1.INTRODUCTION

1.1 Project Overview

This paper describes the primary driver behind the necessity of water quality control in flat systems for maintaining the health of human resources and sustainable, as well as to cut down on the amount of water used for home needs. The water system has a significant negative impact on the natural environment as a result of climate change and fluctuation. Only in water laboratories are incredible methods for sample collection, testing, and analysis used.

However, gathering, analysing, and quickly disseminating information to the appropriate people so they may make informed decisions when they are needed is not always simple. This research presents a water sensor system prototype for societal water level and quality monitoring.

1.2 Purpose

The need for advanced technology to monitor and maintain water quality is growing as it becomes more important to maintain high water quality. However, in this paper, we use lake water as a monitoring tool because it serves important functions such as providing drinking water, domestic use, recreation areas, important fisheries, and agricultural needs. If pollution is present in lake water, it can lower the water's quality and make it unsafe to drink as well as harm aquatic organisms. The attainable difficulties are becoming more difficult because to the adverse interactions between climate change and consistency. As a result, an increase in human activity has accelerated contamination and harm to lakes' freshwater supplies.

2.LITERATURE SURVEY

2.1 Existing Problem

Nowadays Water is the most valuable for all the human beings drinking water utilities faces challenges in real-time operation. These challenges occurred because of growing population, limited water resources, ageing infrastructure etc. Hence there is a need of better methodologies for monitoring the water quality. To reduce the water related diseases and prevent water population World health Organization (WHO) has also stated this crisis as "the largest mass poisoning of a population in history”

2.2 Reference

1.K. Khurana, R. Singh, A. Prakash, R. Chhabra, An IoT Based Water Health Monitoring System, International Journal of Computer Technology and Applications (IJCTA), 9(21), pp. 07-13, 2016.

2.Guidelines for Water Quality Monitoring Central, Central Pollution Control Board, 2007-2008

3.A.S. Rao, S. Marshall, J. Gubbi, M. Palaniswami, R. Sinnott, V. Pettigrove, Design of Low-cost Autonomous Water Quality Monitoring System, International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2013.

4. 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.

5.B. Chen, Y. Song, T. Jiang, Z. Chen, B. Huang, and B. Xu, "Real-time estimation of population exposure to PM2.5 using mobile- and station-based big data," Int J Environ Res Public Health, vol. 15, Mar 23 2018.

6. 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.

7. 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.

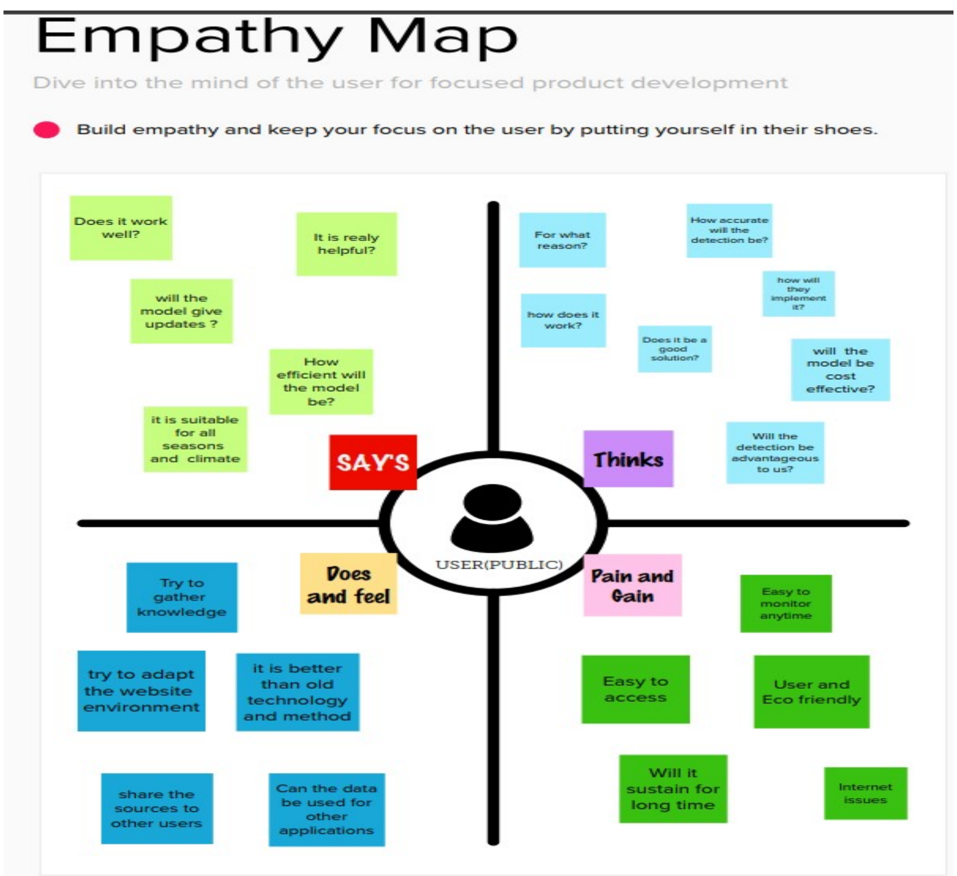
8. K. Andersson and M. S. Hossain, "Heterogeneous Wireless Sensor Networks for Flood Prediction Decision Support Systems", in 2015 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS) : 6th IEEE INFOCOM International Workshop on Mobility Management in the Networks of the Future World, 2015

