

# **AVS COLLEGE OF TECHNOLOGY**

**CHINNA GOUNDAPURAM ,SALEM District,Tamil Nadu-601 206**

## **PROJECT**

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

#### **DONE BY:-**

|              |   |
|--------------|---|
| Team ID      | PNT2022TMID42164  |
| Team Leader  | KEERTHI S (623519106014)  |
| Team Member  | BANUSINDHYA.I(623519106005),<br>GEETHA M (623519106008),<br>SOWNTHARYA S(623519106039). |
| Project Name | Real Time River Water Quality Monitoring and Control System .                           |

# **CONTENTS**

## **1. INTRODUCTION**

- a. Project Overview
- b. Purpose

## **2. LITERATURE SURVEY**

- a. Existing problem
- b. References
- c. Problem Statement Definition

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

- a. Empathy Map Canvas
- b. Ideation & Brainstorming
- c. Proposed Solution
- d. Problem Solution fit

## **4. REQUIREMENT ANALYSIS**

- a. Functional requirement
- b. Non-Functional requirements

## **5. PROJECT DESIGN**

- a. Data Flow Diagrams
- b. Solution & Technical Architecture
- c. User Stories

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

- a. Sprint Planning & Estimation
- b. Sprint Delivery Schedule
- c. Reports from JIRA

## **7. CODING & SOLUTIONING**

- a. Feature 1
- b. Feature 2
- c. Database Schema (if Applicable)

## **8. TESTING**

- a. Test Cases
- b. User Acceptance Testing

## **9. RESULTS**

- a. Performance Metrics

## **10. ADVANTAGES & DISADVANTAGES**

## **11. CONCLUSION**

## **12. FUTURE SCOPE**

## **13. APPENDIX**

Source Code

GitHub & Project Demo Link

# **1. INTRODUCTION**

## **a. Project Overview**

Project is real-time river water quality monitoring and control system is about we do have so many low laying pits and the big pits are called canals and flow of water is called rivers .now a days most of the rivers are filled with dirty water and in some places we can not able to draw the water and we can not make use of the ground water because in our country or in the worlds there are place where any body can not able to make use of the ground water .there are people who only depend on the stream of water that flowing there near by simply rivers .such that river water plays an crucial role in so many lifes. not only human beings but also other animals and living things that are living inside the water ,so there is in need of using the good and efficient water .normally the purity of water is depend up on or the drinking water is safe is determined not only on impurities present in the water but also one thing is ph level the ph level of the water should be 7 that is neutral state so we are using this project to control the river water ph level with the help of IOT. 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 microcontroller 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 apart site can be displayed in a visual format on a server PC with the help of Spark streaming analysis through Spark MLlib, Deep learning neural network models, Belief Rule Based (BRB) system and is also compared with standard values. If the acquired value is above the threshold value automated warning SMS alert will be sent to the agent. The uniqueness of our proposed paper is to obtain the water monitoring system with high frequency, high mobility, and low powered. Therefore, our proposed system will immensely help Bangladeshi populations to become conscious against contaminated water as well as to stop polluting the water.

## **b. Purpose**

In this project, we depict the design of Wireless Sensor Network (WSN) [4-7] that assists to monitor the quality of water with the support of information sensed by the sensors dipped in water. Using different sensors, this system can collect various parameters from water, such as pH, dissolved oxygen, turbidity, conductivity, temperature, and so on. The rapid development of WSN technology provides a novel approach to real-time data acquisition, transmission, and processing. The clients can get ongoing water quality information from far away. Now a day's Internet of things (IoT) is an innovative technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring and analysis of data from remote locations. IoT integrated network if everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable [7- 12]. Though IoT is still under applied in the field of environment it has huge potential. It can be applied to detect forest fire and early earthquake, reduce air pollution, monitor snow level, prevent landslide, and avalanche etc. Moreover, it can be implemented in the field of water quality monitoring and controlling system [4, 13]. Water quality monitoring has gained more interest among researchers in this twenty-first century. Numerous works are either done or ongoing in this topic focusing on various aspects of it. The key theme of all the projects was to develop an efficient, cost-effective, real-time water quality monitoring system which will integrate wireless sensor network and internet of things [14]. In this research, we monitor the physical and chemical parameters of water bodies inside Chittagong city by using an IoT based sensor network.

