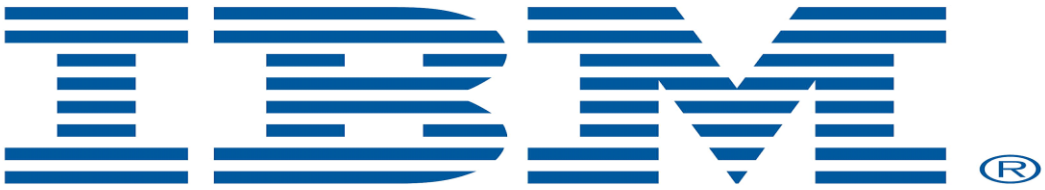

PROJECT REPORT

TITLE - REAL-TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM

TEAM ID: PNT2022TMID42318

TEAM MEMBERS

Vinitha.R, Kaviya.K, Shanthini.P, Gokul Kannan.S

ADITHYA INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VINITHA.R -710119106010

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DATE:

PLACE:

ABSTRACT

Water pollution is one of the biggest threats for the green globalization. Water pollution affects human health by causing waterborne diseases. To prevent the water pollution, necessary steps are to be taken. First step is to estimate the water parameters like pH, turbidity, conductivity etc., as the variations in the values of these parameters point towards the presence of pollutants.The contamination level of water has been determined by comparing the obtained parameters with their respective ideal ranges. The sensors are interfaced with Arduino UNO and Raspberry Pi for data processing and transmission. The system is designed to float on the water body there by transmitting the measured data trough Wi-Fi to the remote place. In the present scenario, water parameters are detected by chemical tester laboratory test, where the testing equipment's are stationary and samples are provided to testing equipment's. Thus, it is a manual system with tedious process and is very time consuming. In order to minimize the time and to make the system automated, the testing equipment's can be placed in the river water and detection of pollution can be made remotely. To ensure the safe supply of drinking water, the quality should be monitored in real time for that purpose

Arduino based water quality monitoring has been proposed. In this report, the design of Arduino based water quality monitoring system that monitors the quality of water in real time is presented. This system consists of different sensors which measures the water quality parameter such as pH, conductivity, muddiness of water, temperature. The measured values from the sensors are processed by microcontroller and the processed values are transmitted using GSM to the concerned authority.

INTRODUCTION

PROJECT OVERVIEW

- River water qualitycan be monitored by the web application.
- Can be able to know if there are any dust particles present in the water.
- The PH level of the water can be monitored.
- Water temperature can be monitored.
- Alerting the authorities if the water quality is not good so that theycan go and announce the localities not to drink that water.

PURPOSE

- The main purpose is to maintain and restore the wholesomeness of national aquatic resources by prevention and control of pollution
- To ensure that safe drinking water is supplied to the public
- To protect, restore, and enhance environmental quality towards good public health.
- Then also to check the waste water is safe for discharge into public streams, rivers and waterways.

LITERATURE SURVEY

EXISTING PROBLEM

Thereare several typesof impurities in water resource.

BIOLOGICAL IMPURITIES

Theseare caused by the presence of living organisms. They include,

- Algae
- Protozoa
- Pathogens
- Bacteria

BIOLOGICAL IMPURITIES

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- Algae
- Protozoa
- Pathogens
- Bacteria

COLLOIDAL IMPURITIES

Theseinclude,

- Organic waste products
- Amino acids

If we consume the water which have the impurities, we will be affected by the diseases suchas,

- Cholera
- Diarrhea
- Dysentery
- Typhoid

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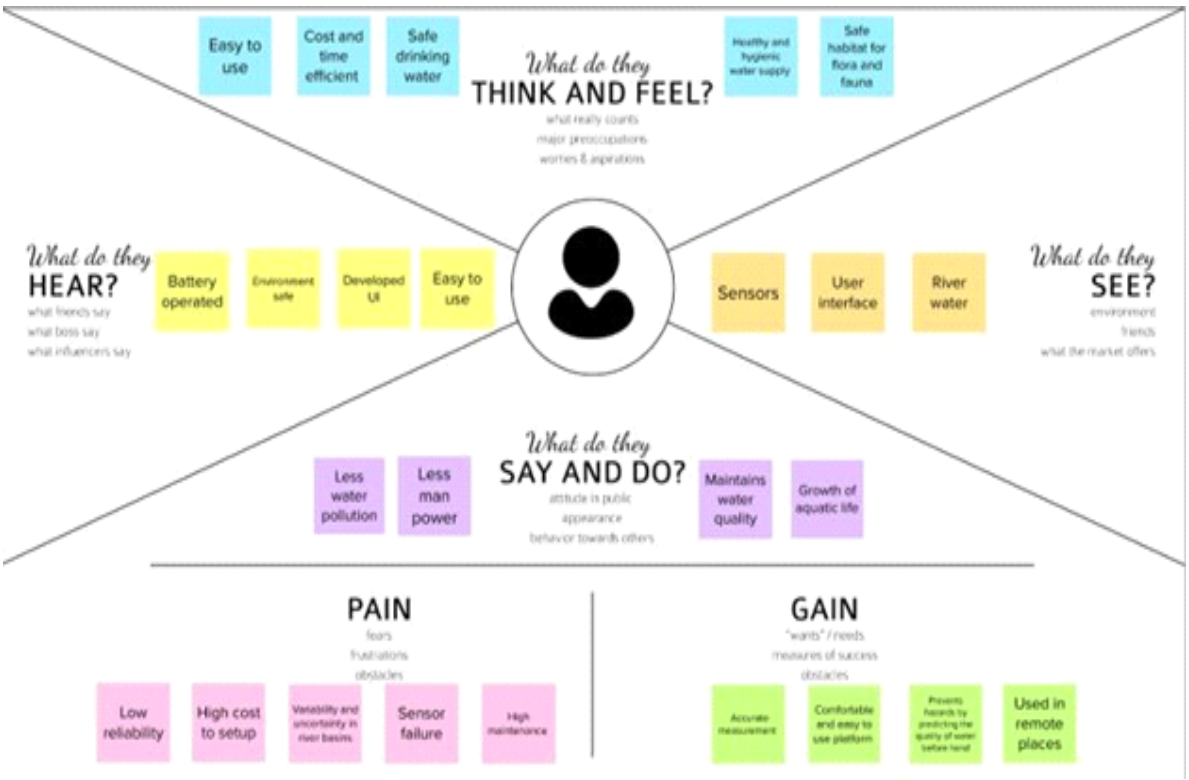
PROBLEM STATEMENT DEFINITION

Due to the fast growing, urbanization supply of safe drinking water is a challenge for the every city authority. Water can be polluted any time. So, the water we reserved in the water tank at our roof top or basement in our society or apartment may not be safe. Still in India most of the people use simple water purifier that is not enough to get surety of pure water. Sometimes the water has dangerous particles or chemical mixed and general purpose, water purifier cannot purify that. And it's impossible to check the quality of water manually in every time. So, an automatic real-time monitoring system is required to monitor the health of the water reserved in our water tank of the society or apartment. So, it can warn us automatically if there is any problem with the reserved water. And we can check the quality of the water anytime and from anywhere. By keeping this mind, we designed this system especially for residential areas.

IDEATION AND PROPOSED SOLUTION

EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledgeabout a user's behaviours, and attitudes. It is a useful tool to helps teams better understand theirusers. Creating an effective solutionrequires understanding the true problemand the person who is experiencing it. The exercise of creating the map helps participants considerthings from the user's perspective along with his or her goals and challenges.

