

# **PROJECT REPORT**

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

**TEAM ID: PNT2022TMID14081**

### **TEAM MEMBERS:**

- 1.UDHAYANITHI
- 2.VENKATESH
- 3.VIGNESH
- 4.VINISHA

# INDEX

## **1.INTRODUCTION**

### **1.1 Project Overview**

### **1.2 Purpose**

## **2.LITERATURE SURVEY**

### **2.1 Existing problem**

### **2.2 References**

### **2.3 Problem Statement Definition**

## **3.IDEATION & PROPOSED SOLUTION**

### **3.1 Empathy Map Canvas**

### **3.2 Ideation & Brainstorming**

### **3.3 Proposed Solution**

### **3.4 Problem Solution fit**

## **4.REQUIREMENT ANALYSIS**

### **4.1 Functional requirement**

### **4.2 Non-Functional requirements**

## **5.PROJECT DESIGN**

### **5.1 Data Flow Diagrams**

### **5.2 Solution & Technical Architecture**

### **5.3 User Stories**

## **6.PROJECT PLANNING & SCHEDULING**

### **6.1 Sprint Planning & Estimation**

## **6.2 Sprint Delivery Schedule**

## **6.3 Reports from JIRA**

## **7. CODING & SOLUTIONING**

### **7.1 Feature 1**

### **7.2 Feature 2**

## **8. TESTING**

### **8.1 Test Cases**

### **8.2 User Acceptance Testing**

## **9. RESULTS**

### **9.1 Performance Metrics 10.**

## **ADVANTAGES & DISADVANTAGES11.**

## **CONCLUSION**

## **12. FUTURE SCOPE**

## **13. APPENDIX**

### **13.1 Source Code**

### **13.2 GitHub & Project Demo Link**

## **INTRODUCTION**

### **1.1 Project Overview:**

#### **River Water quality monitoring System**

River water which is used as drinking water is a very precious commodity for all human beings. 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 for 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 biotic 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 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 frameworks 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 swimming pools. 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 fields, hence the parameters affecting the quality of river-water need to be analyzed and to be used for water treatment purpose.

S. N O	TITLE	TECHNOLOGY	ADVANTAGES	DRAWBACKS
1	Design And Development Of A Water Quality Monitoring System By Using IOT	This system checks the quality of water in real time through various sensors (one for each parameter ,Ph, Temp, Pollution)and uses with module to transfer the data collected from sensor to smart Phone/Pc	This system consists of multiple sensors to measure a various parameter. It is more accuracy and requires less man power.	This method consumes more time and cost of the system depends on the number of parameter
2	Water Quality Monitoring System Using IOT And Machine Learning	To measure various chemical and physical properties of water like temperature and particle density of water using sensor	Due to automation it will reduce the time to check the parameter.  This is economically affordable for common people. Accuracy in measurement. Email alert is sent to user	System hardware need to be handled with care.  Only limited user are added to handle the system. Only one person authorized to access it.
3	Real-Time Water Quality Monitoring System	Existing method, the system which are semi-automated or manually controlled device which are handle by the person responsible of monitoring the water quality	Based on the existing water quality monitoring system and scenario of water stay that proposed system is more suitable to monitor the water.	These analysis can be performed by human intervention which are specific period only.

## **2.2 References:**

1. K.S. Adu-Manu, C. Tapparello, W. Heinzelman, F.A. Katsriku, J.-D. Abdulai

**Water quality monitoring using wireless sensor networks:** Current trends and future research directions ACM Transactions on Sensor Networks (TOSN) (2017).

2. S. Thombre, R.U. Islam, K. Andersson, M.S. Hossain

**IP based Wireless Sensor Networks : performance Analysis using Simulations and Experiments.**Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 7 (2016).

3. Rushikesh Kshirsagar, R.Mudhalwadkar, Saish Kalaskar

**Design and Development of IoT Based Water Quality Measurement System.** The idea about low-cost IOT based portable approach for water quality measurements system. Because of its low-cost approach, everyone can afford to use it to determine quality of water(2019).

4. N. Vijayakumar, R. Ramya

**The real time monitoring of water quality in IoT environment.** The parameters such as temperature, PH, turbidity, conductivity, dissolved oxygen of the water can be measured. The measured values from the sensors can be processed by the core controller. The raspberry PI B+ model can be used as a core controller (2015).

5. M.Chitra, D. Sadhihs Kumar, R. Aravindh, M. Murali, R. Vaithilingame

**IoT based Water Flood Detection and Early Warning System.**The collected information (data) from the water level sensor and temperature and humidity sensor passed to Thingview Android application in order to find the flow graph level of the water level in the river and temperature, humidity values and sends SMS to the registered contact mobile numbers (2020).

6. Dr.Geetha

**IoT based real time water quality monitoring system using smart sensor**

WQM is a cost effective and efficient system designed to monitor drinking water quality with the help of IOT(2020).

## **2.3 Problem Statement:**

The reduce the river water pollution and to monitor the parameters of river water and control measures can impact vegetation, health. The Real time analysis of Indicators of River water(Ph,salinity,nutrients,etc...)



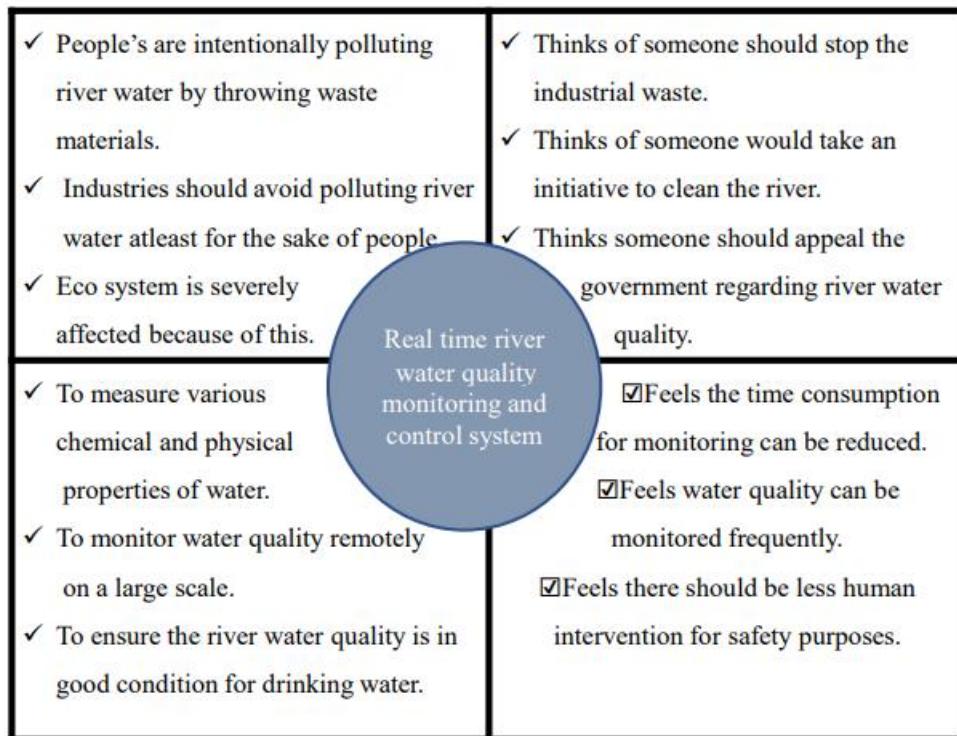


I am	Common people living a normal life on Earth	Common people living on Earth who consume water in their day-to-day life for different purpose
I'm trying to	Monitor the quality of the water	Wants to monitor the water consumed everyday whether the water is contaminated or pure, pH, temperature, salinity in it
but	Do not know to monitor the quality of water	Time consuming process for manual testing
because	Lack of required knowledge	Common people lack knowledge of this type of testing, sensors etc.
Which makes me feel	Doubted and fearful of the consumed water	Decline of pure water, increasing viral diseases

