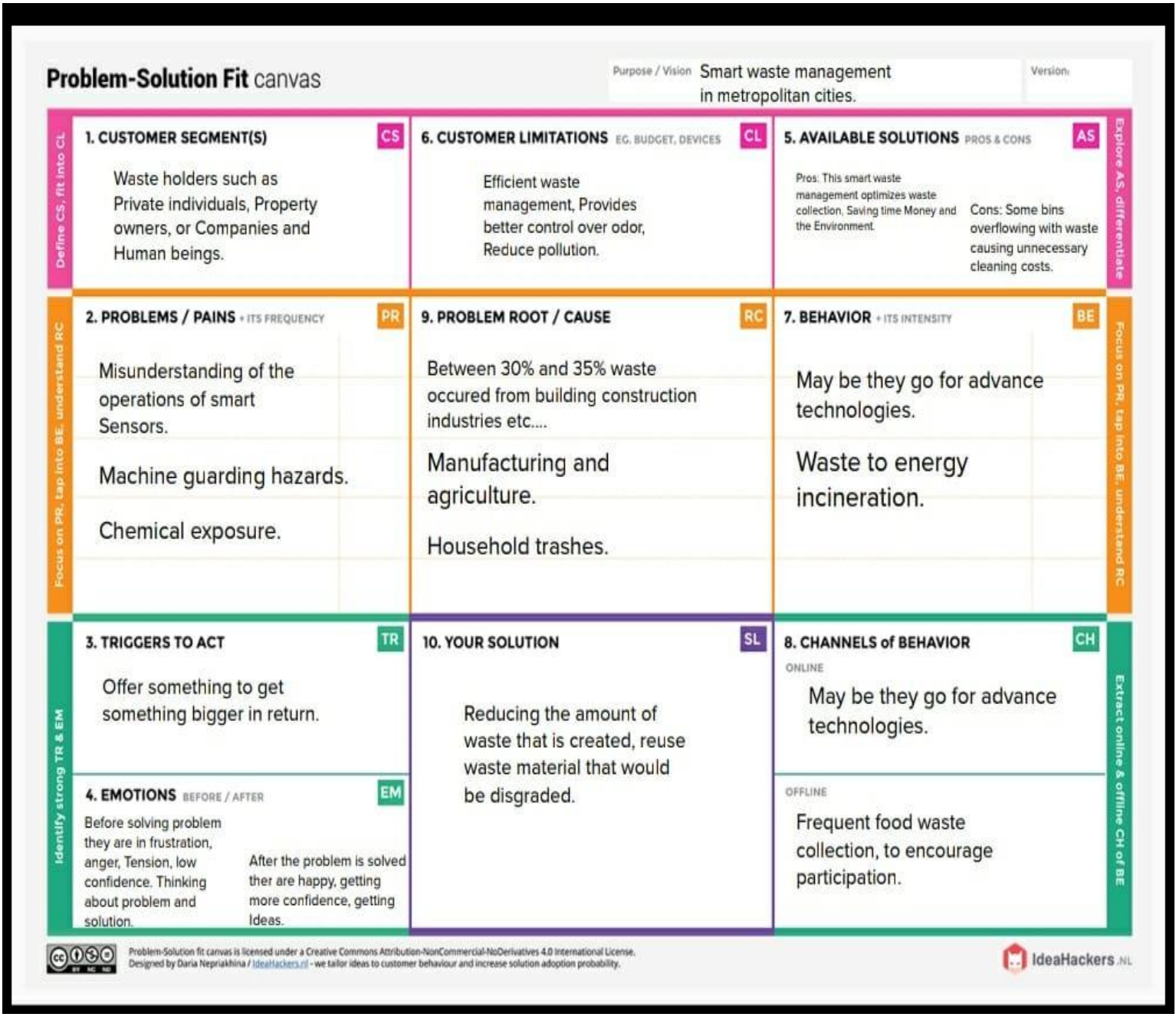
2.5 Ideation & Brainstorming:



2.6.Proposed Solution:



Problem solution fit:



3. REQUIREMENT ANALYSIS

3.1 Functional and non functional requirement

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	14 October 2022
Team ID	PNT2022TMID34218
Project Name	SMART WASTE MANAGEMENT SYSTEM
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Detailed bin inventory.	All monitored bins and stands can be seen on the map, and you can visit them at any time via the Street View feature from Google. You can see bin details in the Dashboard – capacity, waste type, last measurement, GPS location and collection schedule or pick recognition.
FR-2	Real time bin monitoring.	The Dashboard displays real-time data on fill-levels of bins monitored by smart sensors. In addition to the % of fill-level, based on the historical data, the tool predicts when the bin will become full, one of the functionalities that are not included even in the best waste management software.. Sensors recognize picks as well; so you can check when the bin was last collected. With real-time data and predictions, you can eliminate the overflowing bins and stop collecting half-empty ones.
FR-3	Expensive bins.	We help you identify bins that drive up your collection costs. The tool calculates a rating for each bin in terms of collection costs. The tool considers the average distance bin discharge in the area. The tool assigns bin a rating (1-10) and calculates distance from bin discharge.
FR-4	Adjust bin distribution.	Ensure the most optimal distribution of bins. Identify areas with either dense or sparse bin distribution. Make sure all trash types are represented within a stand. Based on the historical data, you can adjust bin capacity or location where necessary.

FR-5	Eliminate unefficient picks.	Eliminate the collection of half-empty bins. The sensors recognize picks. Raspberry Pi camera with 12 MP and high resolution of upto 1080p is used. By using real-time data on fill-levels and pick recognition, we can show you how full the bins you collect are.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

NFR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	IoT device verifies that usability is a special and important perspective to analyze user requirements, which can further improve the design quality. In the design process with user experience as the core, the analysis of users' product usability can indeed help designers better understand users' potential needs in waste management, behavior and experience.
NFR-2	**Security**	Use a reusable bottles Use reusable grocery bags Compost it Purchase wisely and recycle Avoid using use and throw food and drink containers.
NFR-3	**Reliability**	Smart waste management is also about creating better working conditions for waste collectors and drivers. Instead of driving the same collection routes and servicing empty bins, waste collectors will spend their time more efficiently, taking care of bins that need servicing.
NFR-4	**Performance**	The Smart Sensors use ultrasound technology to measure the fill levels (along with other data) in bins several times a day. Using a variety of IoT networks (NB-IoT,GPRS), the sensors send the data to Sensoneo's Smart Waste Management Software System, a powerful cloud-based platform, for datadriven daily operations, available also as a waste management app. Customers are hence provided data-driven decision making, and optimization of waste collection routes, frequencies, and vehicle loads resulting in route reduction by at least 30%.

NFR-5	Availability	By developing & deploying resilient hardware and beautiful software we empower cities, businesses, and countries to manage waste smarter.
NFR-6	Scalability	Using smart waste bins reduce the number of bins inside town and cities because we are able to monitor the garbage 24/7 more cost effectively and scalability is high

4. PROJECT DESIGN:

4.1 **Data Flow Diagrams**:

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 A smart waste management platform uses analytics to translate the data gather in your **bins into actionable insights to help you improve your waste services.** You can receive data on metric such as:

- The first test conducted is the situation where the garbage bin is empty or its garbage level is very low
- Then, the bin is filled with more garbage until its level has surpassed the first threshold **value, which is set to 80% then the first warning SMS is being sent, as depicted**
- The first notification SMS sent by the system, once the waste reaches the level of 85% full
- The second notification SMS sent by the system, indicating that bin is at least 95% full and **the garbage needs to be collected immediately**

- Locations prone to overflow
- The number of bins needed to avoid overflowing waste
- The number of collection services that could be saved
- The amount of fuel that could be saved
- The driving distance that could be saved

Data flow diagram:

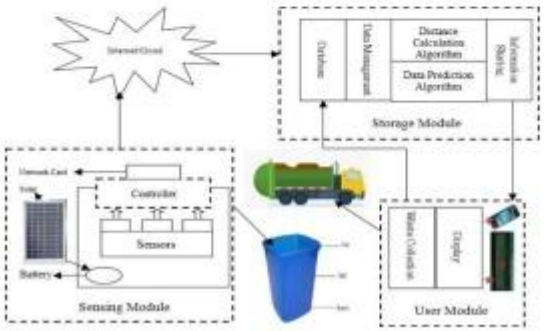
Project Design Phase-II
Data Flow Diagram & User Stories

DATE	15 OCTOBER 2022
TEAM ID	PNT2022TMID34218
PROJECT NAME	SMART WASTE MANAGEMENTFOR METROPOLITAN CITIES.
MAXIMUM MARKS	4 MARKS

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.