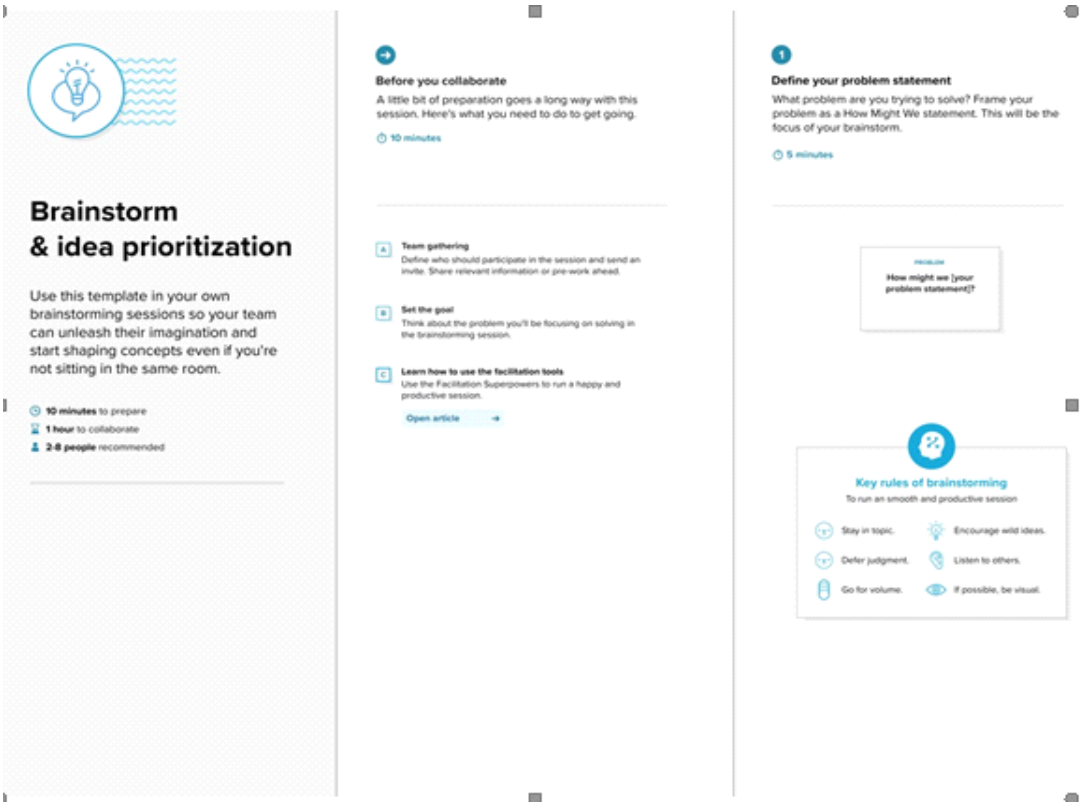


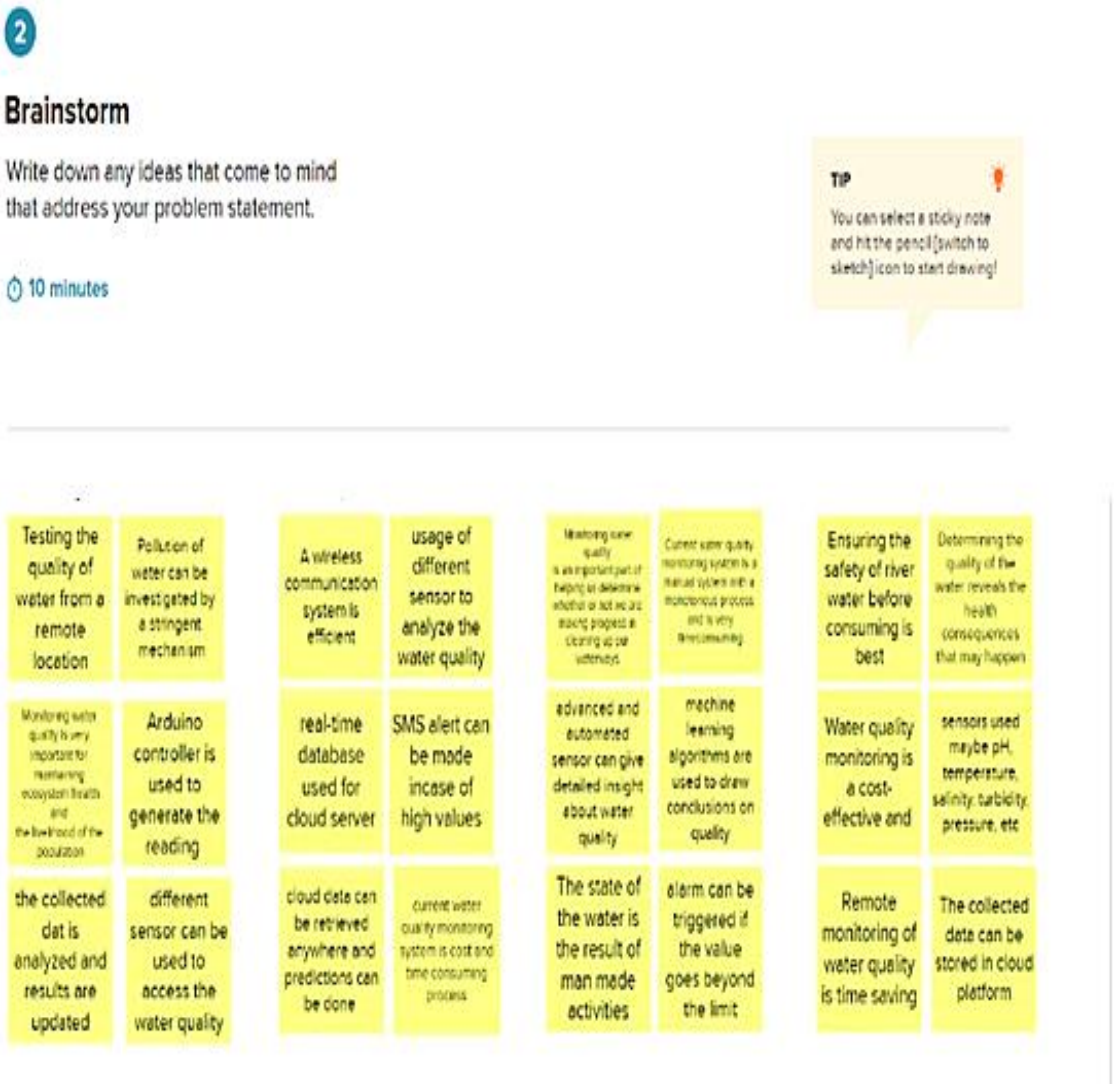
IDEATION & BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon,and all participants are encouraged to collaborate, helping each other develop a rich amount ofcreative solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sittingin the same room

Step-1: Team Gathering, Collaboration and Select the Problem Statement.





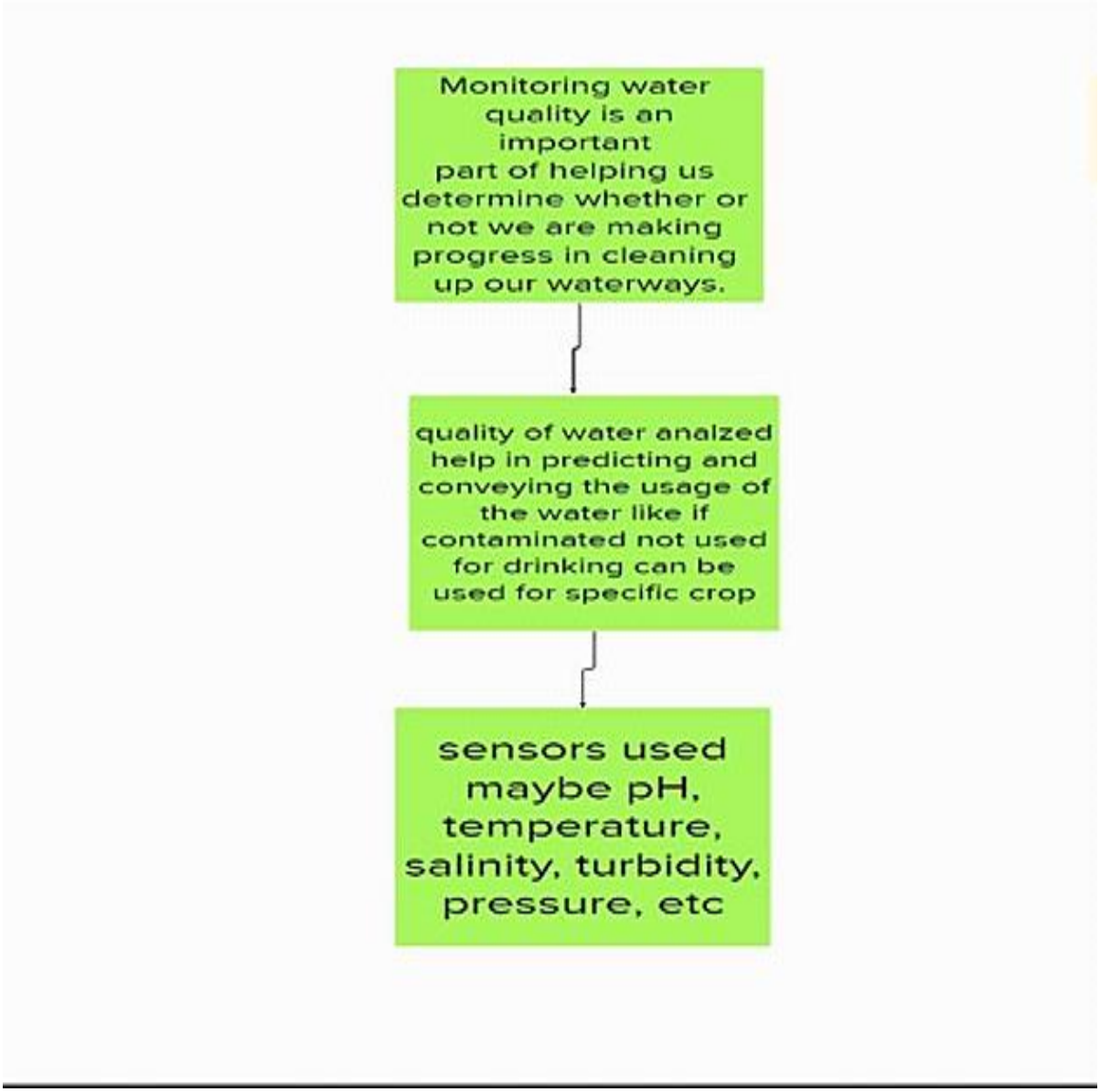
Step-2: Brainstorm, Idea Listing and Grouping.