## **IDEATION & PROPOSED SOLUTION**

### **3.1 Empathy Map Canvas:**

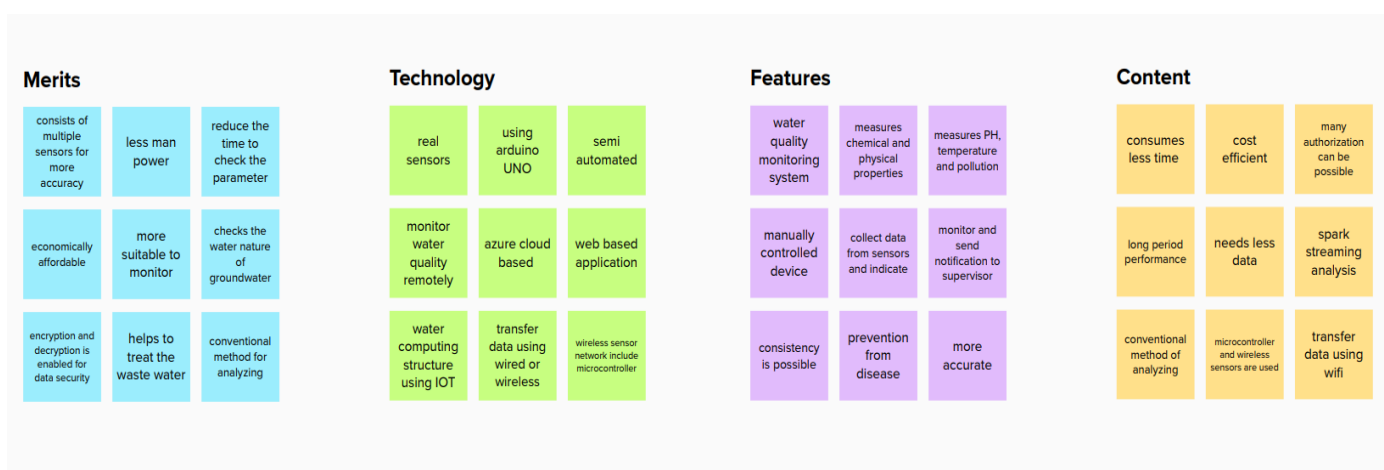
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



### 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. 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 of creative 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 sitting in the same room.



### **3.1 Proposed Solution:**

<b>S.No.</b>	<b>Parameter</b>	<b>Description</b>
1.	Problem Statement (Problem to be solved)	Due to lack of a complete monitoring system, the river water was not in the control for drinking and has changes in the chemical and physical properties
2.	Idea / Solution description	The main aim of the project is to build a model which is used for monitoring quality of the river water and control its parameter
3.	Novelty / Uniqueness	In our Project we give more important for physical and chemical properties of the water
4.	Social Impact / Customer Satisfaction	By solving this issue, the people can use the river water for even drinking purpose.
5.	Business Model (Revenue Model)	The proposed system will help to monitor Quality of the river water and maintain its parameter
6.	Scalability of the Solution	It is highly scalable because it is cost efficient and provide more accuracy

## 3.2 PROBLEM SOLUTION:

### Problem-Solution fit canvas 2.0

Purpose / Vision

<p><b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span></p> <p>Who is your customer? i.e. working parents of 0-5 y.o. kids</p> <p>Deaf-mute and a normal person are the customers of this project.</p> <p>Define CS, fit into CC</p>	<p><b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span></p> <p>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.</p> <p>The new network connection of the device should be stable to capture the voice or sign languages</p>	<p><b>5. AVAILABLE SOLUTIONS</b> <span>AS</span></p> <p>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros &amp; cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking</p> <p>Nowadays Deaf Mute Communication Interpreter, Under Wearable communication method, there are Glove based system, Keypad method and Handicom Touchscreen.</p> <p>Explore AS, differentiate</p>
<p><b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span></p> <p>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</p> <p>Communication between the deaf and non-deaf has always been a very cumbersome task. This paper aims to cover the various prevailing methods of deaf-mute communication interpreter system. The two broad classification of the communication methodologies used by the deaf-mute people are Wearable Communication Device and Online Learning System.</p> <p>Focus on J&amp;P, tap into BE, understand RC</p>	<p><b>9. PROBLEM ROOT CAUSE</b> <span>RC</span></p> <p>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</p> <p>Communications between deaf-mute and a normal person has always been a challenging task. It is very difficult for mute people to convey their message to normal people. Since normal people are not trained on hand sign language. In emergency times conveying their message is very difficult. The human hand has remained a popular choice to convey information in situations where other forms like speech cannot be used. Voice Conversion System with Hand Gesture Recognition and translation will be very useful to have a proper conversation between a normal person and an impaired person in any language.</p>	<p><b>7. BEHAVIOUR</b> <span>BE</span></p> <p>What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</p> <p>Easy to use. can be able to respond quickly. Able to produce absolute translation. Should consume less data. Requirement of internet speed.</p> <p>Focus on J&amp;P, tap into BE, understand RC</p>
<p><b>3. TRIGGERS</b> <span>TR</span></p> <p>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</p> <p>If any specially abled people use this device for communication make the others to use this device.</p> <p><b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span></p> <p>How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure &gt; confident, in control - use it in your communication strategy &amp; design.</p> <p>It enables Specially abled people to convey their information using signs which get converted to human-understandable language and speech.</p> <p>Identify strong TR &amp; EM</p>	<p><b>10. YOUR SOLUTION</b> <span>SL</span></p> <p>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</p> <p>An app is built which uses this model. This app enables deaf and dumb people to convey their information using signs which get converted to human-understandable language and speech is given as output.</p>	<p><b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span></p> <p><b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7</p> <p>The specially abled people need to access the device.</p> <p><b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</p> <p>Store The datas and informations being transferred.</p> <p>Extract online &amp; offline CH of BE</p>



Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 license  
Created by Daria Nepriakhina / Amaltama.com



## **4 REQUIREMENT ANALYSIS**

### **4.1 Functional Requirements:**

Following are the functional requirements of the proposed solution.