2.3 Problem Statement Definition

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 use that water

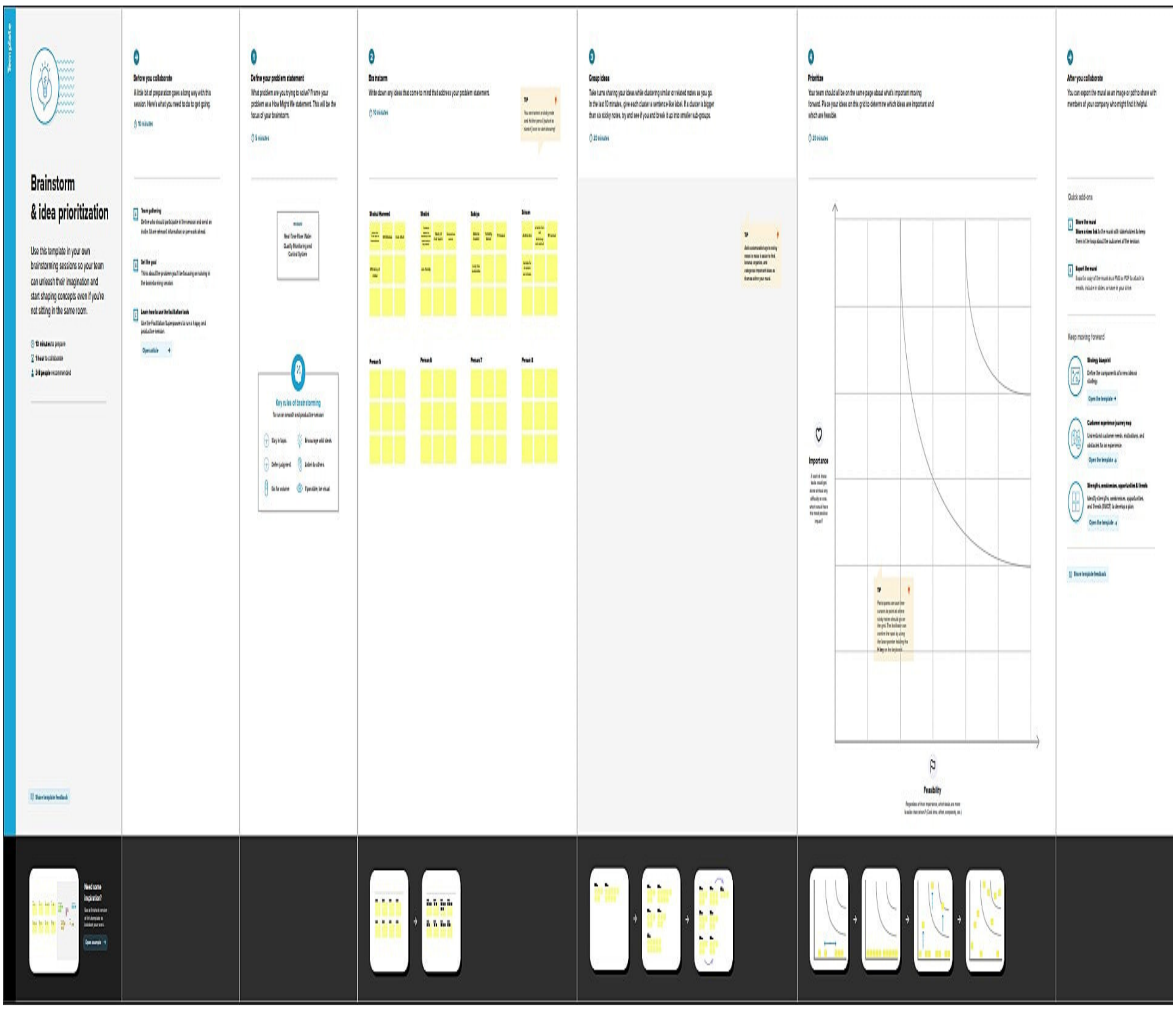
3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Canvas Map



The Empathy Map demonstrates how the general user population views the product and their concerns.

3.2 Ideation & Brainstorming



The above figure represents the ideation and brainstroming of the team to increase the effectiveness of a session, it's critical to include the appropriate knowledge and viewpoints.

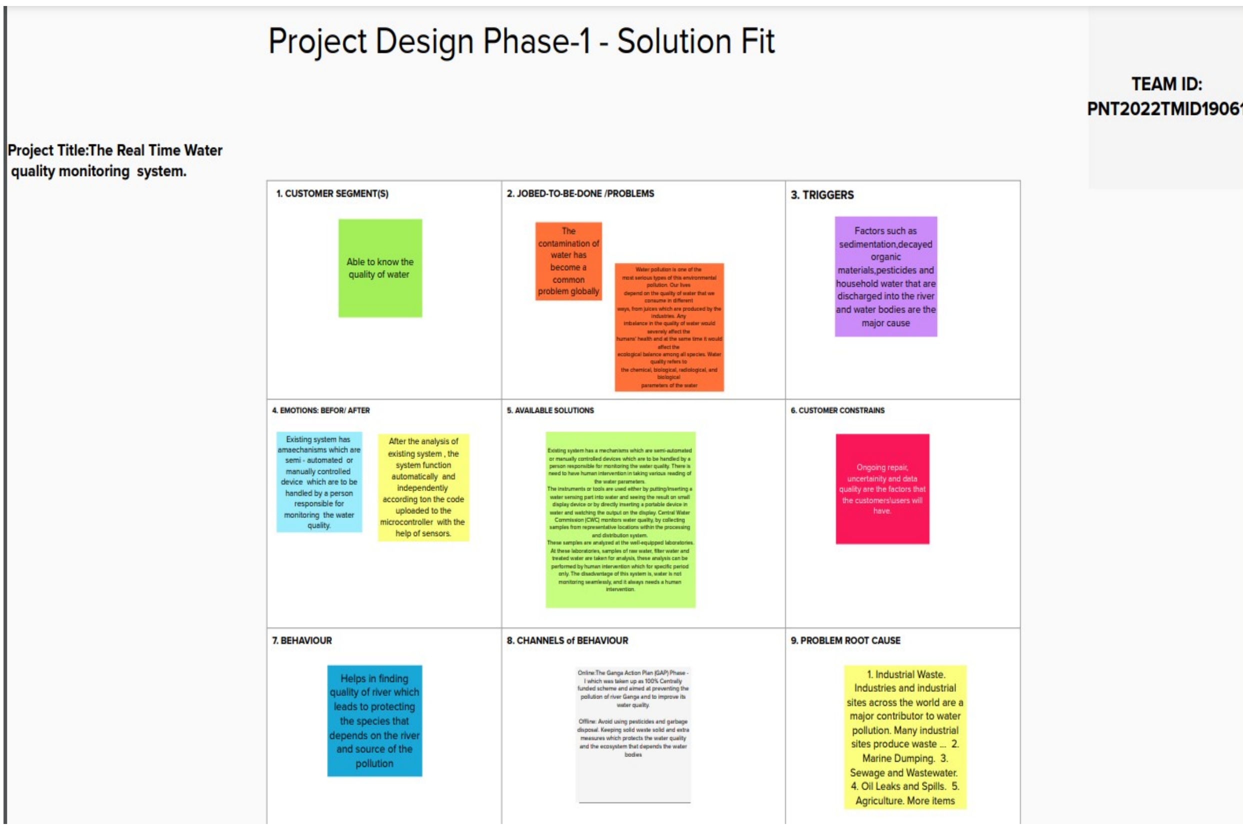
3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The contamination of water has become a common problem globally.
2.	Idea / Solution description	The current water quality monitoring system is a manual system with a tedious process and is very time consuming. In order to increase the frequency, the testing equipment can be placed in the water resources and detection of pollution can be made remotely. We need to estimate the water parameters like pH, turbidity, temperature and TDS as the variations in the values of these parameters point towards the presence of pollutants. Here we have designed and developed a low cost system for real time monitoring of the water quality using IoT.
3.	Novelty / Uniqueness	Real-time water quality monitoring uses technologically advanced monitoring sensors to collect in-stream water quality measurements and make data available for analysis and action in real time. Field teams deploy sensors strategically at designated points in a given surface water area to monitor waters within defined measurement parameters. Those sensors are monitored continuously to create a high-density dataset for fast analysis through a cloud-based data analytics platform.