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes



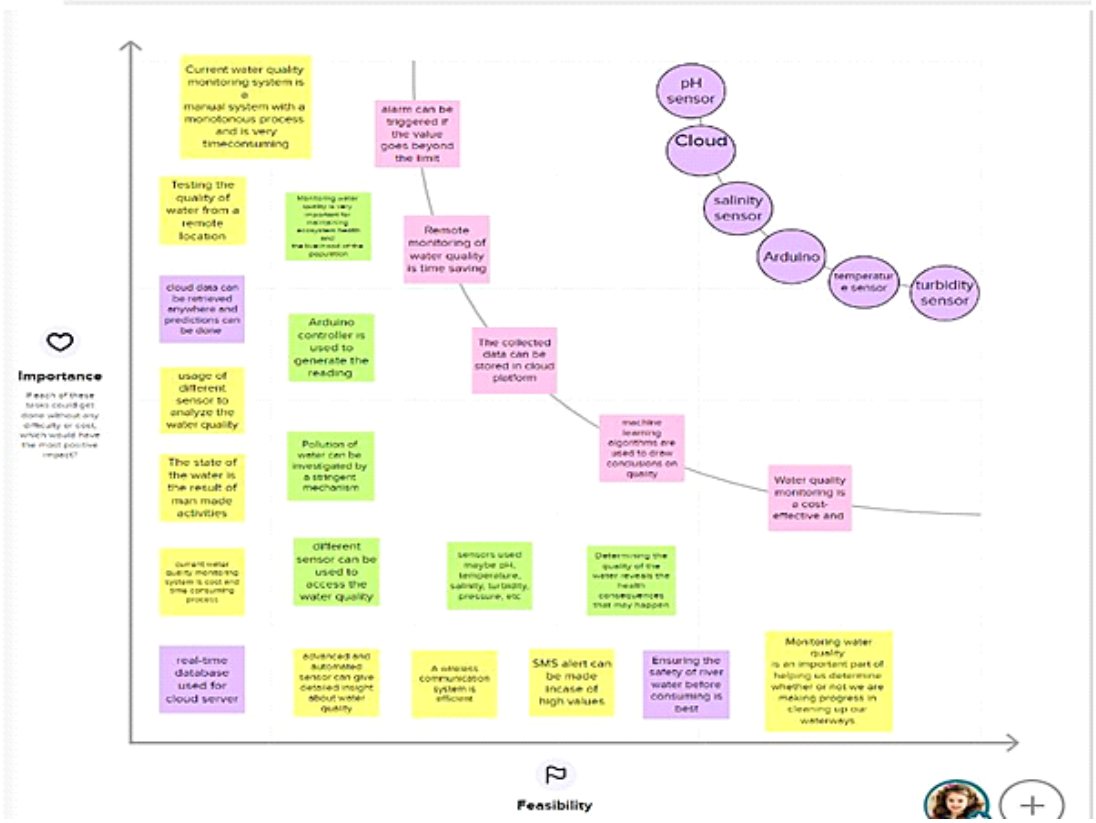
Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

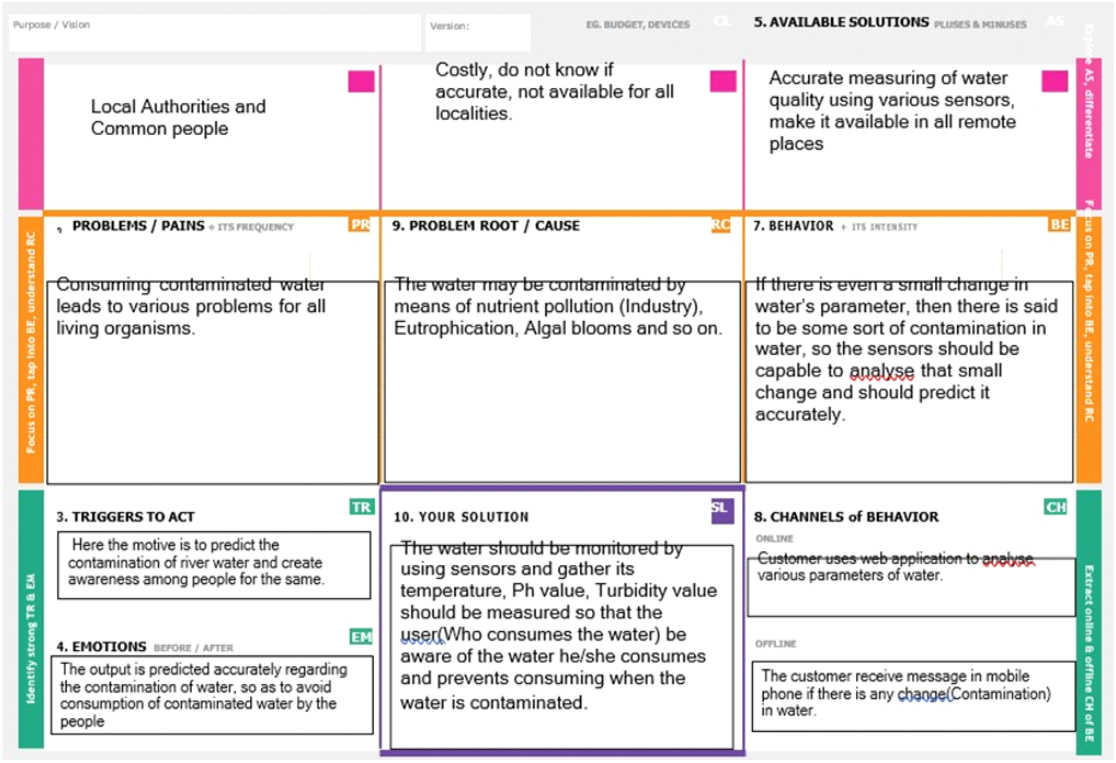


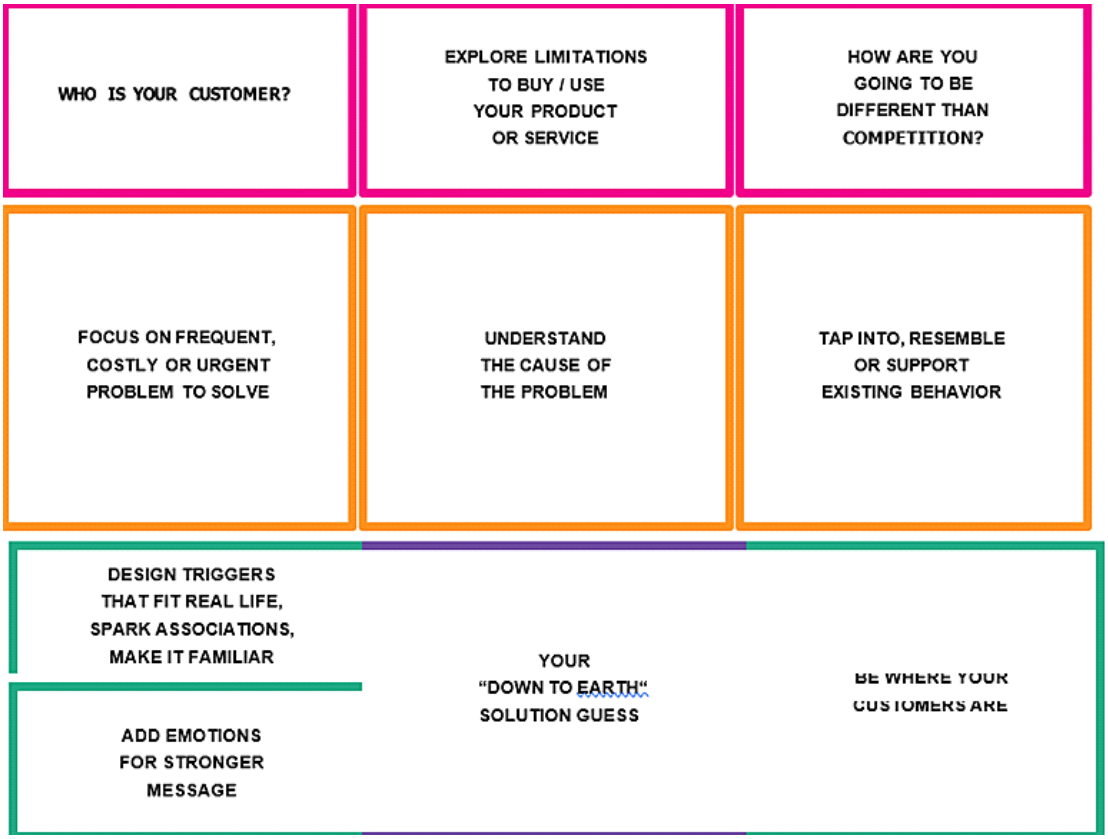
PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement	IOT Based Real Time River Water QualityMonitoring and Control System
2.	Idea / Solution description	• To monitor the quality of water using sensors like temperature, potentiometer(pH), turbidity, salinity and so on. • Collecting those data andstoring it in cloud and perform analyse to check if the water is contaminated or not for drinking.
3.	Novelty / Uniqueness	1.Based on the collected data prediction is made whether the water can be used for cultivation of specific cropsand suitable forthe aquatic animals.
4.	Social Impact / Customer Satisfaction	Algal growth, fertilizers, pesticides cause riverpollution which can impact all living beings.
5.	Business Model (Revenue Model)	Service based product is developed to serve the local peopleto know the quality of water before consuming it

		or using it for any purpose.
6.	Scalability of theSolution	Developing the product as both web and mobile application it is portable, and data canbe accessed from anywhere anytime.

