



# **REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM**

**(Category: INTERNET OF THINGS)**



**NAALAIYA THIRAN PROJECT BASED LEARNING ON PROFESSIONAL  
READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP**

## **PROJECT REPORT**

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**P.S.V COLLEGE OF ENGINEERING AND TECHNOLOGY**

**(An ISO 9001:2015 Certified Institution)**

**(Accredited by NAAC with 'A' Grade)**

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**Certified that this project report “REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM” is the bonafide work of “PRASANTHKUMAR G (611819106036), RAGUNATHAN P (611819106042), NAVEENKUMAR S (611819106031), KARTHICK S (611819106016) ” who carried out the project work under my supervision.**

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**INTERNAL EXAMINAR**

**EXTERNAL EXAMINAR**

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## **ABSTRACT:**

- ✓ River water quality can 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 they can go and announce the localities not to drink that water.

## **OBJECTIVE :**

- The main objective of this project is to monitor the quality of river water.
- In this project we provide an effective solutions for monitor the quality of river water.
- This system is the most efficient and user friendly way for monitoring the quality of river water in real time by iot
- The main aim is to develop a system for continuous monitoring of river water quality at remote places using.
- pH, conductivity, turbidity level, etc. are the limits that are analyzed to improve the water quality.
- Connecting IoT devices to the Watson IoT platform and exchanging the sensor data.
- Creating a Web Application through which the user interacts with the device.

# **INTRODUCTION**

## **1.1 Project Overview:**

Water is one of the major compounds that profoundly influence ecosystem. But, nowadays it is been exploited heavily due to rapid industrialization, human waste and random use of pesticides and chemical fertilizers in agriculture, which leads to water contamination. The system consists of several sensors which are used for measuring physical and chemical parameters of water. The parameters such as temperature, pH, and dissolved oxygen of the water can be measured. Using this system a person can detect pollutants from a water body from anywhere in the world. Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming This paper proposes a sensor based water quality monitoring system. The main components of Wireless Sensor Network (WSN) include a micro-controller or processing the system, communication system for inter and intra node communication and several sensors Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology Data collected at the IBM cloud Server and verify them to trigger the actions to be performed.

## **1.2 Purpose:**

Water quality refers to chemical, physical biological and radio logical characteristics of water. It is a measure of the condition of water relative to the necessities of one or more bio-tic species and or to any human need or purposes .Water quality monitoring is defined as a sampling and analysis of the water in lake, stream, ocean and river and conditions of the water body. Smart water quality monitoring is a process of real-time monitoring and the analysis of water to identify changes in parameters based on the physical, chemical and biological characteristics.Monitoring water quality is clearly important: in our seas, our rivers, on the surface and in our ports, for both companies and the public. It enables us to assess how they are changing, analyze trends and to inform plans and strategies that improve water quality and ensures that water meets its designated use.There are several indicators determining water quality. These include dissolved oxygen, turbidity, bio indicators, nitrates, pH scale and water temperature.Monitoring water quality helps to identify specific pollutants, a certain chemical, and the source of the pollution.There are many sources of water pollution: wastewater from sewage seeping into the water supply; agricultural practices (e.g., the use of pesticides and fertilizer); oil pollution, river and marine dumping, port, shipping and industrial activity. Monitoring water quality and a water quality assessment regularly provides a source of data identify immediate issues – and their source.

- Identifying trends, short and long-term, in water quality.
- Data collected over a period of time will show trends, for example identifying increasing concentrations of nitrogen pollution in a river or an inland waterway. The total data will then help to identify key water quality parameters.

- Environmental planning methods: water pollution prevention and management.
- Collecting, interpreting and using data is essential for the development of a sound and effective water quality strategy. The absence of real-time data will however hamper the development of strategies and limit the impact on pollution control. Using digital systems and programs for data collection and management is a solution to this challenge.
- Monitoring water quality is a global issue and concern: on land and at sea. Within the European Union, the European Green Deal sets out goals for restoring biological biodiversity and reducing water pollution, as well as publishing various directives to ensure standards of water quality. Individual nation states, for example France, have also clear regulatory frame works requiring the effective monitoring of water quality. In the United States, the Environmental Protection Agency (EPA) enforces regulations to address water pollution in each state. Across the world, countries increasingly understand the importance of effective water quality monitoring parameters and methods.

## **2. LITERATURE SURVEY**

### **2.1 Existing Problem:**

Due to population growth, urbanization ,and climatic change ,competition for water resources is expected to increase, with a particular impact on agriculture, river water. Water will be suitable to potable water monitoring compound spillage identification done rivers, remote estimation for swimmingpools. It



holds self-sufficient hubs that unite with the cloud to ongoing water control .The River water needed to be treated before it is used in agriculture feilds,hence the parameters affecting the quality of river-water need to be analysed and to be used for water treatement purpose.

## **2.2 References:**

- [1] K. S. Adu-Manu, C. Tapparello, W. Heinzelman, F. A. Katsriku, and J.-D. Abdulai, "Water quality monitoring using wireless sensor networks: Current trends and future research directions," *ACM Transactions on Sensor Networks (TOSN)*, vol. 13, p. 4, 2017.
- [2] B. Chen, Y. Song, T. Jiang, Z. Chen, B. Huang, and B. Xu, "Real-time estimation of population exposure to PM<sub>2.5</sub> using mobile- and station-based big data," *Int J Environ Res Public Health*, vol. 15, Mar 23 2018.
- [3] B. Paul, "Sensor based water quality monitoring system," BRAC University, 2018.
- [4] K. Andersson and M. S. Hossain, "Smart Risk Assessment Systems using Belief-rule-based DSS and WSN Technologies", in 2014 4th International Conference on Wireless Communications, Vehicular Technology, Information Theory and Aerospace and Electronic Systems, VITAE 2014 : Co-located with Global Wireless Summit, Aalborg, Denmark 11-14 May 2014, 2014.
- [5] S. Thombre, R. U. Islam, K. Andersson, and M. S. Hossain, "IP based Wireless Sensor Networks : performance Analysis using Simulations and Experiments", *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications*, vol. 7, no. 3, pp. 53–76, 2016.
- [6] K. Andersson and M. S. Hossain, "Heterogeneous Wireless Sensor Networks for Flood Prediction Decision Support Systems", in 2015 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS) : 6th IEEE INFOCOM International

Workshop on Mobility Management in the Networks of the Future World, 2015, pp. 133–137.

## 2.3 Problem Statement:

River water is a finite resource that is necessary for agriculture, industry and the survival of all living things on the planet, including humans. Sometimes the dangerous particles or chemicals are mixed in the river water and general purpose water purifier cannot purify that. And it's impossible to check the quality of river water manually in every time. Bathing in contaminated river waters causes skin diseases, allergies, and other such ailments. So an automatic real-time river water quality monitoring and control system is required to monitor the water reserved in our river water. And we can check the quality of water anytime and from anywhere. The Real time analysis of Indicators of River water (pH, salinity, nutrients, etc.,)