<b>FR No.</b>	<b>Functional Requirement (Epic)</b>	<b>Sub Requirement (Story / Sub-Task)</b>
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

### **4.2 Non-functional Requirements:**

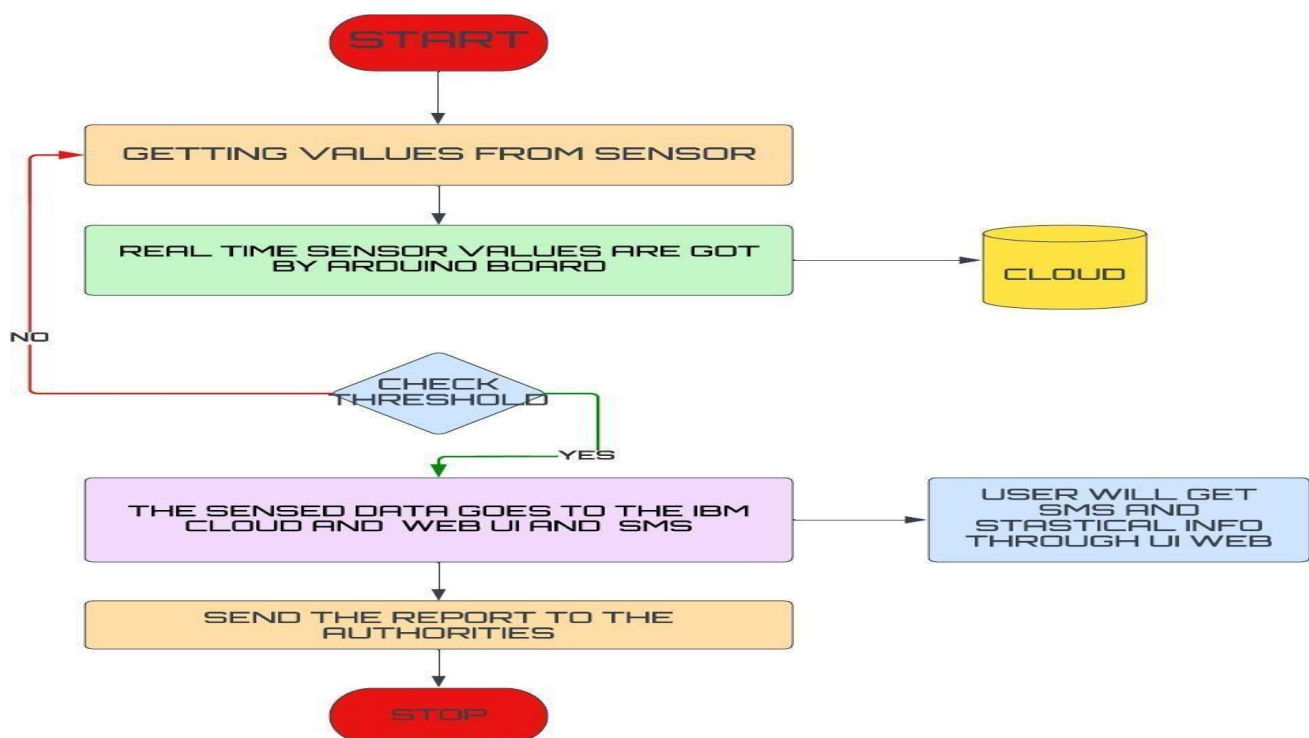
Following are the non-functional requirements of the proposed solution.

<b>FR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR-1	<b>Usability</b>	Load time for user interface screens shall not be more than 2 seconds.
NFR-2	<b>Security</b>	User account is password protected Account creation done only after email verification
NFR-3	<b>Reliability</b>	Users can access their account 98% of the time without failure
NFR-4	<b>Performance</b>	Load time for user interface screens shall not be more than 2 seconds. Login info verified within 10 seconds.
NFR-5	<b>Availability</b>	Maximum down time will be about 4 hours
NFR-6	<b>Scalability</b>	System can handle about 1000 users at any given time

## 5 PROJECT DESIGN

### 5.1 Data Flow Diagrams:

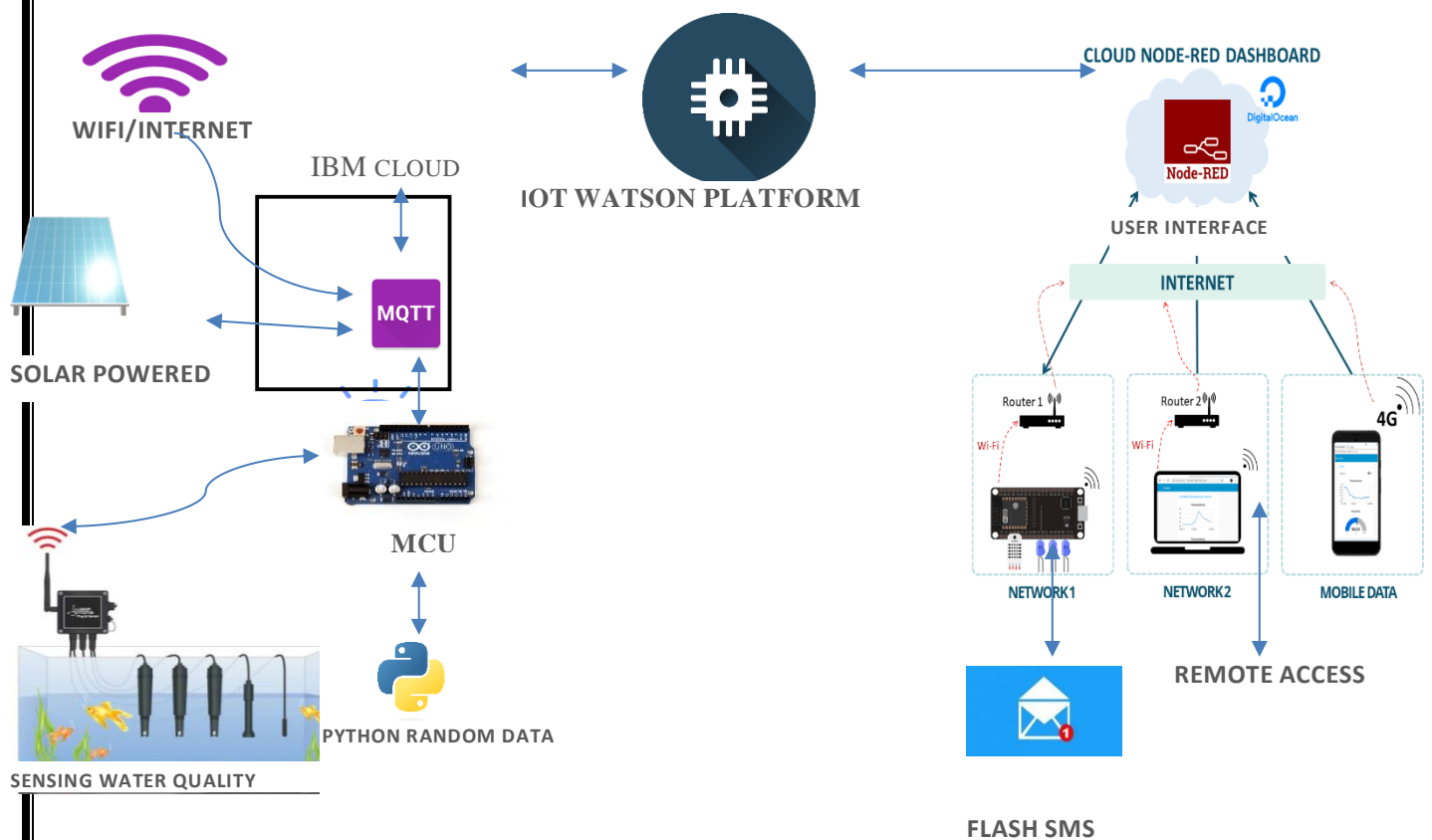
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirements graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



