PANDIAN SARASWATHI YADAV ENGINEERING COLLEGE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

HX 8001-PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITAN CITIES USING IOT

NALAIYA THIRAN PROJECT REPORT 2022

Submitted by,

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TEAM ID: PNT2022TMID47912

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1. INTRODUCTION

1.1 PROJECT OVERVIEW:

The term "Internet of Things" refers to items that are connected to the internet and occasionally allow users to operate these gadgets remotely. The Internet of Things (IoT) is a theory in which remote items connect to one another automatically across wired and wireless networks. To offer users cutting-edge intelligent services, IoT objects share information and communicate with one another. The IoT has piqued significant academic interest as a result of recent developments in mobile devices outfitted with various sensors and communication modules, as well as communication network technologies like Wi-Fi and LTE. Waste management has grown to be a big problem in academics, industry, and government as important IoT application domains as a result of the features and benefits of IoT services.

1.2. PURPOSE :

The term "Internet of Things" (IoT) refers to the existing global network of internet-connected gadgets that is constantly growing.Through real-time monitoring and administration of city processes, IoT is essential to improving smart city applications.Solid waste management is one of the main issues with smart city applications because it affects both the environment and society's health.The goal of solid waste management is to limit the amount of solid waste disposed of on land by recovering materials and energy from solid trash as shown. By 2050, it is anticipated that worldwide waste will reach 3.40 billion tonnes, more than tripling population increase during that time.

2. LITERATURE SURVEY

An inevitable consequence of development and industrial progress is generation of waste. Therefore, efficient waste management is a matter of international concern and countries have setup robust regulatory waste management regimes for balancing the objectives of development and environment sustainability. In India, the national

environment policy, 2006 while suggesting measures for collection of wastes and safe disposal of residues [7].

The metro cities and major economic hubs generate the maximum volume of waste, but a survey of 20 smaller cities selected to be developed as smart cities show that most are struggling to manage waste. So, there should be an improvement in the waste management techniques.

2.1 EXISTING PROBLEM :

TITLE	AUTHOR & YEAR	JOURNAL NAME	REMARKS
Smart Waste Management System Using IOT	S.A.Mahajan & 2017		This project shows how the smart waste management system using IOT cam be implemented. This proposed system assures the collection of garbage level reaches its maximum level. Thus, dustbins will be cleared as and when filled, giving way to cleaner city.
Smart Waste Management System Using IOT	Tejashree Kadus & 2020		Improper disposal and improper maintenance of domestic waste create issues in public health and environment pollution thus this paper attempts to provide practical solution towards managing the waste collaborating using IOT. 4
Garbage Managing System Using IOT	Asha and Balamurugan& 2019		This model creates awareness about how hygiene of our surrounding garbage cans is important. It also helps in segregating dry and wet waste & also helps in checking the toxicity level of the waste further simplifying the municipality work of collecting garbage .
Automation of Smart Waste Management Using IOT	Madhuri Mohare & 2019		Here using a one variable voltage source & set -250v as a threshold value By varying voltage below threshold value we got output on virtual terminal that is dustbin is not full. 5

IOT Adoption barriers of smart cities waste management	Manu Sharma & 2020		Waste management of smart cities is considered to be the most important issue in developing countries over the past decades. A review of existing literature revealed fifteen IOT of smart cities waste management.
IOT Technologies Based Smart Waste Collection	Brucu Oralhan and Yavuz Yigit & 2016		Our presented smart waste management system can be improved by using some other knowledge such as a garbage container area population, using future garbage container fill level estimation. 6

2.2 REFERENCES :

1. Tarandeep Singh , Rita Mahajan , Deepak Bagai, “Smart Waste Management using Wireless Sensor Network”, in IJRCCE Volume 4

, Issue 6 , June 2016.

2. Narayan Sharma, “Smart Bin Implemented for Smart City”, International Journal of Scientific & Engineering Research, Volume 6, Is sue 9, September-2015

3. Issac, R;Akshai,M. “An effective solid waste management system for Thiruvalla Municipality in Android OS” IEEE Conference Publications , 2013.

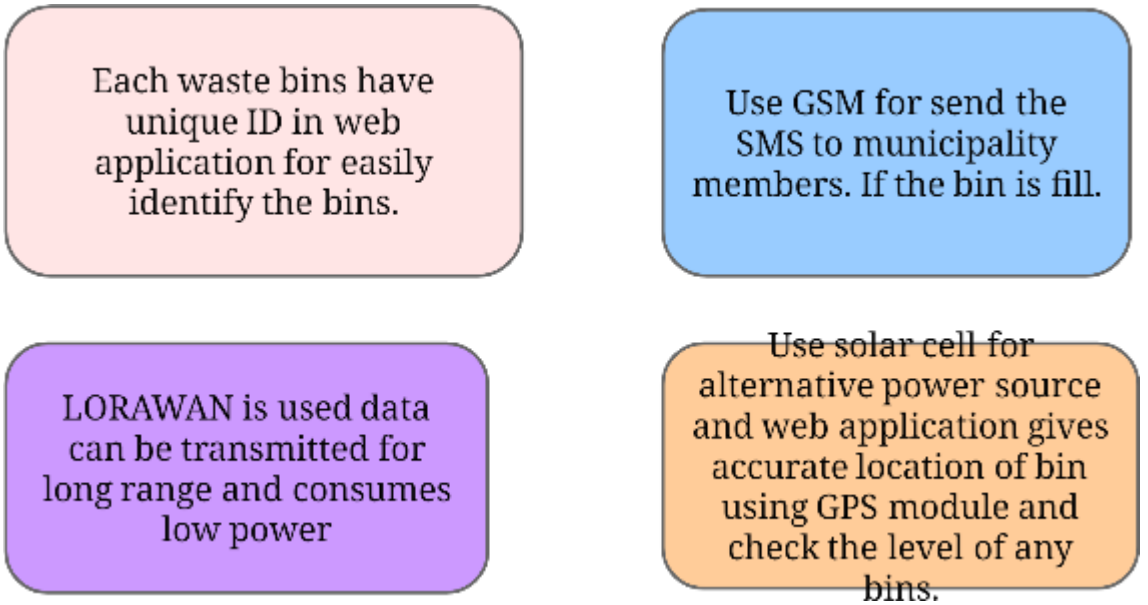
4.Longhi,S ; Marzioni,D ; Alidori, E ; Di Buo,G.; Pris,M. ; Grisostomi, M. ; Pirro,M. “Solid Waste Management Architecture Using Wireless Sensor Network Technology”, New Technology, Mobility and Security (NTMS), 2012 5th International Conference.

5.MANGESH, N., SWAPNIL, K., AVINASH, P. & AVINASH,G. 2017. Iot Based Waste Management for Smart City. International Journal of Advance Research, Ideas and Innovations in Technology, 3, 247-250.

6.BANDAL, A., MANKAR, R., NATE, P., POWAR, R. & S.A.J ADHAV, P. 2017. Smart Wi-Fi Dustbin System. International Journal of Advance Engineering and Research Development, 4, 33 6-339.