PROBLEM SOLUTION




WHO IS YOUR CUSTOMER?
EXPLORE LIMITATIONS TO BUY / USE YOUR PRODUCT OR SERVICE
HOW ARE YOU GOING TO BE DIFFERENT THAN COMPETITION?
FOCUS ON FREQUENT, COSTLY OR URGENT PROBLEM TO SOLVE
UNDERSTAND THE CAUSE OF THE PROBLEM
TAP INTO, RESEMBLE OR SUPPORT EXISTING BEHAVIOR
DESIGN TRIGGERS THAT FIT REAL LIFE, SPARK ASSOCIATIONS, MAKE IT FAMILIAR
ADD EMOTIONS FOR STRONGER MESSAGE
YOUR "DOWN TO EARTH" SOLUTION GUESS
BE WHERE YOUR CUSTOMERS ARE

REQUIREMENT ANALYSIS

Functional Requirements:

Following are the functional requirements of the proposedsolution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/ Sub-Task)
FR-1	User Login	Confirmation throughverified password

FR-2	View WaterDetails	View current water details in website View traditional water eligibility in website
FR-3	Logout	Logs out the usersuccessfully

Non-functional Requirements:

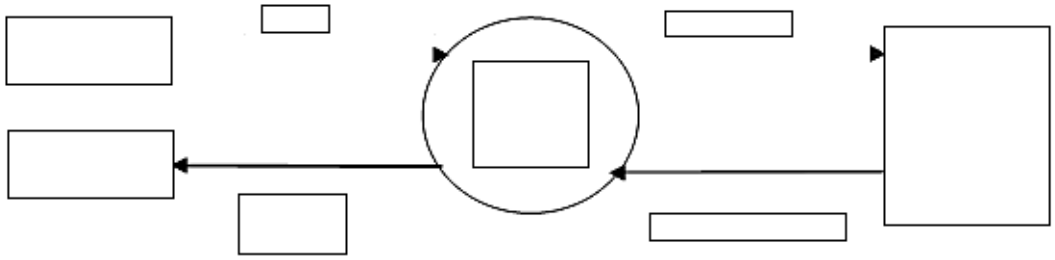
Following are the non-functional requirements of the proposedsolution.

FR No.	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	Load time for user interface screens shall not be more than 2 seconds.
NFR-2	**Security**	User account is password protected Account creation doneonly after emailverification
NFR-3	**Reliability**	Users can access their account 98% of thetime without failure
NFR-4	**Performance**	Load time for user interface screens shall not bemore than 2 seconds. Login info verified within 10 seconds.
NFR-5	**Availability**	Maximum down timewill be about4 hours

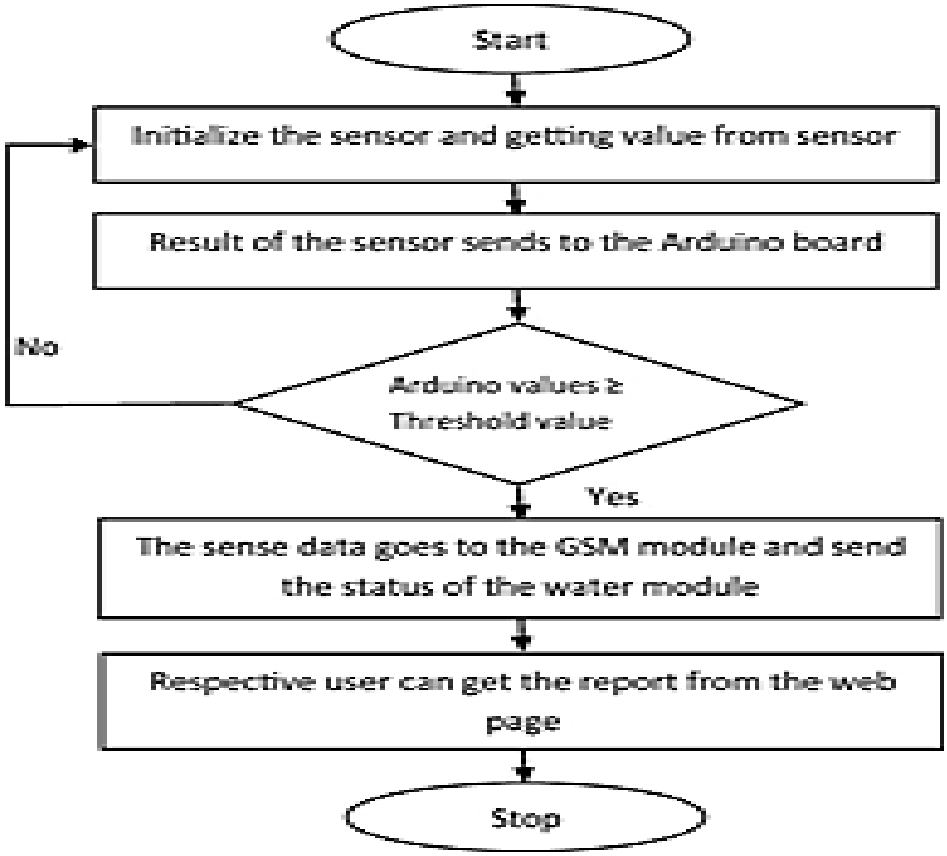
NFR-6	**Scalability**	System can handle about1000 users at any giventime

PROJECT DESIGN

DATA FLOW DIAGRAMS



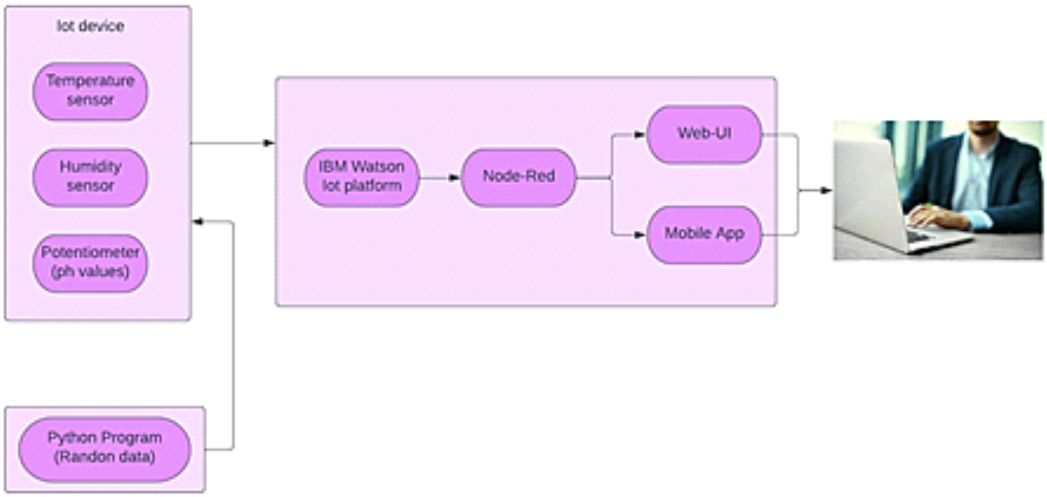
FLOW CHART



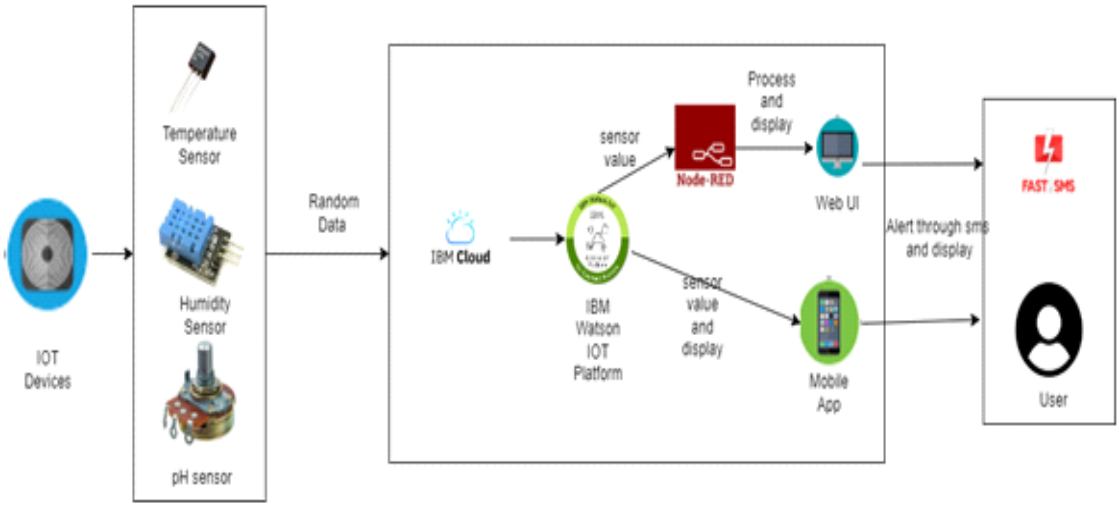
SOLUTION & TECHNICALARCHITECTURE

Solution architecture is a complex process – with many sub-processes – that bridgesthe gap between business problems and technology solutions. Its goals areţo