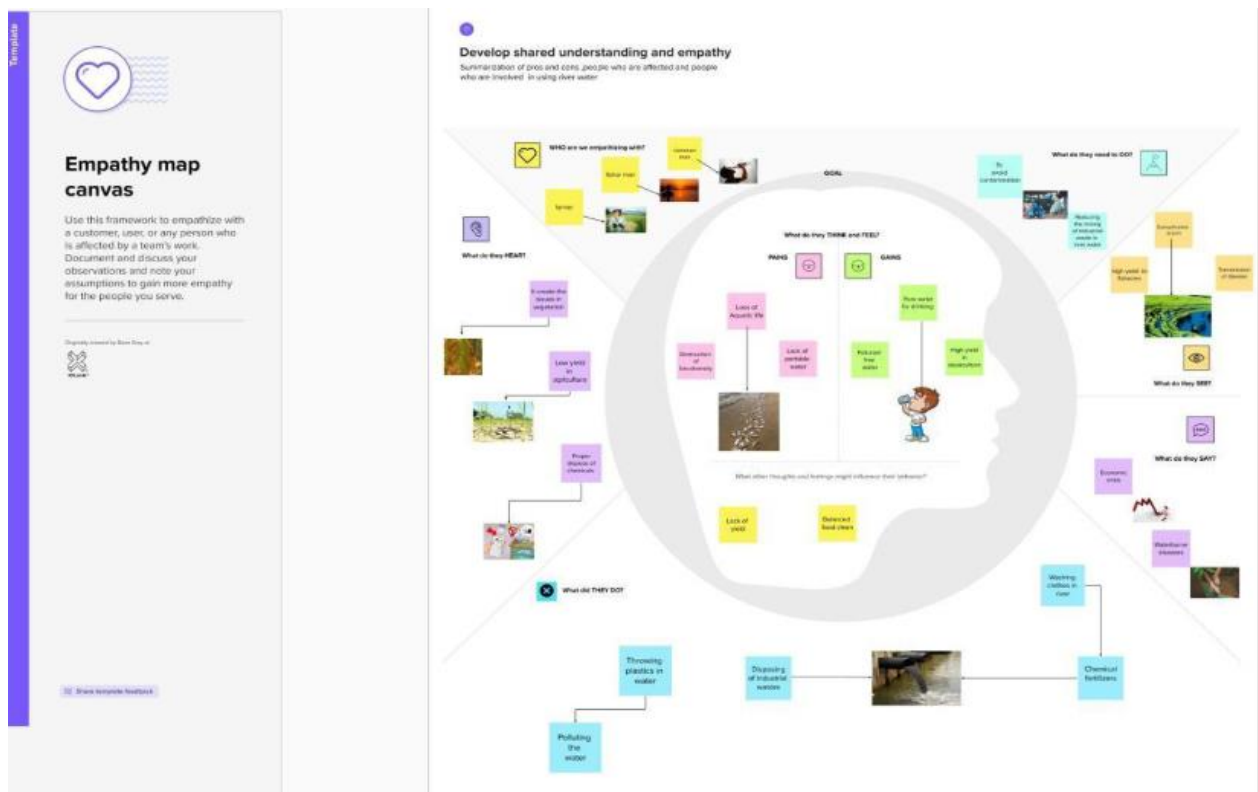
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	common man who lives an ordinary life	get pure water from a river	at the time it is difficult to use the water from the river	of contamination and plastic pollutants in river water	very bad and disappointment
PS-2	A farmer from the agriculture site	get a pollutant free water from the river for agriculture field	at the time it is difficult to use the water from the river	of contamination and plastic pollutants in river water	very bad and disappointment

## IDEATION & PROPOSED SOLUTION

### 3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an

effective solution requires understanding the true problem and the person who is experiencing it.



### 3.2 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.

In Brainstorm and idea prioritization template the problem statement ,ideas of team members, idea making and grouping have to be displayed. The requirements and qualities of the river water also be displayed. The ideas of the team members should be categorized into high priority and lowp riority. The high priority ideas are placed at the top of the graph.



## 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
- 👤 2-3 people recommended



[Show template feedback](#)



### 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.

🕒 10 minutes



#### Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.



#### Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.



#### Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy & productive session.

[Open article](#)



### 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

### PROBLEM STATEMENT

River water is a finite resource that is necessary for agriculture, industry and the survival of all living things on the planet, including humans. Sometimes the dangerous particles or chemicals are mixed in the river water and general purpose water purifier cannot purify that. And it's impossible to check the quality of river water manually in every time. And we can check the quality of water anytime and from anywhere.



2

### Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes



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 can break it up into smaller sub-groups.