4.	Social Impact / Customer Satisfaction	The benefits of advancing to a real-time water quality monitoring system are many but include as the most important, access to instantaneous data, ease and convenience of use, and improved accuracy of water quality measurements. Instant data and eliminated lag time in obtaining results allows for critical decision making before conditions in the field have changed, which is vital to preventing expensive repairs from a system breakdown. The systems allow easy access to all of the data in one place via the Internet, so users from any location—in the field, lab, or on site at a project or local emergency—can reach it. And the data itself is more accurate, not only because the human error involved in manual sampling is eliminated, but because monitoring results represent continuously analyzed data over multiple days and times instead of singular moments in time. All of these benefits help water system managers identify threats to surface water earlier, make more fully informed decisions affecting the systems and the public they serve, and comply with ever-changing regulatory water quality monitoring requirements at federal, state and local levels.
5.	Business Model (Revenue Model)	Frequent update of data , avoiding chemical and physical sampling in laboratory , reliable, easily accessible.

6.	Scalability of the Solution	This model briefly explains about minimal cost system that monitors the quality of water utilizing Raspberry pi module and PH, Turbidity, Conductivity and temperature sensors. The yield will be transferred to the cloud and the information from the cloud in inspected and put into public space if not checking does not takes place in proper format.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution

FR No.	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 detailsin website View traditional water eligibility in website
FR-3	Logout	Logs out the user successfully

4.2 Non-Functional requirements

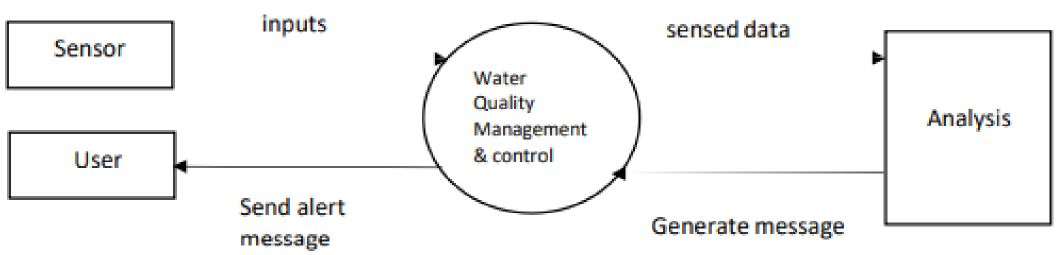
Following are the non-functional requirements of the proposed solution

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	It is efficient to use and has simple monitoring system
NFR-2	Security	IoT networks are incredibly safe and communication speed is also high. Account creation done only after email verification. The technology comfortably resolves all the issues
NFR-3	Reliability	Users can access their account 98% of the time without failure
NFR-4	Performance	Load time for user interface screens shall not be more than 2 seconds. Login info verified within 10 seconds
NFR-5	Availability	The monitoring system is made available for use at anytime with accuracy
NFR-6	Scalability	System can handle about 1000 users at

		any given time.

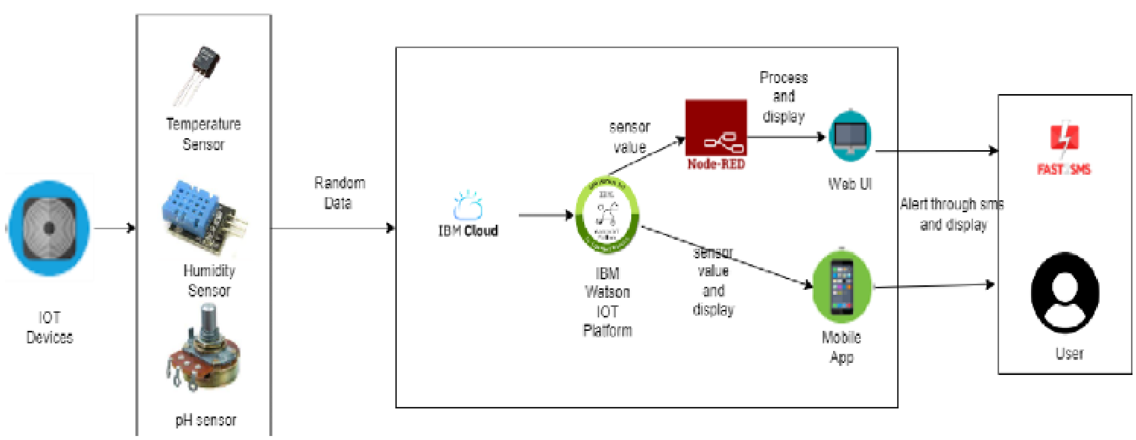
5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture

The Deliverable shall include the architectural diagram as below and the information as per the table 1 and table 2.