### 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



### Application Characteristics:

S.No	Characteristics	Description	Technology
1.	PH level Monitoring	The PH level of river water can be monitored via placing sensors in rivers.	PH-sensor
2.	Air Quality Monitoring	The clarity and purity of river water can be monitored	Surface Mount Sensor
3.	Temperature Monitoring	The temperature of river water can be monitored	Temperature sensor
4.	Water Treatment	can be used as both a safety device in the water purification process as carbon dioxide, methane, and carbon monoxide are some of the key gases produced during the treatment process	NDIR gas sensors
4.	Soil Condition Monitoring	Soil condition monitoring sensors allow farmers to collect data about rainfall, temperature, and other metrics over time to track trends and predict irrigation needs.	Acoustic sensor

### **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 G mail	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 Monitoing is Required.	High	Sprint-2

**6.****PROJECT PLANNING AND SCHEDULING****6.1 SPRINT PLANNING & SCHEDULING:**

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

## **6.2 SPRINT DELIVERY SCHEDULE**

### **Product Backlog, Sprint Schedule, and Estimation**

<b>Sprint</b>	<b>Functional Requirement(Epic)</b>	<b>User Story Number</b>	<b>User Story/Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
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	PRAGADEESHVARAN.S
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	SOORYA PRAKASH.S
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	SASIDHARAN.M
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	GUNA.M

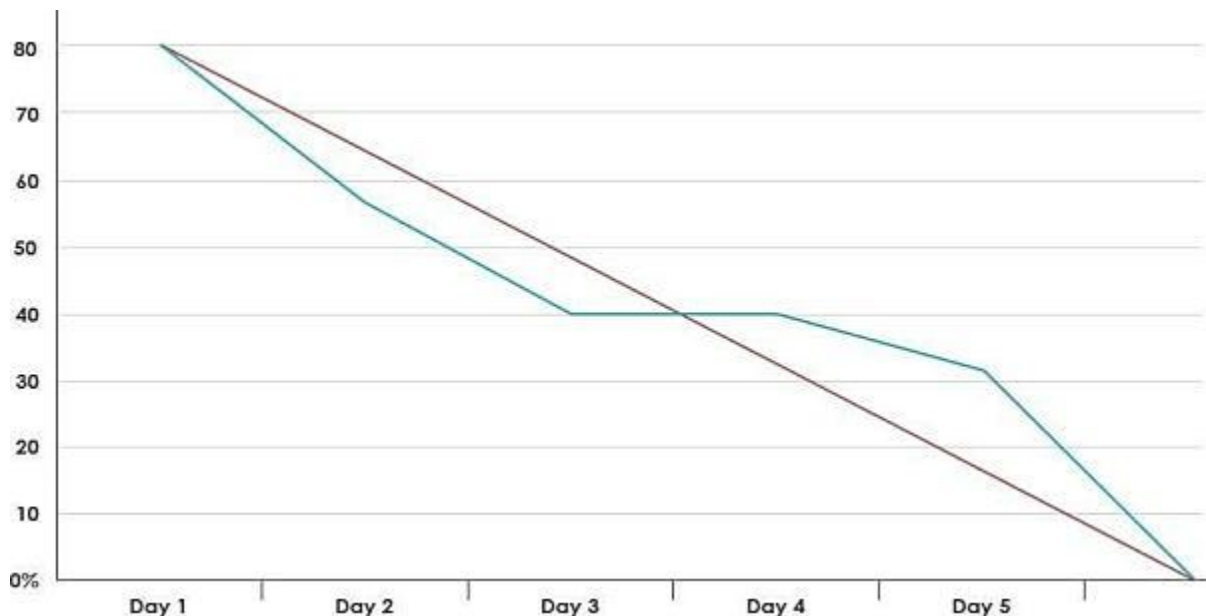
## Project Tracker, Velocity & Burndown Charts

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	6 Days	24 Oct 2022	29 Oct 2022	20	27 Oct 2022
Sprint -2	20	6 Days	28 Oct 2022	04 Nov 2022	30	30 Oct 2022
Sprint -3	20	6 Days	03 Nov 2022	10 Nov 2022	49	04 Nov 2022
Sprint -4	20	6 Days	08 Nov 2022	15 Nov 2022	50	09 Nov 2022