DFD for smart waste management for metropolitan cities.



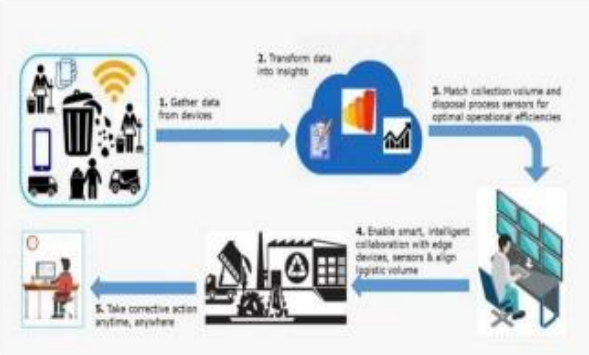
5.2.Solution & Technical Architecture:

Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	15 October 2022
Team ID	PNT2022TMID34218
Project Name	SMART WASTE MANAGEMENTSYSTEM FOR METROPOLITAN CITIES
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2



Guidelines:

1. Our proposed model provide real time monitoring to the garbage bins placed in various locations.
2. The garbage bins are build with a sensor module(Ultrasonic sensor) which continuosly monitors the garbage bin.
3. Any moment the garbage level passes over the critical level (i.e 80%),the system generates a notification to the monitoring panel (admin panel /garbage cleaning team) and so the cleaning team collects the garbage from the identified garbage bin.

4.2 User stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release

Admin(who manages server)	Web server login	USN-1	As a admin, I can able to track the truck driver name, id, contact number, location, and also the location of the dustbin.	I can Manage and direct workers through web server	High	Sprint-1

Co-Admin	Login	USN-2	As a co-admin I'll monitor the workers, whether the work has been done properly, checking the availability of workers and also monitor the waste collected by the truck driver within the scheduled time	I can monitor the garbage bin activity	High	Sprint-1
Customer (Web user)	User	USN-3	As a user , I can able to raise queries to higher authorities about the maintenance and disposal of waste	I can raise queries	Medium	Sprint-2
Customer Care Executive	Worker	USN-4	As a customer care executive I will try to rectify the queries from customers by contacting coadmin. In case of emergency situation query can be reported to Admin.	I can attend calls and respond people and solve their problems	High	Sprint-1

Truck driver	Worker	USN-5	The truck driver is a worker who has been assigned to collect the garbage and he have to report to admin about when and where and also the timings , the garbage has been picked up according the daily schedule.	I will do the work properly and report the data at the scheduled time	High	Sprint1

5. PROJECT PLANNING & SCHEDULING:

5.1 Sprint Planning & Estimation:

PHASE	TITLE	DESCRIPTION
Ideation Phase	Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.
	Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements

	Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.
Phase-1	Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.
	Problem Solution Fit	Prepare problem - solution fit document.
	Solution Architecture	Prepare solution architecture document.
Phase-2	Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).
	Functional Requirement	Prepare the functional and Nonfunctional requirement document.
	Data Flow Diagrams	Draw the data flow diagrams and submit for review.
	Technology Architecture	Prepare the technology architecture diagram.
Project planning phase	Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.

Project development phase	Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.

5.2 Sprint Delivery Schedule:

Sprint	Functional Requirement (Epic)	Task	Story Point-s	Priority	Team Members
Sprint-1	Registration	As a team lead, I can enrolled for the project by entering my email, password and within that I can enter my team members name and their email.	2	High	Muthumari
Sprint-1		As a team lead, I will receive confirmation email once, I have enrolled for the project with team id and along with team members name.	2	High	Muthumari
Sprint-2	Login	As a team member, I can login to the IBM portal by entering email & password	1	Medium	Madhumitha
Sprint-2		As a team member, I can login to the IBM portal by entering email & password	1	Medium	Princy fuela
Sprint-2		As a team member, I can login to the IBM portal by entering email & password	1	Medium	Muthukumari
Sprint-2		As a team member, I can login to the IBM portal by entering email & password	1	Medium	Madhumitha