5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	FunctionalRequirement (Epic)	UserStory Number	User Story / Task	Acceptance criteria	Priority	Release
User(Mobile user)	Check Notification	USN-1	User can check the notification of the alert message.	User can check the notification	High	Sprint-1
	Check water parameters	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

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & 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	Shalini, Sobiya, Shahul hammed, Sriram
	Registration via facebook	USN-3	As a user, I can register for the application through Facebook	2	Low	
	Registration via Mail ID	USN-4	As a user, I can register for the application through Gmail	2	Medium	
Sprint-2	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	
	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	
	IBM Cloud service access		Get access to IBM cloud services.	2	High	

Sprint-3	Create the IBM Watson IoT and device Settings	USN-6	To create the IBM Watson IoT Platform and integrate the microcontroller with it, to send the sensed data on cloud	2	High	Shalini, Sobiya
	Create a node red service	USN-7	To create a node red service to integrate the IBM Watson along with the Web UI	2	Medium	Sriram, Shahul hameed
	Create a Web UI	USN-8	To create a Web UI, to access the data from the cloud and display all parameters.	2	Medium	Sobiya, Sriram,
	To develop a Python code	USN-9	Create a python code to sense the physical quantity and store data.	2	Medium	Shahul, Sobiya

6.2 Sprint Delivery Schedule

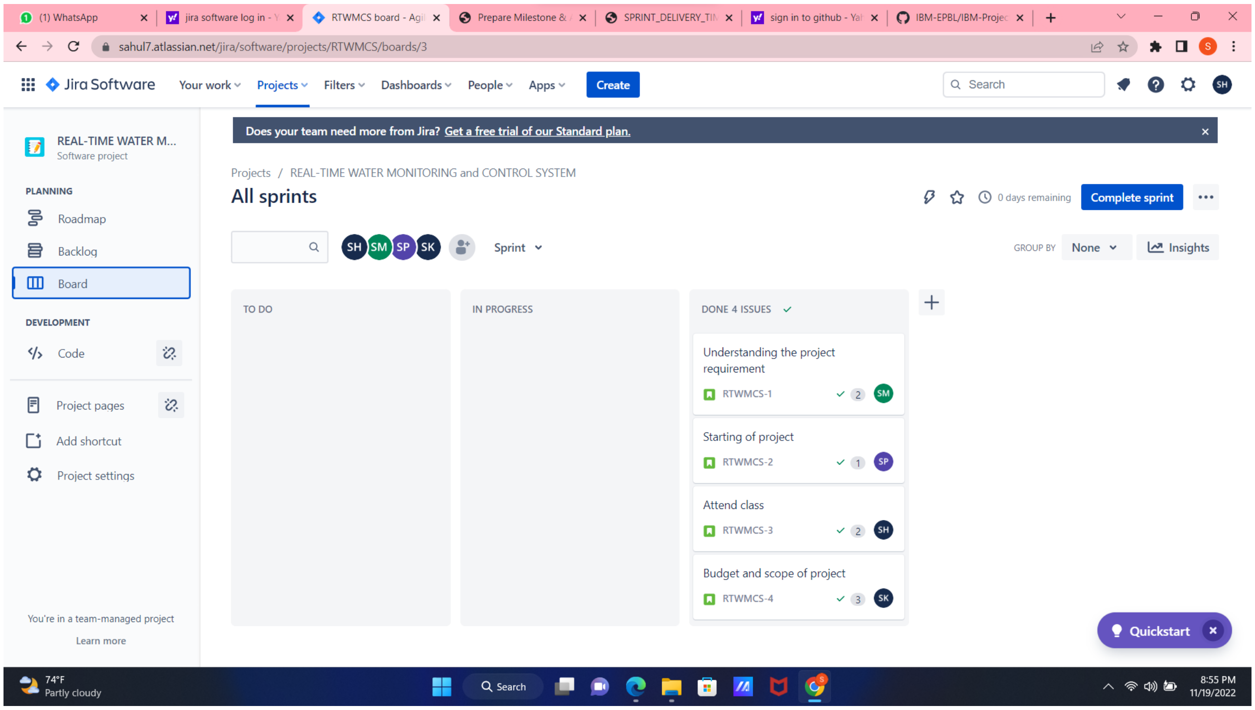
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	2 Days	25 Oct 2022	27 Oct 2022	20	29 Oct 2022
Sprint-2	20	4 Days	27 Oct 2022	31 Oct 2022	40	
Sprint-3	20	12 Days	31 Oct 2022	11 Nov 2022	60	
Sprint-4	20	6 Days	12 Nov 2022	18 Nov 2022	80	19 Nov 2022