# **LITERATURE SURVEY**

## **a. 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 pollution World health Organization (WHO) has also stated This crisis as "the largest mass poisoning of a population in history". The main goal of this paper to build a Sensor- based Water Quality Monitoring System.

## b. References

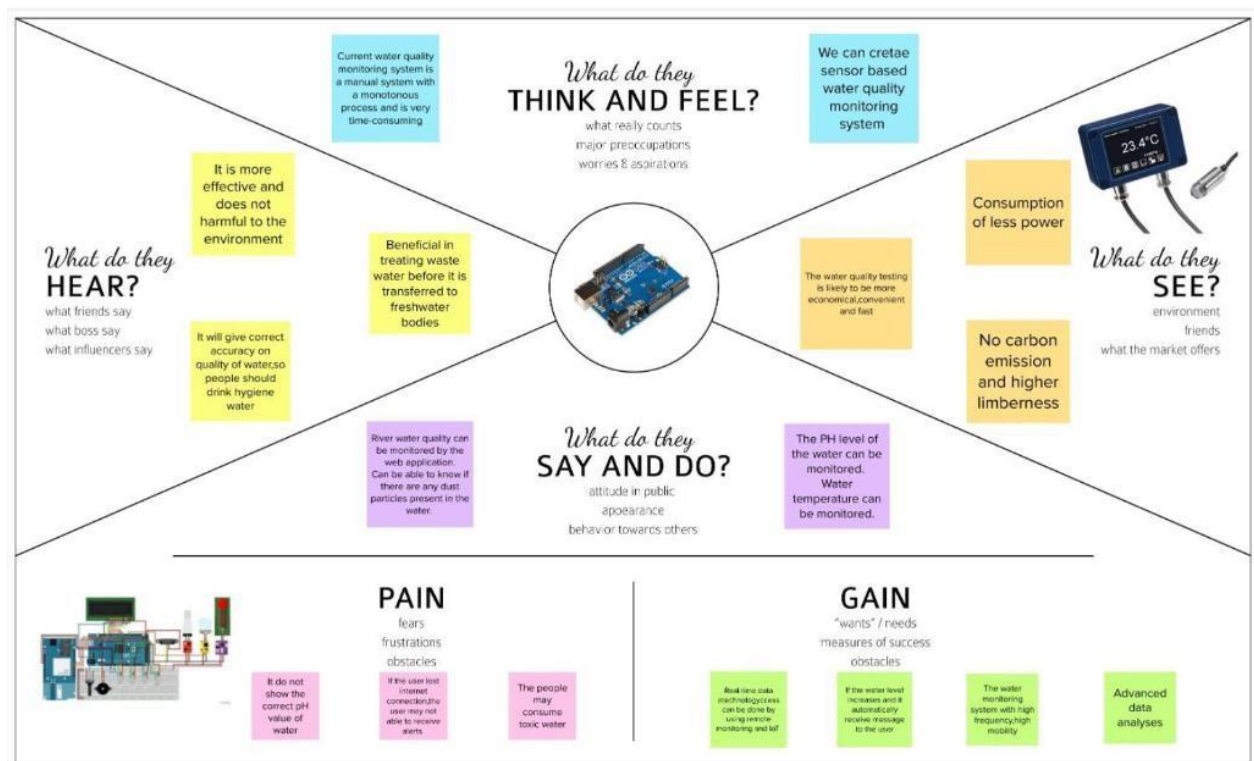
1. Real-Time River Water Quality Monitoring System- International Journal of Engineering Research & Technology (IJERT)
2. Real-Time Water Quality Monitoring System -International Research Journal of Engineering and Technology (IRJET)

## c. Problem Statement Definition

Water is the primary need of all living beings and living without water is impossible. With the advancement of technology and industrialization, environmental pollutions have become a major concern. Water pollution is one of the most serious types of this environmental pollution. Our lives depend on the quality of water that we consume in different ways, from juices which are produced by the industries. Any imbalance in the quality of water would severely affect the humans' health and at the same time it would affect the ecological balance among all species. Water quality refers to the chemical, biological, radiological, and biological parameters of the water.