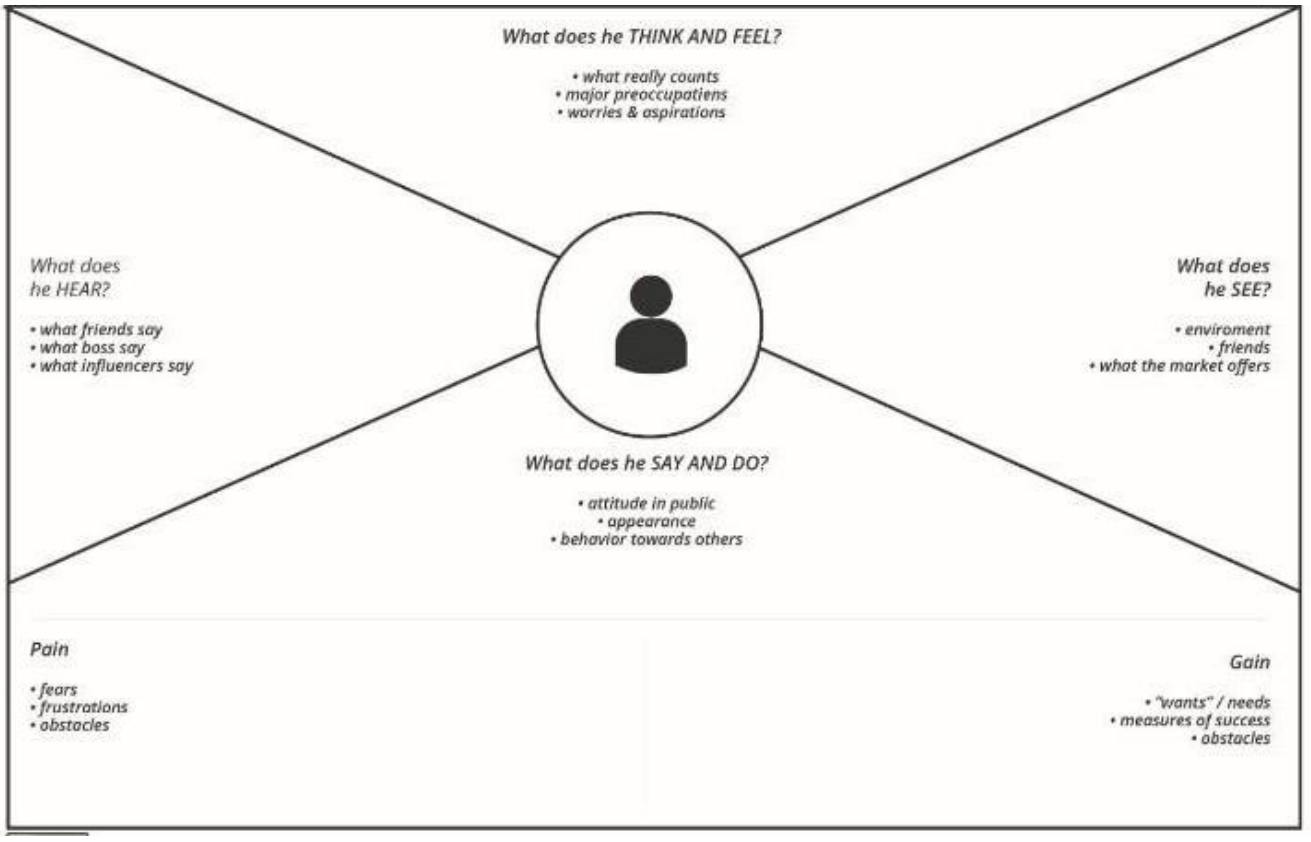
7. BOROZDUKHIN, A., DOLININA, O. & PECHENKIN, V. App roach to the garbage collection in the “Smart Clean City” project. Information Science and Technology (CiSt), 2016 4th IEEE International Colloquium on, 2016. IEEE, 918-922.