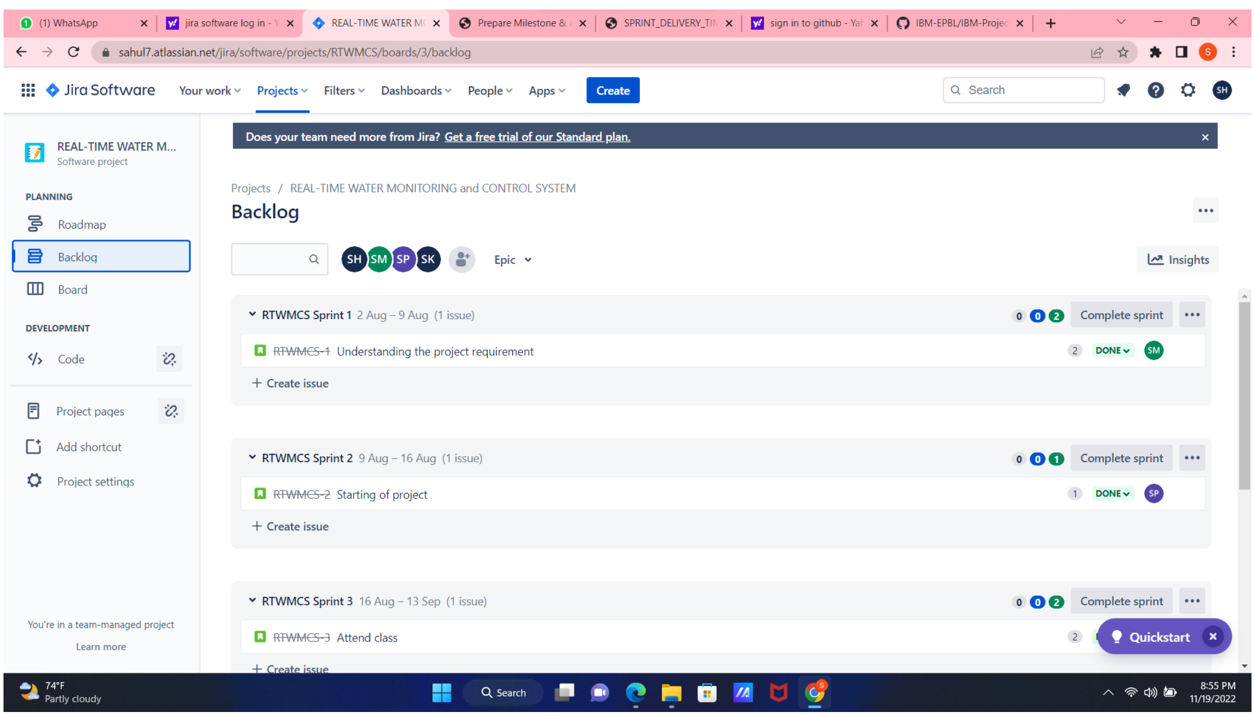
Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