20 minutes

#### REQUIREMENTS



#### QUALITIES

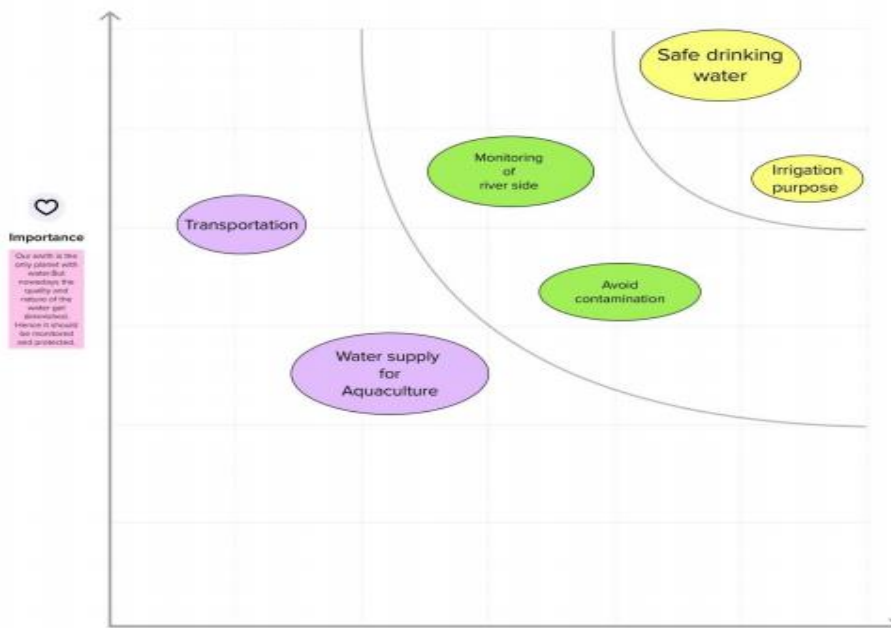


4

### 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.

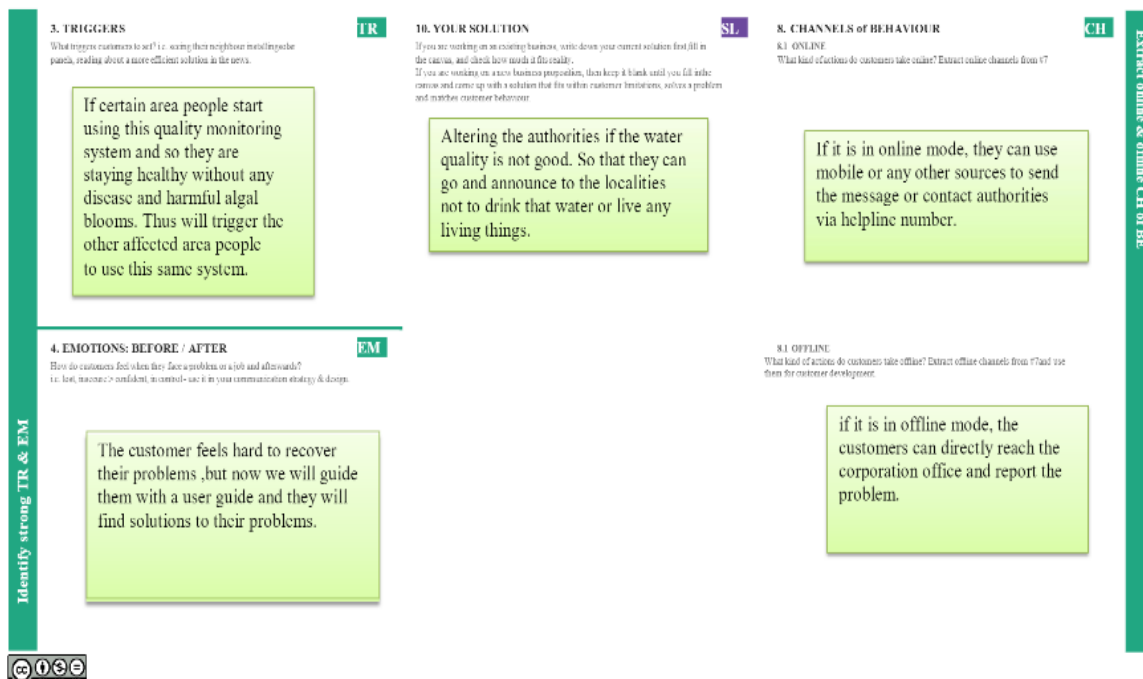
20 minutes



## 3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	River water is a finite resource that is necessary for agriculture, industry and the survival of all living things on the planet, including humans. Sometimes the dangerous particles or chemicals are mixed in the river water and general purpose water purifier cannot purify that. And it's impossible to check the quality of river water manually in every time. contaminated river waters causes skin diseases, allergies, and other such ailments. So an automatic real-time river water quality monitoring and control system is required to monitor the water reserved in our river water. And we can check the quality of water anytime and from anywhere.
2.	Idea / Solution description	River water quality can be monitored by the web application. It can be able to know if there are any dust particles in the river water. The PH level of the river water can be monitored. Water temperature can be monitored. Alerting the authorities if the water quality is not good so that they can go and announce the localities not to drink that river water.
3.	Novelty / Uniqueness	After detection of impurities individual notification will sent to the people and also send the separate notification to the department of water resources.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> <li>Increasing innovation and productivity.</li> <li>Gain a high field for farmer, common man and fisher man.</li> </ul>
5.	Business Model	Water monitoring and control model
6.	Scalability of the Solution	This system uses different sensors for monitoring the water quality by determining pH, turbidity, conductivity and temperature. The Arduino controller used will access the sensor data. With the use of IoT, the collected data is analyzed and the pollution of water can be investigated by a stringent mechanism.

### 3.4 PROBLEM SOLUTION:



## 4 .REQUIREMENT ANALYSIS



## Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Login	Confirmation through verified password
FR-2	View Water Details	View current water details in website View traditional water eligibility in website
FR-3	Logout	Logs out the user successfully

## Non-functional Requirements:

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

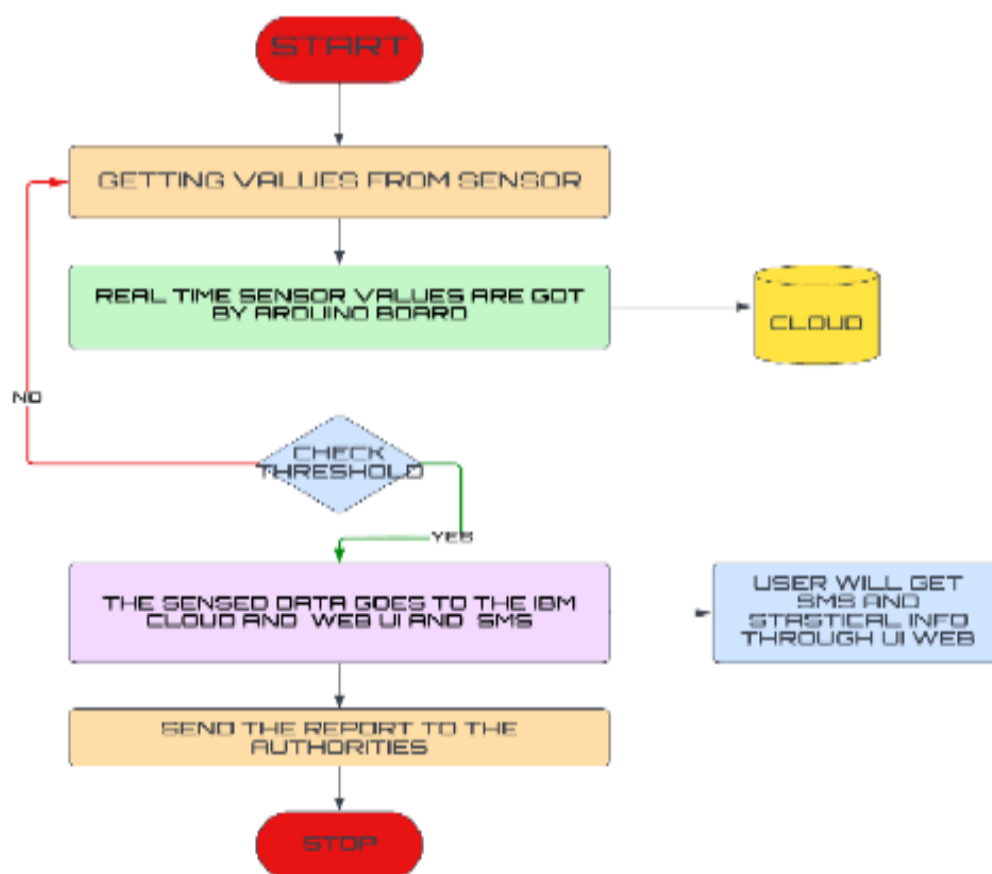
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Load time for user interface screens shall not be more than 2 seconds.
NFR-2	Security	User account is password protected Account creation done only after email verification
NFR-3	Reliability	Users can access their account 98% of the timewithout 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 time will be about 4 hours

## 5. PROJECT DESIGN



## 5.1 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.



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE

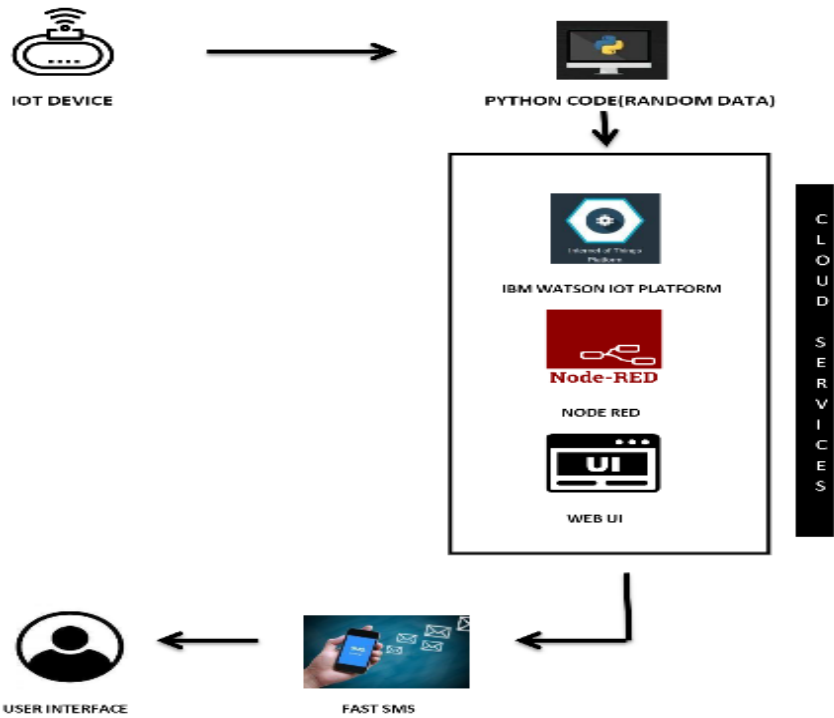
## Flow:

- Feed the data received from the Sensor unit which are placed in the river sides.
- The collected data will be displayed in the Web page to the user.
- Then the collected data is sent to the data base, where the collected data and the predefined data are checked and monitored.
- If any data exceed the predefined data then the control signal will send to the Admin.
- The collected data will be stored in the IBM cloud storage. Later the data will be controlled by the admin via Web UI