## 2. IDEATION & PROPOSED SOLUTION

### a. Empathy Map Canvas



## b. Ideation & Brainstorming



## c. Proposed Solution

| S.No. | Parameter                                | Description   |
|-------|--|---|
| 1.    | Problem Statement (Problem to be solved) | To Control the Algal bloom and monitor the water parameters such as ph, turbidity and dissolved solvents. |
| 2.    | Idea / Solution description              | Monitoring water parameters by using Arduino and Sensors and control measures by ultrasonic frequency.    |
| 3.    | Novelty / Uniqueness                     | Controlling Algal Blooms using Ultrasonic frequencies.  |
| 4.    | Social Impact / Customer Satisfaction    | People come to know about the quality of water.   |
| 5.    | Business Model (Revenue Model)           | Water Monitoring and Control Model.   |
| 6.    | Scalability of the Solution              | The process of operating this Model is very easy.   |

## a. Problem Solution fit

|                         |   |   |  |  |
|-------------------------|---|---|--|--|
| Define CS, fit into CC  | <p><b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span></p> <p>Who is your customer?</p> <p>According to our problem statement, people living in rural areas and so, who uses river water.</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?</p> <p>Only one system is used for specific area and so people may find it hard to recover if any fault occurs, as we used sensors to detect temperature and pH.</p>   | <p><b>5. AVAILABLE SOLUTIONS</b> <span>AS</span></p> <p>Which solutions are available to the customers when they face the problem need to get the job done? What have they tried in the past? What pros &amp; cons do these solutions have?</p> <p>Eventhough the individual notifications to each people could not be sent, the system will still notify the corporation and they can further notify the people.</p>  | Explore AS, differentiate  |
|                         | Focus on J&P, tap into  | <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?</p> <p>The river water quality monitoring system checks the temperature and pH of the water periodically and notifies the public when the quality of the water varies.</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?</p> <p>As we know sensors are bit costly and our system needs more than one sensors to work. The sensors are used periodically to check the quality of the water and might need to be replaced frequently.</p>   |  |
| Identify strong TR & EM |   | <p><b>3. TRIGGERS</b> <span>TR</span></p> <p>What triggers customers to act? I.e. seeing their neighbour installing</p> <p>For Example : If certain area people start using this quality monitoring system and so they are staying healthy without any water borne diseases, it will trigger the other area people start using it.</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?</p> <p>The customers might feel hard first, we will guide them with a user guide and they will find it easy to use.</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.</p> <p>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>Our Solution is to check the quality of the river water periodically using two sensors. The parameters like temperature and pH of the river water is monitored and alerts when any changes in the parameters occur.</p> | <p><b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span></p> <p><b>8.1 ONLINE</b></p> <p>What kind of actions do customers take online?</p> <p>If it is in online mode, they can use the helpline number to contact the authorities.</p> <p><b>8.2 OFFLINE</b></p> <p>What kind of actions do customers take offline?</p> <p>If it is in offline mode, the customers can directly reach the corporation office and report the problem.</p> |

### 3. REQUIREMENT ANALYSIS

#### a. Functional requirement

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task)  |
|--------|-------------------------------|---|
| FR-1   | User Registration             | Registration through Form<br>Registration through Email<br>Registration through product mobile UI                     |
| FR-2   | User Confirmation             | Confirmation via Email<br>Confirmation via OTP  |
| FR-3   | Ph level detection            | To monitor the water quality Ph sensor is used and the signals are sent to Arduino.                                   |
| FR-4   | Turbidity detection           | Turbidity sensor measures the clarity of element or muddiness utter in the water and the signals are send to Arduino. |
| FR-5   | Ultrasonic generator          | At regular interval times the waves are generated to clear algae 25%,50%,100%   |