6.3 Report from Jira

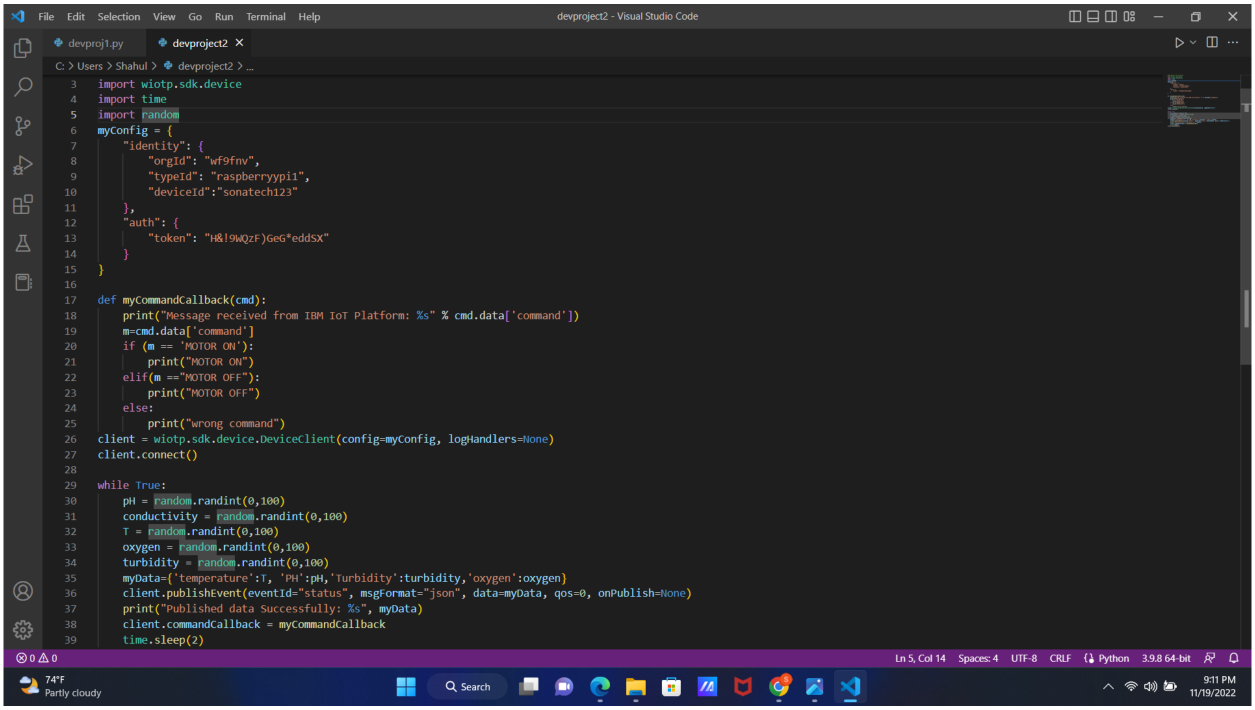




7. CODING & SOLUTIONING (Explain the features added in the project along with code)

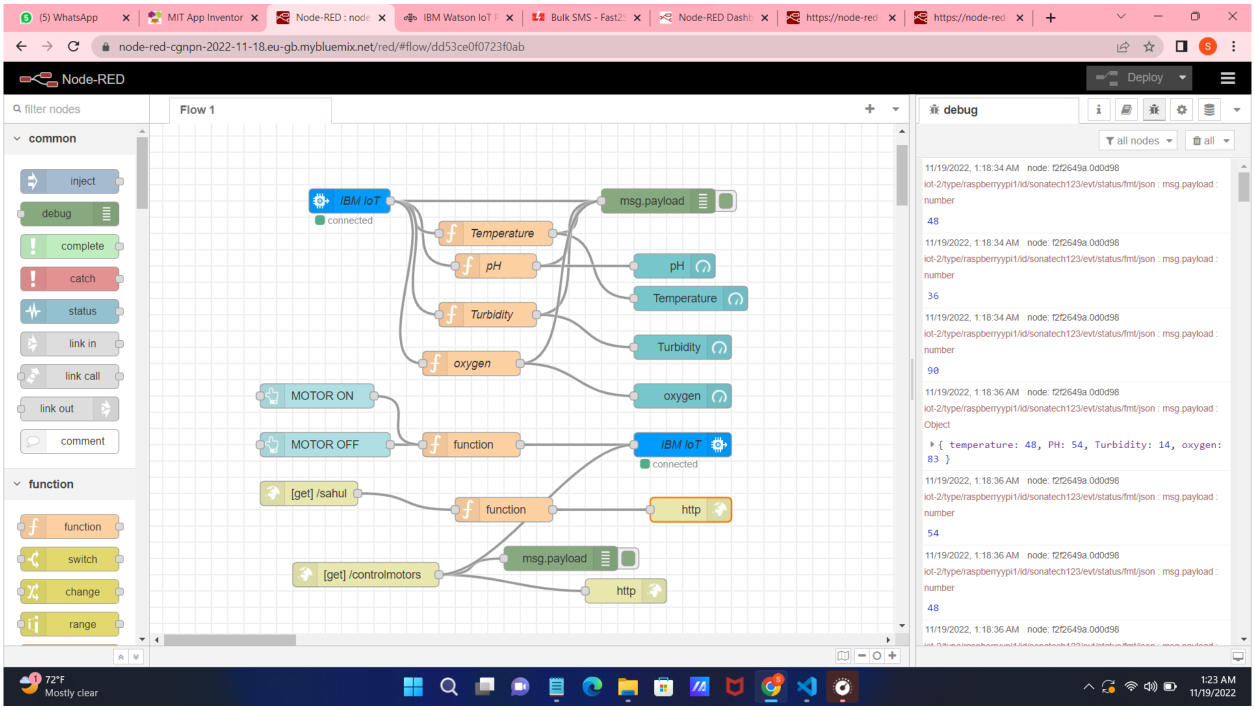
7.1 Feature 1

The proposed system has coding part in which the coding is been done using Python IDE or visual studio and the python code is been connected to UI as well as Watson IOT cloud platform.

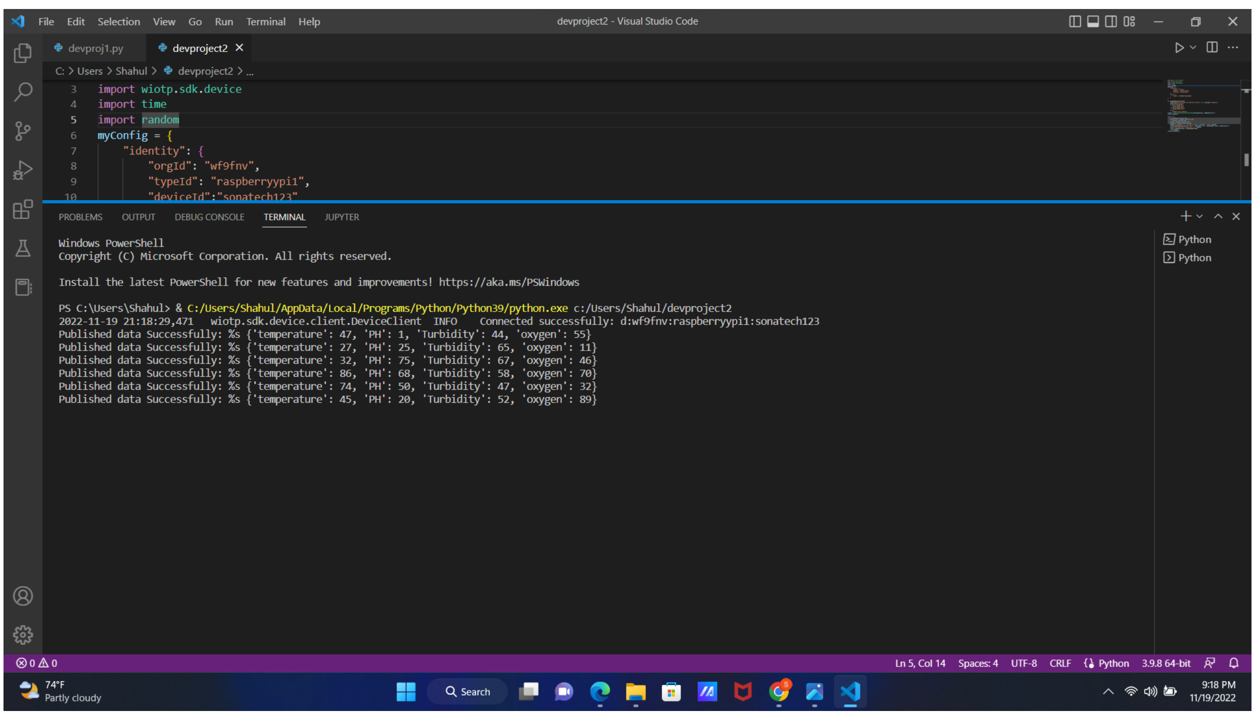


7.2 Feature 2

The following diagram shows the circuit connection made for the proposed system using UI.The sensors are connected as per the proposed system requirements and the python code is been compiled and the simulation is done.