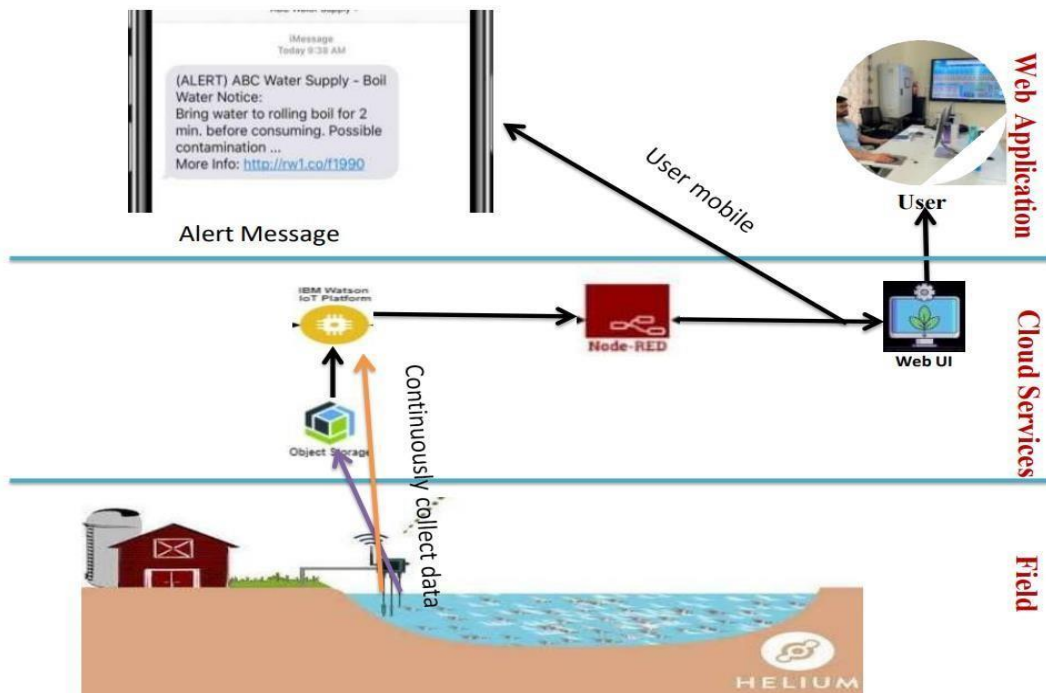
## Components & Technologies:

S.No	Component	Description	Technology
1.	Sensor Data	The data is collected from the various sensor placed in the river sides.	ESP32Wifi module Raspberry Pie.
2.	Database for Storage	The data/info need to be stored for accessing it in future	MySQL-Oracle
3.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
4.	Cloud Database	Database Service on Cloud	IBM cloud
5.	Data Storage	File storage requirements	IBM Block Storage

## TECHNOLOGY ARCHITECTURE



## SOLUTION ARCHITECHURE:



## USER JOURNEY:

# User journey

by the design team of innovative interventions

People

e 2-9

Time

30 min

Difficulty

Beginner

Creating a user journey is a quick way to help you and your team gain a deeper understanding of who you're designing for, also the stakeholder in your project. The information you add here should be representative of the observations and research you've done about your users. [Learn more](#)

Phases	Including the first water			Finding the pH level of water			Separation of pure water and dirty water			Recycling of dirty water for agricultural use			
Steps	Whether the river water is dirty or not	Check the surroundings of river water	Also feel whether the industrial waste is mixed into the river water	Check whether the pH is between 6.5 and 8.5	So finding the drinking level of pit	If the pH level is normal we can use it for drinking purpose	Some proposed filters to remove heavy metals from the water and mix with a filter water	Using pure water finding machine	Usage of water purifier to separate pure water and dirty water	Collect the dirty water and send the water to the recycling facility	Using chemical components for recycling process	Finally recycled water is sent to farmers for agricultural purpose	
Feelings	<p>What your user might be thinking and feeling at the moment</p> <p>👍</p> <p>👎</p>	If the river water quality is not good we have to look for the level of the river	Animals and birds are drinking river water	The river water is essential for human beings	If the pH level of the river water is normal it is suitable for drinking	They feel more secure about their environment	They feel comfortable after drinking pure water daily	Supplying some amount of water for the industrial purpose	The user will be more secure about the chemicals removed from the water	They feel happy about drinking pure water	The recycling water can also be used for some other purpose	Also used for some industrial purpose	It is an eco-friendly company which is recycling water
Pain points	<p>Problems your user runs into</p> <p>👍</p> <p>👎</p>	Chemical waste and industrial waste are discharged into the river	Threat of acid rain may cause the river to dry for	Pollution may occur due to acid rain	Because of the chemical waste it will create some more animals	Water pollution may cause diseases	It will affect the Eco system	This water is harmful for drinking	This causes harm to the organisms living in the river water	Also increasing the water temperature when the living organisms	Sewage and waste water are mixed into the river water	It is an eco-friendly company which is recycling water	Climate change will affect river water
Opportunities		We use the detector to easily identify our device	Using drone for everyone monitoring	Our device is miniature compared to other devices	We include sensor for detecting the level of water	Used solar panel for energy	We insert high quality battery	Water proof device is used for ensuring safety	By using this device we can also control the pH level of the water	Any time and any where can find the device	We can grow the plants in the water and use it for drinking if the level is not high	Control the water quality using this device	It is an eco-friendly company which is recycling water

Share your feedback

## 5.3 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
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account /dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Google	I can register & access the dashboard with Google Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can access through Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	Login Details are received to me.	High	Sprint-1
	Interface	USN-6	As a user, I can log into the application by entering email & password.	Easy Access application	High	Sprint-1
Customer (Web user)	Dashboard	WUSN-7	As a web User, I can get all information (data)(Temp etc..)	I can easily Understand how to use it.	High	Sprint-1
Customer Care Executive	View Perspective	CCE	As a Customer care, I can view the data in graph plots	Easy Understanding of Graphs	High	Sprint-1
Administrator	Risk factor	ADMIN-1	As a Admin, Update must be done at each step and take care of any errors	Heavy Monitoring is Required.	High	Sprint-2

## 6.PROJECT PLANNING AND SCHEDULING

## 6.1 SPRINT PLANNING & SCHEDULING

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project is done by gathering information about related details on technical papers and web browsing.	06 OCTOBER 2022
Empathy Map	Prepared Empathy Map Canvas to combine thoughts and pains, gains of the project with all team members .	08 OCTOBER 2022
Ideation	Brainstorming session is conducted with all team members to list out all the ideas and prioritise the top 3 ideas.	09 OCTOBER 2022
Proposed Solution	Prepared the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	28 OCTOBER 2022
Problem Solution Fit	Prepared problem - solution fit document.	30 OCTOBER 2022

## 6.2 SPRINT DELIVERY SCHEDULE

## Product Backlog, Sprint Schedule, and Estimation

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 register for the application by entering my email, password, and confirming my password.	2	High	Prasanthkumar G
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Ragunathan P
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Naveenkumar S
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Karthick S
Sprint-1	Login	USN-5	As a user, I can log into the application by Entering email & password	1	High	Ragunathan P

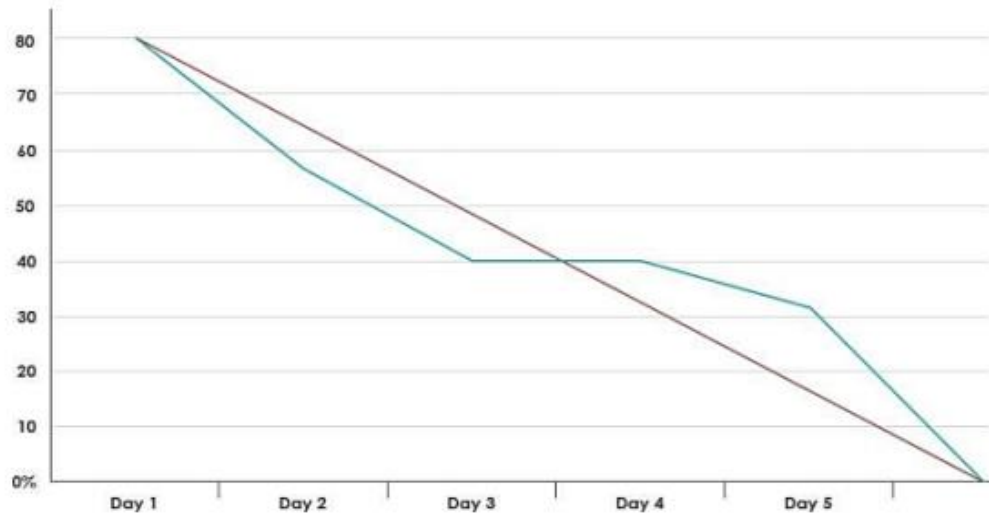
## Project Tracker, Velocity & Burndown Charts