2.2 PROBLEM STATEMENT DEFINITION :

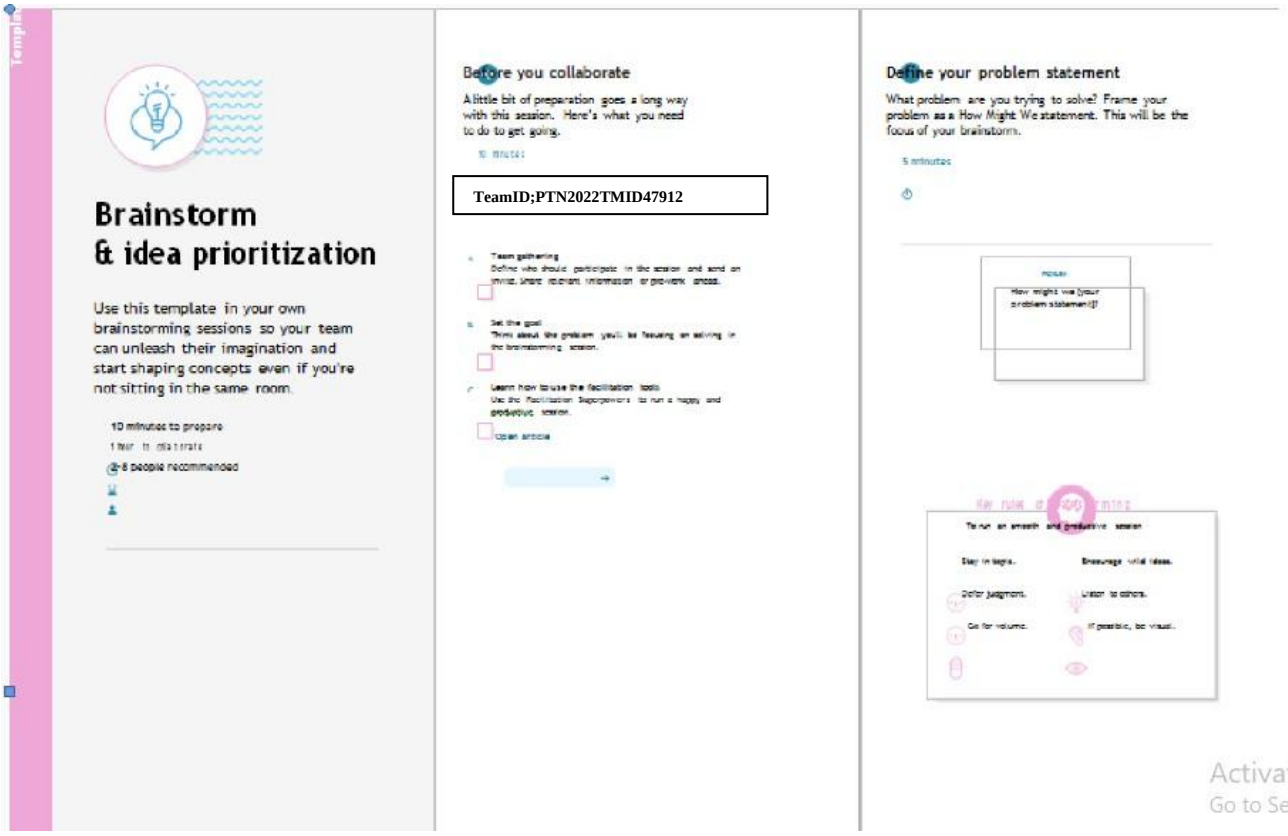


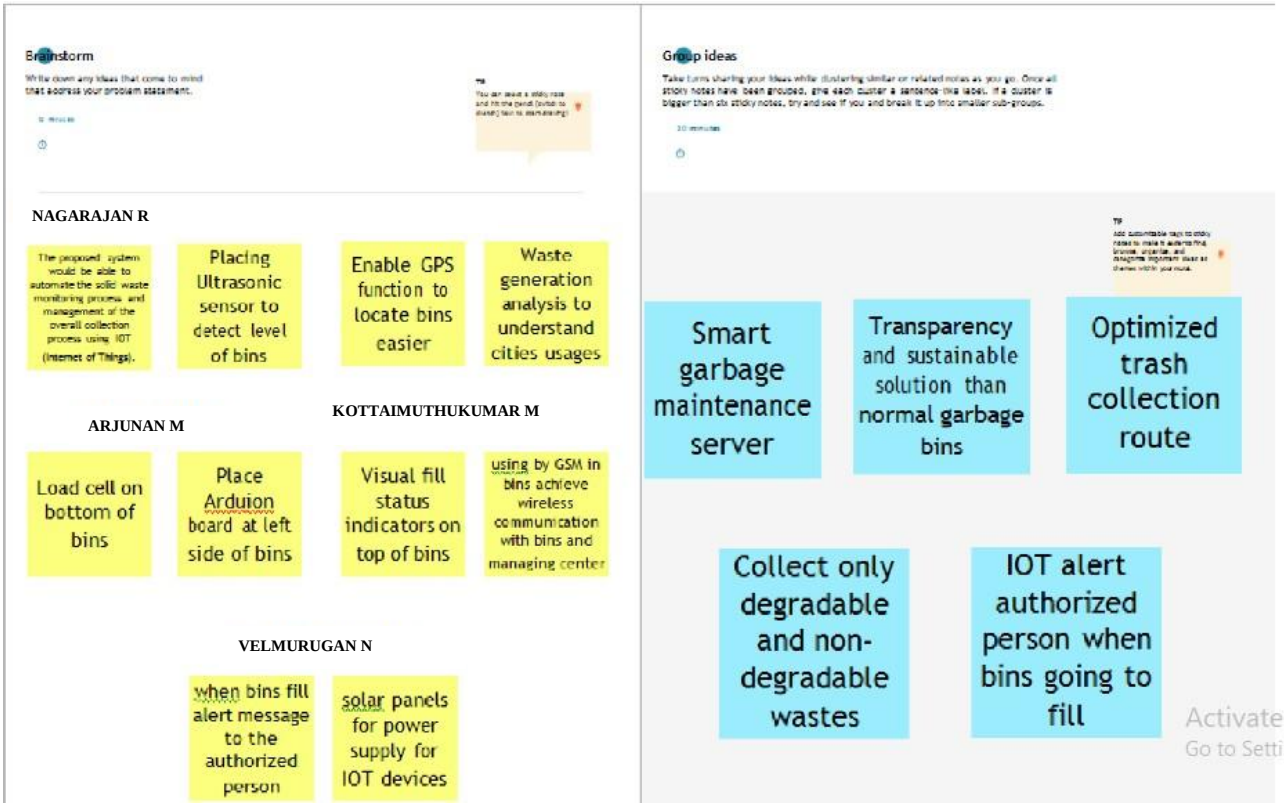
3. IDEATION & PROPOSED SOLUTION

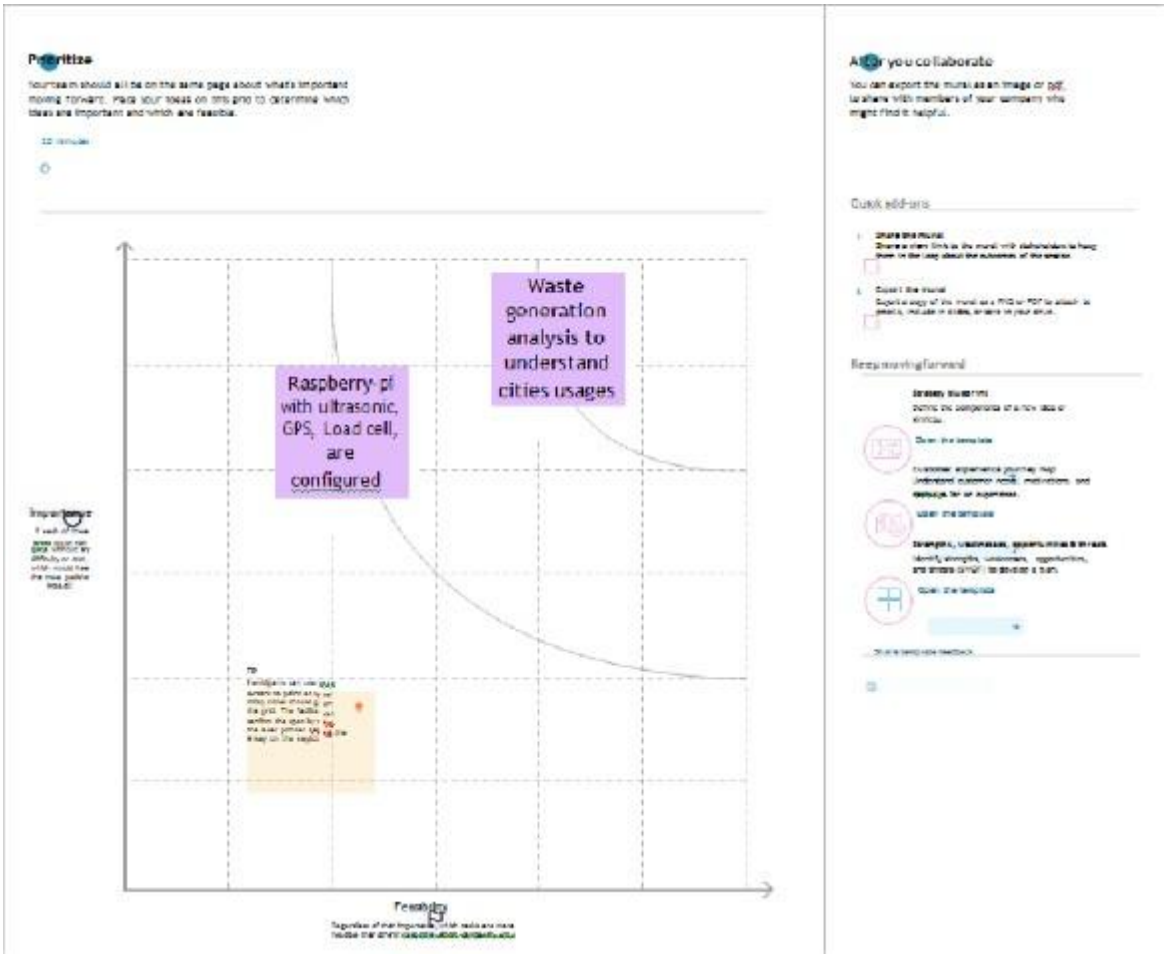
3.1 Empathy Map Canvas :



3.2 Ideation & Brainstorming


Brainstorm
& idea prioritization
Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.
10 minutes to prepare
1 hour to collaborate
2-8 people recommended
Before you collaborate
A little bit of preparation goes a long way with this session. Here's what you need to do to get going.
TeamID;PTN2022TMID47912
Define your problem statement
What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.
5 minutes
Activate Wi
Go to Settings t


Brainstorm
NAGARAJAN R
The proposed system would be able to automate the solid waste monitoring process and management of the overall collection process using IOT (Internet of Things).
Placing Ultrasonic sensor to detect level of bins
Enable GPS function to locate bins easier
Waste generation analysis to understand cities usages
ARJUNAN M
KOTTAIMUTHUKUMAR M
Load cell on bottom of bins
Place Arduion board at left side of bins
Visual fill status indicators on top of bins
using by GSM in bins achieve wireless communication with bins and managing center
VELMURUGAN N
when bins fill alert message to the authorized person
solar panels for power supply for IOT devices
Group ideas
Smart garbage maintenance server
Transparency and sustainable solution than normal garbage bins
Optimized trash collection route
Collect only degradable and non-degradable wastes
IOT alert authorized person when bins going to fill
Activate Wi
Go to Settings



3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Rapid increase in volume and types of hazardous waste as a result of continuous economic growth, urbanization and industrialization is becoming a burgeoning problem for waste management agencies to ensure an effective and sustainable management of waste.
2.	Idea / Solution description	Smart waste management is characterized by the usage of technology in order to be more efficient when it comes to managing waste. 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!
3.	Novelty / Uniqueness	The smart cities concept highlights the use of Information and Communication Technology (ICT) to increase the quality and build more efficient technological solutions in different urban network services of a city life. One of the most famous models used to make a smart city is Internet Of Things (IOT)
4.	Social Impact / Customer Satisfaction	Poor waste management contributes to climate change and air pollution, and directly affects many ecosystems and species.