SOLUTION ARCHITECTURE DIAGRAM



TECHNICAL ARCHITECTURE DIAGRAM



USER STORIES

User Type	Functional Requirement (Epic)	User StoryNumber	User Story / Task	Acceptance criteria	Priority	Release
User(Mobile user)	Check Notification	USN-1	User can check then notification of the alert message.	User can check the notification	High	Sprint-1
	Check water parame	USN-2	User can check the level of water Parameters like temperature, humidity, PH level etc.	User can check the level of water parameters	High	Sprint-1

PROJECT PLANNING & SCHEDULING

SPRINT PLANNING & ESTIMATION & DELIVERY SCHEDULING

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Check Notification	USN-1	As a user, I can check the notification of the alert message.	20	High	Vinitha.R
Sprint-2	Check water parameters	USN-2	As a user, I can check the level of water parameters like temperature, humidity, PH level etc.	20	High	Shanthini.P
Sprint-3	Registration Page	USN-3	As a user, I can register into the appication	20	High	Kaviya.K
Sprint-4	Login Page	USN-4	Asa user, I can logininto the applicatio	20	High	Gokul Kannan.S

			n			

Project Tracker, Velocity & Burndown Chart

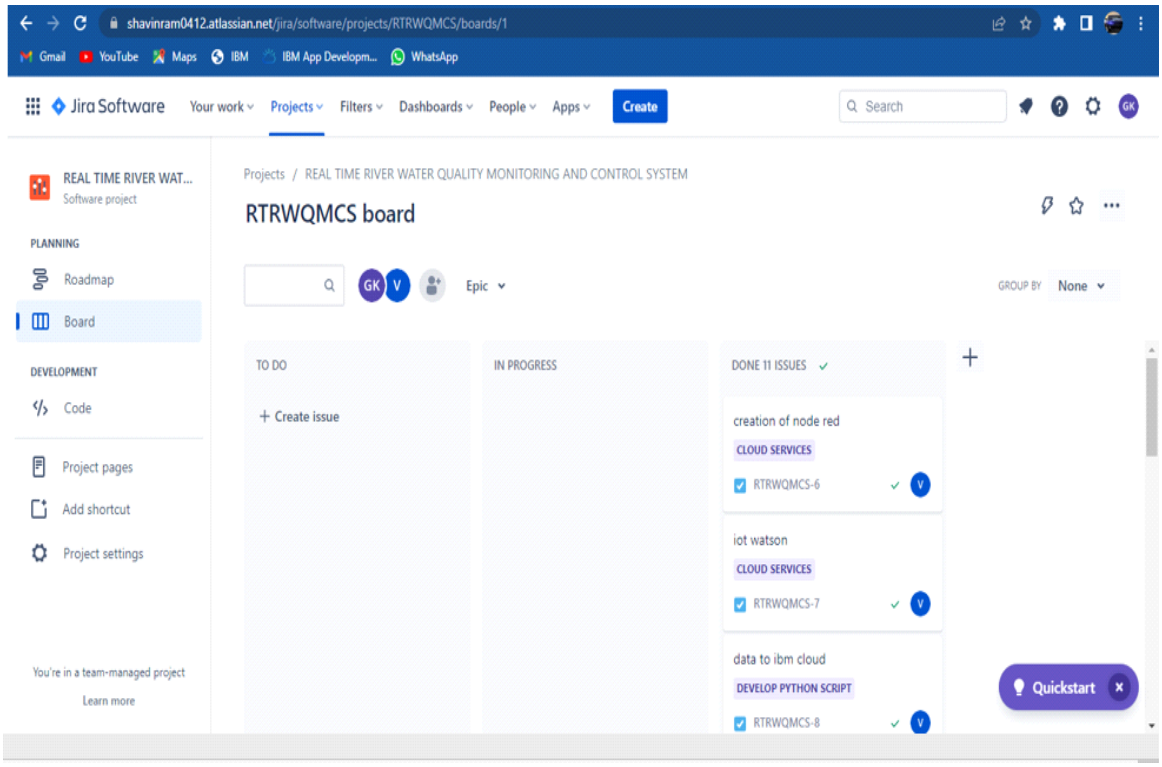
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (ason Planned EndDate)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	09 Nov 2022	20	09 Nov 2022
Sprint-3	20	6 Days	10 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	12 Nov 2022	13 Nov 2022	20	13 Nov 2022

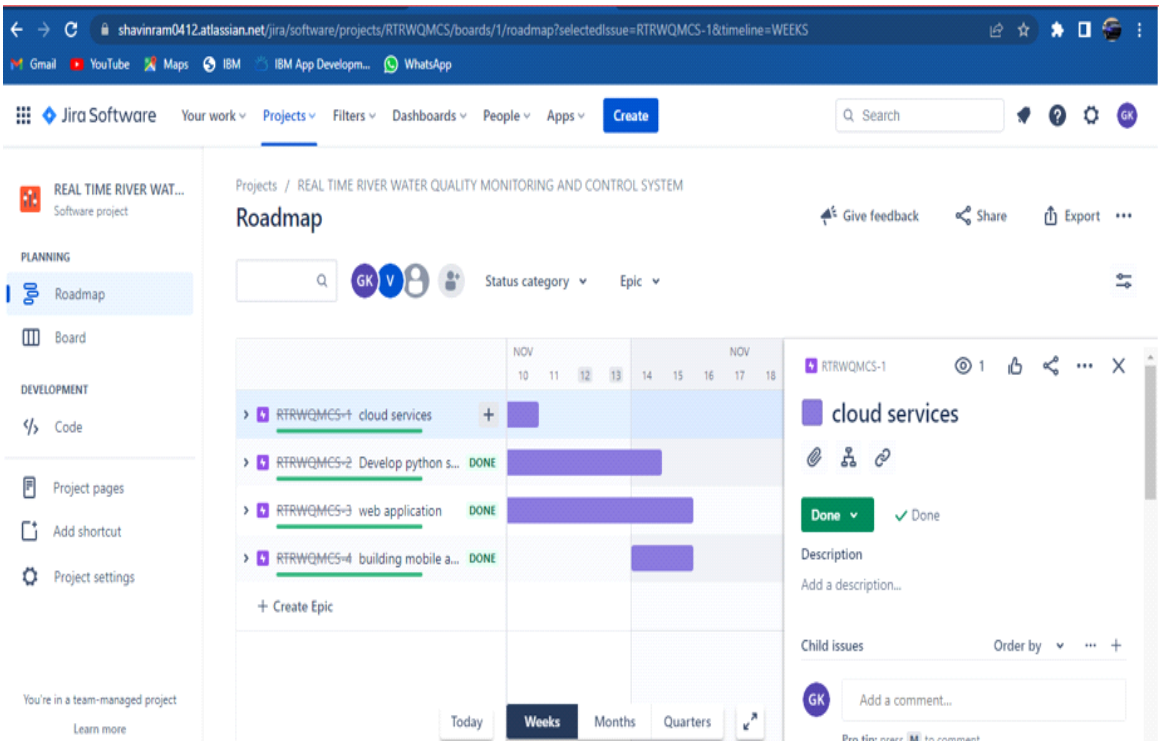
REPORTS FROM JIRA

Jira Software is part of a family of products designed to help teams of all types manage work. Originally, Jira was designed as a bug and issue tracker. But today, Jira has evolved into a powerful work management tool for all kinds of use cases, from requirements and test case management to agile software development.

Jira is one of the best open-source tools for planning and tracking in Agile methodology. Development teams use Jira for tracking bugs and projects, managing Scrums, and visualizing

workflows with Kanban boards. Workflows in Jira make it easy to plan, track, release, and report on software.