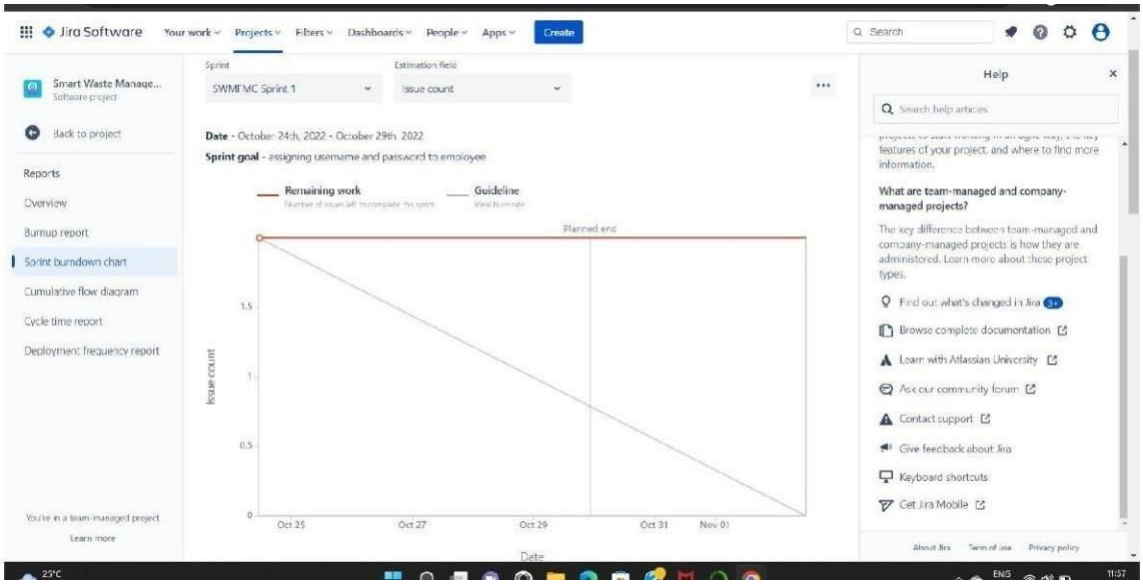
Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date (Planned)	Story Points Completed (Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	22 Oct 2022	27 Oct 2022	20	06 Nov 2022

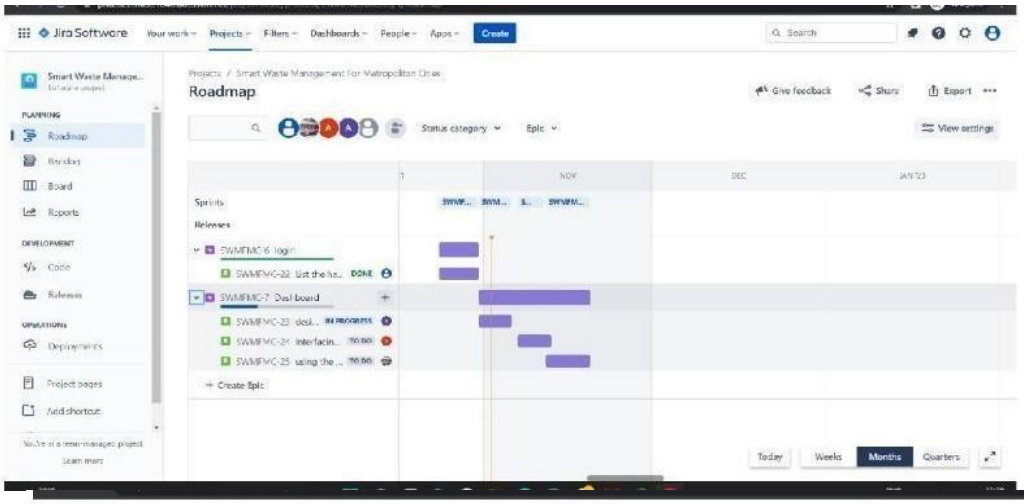
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	30	07 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	49	08 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	50	09 Nov 2022