		Landfills, considered the last resort in the waste hierarchy, release methane, a very powerful greenhouse gas linked to climate change. Methane is formed by microorganisms present in landfills from biodegradable waste, such as food, paper and garden waste. Depending on the way they are built, landfills might also contaminate soil and water. After waste is collected, it is transported and treated. The transport process releases carbon dioxide — the most prevalent greenhouse gas — and air pollutants, including particulate matter, into the atmosphere.
5.	Business Model (Revenue Model)	Waste Management generates revenue through the provision of various waste management and disposal services and recycling solutions to residential, commercial, industrial, and municipal clients. The Company derives its revenue in the form of various fees associated with its service offerings.
6.	Scalability of the Solution	Waste management is important as it saves the environment from the toxic effects of inorganic and biodegradable element present in waste. Mismanagement of waste can cause water contamination, soil erosion and air contamination. Waste can be recycled if collected and managed efficiently.

3.4 Problem Solution fit

Problem Statement (PS)	Iam	I'm trying to	But	Because	Which makes me feel
PS-1	Need clean environment	Garbage level checking	In cities it's not easy	The wastage monitoring machine is not working	The customer becomes very happy
PS-2	Monitoring	Analyse the polution	It leads to high level wastage	It's a summer season	They are disappointed

4. REQUIREMENT ANALYSIS

4.1 Functional requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Smart sensors	Smart Sensors are designed for monitoring fill level in smart trash bins and containers using ultrasonic technology. Sensors transfer data very simple via all currently available IoT networks and/or GPRS. Sensors monitor all types of waste in bins and containers of different sizes. They are robust, water and shock-resistant. Fire alarm, tilt recognition and other features are included.
FR-2	Smart Waste Management Software System	The powerful cloud-based waste management software system enables the customer to configure, monitor and manage daily operations of a waste management company. In addition, to live data from Waste monitoring, the tool can also hold complex bin database, plan the optimal collection routes, predict filling cycles, and manage reports from employees and citizens
FR-3	Citizen app	Citizens app provides access to data from Smart Sensors to citizens. The mobile app informs about the location and fill level of monitored bins and enables you to find the nearest available bin for disposal of garbage or report an issue. Logged users can access even more information about the bins, request a pickup or maintenance. Available for free on Android and iOS.
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 inefficient picks	Eliminate the collection of half-empty bins. The sensors recognize picks. By using real-time data on fill-levels and pick recognition, we can show you how full the bins you collect are. The report shows how full the bin was when picked. You immediately see any inefficient picks below 80% full.

4.2 Non functional requirements:

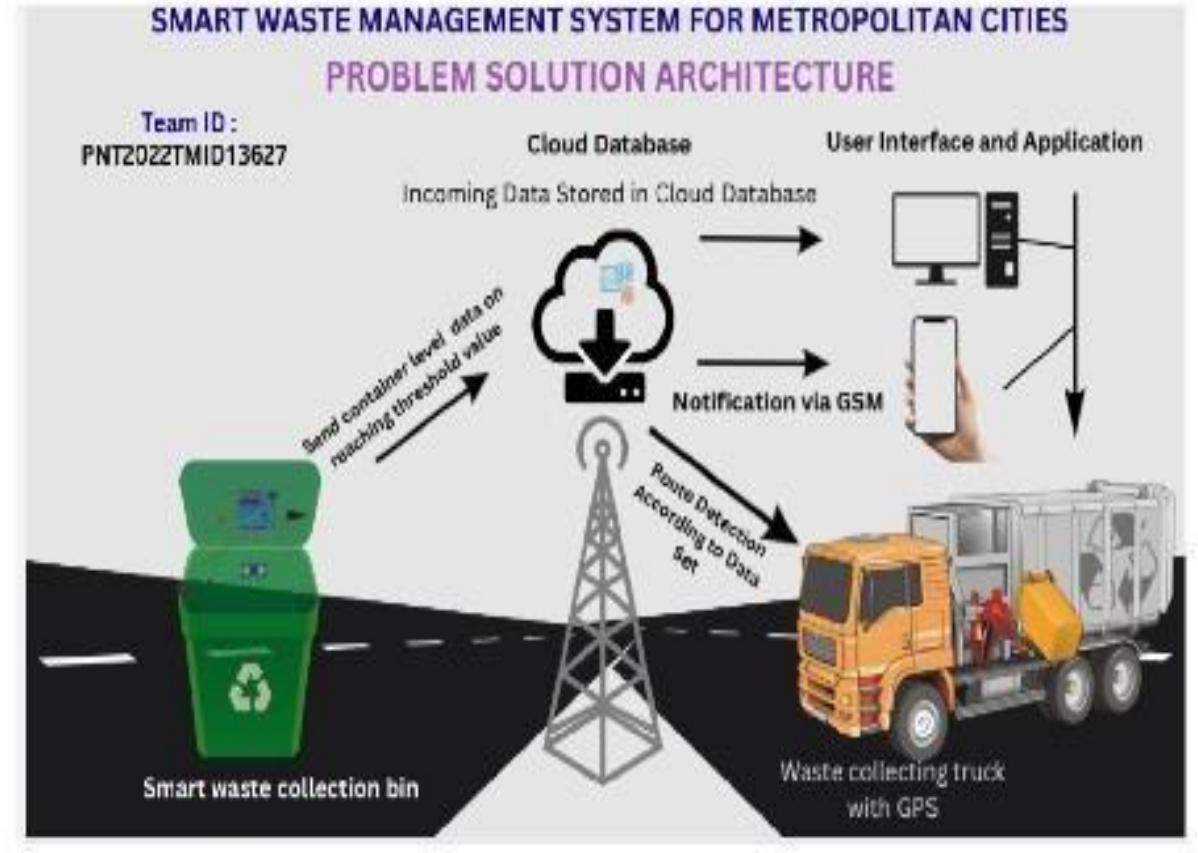
Non-functional Requirements:

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

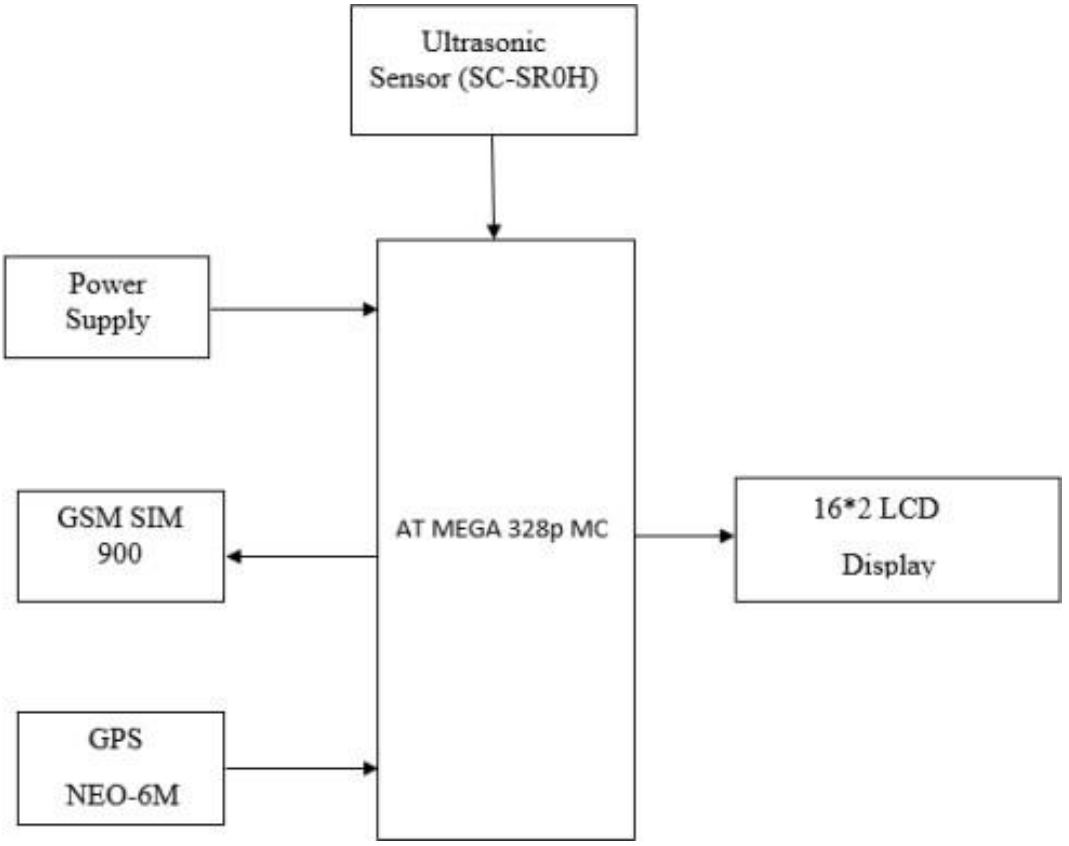
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	IoT device verifies that usability is a special and important perspective to analyse user requirements, which can further improve the design quality. In the design process with user experience as the core, the analysis of users' product usability can indeed help designers better understand users' potential needs in waste management, behaviour and experience.
NFR-2	Security	Use a reusable bottles Use reusable grocery bags Purchase wisely and recycle Avoid single use 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 Smart Waste Management Software System, a powerful cloud-based platform, for data- driven 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.

5. PROJECT DESIGN

5.1 Data Flow Diagram:



5.2 Solution & Technical Architecture:



5.3: User Stories


Awareness
Performance
Useability
Security
Management
Approach
Experience
Recycling makes the best use of waste, conserving valuable resources, such as water, land, and raw material. Recycling saves energy, helps keep materials out of landfills and incinerators, and provides raw materials for the production of new products
Possible waste disposal methods are recycling, composting, incineration, landfills, bioremediation, waste to energy, and waste minimization.
Its purpose is to provide hygienic, efficient and economic solid waste storage, collection, transportation and treatment or disposal of waste without polluting the atmosphere, soil or water system.
IoT solutions for this problems offer municipalities data intelligence and real-time insights. In that regard, the fill patterns of specific containers can be identified by historical data and
the long term.
This system can't measure the fullness levels of containers, and as a result, half-full containers can be emptied, and in contrast, pre-filled ones need to wait until the next collection period come
They can also alert the waste management companies or municipalities if an undesirable incident happens such as sudden temperature rise or displacement of the container by their GPS features.
It solves the problem by using sensors, intelligent monitoring system, and mobile applications
This smart waste management solution reduces fuel consumption and cost. Therefore, this reduction allows waste collection companies or municipalities to allocate their resources efficiently.
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.
Drivers collect empty bins, predefined collection routes of the system cause waste of time, an increase in fuel consumption, and excessive use of resources.

6. PROJECT PLANNING & SCHEDULING

6.1Sprint Planning & Estimation

TITLE	DESCRIPTION	DATE
Literature Survey & InformationGathering	Literature survey on the selectedproject & gatheringinformation byreferringthe,technicalpapers,researchpublicationsetc.	30 SEPTEMBER2022
PrepareEmpathyMap	Prepare Empathy Map Canvas tocapturetheuserPains &Gains, Preparelistofproblemstatements	30SEPTEMBER2022
Ideation	List the by organizing thebrainstormingsessionand prioritizethetop3ideasbasedon thefeasibility&importance.	30SEPTEMBER2022
ProposedSolution	Prepare the proposed solutiondocument, which includes thenovelty,feasibilityofidea, business model, social impact,scalabilityofsolution ,etc.	20OCTOBER2022
ProblemSolutionFit	Prepareproblem-solutionfitdocument.	20OCTOBER2022
Solution Architecture	Prepare solution architecturedocument.	20OCTOBER2022
CustomerJourney	Prepare the customer journeymaps to understand the userinteractions & experiences withtheapplication(entryto exit).	20OCTOBER2022

FunctionalRequirement	Preparethefunctionalandno nfunctional requirementdocument.	20OCTOBER2022
DataFlowDiagrams	Draw the data flow diagrams andsubmitforreview.	20OCTOBER2022
TechnologyArchitecture	Prepare the technologyarchitect urediagram.	20 OCTOBER2022
PrepareMilestone&Activity List	Preparethemilestones&activit ylistoftheproject.	22OCTOBER2022
Project Development - Deliveryof Sprint-1,2, 3&4	Develop&submitthedeveloped codebytestingit.	INPROGRESS..

6.2 Sprint Delivery Schedule

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

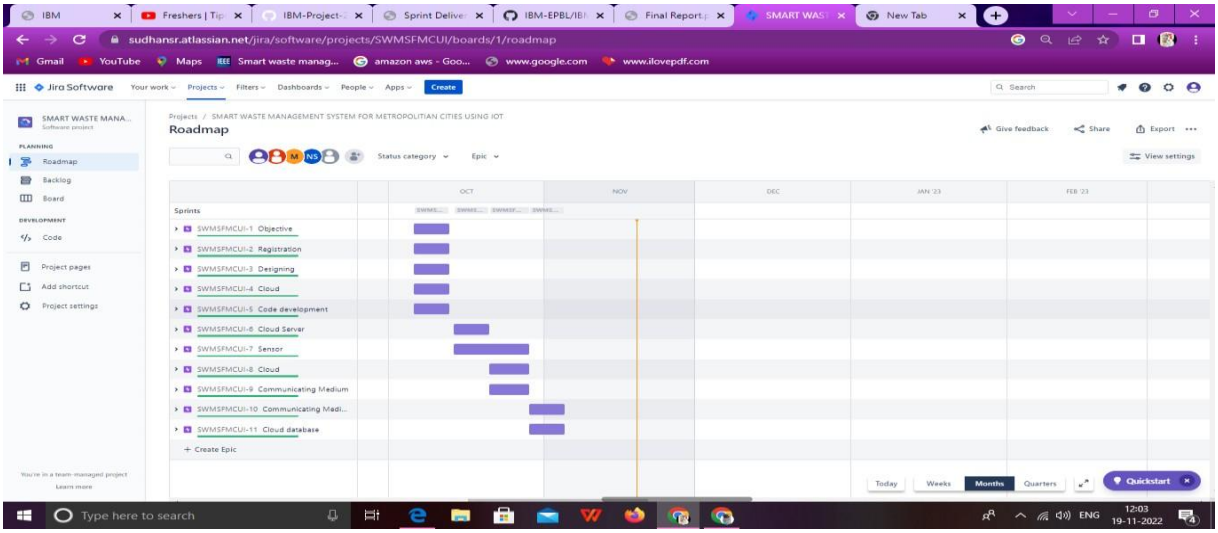
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Objective	USN-1	The smart bin system will alert the nearby garbage collectors when the bin overflows.	6	High	NAGARAJAN R
Sprint-1	Registration	USN-2	The user(garbage collectors) can register for the application using the respective credentials provided to them.	4	Medium	NAGARAJAN R
Sprint-1	Designing	USN-3	Designing a circuit with sensors and arduino interface	6	High	NAGARAJAN R
Sprint-1	Cloud	USN-4	As an administrator, register in IBM cloud	4	Medium	NAGARAJAN R
Sprint-2	Code development	USN-5	Develop a code to send a message when the bin overflows using ultrasonic sensor	10	High	ARJUNAN M
Sprint-2	Cloud Server	USN-6	Cloud web server is created which connects the bin and the authority who is responsible for the disposal of waste from its bin	10	High	ARJUNAN M
Sprint-3	Sensor	USN-7	Detect the level of garbage using sensor and store it in the server for specific interval of time.	10	High	ARJUNAN M
Sprint-3	Cloud	USN-8	Authority should allocate which garbage collector should collect the waste at particular area	10	High	ARJUNANM
Sprint-4	Communicating Medium	USN - 9	Garbage collector receives the message from the authority and goes to collect the garbage	10	High	VRLMURUGAN N
Sprint-4	Communicating Medium	USN-10	Once the garbage is collected the particular person should intimate the completion of the task	5	Medium	VELMURUGAN N
Sprint -4	Cloud database	USN-11	Update the database after task completion	5	Medium	VELMURUGAN N