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	4 Days	24 Oct 2022	27 Oct 2022	20	29 Oct 2022
Sprint-2	20	5 Days	28 Oct 2022	01 Nov 2022	20	04 Nov 2022
Sprint-3	20	8 Days	02 Nov 2022	09 Nov 2022	20	11 Nov 2022
Sprint-4	20	9 Days	10 Nov 2022	18 Nov 2022	20	19 Nov 2022

**Velocity:**

$$AV = \frac{\text{sprint duration}}{\text{velocity}} = \frac{20}{10} = 2$$

**BURNDOWN CHART:**



## 6.3 REPORT FROM JIRA

**TIMELINE CREATED USING JIRA SOFTWARE**



Task	OCT														NOV													
	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14				
<input checked="" type="checkbox"/> RE-1 CREATE IBM CLOUD ACCOUNT																												
<input checked="" type="checkbox"/> RE-2 CONFIGURE NODE RED SERVICES AND IB																												
<input checked="" type="checkbox"/> RE-3 CREATE DEMO APP IN MIT APP INVENTOI																												
<input checked="" type="checkbox"/> RE-4 USING AI COMPANION DEPLOY THE APP																												
<input checked="" type="checkbox"/> RE-5 DESIGN EMPATHY MAP,LITERATURE SURV																												
<input checked="" type="checkbox"/> RE-6 CREATE DATA FLOW DIAGRAM AND TECH																												
<input checked="" type="checkbox"/> RE-7 DEVELOP AN APP USING LOCAL NODE RE																												
<input checked="" type="checkbox"/> RE-8 DEVELOP THE PYTHON SCRIPT WITH VAL																												
<input checked="" type="checkbox"/> RE-9 DESIGN AN UI FOR CUSTOMER INTERACT																												





Task	SEP														OCT														NOV													
	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19														
<input checked="" type="checkbox"/> RE-1 CREATE IBM CLOUD ACCOUNT																																										
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<input checked="" type="checkbox"/> RE-9 DESIGN AN UI FOR CUSTOMER INTERACT																																										

Task	SEP														OCT														NOV													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																						
<input checked="" type="checkbox"/> RE-1 CREATE IBM CLOUD ACCOUNT																																										
<input checked="" type="checkbox"/> RE-2 CONFIGURE NODE RED SERVICES AND IB																																										
<input checked="" type="checkbox"/> RE-3 CREATE DEMO APP IN MIT APP INVENTOI																																										
<input checked="" type="checkbox"/> RE-4 USING AI COMPANION DEPLOY THE APP																																										
<input checked="" type="checkbox"/> RE-5 DESIGN EMPATHY MAP,LITERATURE SURV																																										
<input checked="" type="checkbox"/> RE-6 CREATE DATA FLOW DIAGRAM AND TECH																																										
<input checked="" type="checkbox"/> RE-7 DEVELOP AN APP USING LOCAL NODE RE																																										
<input checked="" type="checkbox"/> RE-8 DEVELOP THE PYTHON SCRIPT WITH VAL																																										
<input checked="" type="checkbox"/> RE-9 DESIGN AN UI FOR CUSTOMER INTERACT																																										

## LISTS IN JIRA:

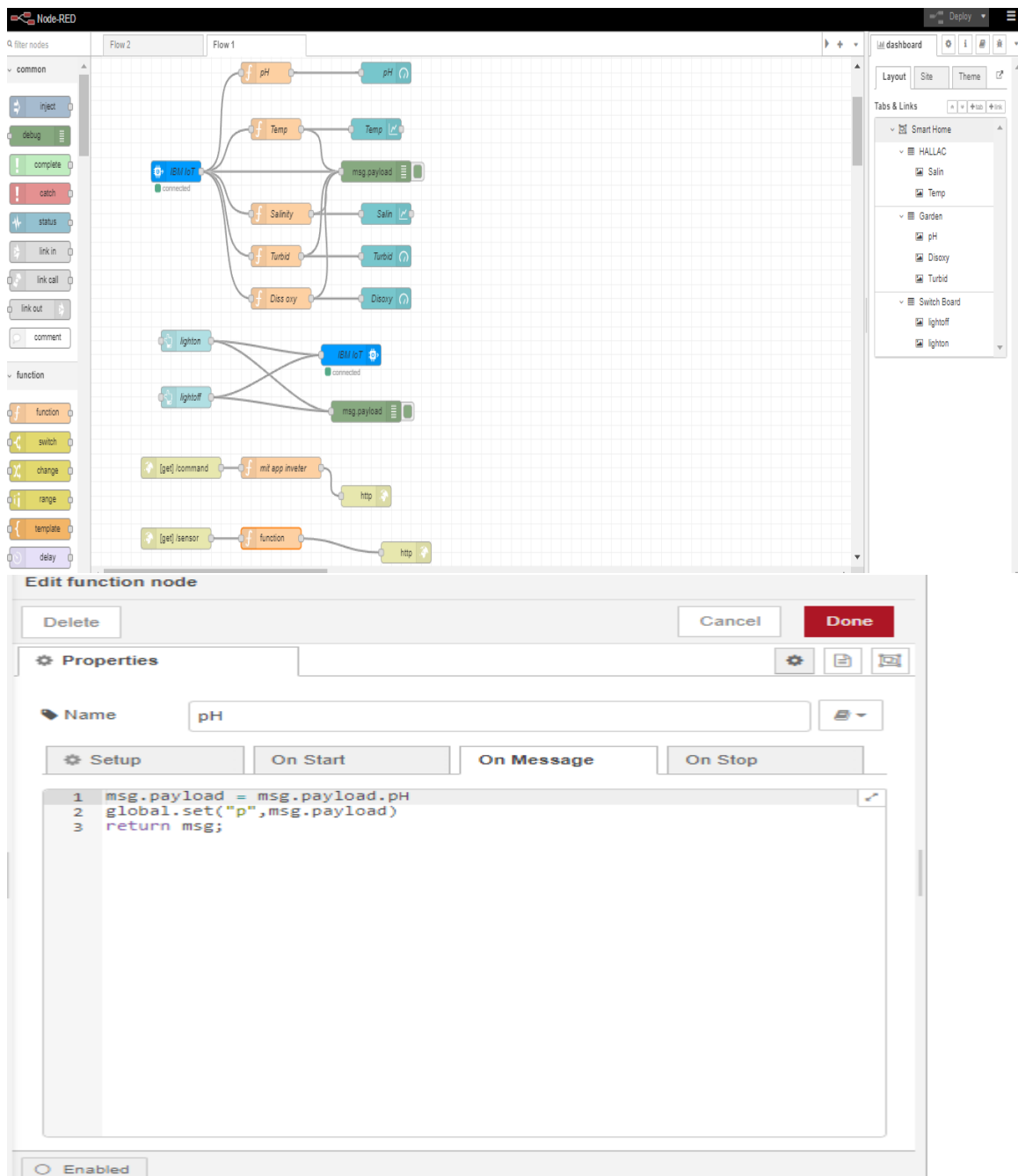
#	Key	Summary	Status	Category
RE-1		CREATE IBM CLOUD ACCOUNT	DONE	PREREQUISITE
RE-2		CONFIGURE NODE RED SERVICES AND IBM WATSON IOT PLA...	DONE	PREREQUISITE
RE-3		CREATE DEMO APP IN MIT APP INVENTOR 2.	DONE	MOBILE APPLICATION
RE-4		USING AI COMPANION DEPLOY THE APP IN MOBILE	DONE	DEPLOYMENT AND TESTING
RE-5		DESIGN EMPATHY MAP,LITERATURE SURVEY FOR OUR PROJE...	DONE	IDEATION PHASE
RE-6		CREATE DATA FLOW DIAGRAM AND TECHNICAL ARCHITECT...	DONE	PHASE 1
RE-7		DEVELOP AN APP USING LOCAL NODE RED AND DEPLOY IT T...	DONE	SPRINT DETAILS
RE-8		DEVELOP THE PYTHON SCRIPT WITH VALID DEVICE CREDEN...	DONE	SPRINT DETAILS
RE-9		DESIGN AN UI FOR CUSTOMER INTERACTING AND GET IT FO...	DONE	SPRINT DETAILS