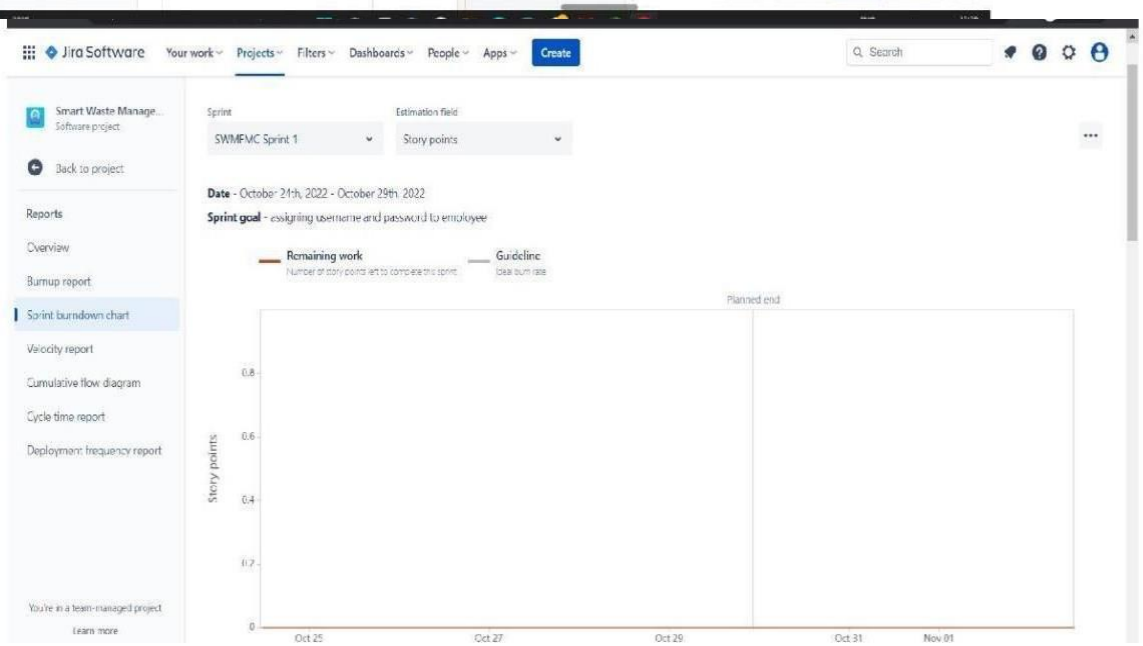
5.3 Reports from JIRA:

Burnout Chart:



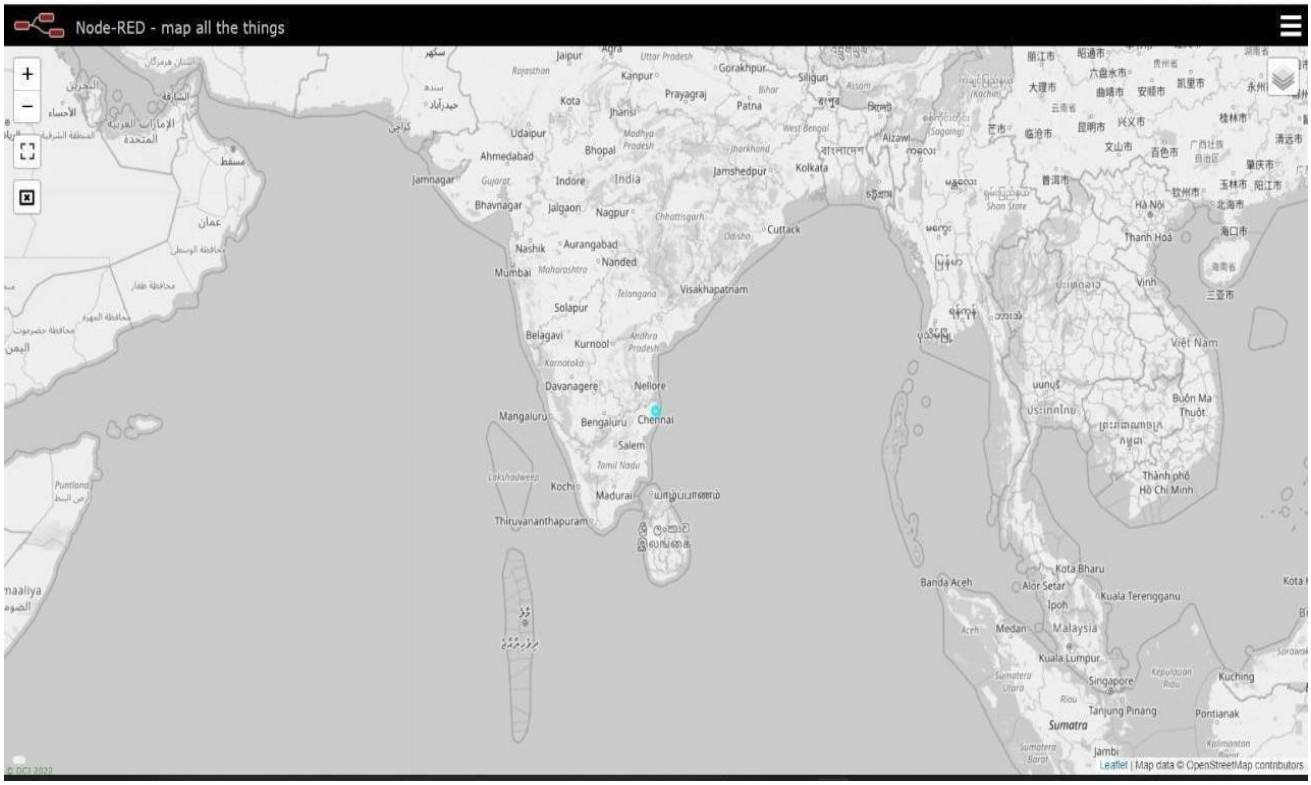
Road map:



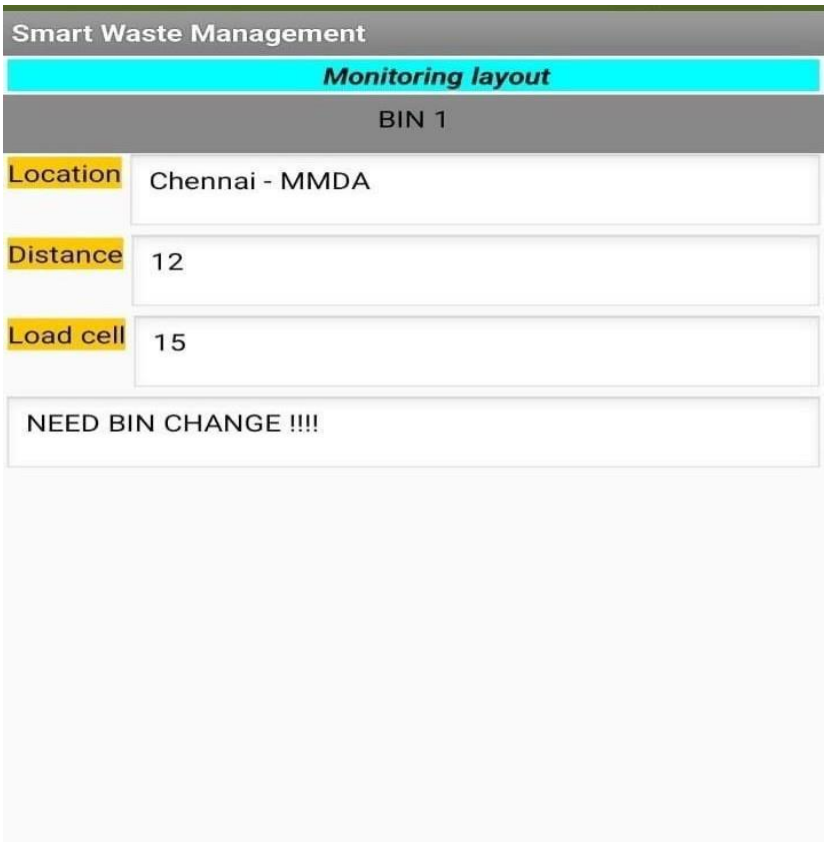


6.CODING & SOLUTIONING:

6.1 Feature 1- LOCATION TRACKER:



6.2 Feature 2- LIVE UPDATE ON COLLECTED DATA:



7. Testing:

7.1 Testcases:

TEST CASE ID	FEATURE TYPE	COMPONENT	TEST SCENARIO	PREREQUISITE	STEPS TO EXECUTE	TEST DATA	EXPECTED RESULT	ACTUAL RESULT	STATUS	COMMENTS	TC FOR AUTOMATION(Y/N)	BUG ID	EXECUTED BY
LOGIN PAGE_TC_001	FUNCTIONAL	HOME PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.ENTER URL AND CLICK GO 2.VERIFY LOGIN/SIGN UP	https://169.51.204.219.30106	L0gin page is visible	Working as expected	PASS	**Successful**			**MADHUMITHA C**

LOGIN PAGE_TC_002	UI	HOME PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.ENTER URL AND CLICK GO 2.VERIFY LOGIN/SIGN UP Elements a.ID text b o x B . password text box c..login button D.new user E.already have an account	https://169.51.20 4.219.30 106	Application should show below UI element	Working as expected	PASS	Successfull			**PRINCY FUELA I**