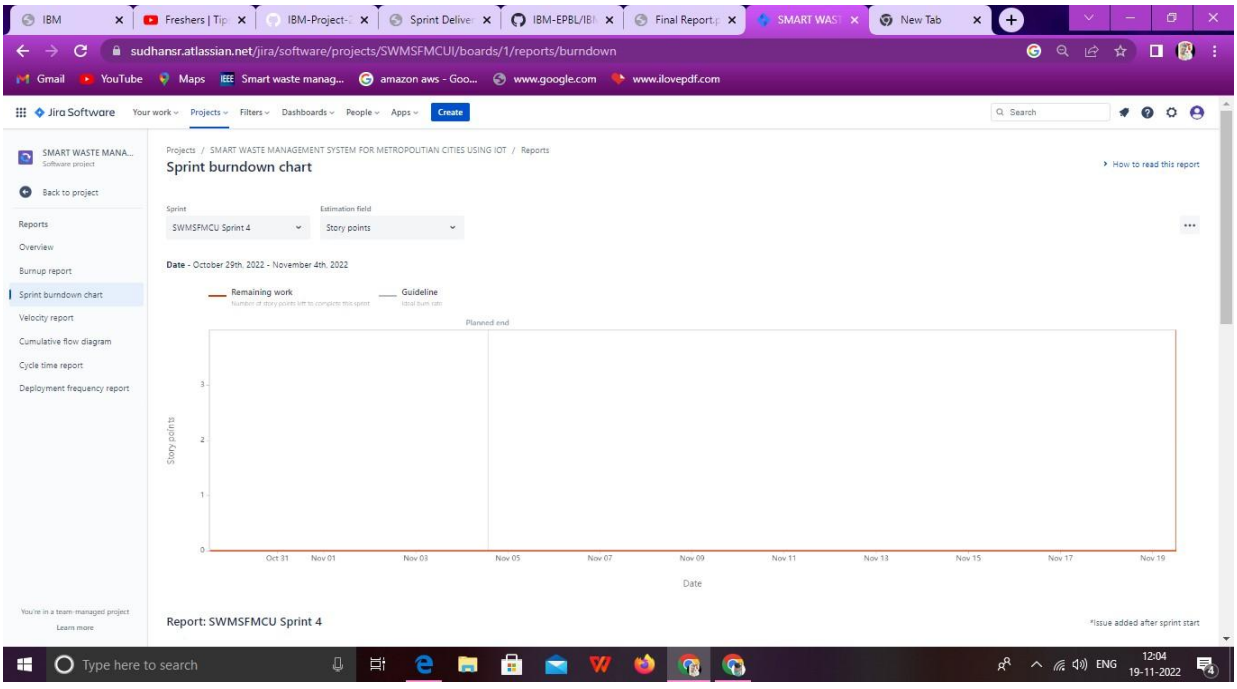
Project Tracker, Velocity & Burndown Chart: (4 Marks)

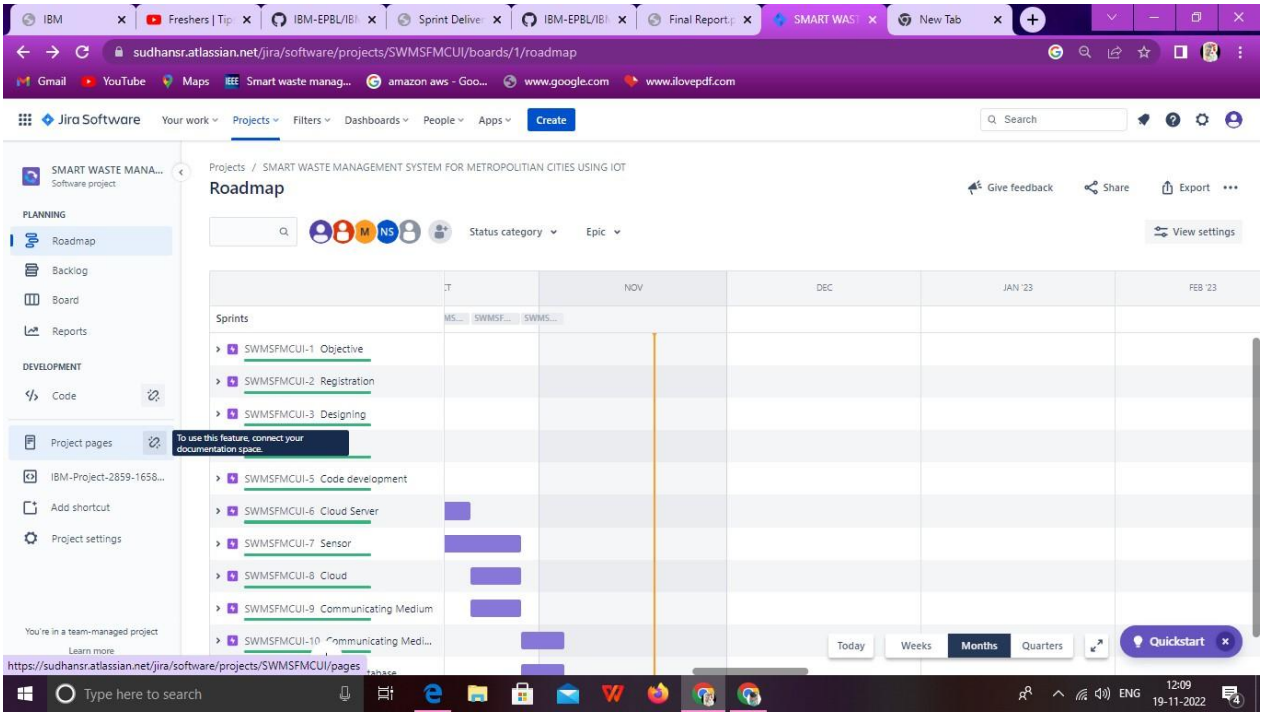
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	30 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