## ISSUES:

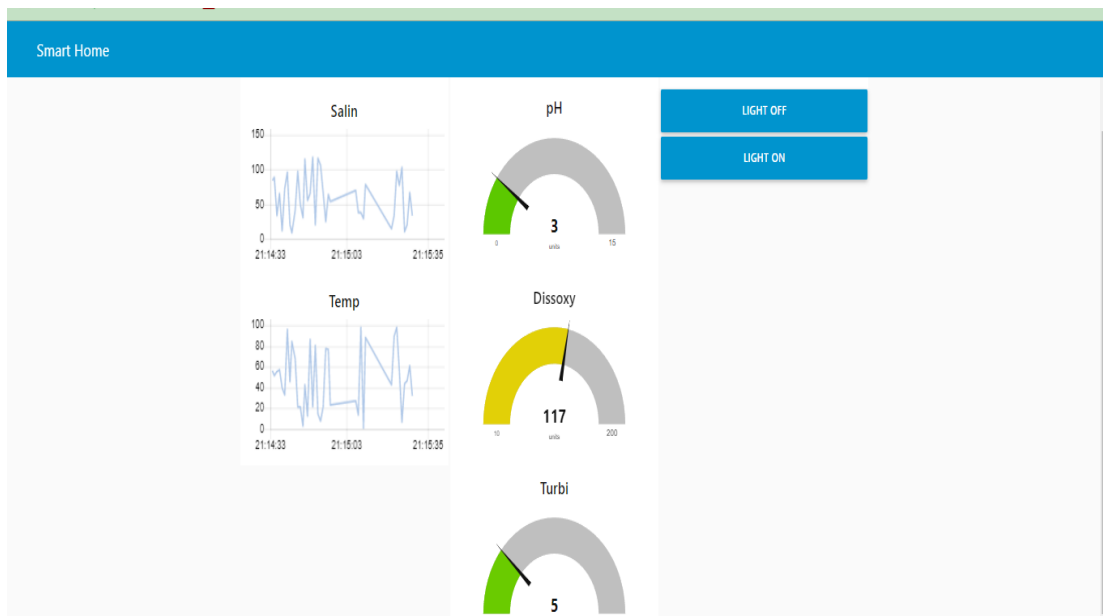
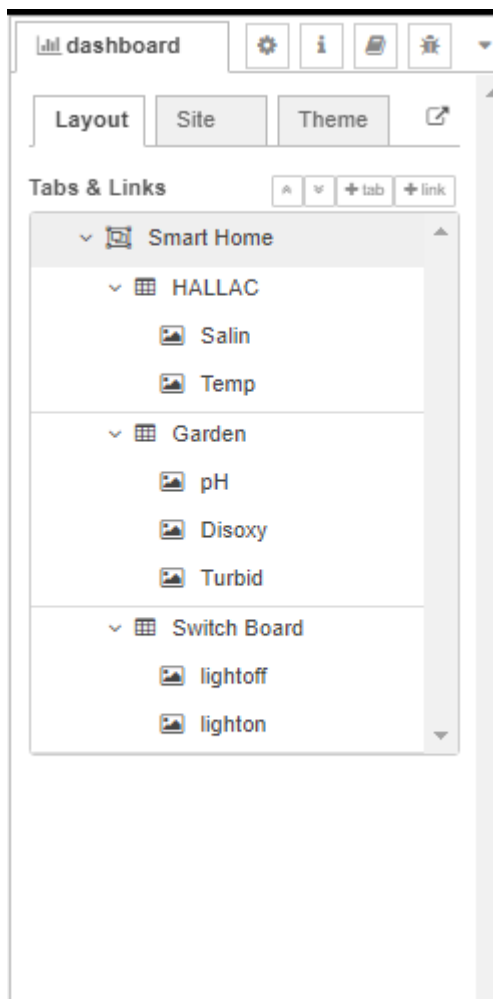
Name :	Type :	Related Schemes
 <b>ERROR IN MSG PAYLOAD EVENTS</b>	Base	▪ <a href="#">Default Issue Type Scheme</a>
 <b>ISSUE IN CONFIGURING NODE RED DASHBOARD</b>	Base	▪ <a href="#">Default Issue Type Scheme</a>
 <b>ERROR 1101</b> IN MIT APP INVENTOR	Subtask	▪ <a href="#">Default Issue Type Scheme</a>
 <b>URL NOT RESPONDED</b> THE NODE RED DATA URL NOT RESPONDED	Subtask	▪ <a href="#">Default Issue Type Scheme</a>

## 7.CODING AND SOLUTIONING

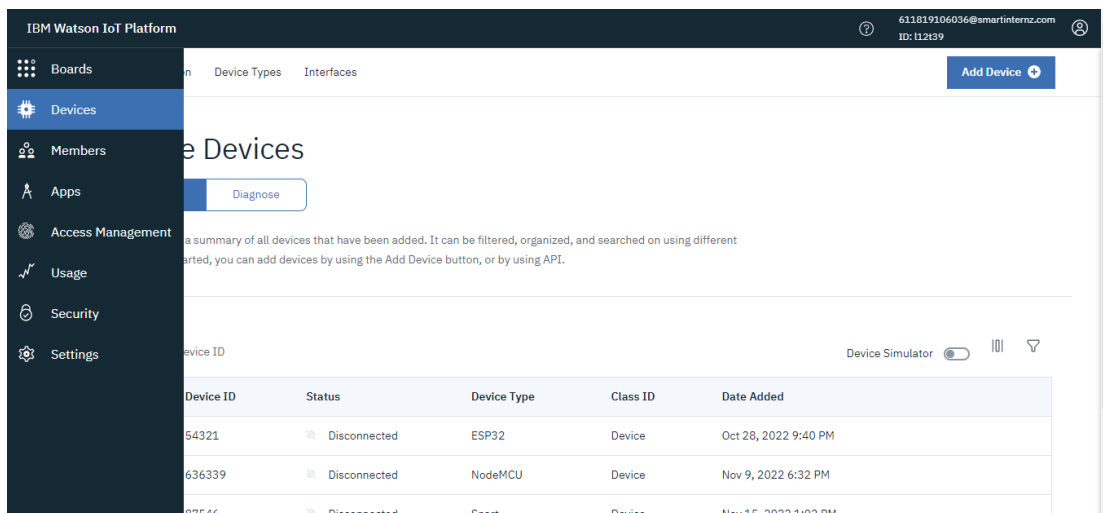
### 7.1 NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:



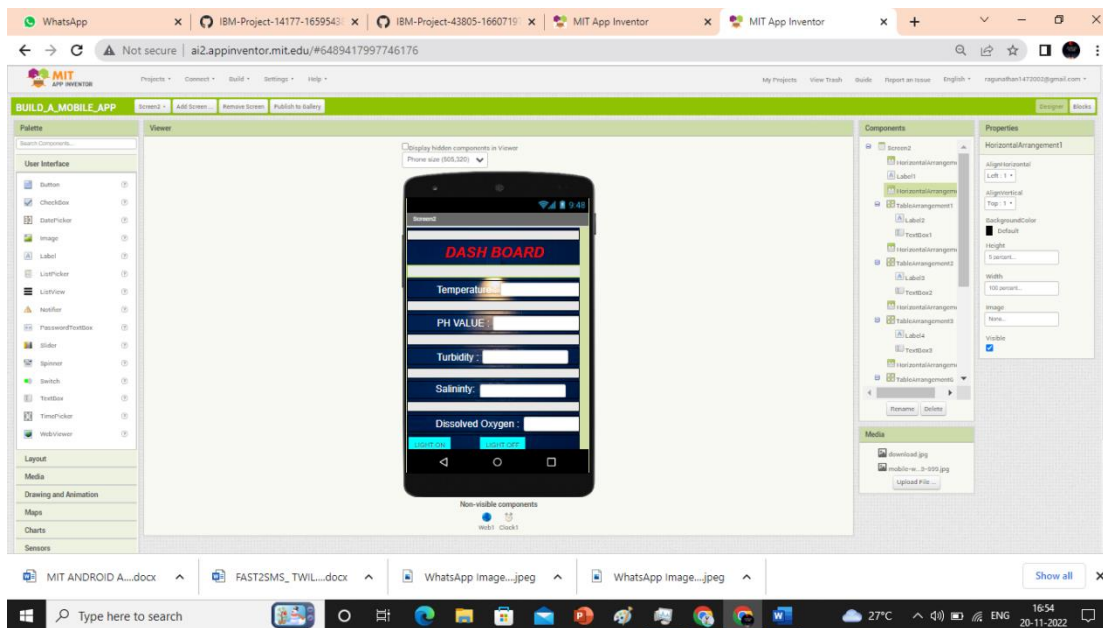
**Node red Dashboard:**

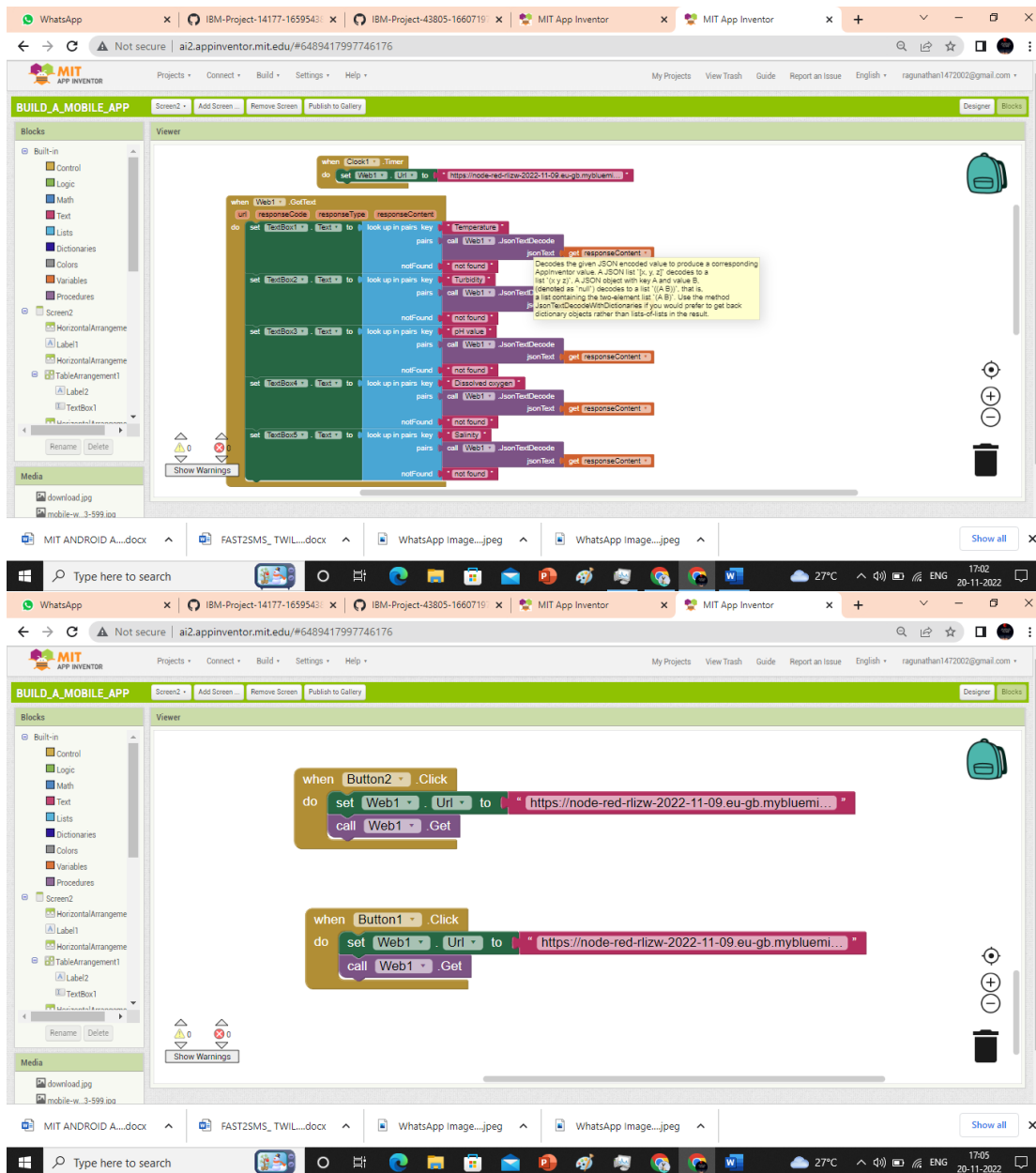


IBM WATSON IOT PLATFORM:



## MIT APP INVENTOR





CODING:

```
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys
```

```
organization = "I12t39"
deviceType = "Spart"
```

```
deviceId = "87546"  
authMethod = "token"  
authToken = "6363396476"
```

```
pH = random.randint(1, 14)  
turb = random.randint(1, 1000)  
temp = random.randint(0, 100)  
Salin = random.randint(0,100)  
Doxy = random.randint(70,120)
```

```
def myCommandCallback(cmd):  
    print("Command Received: %s" % cmd.data['command'])  
    status=cmd.data['command']  
    if status=="lighton":  
        print ("led is on")  
    elif status == "lightoff":  
        print ("led is off")  
    else:  
        print ("please send proper command")
```

```
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()
```

```
deviceCli.connect()
```

```
while True:
```

```
    pH = random.randint(1, 14)
```

```

turb = random.randint(1, 10)
temp = random.randint(20, 100)
Salin = random.randint(0,120)
Doxy = random.randint(70,120)

data = {'pH': pH, 'turb': turb, 'temp': temp , 'Salin': Salin , 'Doxy':
Doxy}

def myOnPublishCallback():
    print("Published pH= %s" % pH, "Turbidity:%s" % turb,
"Temperature:%s" % temp,"Salinity:%s" % Salin,"Disoxygen:%s" %
Doxy,"to IBM WATSON" )

    success = deviceCli.publishEvent("demo", "json", data, qos=0,
on_publish=myOnPublishCallback)
    if not success:
        print("Not Connected to ibmiot")
        time.sleep(1)
        deviceCli.commandCallback = myCommandCallback

deviceCli.disconnect()

```



## OUTPUT

```
*Python 3.7.0 Shell*
File Edit Shell Debug Options Window Help
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: C:\Users\MY PC\AppData\Local\Programs\Python\Python37\qw.py ====
2022-11-22 19:19:52,991 ibmiotf.device.Client INFO Connected successfully: d:112t39:Spant:87546
Published pH= 9 Turbidity:3 Temperature:99 Salinity:108 Disoxygen:101 to IBM WATSON
Published pH= 14 Turbidity:1 Temperature:67 Salinity:44 Disoxygen:72 to IBM WATSON
Published pH= 13 Turbidity:3 Temperature:92 Salinity:53 Disoxygen:100 to IBM WATSON
Published pH= 10 Turbidity:5 Temperature:90 Salinity:120 Disoxygen:99 to IBM WATSON
Published pH= 4 Turbidity:8 Temperature:36 Salinity:89 Disoxygen:84 to IBM WATSON
Published pH= 9 Turbidity:10 Temperature:22 Salinity:117 Disoxygen:88 to IBM WATSON
Published pH= 4 Turbidity:2 Temperature:38 Salinity:17 Disoxygen:78 to IBM WATSON
Published pH= 8 Turbidity:1 Temperature:68 Salinity:82 Disoxygen:83 to IBM WATSON
Published pH= 4 Turbidity:2 Temperature:52 Salinity:33 Disoxygen:118 to IBM WATSON
Published pH= 12 Turbidity:6 Temperature:30 Salinity:0 Disoxygen:120 to IBM WATSON
Published pH= 9 Turbidity:1 Temperature:76 Salinity:2 Disoxygen:106 to IBM WATSON
Published pH= 7 Turbidity:3 Temperature:71 Salinity:92 Disoxygen:101 to IBM WATSON
|
```

## 8. TESTING

### 8.1 Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	15	0	0	15
Client Application	45	0	0	45
Security	1	0	0	1
Outsource Shipping	2	0	0	2
Exception Reporting	10	0	0	10
Final Report Output	4	0	0	4
Version Control	3	0	0	3

### 8.2 USER ACCEPTANCE TESTING:

#### 1. Purpose of Document :

The main purpose of our project is to evaluate the parameters of river water and respective control measures to be taken based on our test cases. The data are published in IBM cloud server. The UI is deployed in the Node Red services and app is developed using MIT APP INVENTOR.