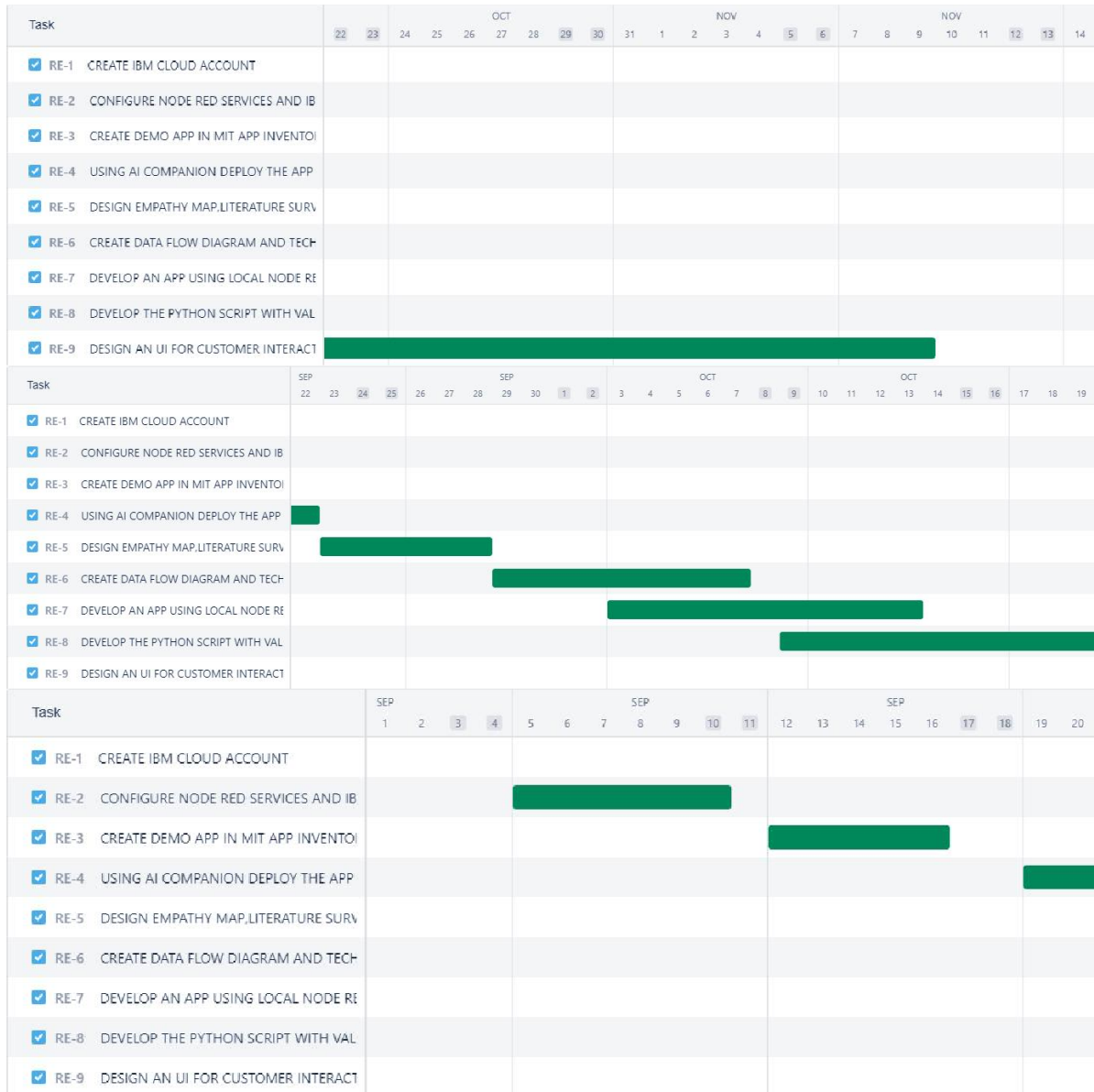
### Velocity:

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

### Burndown Chart:







### 6.3 REPORT FROM JIRA

**TIMELINE CREATED USING JIRA SOFTWARE**

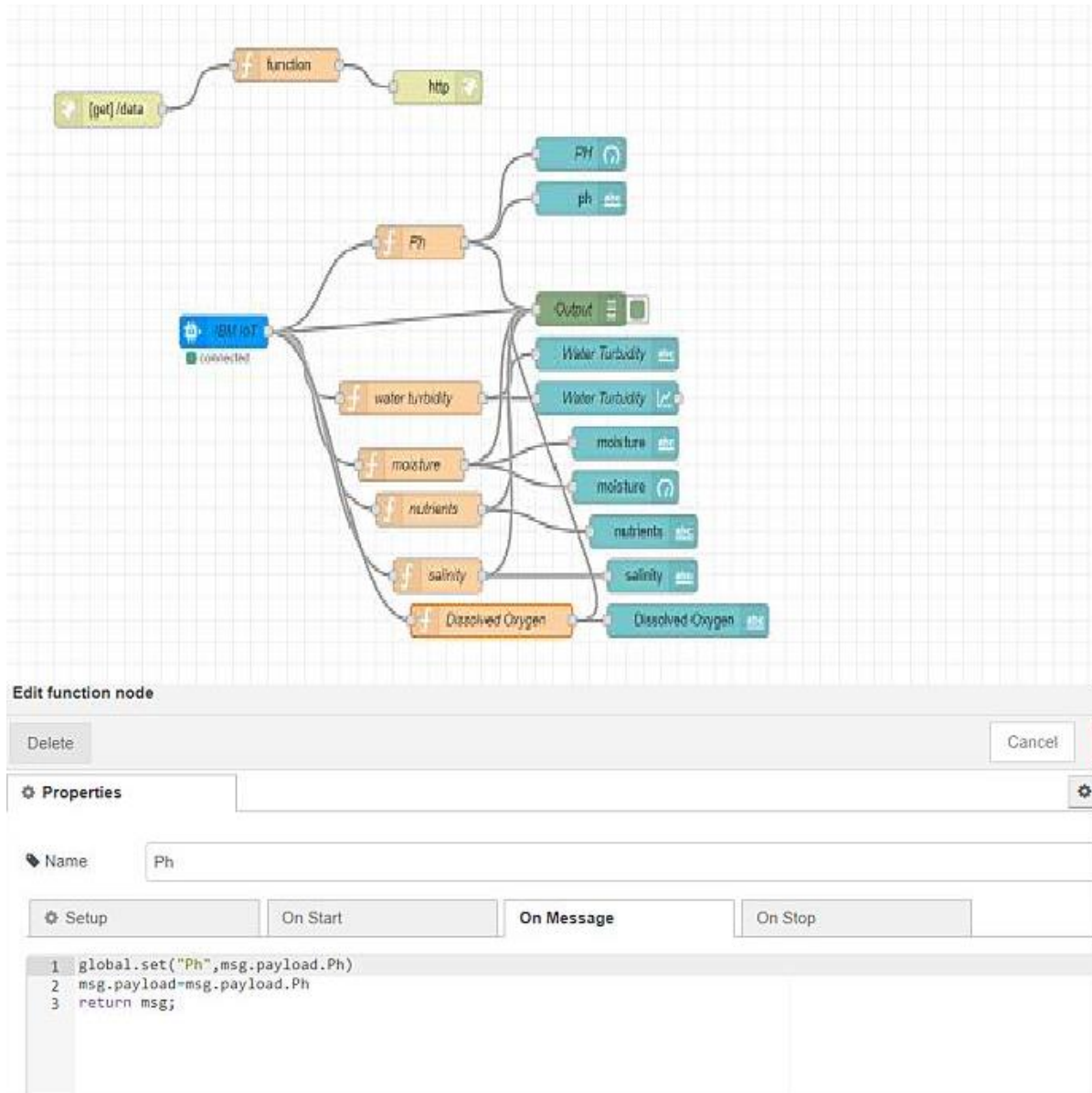
**LISTS IN JIRA:**

#	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 :**

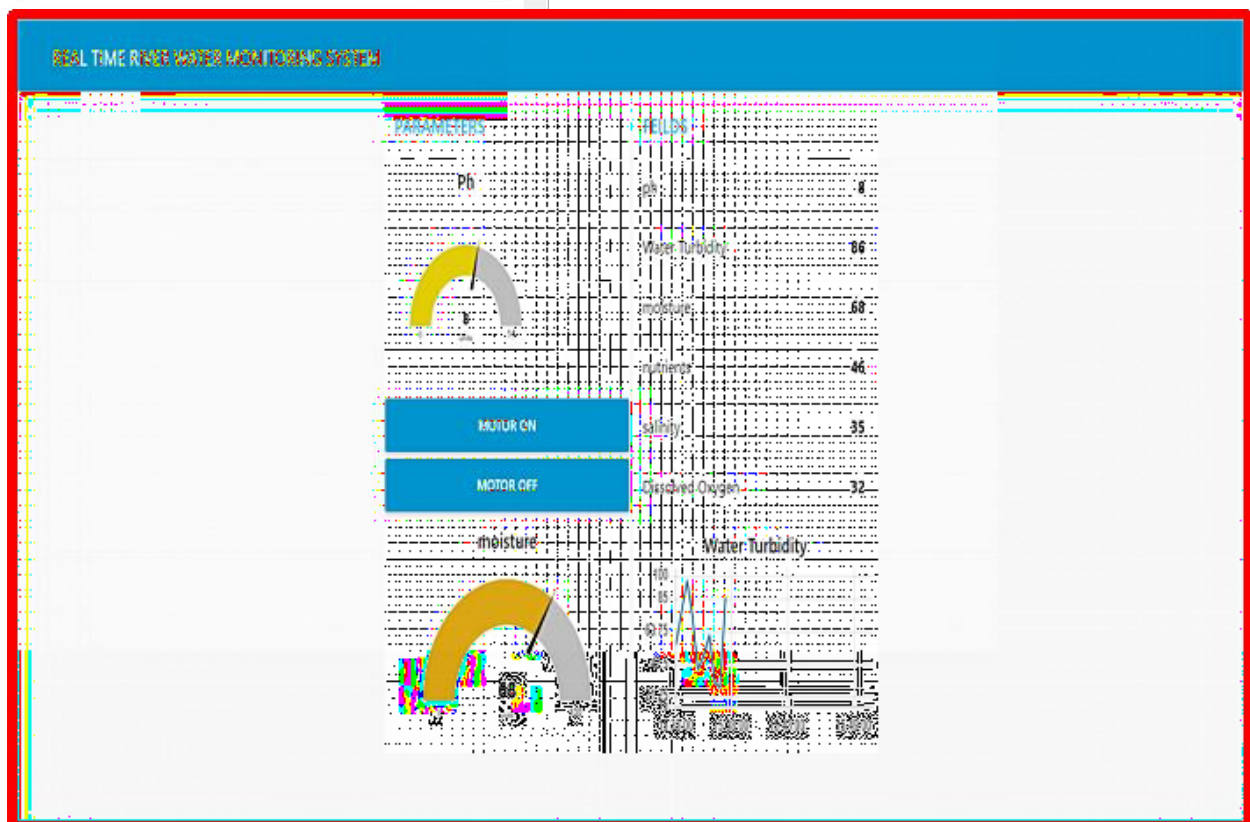
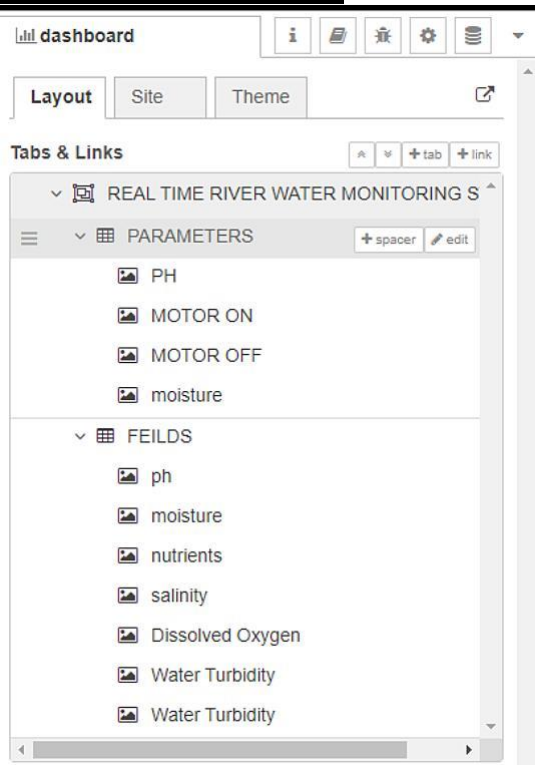
Name	Type	Related Schemes
 <b>ERROR IN MSG PAYLOAD EVENTS</b>	Base	• Default Issue Type Scheme
 <b>ISSUE IN CONFIGURING NODE RED DASHBOARD</b>	Base	• Default Issue Type Scheme
 <b>ERROR 1101</b> IN MIT APP INVENTOR	Subtask	• Default Issue Type Scheme
 <b>URL NOT RESPONDED</b> THE NODE RED DATA URL NOT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

## 7.

**CODING AND SOLUTIONING****7.1 NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:**



## Node red Dashboard:



**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 purpose of this document is to briefly explain the test coverage and open issues of the REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEMS project at the time of the release to User Acceptance Testing (UAT).

## 2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	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 PERFORMANCE 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 soon. 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.

## **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**

### **13.1 SOURCE CODE:**

#### **PYTHON CODE TO PUBLISH DATA**

```
#program to publish data in ibm watson iot platform
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random

#Provide your IBM Watson Device Credentials

#Org_ID
organization = "84708c"

#Device Type
deviceType = "abcd"

#device ID
deviceId = "12345"

#Method of Authentication
authMethod = "token"

#Auth-token
authToken = "12345678"
```



```

# exception handling method
#try block
try:
    deviceOptions = {"org": organization, "type": deviceType, "id":
deviceId, "auth-method":authMethod, "auth-token":authToken}
    deviceCli= ibmiotf.device.Client (deviceOptions)

#to handle the errors
except Exception as e:
    print ("Caught evention connecting device: %s" % str(e))
    sys.exit()

#device connection
deviceCli.connect()

#while Loop for getting the values
while True:
    Ph=random.randint (6,8)
    WaterTurbidity=random.randint (15,100)
    salinity=random.randint (500,1000)
    DissolvedOxygen=random.randint (60,130)
    conductivity=random.randint (100,1200)
    data = {'Ph' : Ph,
'WaterTurbidity':WaterTurbidity,'salinity':salinity,'DissolvedOxygen':
DissolvedOxygen,'conductivity':conductivity}

```

```

#define myonpublishcallback function
def myonPublishCallback():
    print ("Published Ph = %s" % Ph, "WaterTurbidity = %s %% " %
WaterTurbidity,"salinity = %s" % salinity,"DissolvedO2 = %s" %
DissolvedOxygen,"conductivity = %s" % conductivity)
    if(Ph<7.4 and salinity < 600 and DissolvedOxygen < 80 and
conductivity < 200):
        if(Ph>7.4 and salinity > 900 and DissolvedOxygen > 120 and
conductivity > 1100):
            print("UNSAFE, THE VALUES OF PARAMETERS ARE
NOT IN THE RANGE")
        else:
            print("Quality of River water is measured and its correct")

    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish = myonPublishCallback)
    if not success:
        print("Not connected to IOTF")
    #sleep time
    time.sleep(10)
#disconnect device
deviceCli.disconnect()