6.3Reports from JIRA

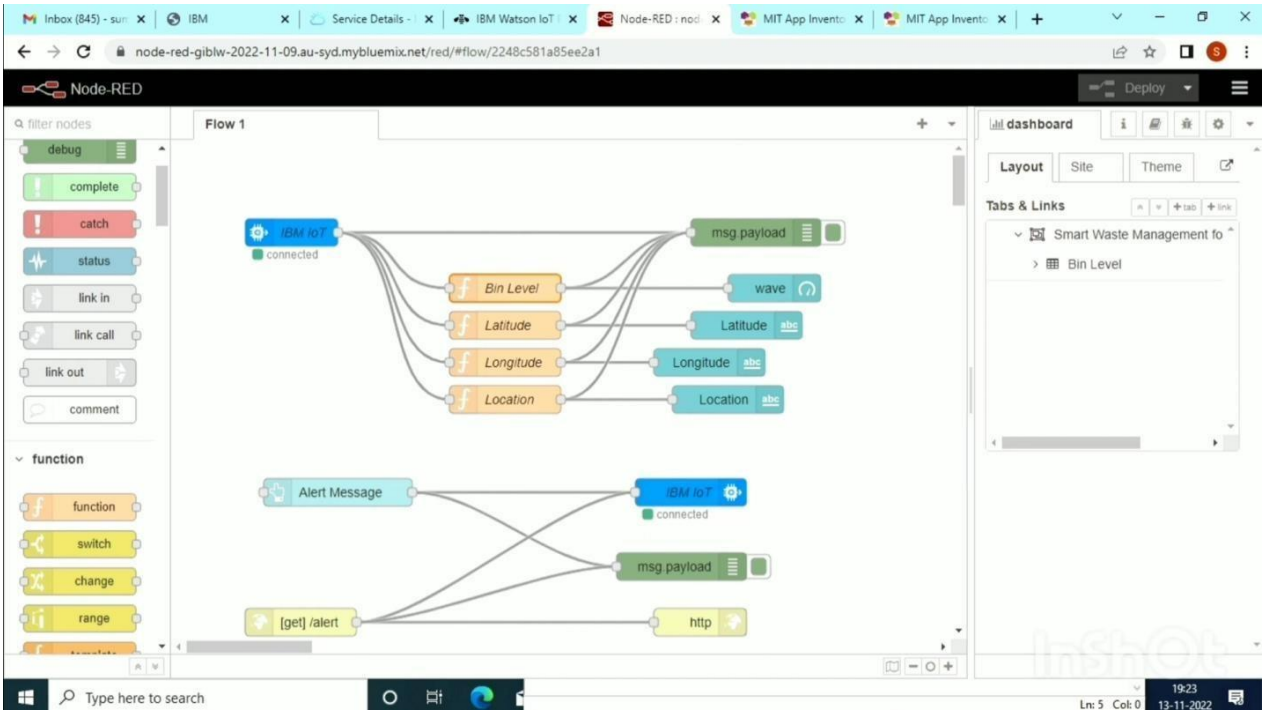




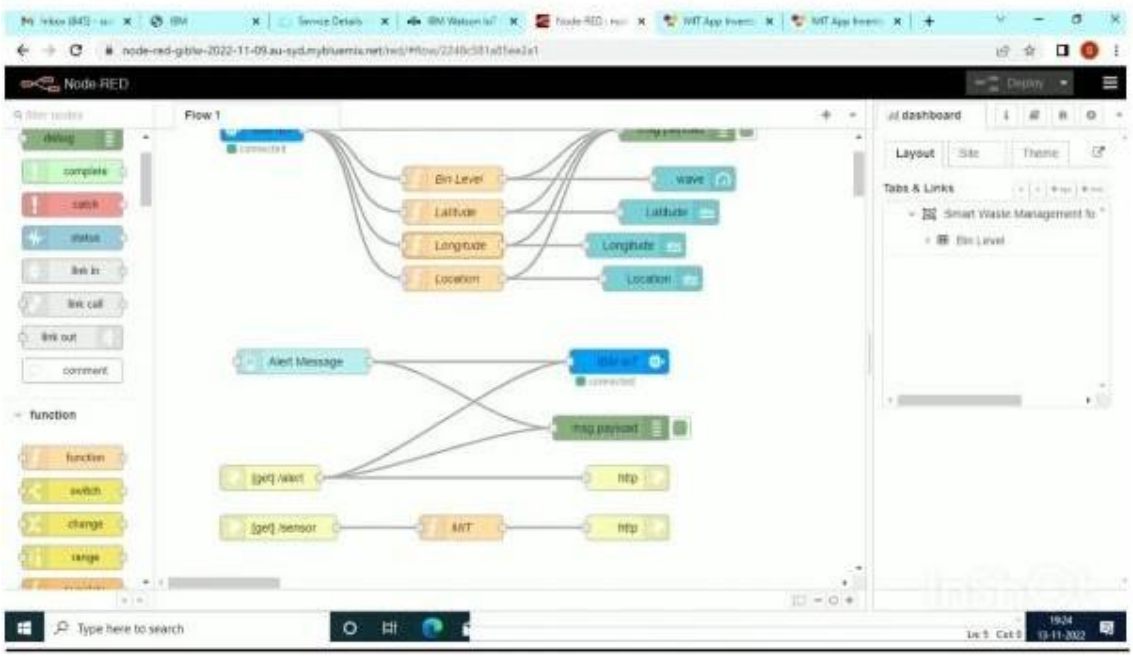


7.CODING & SOLUTIONING

7.1 Feature 1


Node-RED
Deploy
Flow 1
dashboard
Layout
Site
Theme
Tabs & Links
Smart Waste Management fo
Bin Level
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
IBM IoT
connected
Bin Level
Latitude
Longitude
Location
msg payload
wave
Latitude
Longitude
Location
Alert Message
IBM IoT
connected
msg payload
[get] /alert
http
Type here to search
19:23
13-11-2022

7.2)Figure 2


Node-RED
Flow 1
dashboard
Layout
Site
Theme
Tabs & Links
Bin Level
wave
Latitude
Longitude
Location
Alert Message
msg payload
[get] /alert
http
[get] /sensor
MIT
http
function
Type here to search