#### 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	9	5	4	3	21
Duplicate	2	0	2	0	4
External	3	4	1	2	10
Fixed	10	1	5	17	33
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	2	3
Won't Fix	0	3	3	1	7
Totals	24	13	17	25	79

## 9. RESULT

### 9.1 PERFROMANCE METRICS:

NFT - Risk Assessment									
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volumen Changes	Risk Score	Justification
1	REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM	New	Low	No Changes	Moderate	3days	>5 to 10%	ORANGE	As we have seen the changes

## PERFORMANCE TABLE:

PARAMETER	PERFORMANCE	DESCRIPTION
ADMIN TESTING	95%-100%	THE TESTING DONE BEFORE IT IS DEPLOYED AS AN APP
CUSTOMER SATISFACTION	75-85%	THE CUSTOMER NEED TO BE SATISFIED WITH THE MOBILE APPLICATION
USER INTERFACE	65-85%	THE APP CAN USED BY ANYONE.(EASE OF ACCESS)
SEVER RESPONSE	50-75%	url - response
DATA VALIDATION WITH NO. OF TEST CASE	60-80% (15-30 TESTCASE)	VALID DATA FROM THE APP
ERROR	3-5%	REAL-TIME DELAY MAY OCCUR

## **10.ADVANTAGES AND DISADVANTAGES**

### **ADVANTAGES:**

- The prototype developed for water quality maintenance is very beneficial for safeguarding public health and also adds to the clean environment.
- The automation of this water monitoring, cleaning and control process removes the need of manual labor and thus saves time and money.
- The automation of the system makes the control and monitoring process more efficient and effective. Real time monitoring on mobile phone which is possible through the interface of plc with Arduino and Bluetooth module allows remote controlling of the system.

### **DISADVANTAGES:**

- It is difficult to collect the water samples from all the area of the water body.
- The cost of analysis is very high.
- The lab testing and analysis takes some time and hence the lab results does not reflect real time water quality measurement due to delay in measurement.
- The process is time consuming due to slow process of manual data collection from different locations of the water body.
- The method is prone to human errors of various forms.

## 11.CONCLUSION

Thus our project is used to 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. It has widespread Application and extension value. 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 deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi.

## **12.FUTURE SCOPE**

We use water detection sensor has unique advantage. It consumes less time to monitor than a manual method for checking polluted levels, and notifies immediately to reduce affected rate of pollution in water. People who are living in rural areas near to the river will be very satisfied with our idea. It will be useful to monitor water pollution in specific area. So this system prevent people from water pollution. It will be used for farming purpose to check quality water, temperature and PH level. Our Impact of this project is also create a social satisfaction for farmers too. The scalability of this project gives the addition of more different type of sensors. By interfacing the relay we can control the supply of water. We can also implement as a revenue model. 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.

## **13.APPENDIX**

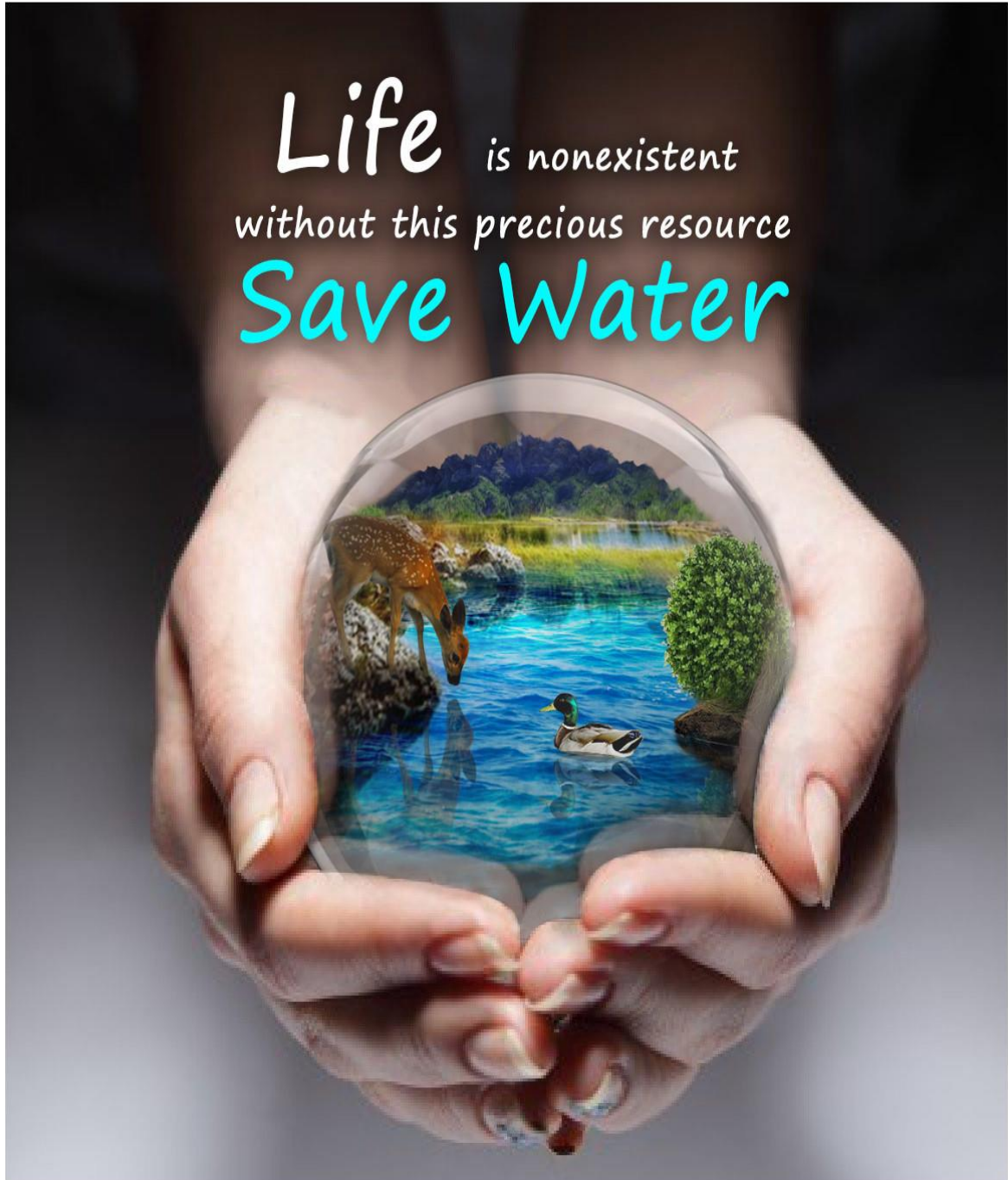
GITHUB LINK:

<https://github.com/IBM-EPBL/IBM-Project-47156-1660796863>

DEMO VIDEO LINK:

<https://drive.google.com/file/d/1NYS2ZGvNrCgfqzScspDbXDkI3lhlVFLY/view?usp=drivesdk>

*Life* is nonexistent  
without this precious resource  
**Save Water**





**“THANK YOU”**