LOGIN PAGE_TC_003	FUNCTIONAL	LOGIN PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login	Id:1111 password:5678	User should navigate your home page.	Working as expected	PASS	Successful			**PRINCY FUELA I**
					button								
LOGIN	FUNCTIONA	LOGIN	VERIFY		1.enter url	Id:1111	Confirm	Workin	PASS	Success			**MUTHUKUMARI T**

PAGE_TC_004	L	PAGE	THE USER IS ABLE TO SEE THE LOGIN/SIGN UP WEN USER CLICK ON MY ACCOUNT BUTTON		and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login butvton	password:5678	ation message sent	g as expected		ful			
LOGIN PAGE_TC_005	UI	LOGIN PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIGN UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login button	Id:1111 password:5678	Confirmation message sent	Working as expected	PASS	Successful			**MUTHUMARIM**
LOGIN PAGE_TC_006	FUNCTIONAL	LOGIN PAGE FOR ADMIN	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIGN UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login button	Id:1111 password:5678	Customer database is visible	Working as expected	PASS	Successful			**MUTHUMARIM**

7.2 User acceptance Testing:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	7

1. Test Case Analysis:

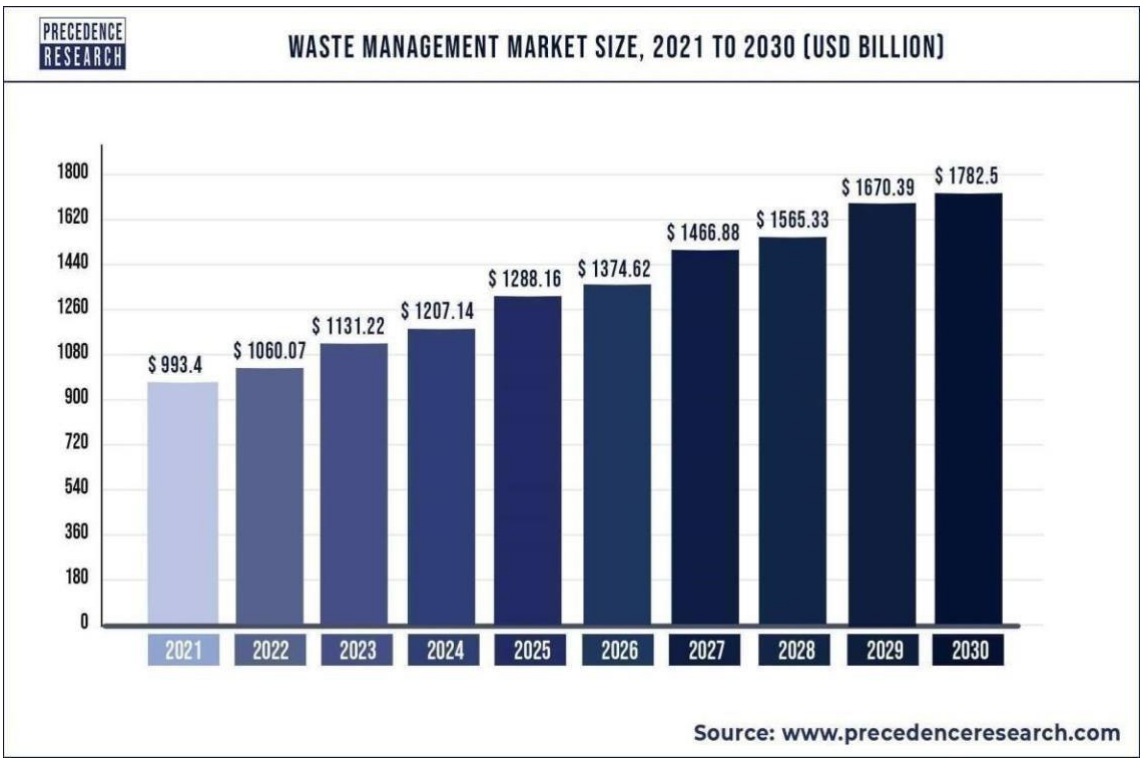
This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fai l	Pas s
Print Engine	7	0	0	7

Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS:

9.1 Performance Metrics:



10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Reduction in Collection Cost

- No Missed Pickups
- Reduced Overflows
- Waste Generation Analysis • CO_2 Emission Reduction

DISADVANTAGES:

- System requires a greater number of waste bins for separate waste collection as per population in the city.
- This results into high initial cost due to expensive smart dustbins compare to other methods. Sensor nodes used in the dustbins have limited memory size.