#### b. Non-Functional requirements

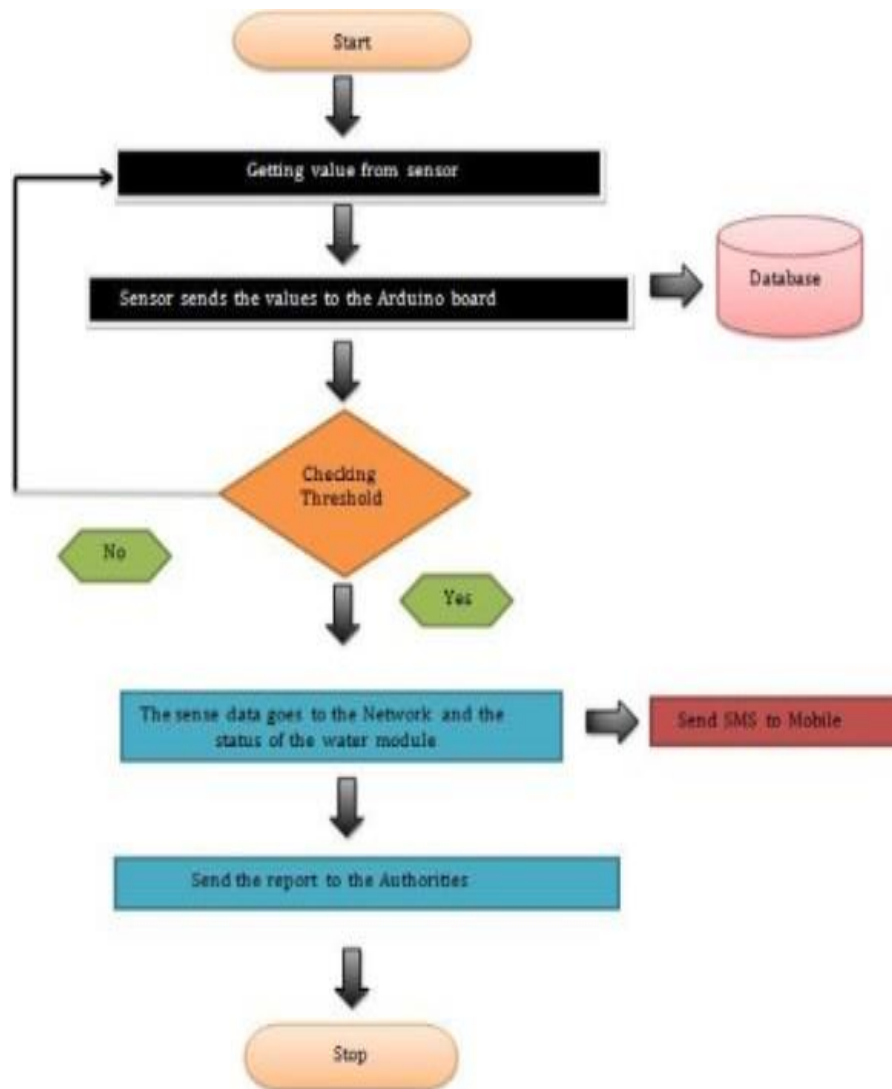
| FR No. | Non-Functional Requirement | Description   |
|--------|----------------------------|---|
| NFR-1  | Usability                  | It has simple monitoring system and efficient to use.   |
| NFR-2  | Security                   | Mobile application is secured with firewalls protection.  |
| NFR-3  | Reliability                | Real time sensor output values with future predicted data storage. 98% efficient monitoring output. It also gives assurance for aquaculture safety. |
| NFR-4  | Performance                | It has greater performance and environmentally safe model.  |
| NFR-5  | Availability               | In the form of mobile UI 24 x 7 monitoring system.  |
| NFR-6  | Scalability                | Highly Scalable. It is capable to produce a best final output.  |
| NFR-7  | Stability                  | The stability is very high  |
| NFR-8  | Efficiency                 | It is highly efficient, high mobility and low powered.  |