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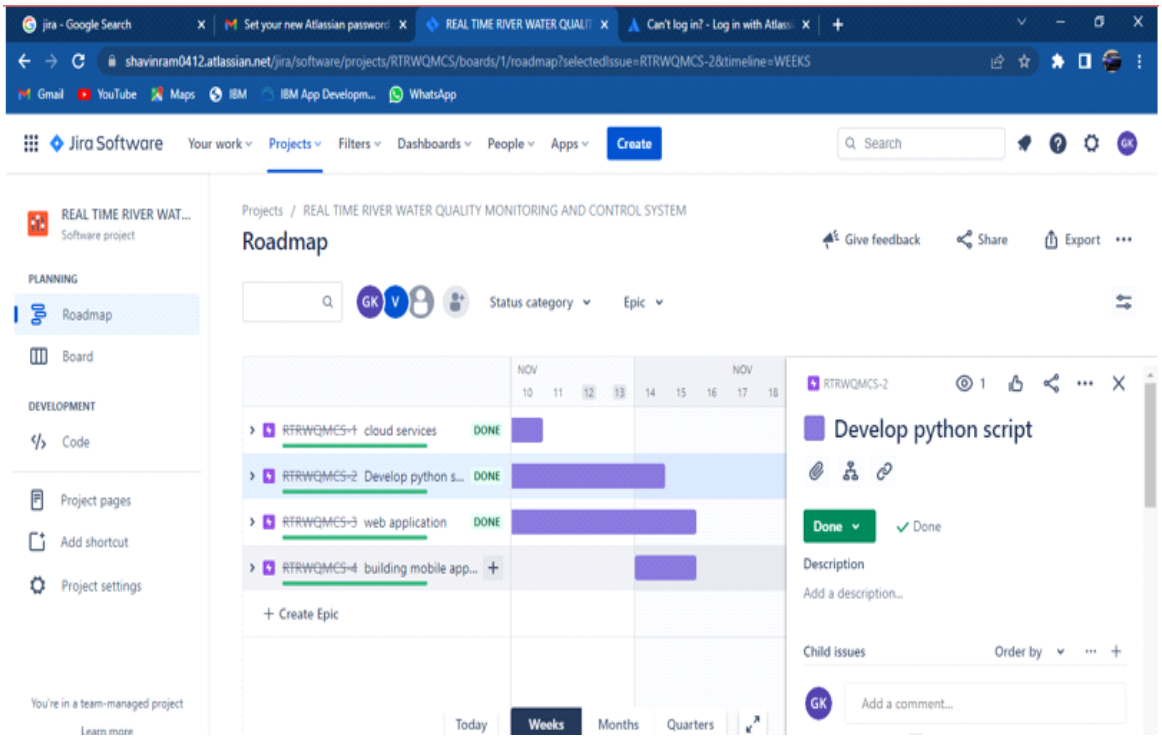
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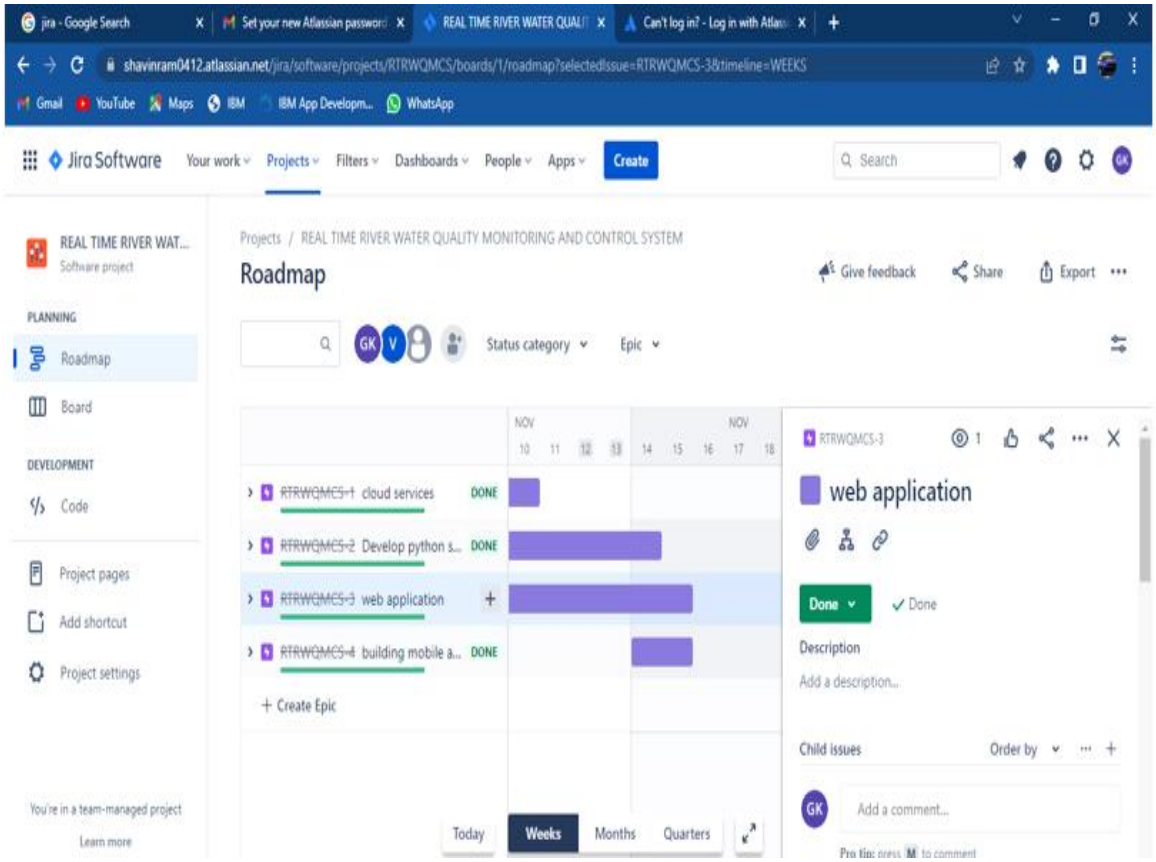
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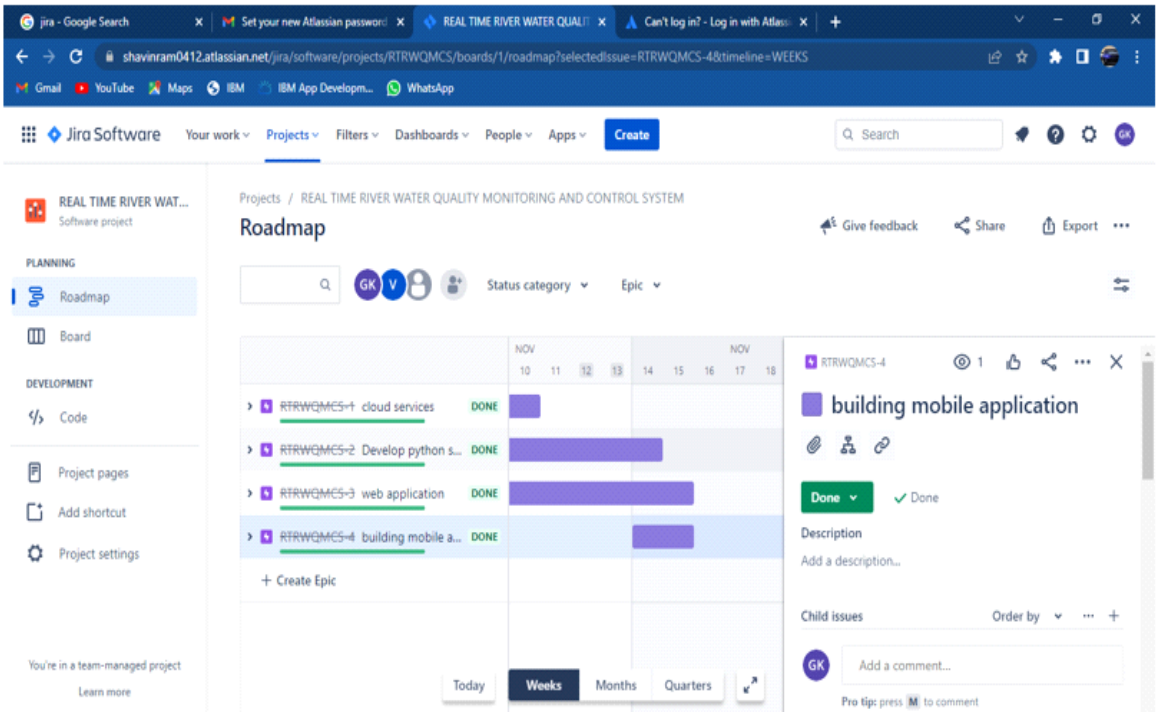
Pro tip: press M to comment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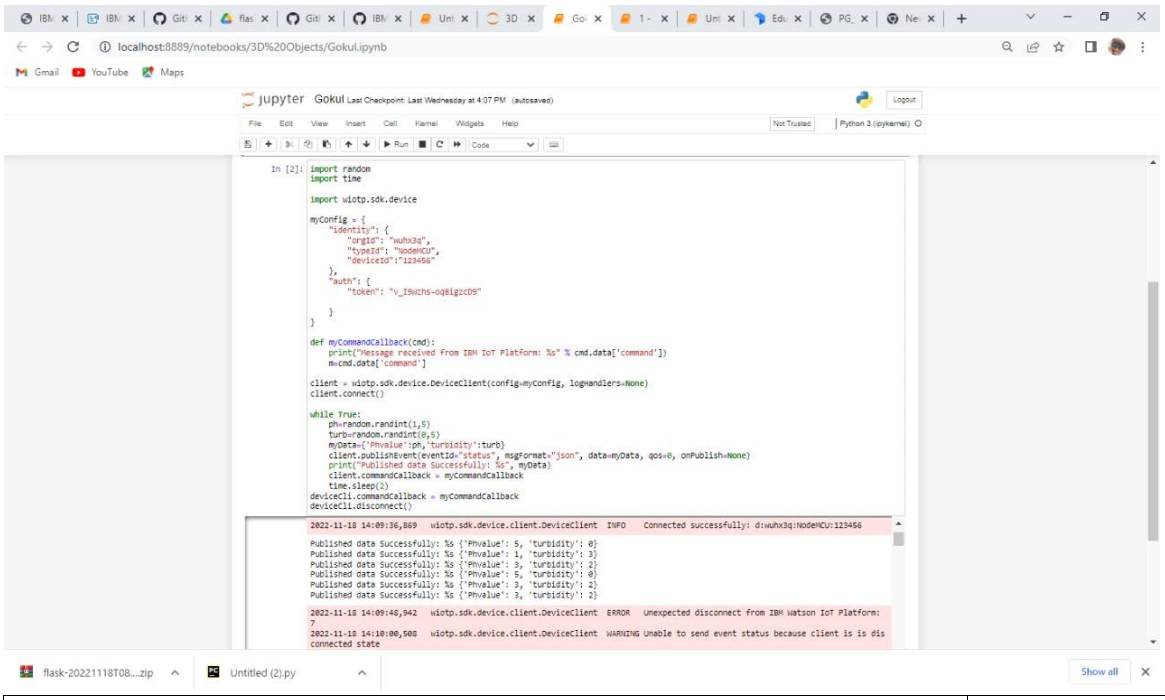
Pro tip: press M to comment