11. CONCLUSION:

A Smart Waste Management system that is more effective than the one in use now is achievable by using sensors to monitor the filling of bins. Our conception of a "smart waste management system" focuses on monitoring waste management, offering intelligent technology for waste systems, eliminating human intervention, minimizing human time and effort, and producing a healthy and trash-free environment. The suggested approach can be implemented in smart cities where residents have busy schedules that provide little time for garbage management. If desired, the bins might be put into place in a metropolis where a sizable container would be able to hold enough solid trash for a single unit. The price might be high.

12. FUTURE SCOPE:

There are several future works and improvements for the proposed system, including the following:

1. Change the system of user authentication and atomic lock of bins, which would aid in protecting the bin from damage or theft.
2. The concept of green points would encourage the involvement of residents or end users, making the idea successful and aiding in the achievement of collaborative waste management efforts, thus fulfilling the idea of Swachh Bharath.
3. Having case study or data analytics on the type and times waste is collected on different days or seasons, making bin filling predictable and removing the reliance on electronic components, and fixing the coordinates.
4. Improving the Server's and Android's graphical interfaces

13. Appendix:

Source Code

```
# Project : Smart Waste
Management # Team ID :
PNT2022TMID01046 import requests
import json import
ibmiotf.application import
ibmiotf.device import time import
random import sys

# watson device details
 organization         =
"ms9s4l"   devicType   =
"Project"   deviceId   =
"TMID01046" authMethod=
"token"      authToken=
"13150415"

#generate random values for randomo variables for distance and loadcell


def myCommandCallback(cmd):
    global a     print("command recieved:%s"
%cmd.data['command'])
control=cmd.data['command']     print(control)
 try:         deviceOptions={"org": organization, "type":
devicType,"id":
deviceId,"auth-method":authMethod,"auth-token":authToken}
deviceCli = ibmiotf.device.Client(deviceOptions) except
Exception as e:
deviceCli = ibmiotf.device.Client(deviceOptions) except
Exception as e:
        print("caught exception connecting device %s" %str(e))
sys.exit()

#connect and send a datapoint "distance and loadcell" with value integer
value into the cloud as a type of event for every 10 seconds
deviceCli.connect()
 while
True:
     distance=
random.randint(10,70)
loadcell= random.randint(5,15)
```

```
    data= {'dist':distance,'load':loadcell}
          if loadcell < 13 and
loadcell > 15:
        load = "90 %"
elif loadcell < 8 and loadcell > 12:
          load = "60 %"
elif loadcell < 4 and loadcell > 7:
          load = "40 %"
else:
          load = "0
%"
if distance < 15:
          dist = 'Risk warning:' 'Dumpster poundage getting high, Time to
collect :) 90 %'

                    elif distance < 40
and distance >16:
          dist = 'Risk warning:' 'dumpster is above 60%'
                    elif distance < 60
and distance > 41:          dist =
'Risk warning:' '40 %'     else:
          dist = 'Risk warning:' '17 %'

                                      if
load == "90 %" or distance == "90 %":
          warn  = 'alert :' 'Risk Warning: Dumpster poundage getting high,
Time to collect :)'                     elif
load == "60 %" or distance == "60 %":
                              warn = 'alert :'
          warn  = 'alert :' 'Risk Warning: Dumpster poundage getting high,
Time to collect :)'                     elif
load == "60 %" or distance == "60 %":
                              warn = 'alert :'
'dumpster is above 60%'     else :
          warn = 'alert :' 'No need to collect right now '
if distance <20:
        warn={'alert':'NEED BIN CHANGE!!!!!!'}
         def
myOnPublishCallback(lat=10.939091,long=78.135731):
        print("Chennai")       print("published distance = %s
" %distance,"loadcell:%s "
%loadcell,"lon = %s " %long,"lat = %s"
%lat)       print(load)
print(dist)         print(warn)
```

```
    time.sleep(10)


    success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish=
myOnPublishCallback)

    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)



    if not success:
        print("not connected to ibmiot")
    time.sleep(10)




    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-40294-1660627377