7.3 Database Schema

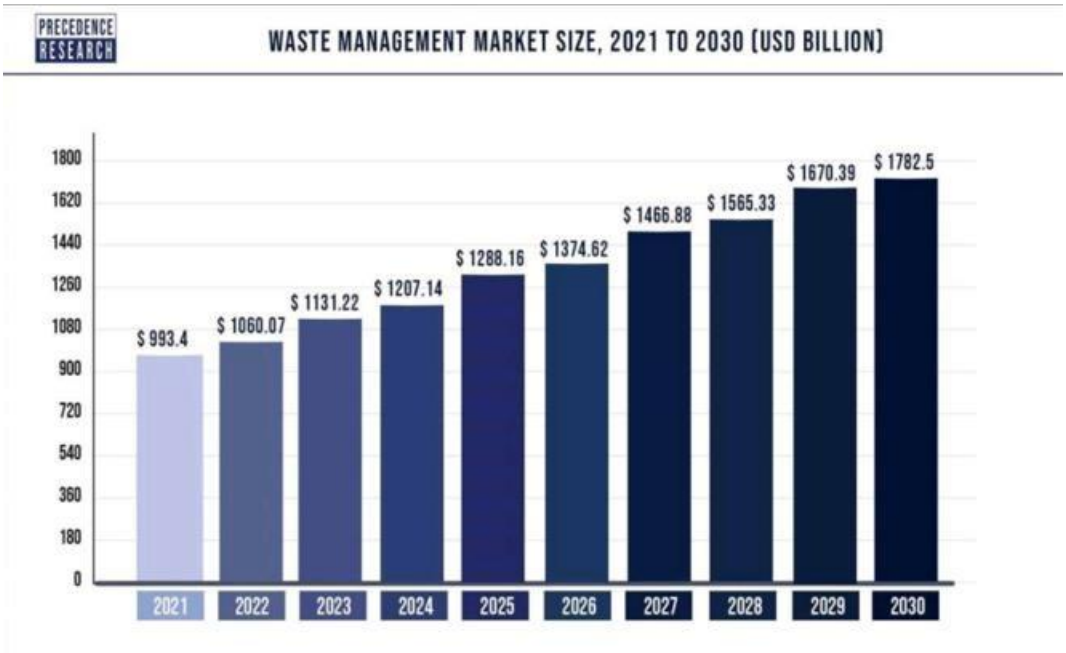
8.TESTING

8.1 Test Cases

TESTCASE ID	TESTCASE	TEST SCENARIO	TEST STEPS	INPUTS	EXPECTED OUTPUT	ACTUAL OUTPUT	TEST RESULT	TEST COMMENTS	BUG ID	TESTED BY
1	IBM WATSON IOT PLATFORM	To check whether the ibm watson is get connected	login to ibm watson iot platform	id , password	it should get login to the watson page	it has been logged in to the login page	PASS	GOOD		KIRUBA M
			check whether it has the separate organization id	new id	it should shows the organization id	separate organization id has been shown	PASS	GOOD		KIRUBA M
			check whether team mates are get connected	team mates id	it should shows the all the team members name / id	it is showing all the team members	PASS	GOOD		KIRUBA M
			check whether separate device name , id , authentication token generated	device name , type	new device should be created	new device has been created	PASS	GOOD		KIRUBA M
			to check whether it is showing output	device code and inputs	it should shows device gets connected and should show the output	its showing that device gets connected and output are verified	PASS	GOOD		KIRUBA M
2	Python Compiler	to check the connection is established in Cloud	To check the whether the pH value is shown are not	pH reading	it need to show the ph value sometimes may random	it show the ph value for the input	PASS	GOOD		MADHUSHREE S
			to check whether the Temperature and humidity are shown	Temperature & humidity	it should show temperature & humidity	it show the temperature & humidity value for input	PASS	GOOD		MADHUSHREE S
3	NODE-RED	to check whether node-red is connected and shows the output	login in to node-red	id , password	it should get login to the node-red page	its get entered into the login page	PASS	GOOD		MADHUSHREE S
			check whether all the necessities are imported and connected	nodes	it should not show any error on nodes	it is not showing any errors	PASS	GOOD		MADHUSHREE S
			check whether all the nodes ar connected	node connection	blocks should gets connected	blocks has been connected	PASS	GOOD		MADHUSHREE S
			check whether the output are shown in nodered	output found or not	output should be obtained	output has been obtained	PASS	GOOD		MADHUSHREE S
4	MIT App Invertor	check whether the outputs are shown in	check whether the login is created	id,password	Get into the MIT app invertor	MIT App invertor is getted	PASS	GOOD		DHANYA R
			check whether new project is created in MIT	Project created	the new project is created	the new project is created	PASS	GOOD		DHANYA R
			check whether the designer page is ready to use	create app	it should created	it is created successfully	PASS	GOOD		DHANYA R
			check whether it the block page is created	create block	block should created	it is created successfully	PASS	GOOD		DHANYA R
			check whether the block run successfully without error	run block	it should get input from cloud	it has been connected and provide output	PASS	GOOD		DHANYA R
5	QR CODE	check whether qr code is generated	check whether the code shows any error	code	it should not shows any error	it is not showing any errors	PASS	GOOD		DHANYA R
			check whether the MIT provide QR code	QR Code	QR code has been generated	QR code is generated	PASS	GOOD		DHANYA R
			check whether the MIT app is installed in mobile	install in mobile	user should install mobile app	app is install successfully	PASS	GOOD		DHANYA R
			check whether the QR code get connected	app link	mobile gets connected	mobile has been connected	PASS	GOOD		DHANYA R
			check whether the screen is found in mobile	screen found	screen should be generated	screen has been generated	PASS	GOOD		DHANYA R
6	TESTING	check entire process	check watson is connected	watson	iot watson should produce its output	iot watson has producing its output	PASS	GOOD		DEVADHARSHINI B
			check node-red is connected	node-red	node-red should produce its output	node-red has been producing its output	PASS	GOOD		DEVADHARSHINI B
			check whether python is connected	python	python should gets connected	python has been connected	PASS	GOOD		DEVADHARSHINI B
			check whether details are shown	MIT App	details in MIT should be shown	details in MIT should be shown	PASS	GOOD		DEVADHARSHINI B

9.RESULTS

9.1 Performance Metrics



10. ADVANTAGES & DISADVANTAGES:

ADVANTAGES:

- Less time and fuel consumption as the trucks go only to the filled containers.
- Decreased noise, traffic flow and air pollution as a result of less trucks on the roads.
- Our smart operating system enable two way communication between the dustbin deployed in the city and service operator. Therefore the focus is only on collection of route based fill level of the containers.
- The sensors installed in the containers provide real time information on the fill level.
- This information helps determine when and where to prioritise collection.
- In this way both service providers and citizens benefit from an optimized system which results in major cost savings and less urban pollution.
- Reduces the infrastructure (trucks, containers), operating (fuel) and maintenance costs of the service by upto 30%.
- Applying this technology to the city optimises management, resources and costs, and makes it a “SMART CITY”.
- Historical information on collections helps adapt the deployment of containers to the actual needs of the city, therefore reducing the number of containers that clutter up the road and increasing public parking spaces.

DISADVANTAGES:

- System requires a greater number of waste bins for separated waste collection as population in the city.
- This results in high initial cost due to expensive smart dustbins compare to other methods.
- Sensor node use in the dustbin have limited memory size.

11. CONCLUSION:

The genesis, characteristics, collection, and transportation of have all been reviewed in an honest and thorough manner. The suggested system would be able to handle and monitor the entire collecting process for solid waste. This method would enable timely solid trash collection while also overcoming all of its drawbacks, including the need for a short route, minimal fuel use, a clean, green environment, and a vehicle that is readily available. The technologies that are incorporated into the proposed system are sufficient to guarantee that it is perfect for managing and monitoring the solid waste collection procedure in a green environment.

12)FUTURE SCOPE:

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

- Change the user authentication and atomic lock systems for bins to better safeguard them from theft and damage.
- Having case studies 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 would make the idea successful and aid in the achievement of collaborative waste management efforts, thus fulfilling the idea of Swachh Bharath.

- Improving the Server's and Android's graphical interfaces.

13) APPENDIX:

13.1) SOURCE CODE:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "vi4esk"
deviceType = "sudhan"
deviceId = "12345"
authMethod = "token"
authToken = "12345678"
# Initialize GPIO
def myCommandCallback(cmd):
 print("Command received: %s" % cmd.data['command'])
 status=cmd.data['command']
 if status=="alarmon":
  print ("DUST BIN IS FULL")
 else:
  print ("Alarm is off")

 #print(cmd)


try:
    deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method":
                    authMethod, "auth-token": authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
#.....................................
except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an event of
type"greeting" 10 times
deviceCli.connect()
while True:
 #Get Sensor Data from DHT11

 latidude=random.randint(0,100)
```

```
 logditude=random.randint(0,100)

 data = { 'latidude' : latitude, 'logditude': logditude }
 #print data
 def myOnPublishCallback():
     print ("Published latitude = %s C" % latidude, "logditude = %s %%" % logditude, "to IBM
Watson")
 success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
 if not success:
  print("Not connected to IoTF")
  time.sleep(10)

 deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```