```

OUTPUT

```
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: E:\IBM PROJECTS\ibmpublish.py =====
2022-11-17 20:42:47,069  ibmiotf.device.Client  INFO  Connected successfully: d:84708c:a
bcd:12345
Published Ph = 8 WaterTurbidity = 54 % salinity = 862 DissolvedO2 = 81 conductivity = 175
Qualitv of River water is measured and its correct
```

Python 3.7.0 Shell

File

Edit

Shell

Debug

Options

Window

Help

Quality of River water is measured and its correct

Published Ph = 6 WaterTurbidity = 80 % salinity = 652 DissolvedO2 = 123 conductivity = 306

Quality of River water is measured and its correct

Published Ph = 8 WaterTurbidity = 57 % salinity = 579 DissolvedO2 = 121 conductivity = 459

Quality of River water is measured and its correct

Published Ph = 7 WaterTurbidity = 85 % salinity = 703 DissolvedO2 = 106 conductivity = 165

Quality of River water is measured and its correct

Published Ph = 8 WaterTurbidity = 61 % salinity = 872 DissolvedO2 = 124 conductivity = 892

Quality of River water is measured and its correct

Published Ph = 6 WaterTurbidity = 75 % salinity = 934 DissolvedO2 = 119 conductivity = 351

Quality of River water is measured and its correct

Published Ph = 7 WaterTurbidity = 65 % salinity = 732 DissolvedO2 = 102 conductivity = 1104

Quality of River water is measured and its correct

Published Ph = 7 WaterTurbidity = 97 % salinity = 791 DissolvedO2 = 75 conductivity = 887

Quality of River water is measured and its correct

Published Ph = 8 WaterTurbidity = 47 % salinity = 992 DissolvedO2 = 111 conductivity = 770

Quality of River water is measured and its correct

Published Ph = 8 WaterTurbidity = 23 % salinity = 570 DissolvedO2 = 73 conductivity = 135

Quality of River water is measured and its correct

Published Ph = 6 WaterTurbidity = 76 % salinity = 516 DissolvedO2 = 88 conductivity = 226

Quality of River water is measured and its correct

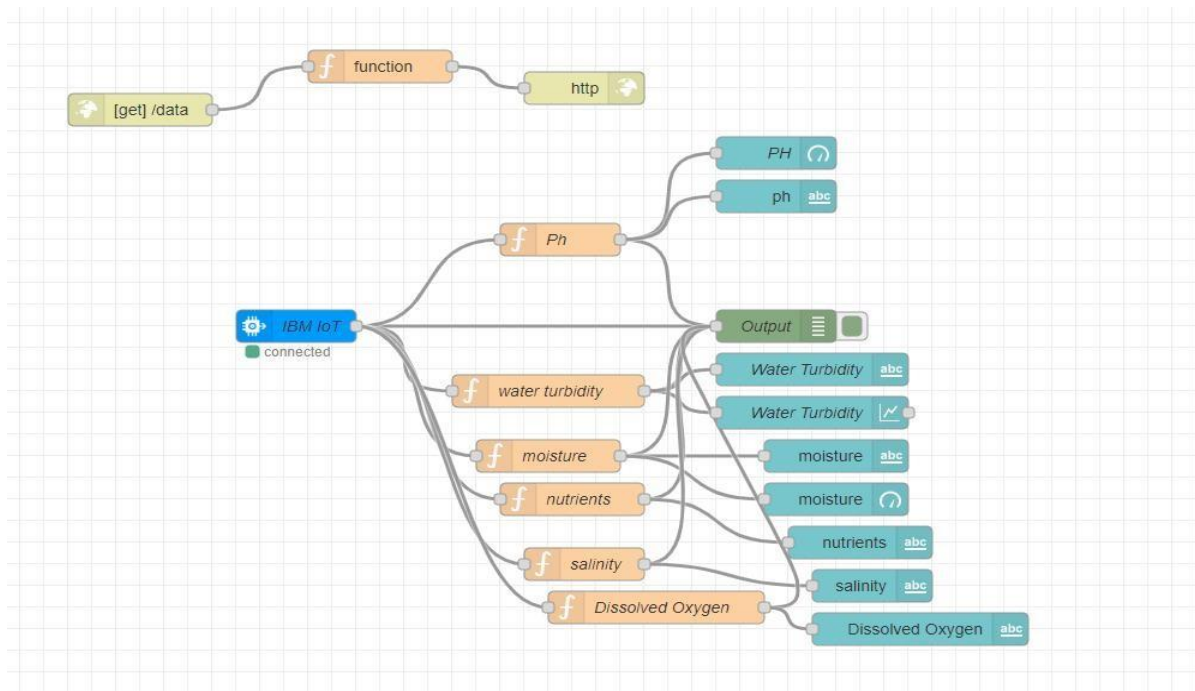
Published Ph = 8 WaterTurbidity = 23 % salinity = 754 DissolvedO2 = 127 conductivity = 1101

Quality of River water is measured and its correct

	Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
▼	12345	Connected	abcd	Device	Nov 9, 2022 9:43 PM	
Identity    Device Information    Recent Events    State    Logs						

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
IoTSensor	{"Ph":6,"WaterTurbidity":34,"salinity":605,"Disso...	json	a few seconds ago
IoTSensor	{"Ph":7,"WaterTurbidity":48,"salinity":871,"Disso...	json	a few seconds ago
event_1	{"Water_Turbidity":41,"Ph":1,"moisture":51,"nutr...	json	a few seconds ago
IoTSensor	{"Ph":8,"WaterTurbidity":88,"salinity":729,"Disso...	json	a few seconds ago
IoTSensor	{"Ph":6,"WaterTurbidity":23,"salinity":504,"Disso...	json	a few seconds ago



## HTML CODE:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <style>
    h1 {text-align: center;}
    p {text-align: center;}
    div {text-align: center;}
    body {
      background-image: url("https://thumbs.dreamstime.com/b/clear-transparent-light-blue-
water-pool-texture-background-150961732.jpg");
      background-color: #cccccc;
    }
  </style>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Login page in HTML</title>
</head>
<body>
```

```

<h1>Login Page</h1>
<form action="">
  <!-- Headings for the form -->
  <div class="headingsContainer">
    <h3>Sign in</h3>
    <p>Sign in with your username and password</p>
  </div>

  <!-- Main container for all inputs -->
  <div class="mainContainer">
    <!-- Username -->
    <label for="username">Your username</label>
    <input type="text" placeholder="Enter Username" name="username" required>

    <br><br>

    <!-- Password -->
    <label for="pswrd">Your password</label>
    <input type="password" placeholder="Enter Password" name="pswrd" required>

    <!-- sub container for the checkbox and forgot password link -->
    <div class="subcontainer">
      <label>
        <input type="checkbox" checked="checked" name="remember"> Remember me
      </label>
      <p class="forgotpsd"> <a href="#">Forgot Password?</a></p>
    </div>

    <button type="submit" onclick="window.location.href = 'https://node-red-qltdp-2022-11-07.eu-gb.mybluemix.net/ui';">Login</button>