CODING &

SOLUTIONING

FEATURE 1

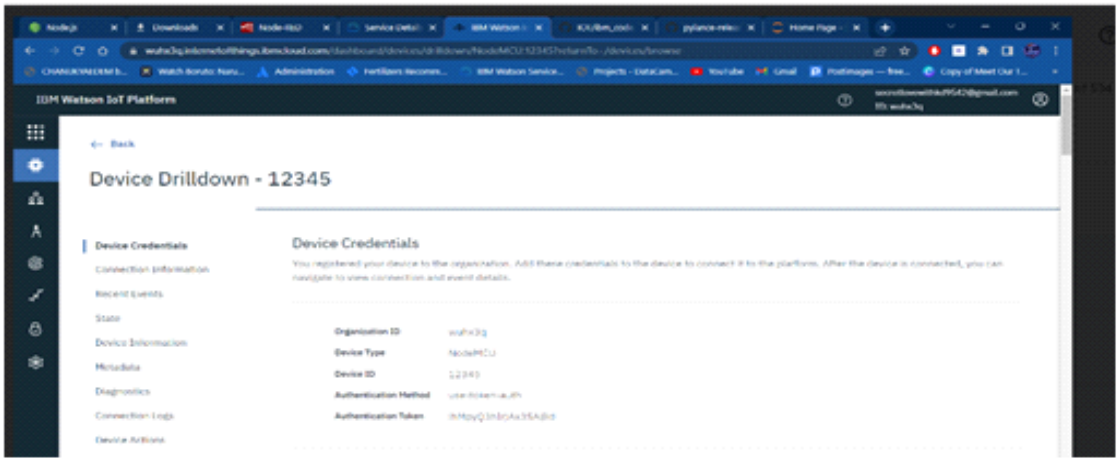



```
#!/usr/bin/env python
# coding: utf-8

# In[1]:

get_ipython().system('pip install wiotp-sdk')

# In[2]:

import random
import time

import wiotp.sdk.device

myConfig = {
    "identity": {
        "orgId": "wuhx3q",
```

```
        "typeId": "NodeMCU",
        "deviceId":"123456"
    },
    "auth": {
        "token": "v_I9Wzhs-oqBigzcD9"

    }
}

def myCommandCallback(cmd):
    print("Message received from IBM IoT
Platform: %s" % cmd.data['command'])
    m=cmd.data['command']

client =
wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None)
client.connect()

while True:
    ph=random.randint(1,5)
    turb=random.randint(0,5)
    myData={'Phvalue':ph,'turbidity':turb}
    client.publishEvent(eventId="status",
msgFormat="json", data=myData, qos=0,
onPublish=None)
    print("Published data Successfully: %s",
myData)
    client.commandCallback =
myCommandCallback
    time.sleep(2)
```

deviceCli.commandCallback = myCommandCallback deviceCli.disconnect()	

ADD A DEVICE



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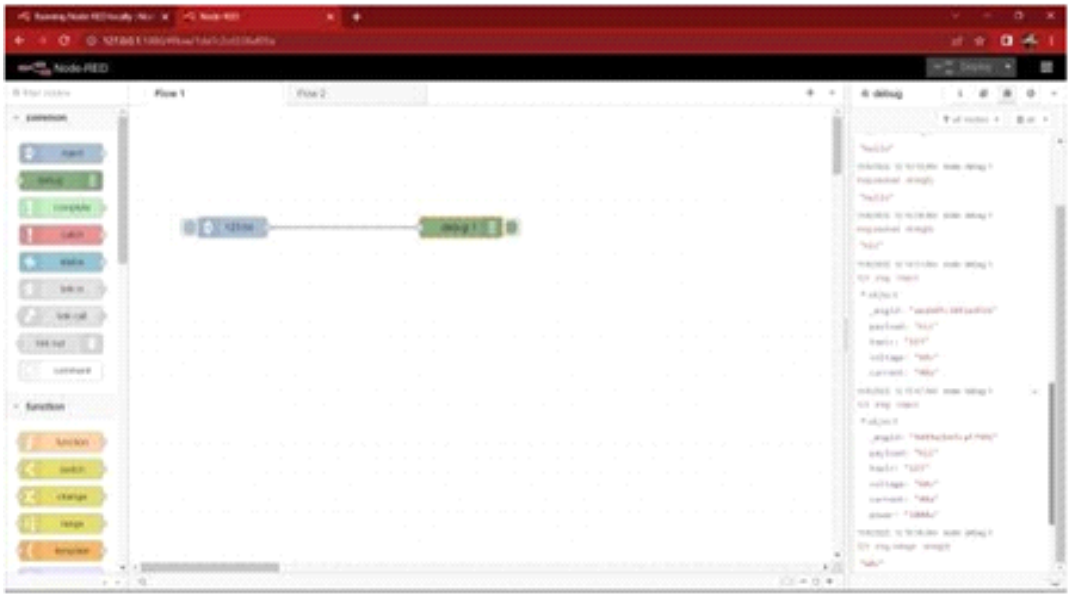

Node-RED
Flow 1
Flow 2
debug

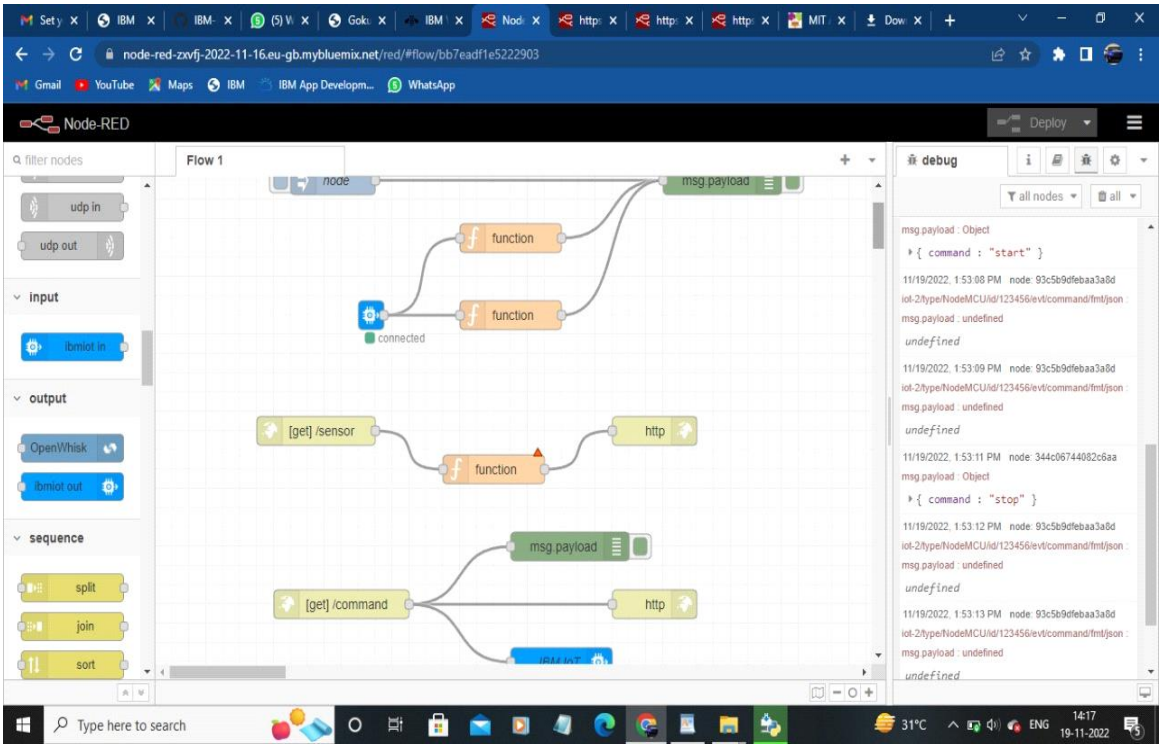
RESULT

Whenever the sensed parameter values exceed the threshold, message is sent to authorized person. Based on the parameters sensed by different sensors, an alert message will be received by the authorized person and accordingly they take necessary action to prevent or control pollution level.

The measured results are compared with drinking water quality standards defined by World Health Organization (WHO).