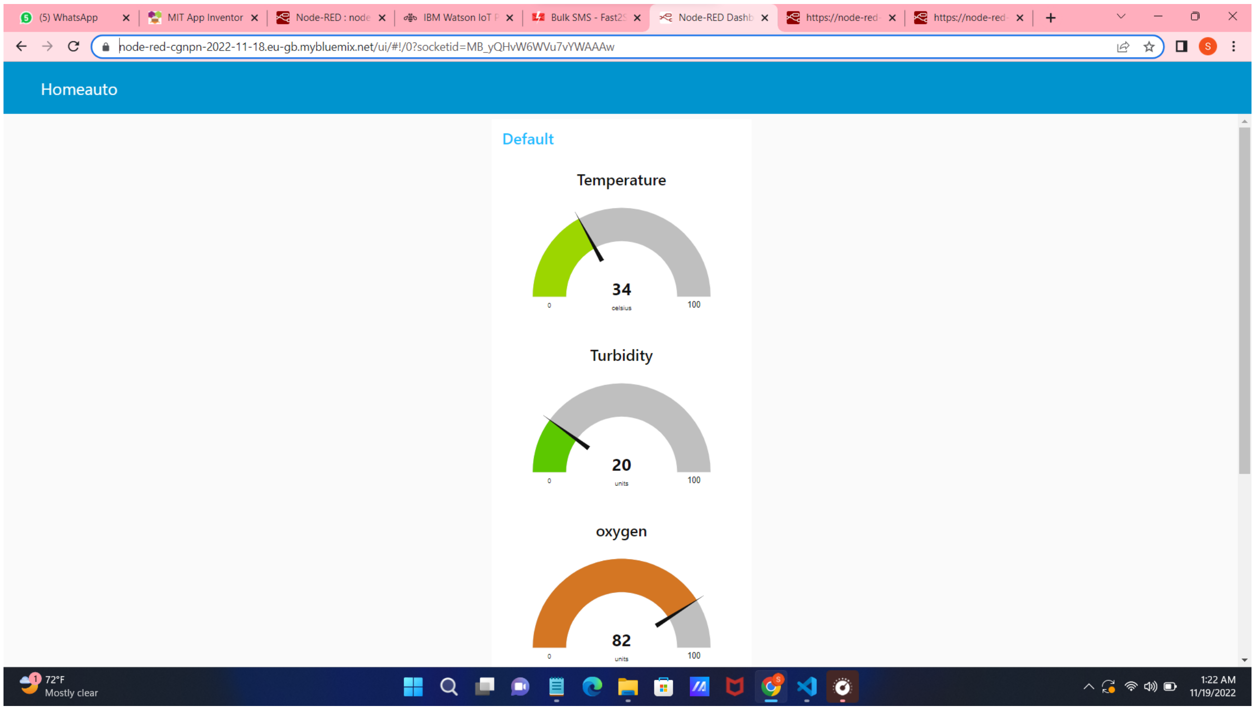


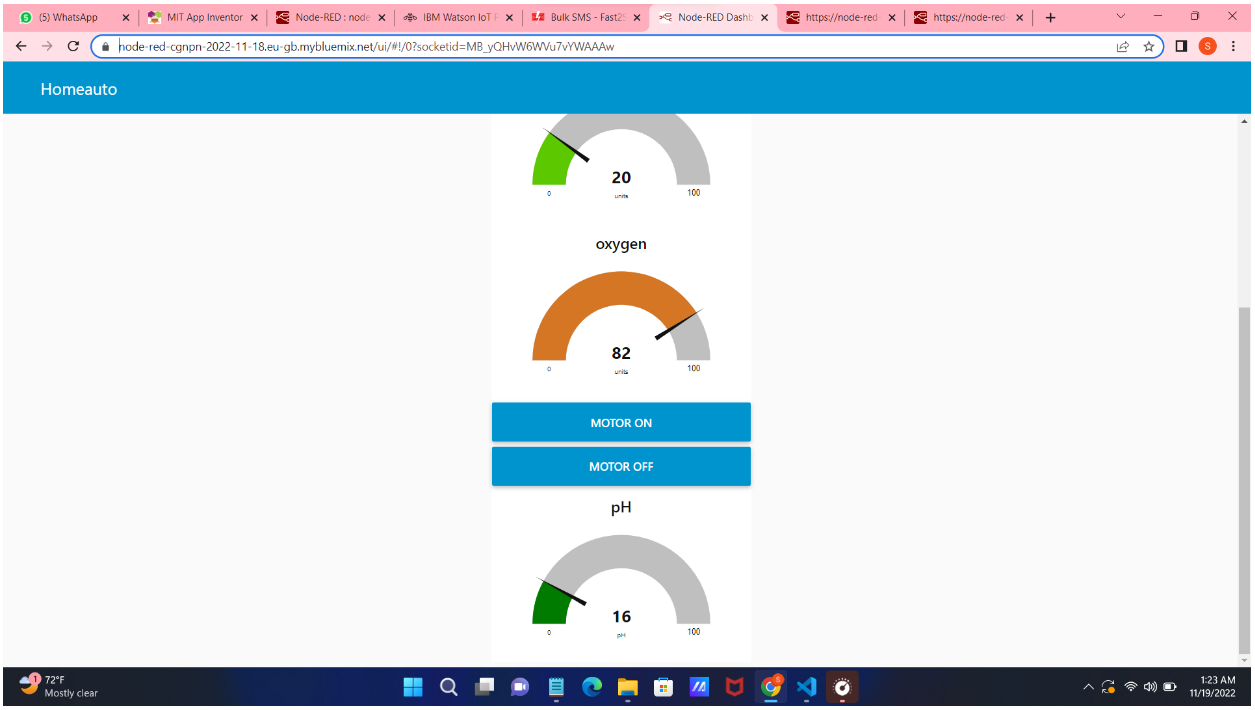
8. TESTING



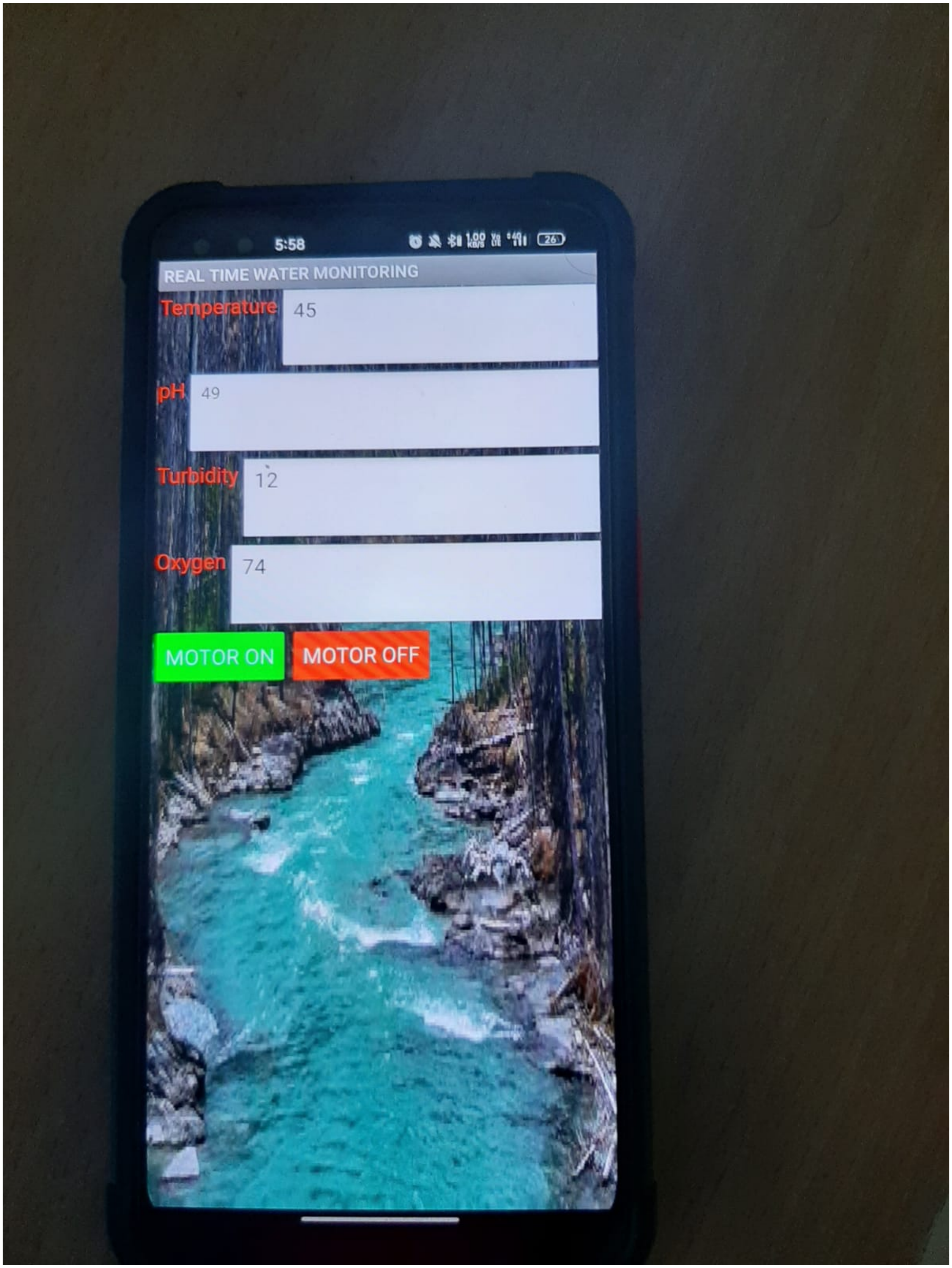
9. RESULTS

The sensors are connected as per the proposed system requirements and the python code is been compiled and the simulation is done. The simulation is been recorded and attached to the drive file . The system functioning and the values of temperature,humidity,oxygen,turbidity and pH level of the water is viewed in the proposed system output.





node-red-cgnpn-2022-11-18.eu-gb.mybluemix.net/ui/#!/0?socketid=MB_yQHvW6WVu7vYWAAAw
Homeauto
20
0
100
oxygen
82
0
100
MOTOR ON
MOTOR OFF
pH
16
0
100


5:58
REAL TIME WATER MONITORING
Temperature
45
pH
49
Turbidity
12
Oxygen
74
MOTOR ON
MOTOR OFF

9.1 Performance Metrics

we are displaying the resulting sensed pH, temp, turbidity, and ORP values. It continuously senses the values of pH, temp, turbidity, and ORP and the resulting values are displayed to the LCD, PC or mobile in real-time. If the acquired value is above the threshold value comments will be displayed as ‘BAD’. If the acquired value is lower than the threshold value comments will be displayed as ‘GOOD’. A bar/line graph will also be shown for perfect understanding. The time series representation of sensor data with decision is shown in Figure

The resulting sensed pH, temp, turbidity, and ORP values. It continuously senses the values of pH, temp, turbidity, and ORP and the resulting values are displayed to the LCD, PC or mobile in real-time. If the acquired value is above the threshold value comments will be displayed as ‘BAD’. If the acquired value is lower than the threshold value comments will be displayed as ‘GOOD’. A bar/line graph will also be shown for perfect understanding. (b) The time series representation of sensor data with decision.

10. ADVANTAGES & DISADVANTAGES

Advantages

Enhances water nature.

Mechanization will reduce the number of times you need to weigh a parameter.

low maintenance

resistance to water infections

Continually most of the website's data

Disadvantages

Collecting water samples from every part of the water body is challenging.

The method is time-consuming since manual data collecting is labor-intensive and time-consuming from numerous places around the water body.

11. CONCLUSION