    <!-- Sign up link -->

```

<p class="register">Not a member? <a href="#">Register here!</a></p>

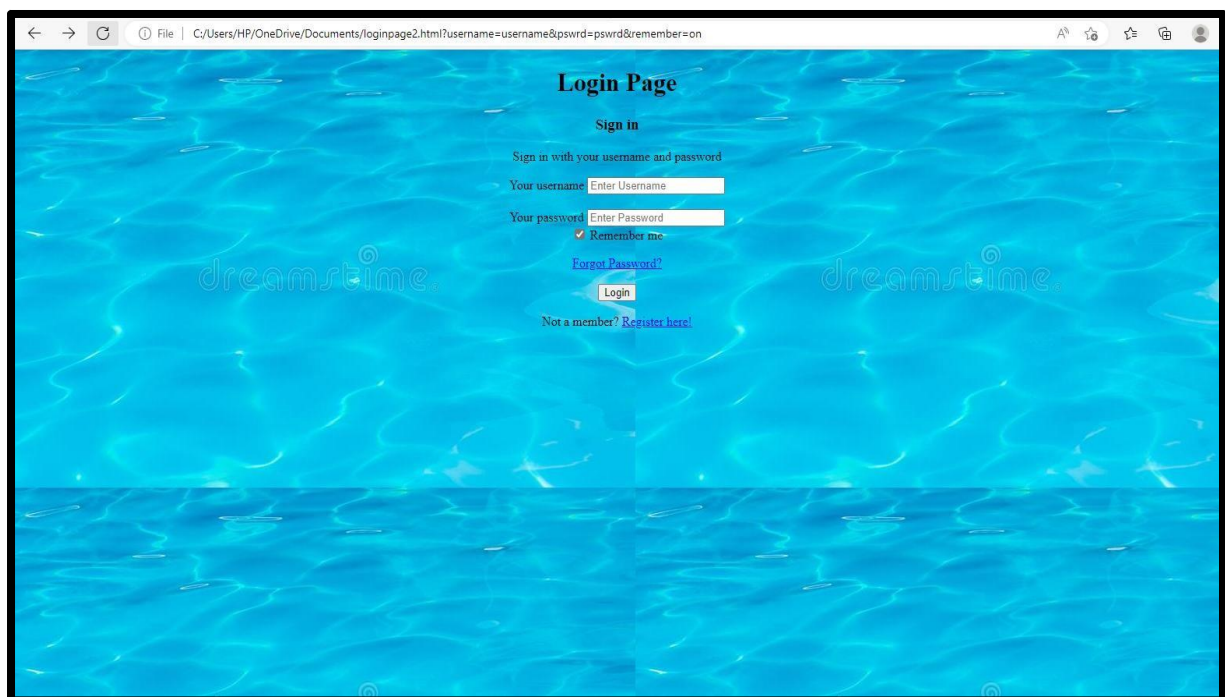
</div>

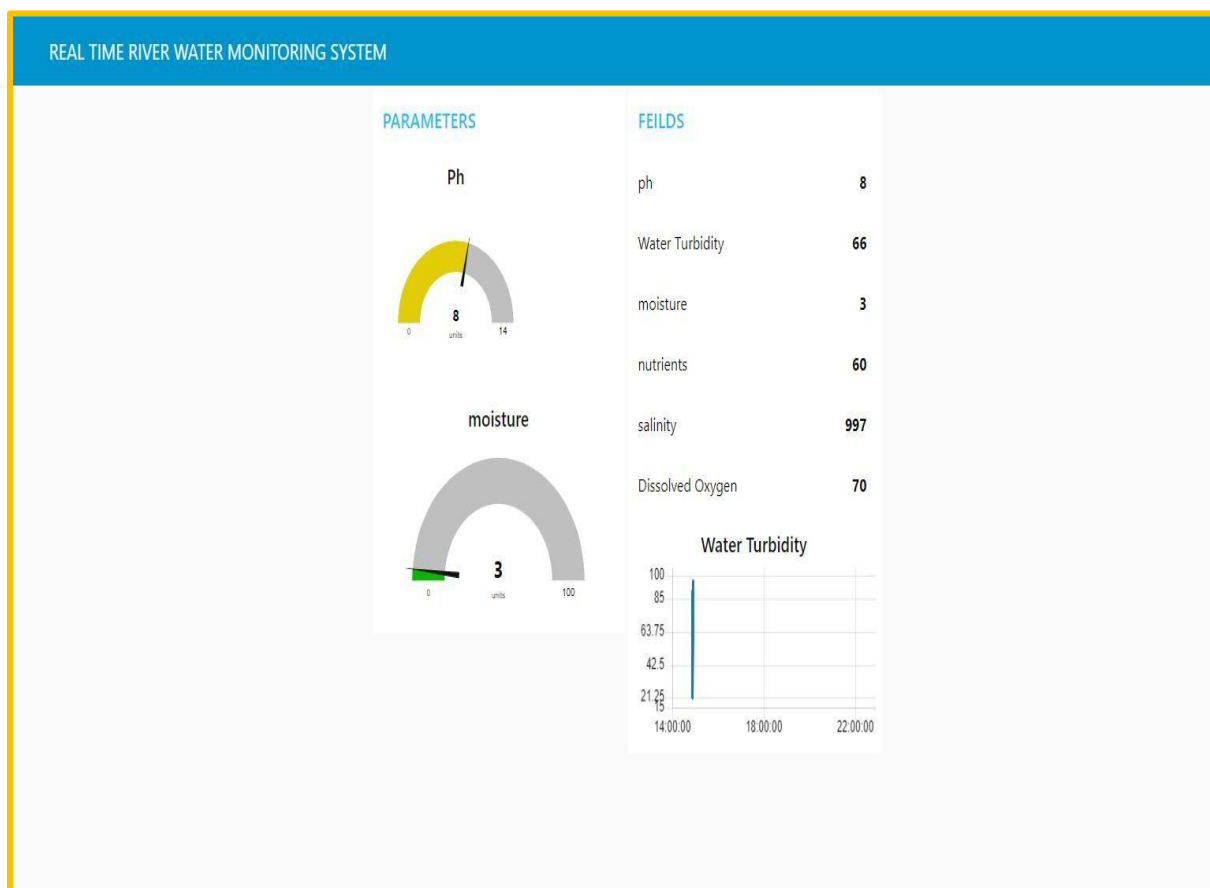
</p>

</form>

</body>

</html>





## MOBILE APP



### **13.2 GIT-HUB LINK:**

**<https://github.com/IBM-EPBL/IBM-Project-45092-1660728213.git>**

### **PROJECT DEMO LINK:**

1. **[https://node-red-qltdp-2022-11-07.eu-gb.mybluemix.net/ui/#!/0?socketid=WzX3XVVK\\_oZjhjBAAAI](https://node-red-qltdp-2022-11-07.eu-gb.mybluemix.net/ui/#!/0?socketid=WzX3XVVK_oZjhjBAAAI)**
2. **<https://possible-wheat-booth.glitch.me/>**