SAFE LIMITS FOR DRINKING WATER

Parameters monitored	Quality range	Units
Turbidity	5–10	NTU
pH	6.5–8.5	pH
Conductivity	300–800	microS/cm



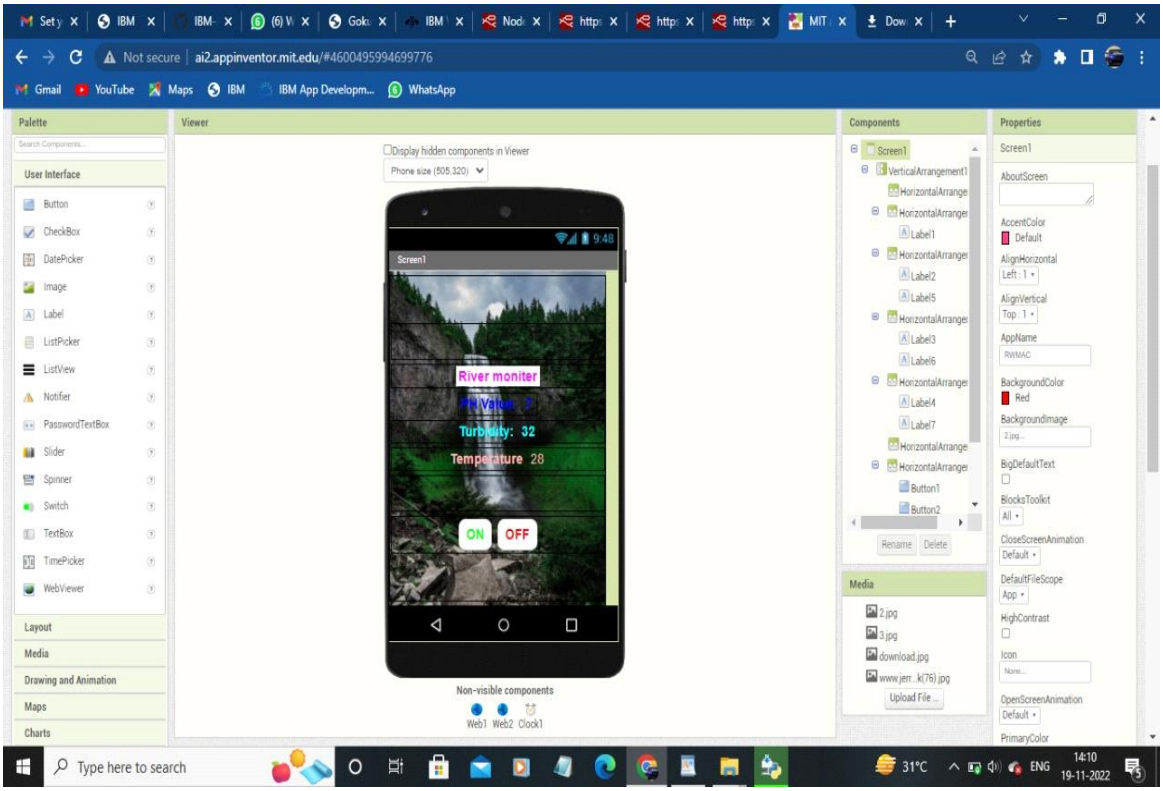

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Image
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Spinner
Switch
TextBox
TimePicker
WebViewer
Layout
Media
Drawing and Animation
Maps
Charts
Viewer
Display hidden components in Viewer
Phone size (505,320)
Screen1
River moniter
PH Value: 7
Turbidity: 32
Temperature 28
ON
OFF
Non-visible components
Web1
Web2
Clock1
Components
Screen1
VerticalArrangement1
HorizontalArrange
Label1
Label2
Label5
Label3
Label6
Label4
Label7
Button1
Button2
Rename
Delete
Media
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Upload File ...
Properties
Screen1
AboutScreen
AccentColor
Default
AlignHorizontal
Left : 1
AlignVertical
Top : 1
AppName
RWMAC
BackgroundColor
Red
BackgroundImage
2.jpg...
BigDefaultText
BlocksToolkit
All
CloseScreenAnimation
Default
DefaultFileScope
App
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None...
OpenScreenAnimation
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PrimaryColor
Type here to search
31°C
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14:10
19-11-2022

ADVANTAGES

The advantages of river water quality monitoring system are,

- To develop a system for continuous monitoring of river water quality at remote places.
- Due to automation it will reduce the time to check the parameters.
- This is economically affordable for common peoples.

- Provides the prevention from diseases caused by water.
- High detection in accuracy.
- Low power consumption.
- SMS alert is also send to user.

APPLICATION

Commercial and domestic use

The water for commercial uses come from the surface and under ground sources. The extend to which community uses a surface or underground source depends on which source is more abundunt in the particular area.

Water supply agencies

Water supply is the provision of water by public utilities, commercial organisations, community endeavors or by individuals usually via system of pipes.

Useful for health departments to identify the reason of water diseases

Waterborne illness have two causes of pollution eg. dangerous levels of nitrates or heavy material in the water supply due to industrial pollution or the over use of agriculture chemicals. Dirt and contamination, viruses causes different kinds of diseases.

Residential Areas

This system will be more useful in residential areas like small village or town.

In different organizations

So the system of monitoring the water quality will be very much useful in organizational area like any industry,construction sites, Hostels, Schools, colleges etc.

CONCLUSION

Real time system for water quality measurement based on GSM is presented in this report. The system is incredibly versatile and economical. It is a real-time system that measures numerous parameters pertaining to the water and send them to the monitoring center. The system can monitor water quality automatically, and it is low in cost and doesn't need individuals on duty The system has good flexibility. It is a versatile system, because of which simply by replacing the sensors and by making some changes within the computer code, the system can be used to measure some other parameters of water. The system is reliable and easy to maintain and it can be extended to measure water pollution as well. By effectively using the proposed system, one can save time and cost can also be reduced.

Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage and existing GSM network. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So, the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be

used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic,air pollution,industrial and agricultural production and so on.

By keeping the embedded devices in the environment for monitoring enables self protection(i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By this we can bring the environment into real life i.e., it can interact with other objects through the network.

FUTURE SCOPE

The capability of water quality monitoring system can be enhanced to obtain more efficient reliable results. The number of parameters to be sensed can be increased by the addition of multiple sensors to measure dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD), ammonia nitrogen, nitrate, nitrite, phosphate. The system can be further upgraded using wireless sensor networks. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value. Work can be carried on to include controlling the supply of water.

For monitoring environmental conditions, drinking water quality, treatment and disinfection of waste water etc. This system could also be implemented in various industrial processes. The system can be modified according to the needs

of the user and can be implemented along with lab view to monitor data on computers.

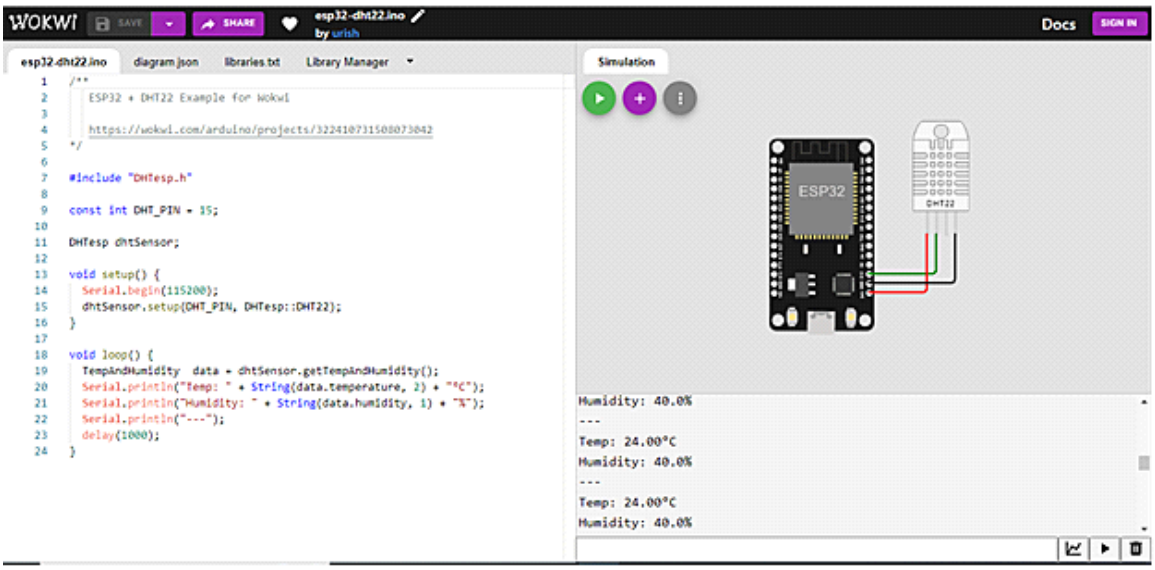
APPENDIX

SOURCE CODE

**

ESP32 + DHT22 Example for Wokwi

```
  https://wokwi.com/arduino/projects/322410731508073042
*/
#include "DHTesp.h"
const int DHT_PIN = 15;
DHTesp dhtSensor;
void setup() {
  Serial.begin(115200);
  dhtSensor.setup(DHT_PIN, DHTesp::DHT22);
}
void loop() {
  TempAndHumidity  data = dhtSensor.getTempAndHumidity();
  Serial.println("Temp: " + String(data.temperature, 2) + "°C");
  Serial.println("Humidity: " + String(data.humidity, 1) + "%");
  Serial.println("---");
  delay(1000);
}
```



Github link: https://github.com/IBM-EPBL/IBM-Project-41095-1660639371

Demo link: https://youtu.be/vAFPlzh0yVY