We offered an all-encompassing platform that can be used to combine historical and real-time sensor data. Data loading and access via programming interfaces are both made possible by a web-based interface. Checking the pH using a sensor that is related to water usage. This framework is capable of automatically monitoring water usage, sending notifications to the appropriate parties, and not requiring family members to perform any duties or engage in any physical activity. Those water nature attempts around need to be more efficient, practical, and swift. These frameworks need to be flexible enough to allow for the replacement of the relevant sensors and the evolution of the relevant projects. Other water quality metrics, such as turbidity, temperature, and oxygen levels, can be screened using this framework.

12. FUTURE SCOPE

The proposed system's implementation aims to make the water management system autonomous, which results in a smart building.
Expanding the capacity to link the city's many structures to a single network, continually track water use in various locations, look into the factors that influence water quality changes, and make the necessary adjustments.

13. APPENDIX

Source Code GitHub :

```
import wiotp.sdk.device
import time
import random
```

```python
myConfig = {
    "identity": {
        "orgId": "wf9fnv",
        "typeId": "raspberryypi1",
        "deviceId":"sonatech123"
    },
    "auth": {
        "token": "H&!9WQzF)GeG*eddSX"
    }
}

def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" %
cmd.data['command'])
    m=cmd.data['command']
    if (m == 'MOTOR ON'):
        print("MOTOR ON")
    elif(m =="MOTOR OFF"):
        print("MOTOR OFF")
    else:
        print("wrong command")
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    pH = random.randint(0,100)
    conductivity = random.randint(0,100)
    T = random.randint(0,100)
    oxygen = random.randint(0,100)
    turbidity = random.randint(0,100)
    myData={'temperature':T,
'PH':pH,'Turbidity':turbidity,'oxygen':oxygen}
    client.publishEvent(eventId="status", msgFormat="json", data=myData,
qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
```

```
    time.sleep(2)
client.disconnect()
```

Project Demo Link: https://drive.google.com/file/d/1DXw_occheExifw7IRlZiNsF1ugCNk4Zn/view?usp=drivesdk