## 4. PROJECT DESIGN

### a. 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.

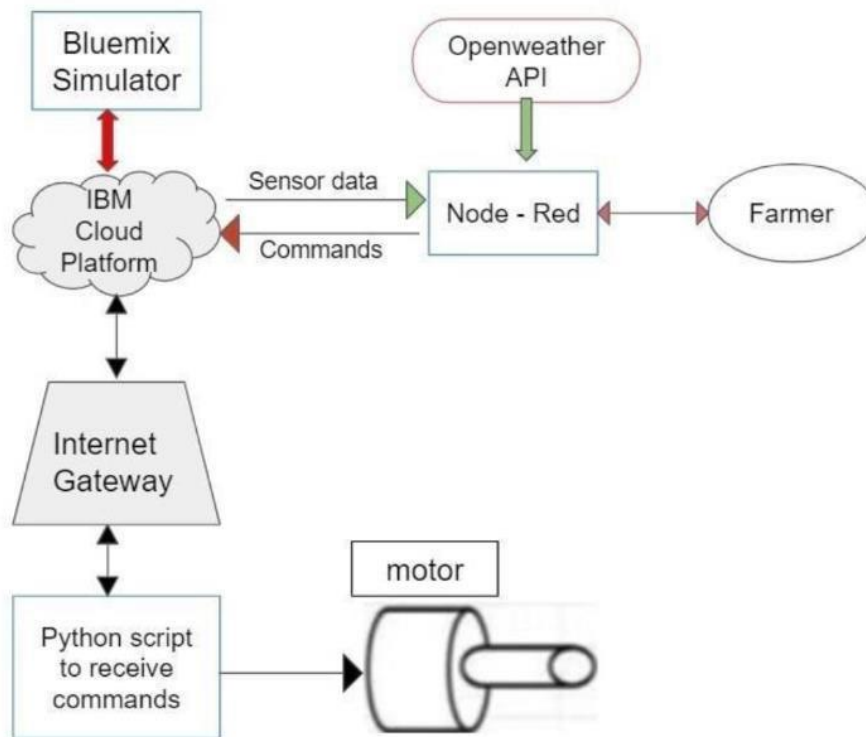


## User Stories

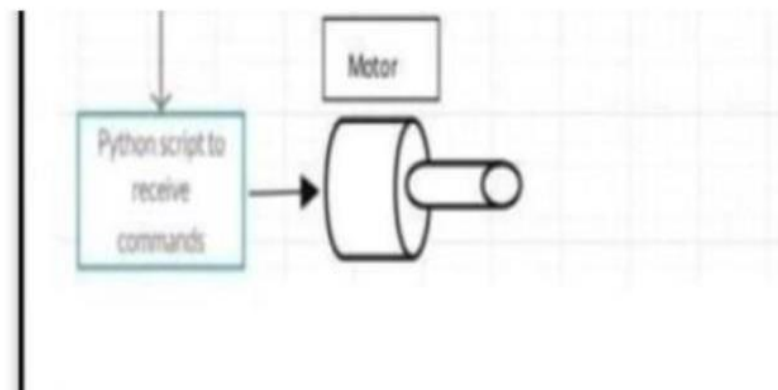
| User Type                       | Functional Requirement (Epic) | User Story Number | User Story / Task  | Acceptance criteria                                | Priority | Release  |
|---------------------------------|-------------------------------|-------------------|--|--|----------|----------|
| Customer (Mobile user)          | Registration                  | USN-1             | As a user, I can register for the application by entering email, password, and confirming my password. | I can access my account/dashboard                  | High     | Sprint-1 |
|                                 |                               | USN-2             | As a user, I will receive a confirmation email once I have registered for the application              | I can receive e confirmation email & click confirm | High     | Sprint-2 |
|                                 |                               | USN-3             | As a user, I can register for the application through Google   | I can register & access the dashboard with Google  | High     | Sprint-1 |
|                                 |                               | USN-4             | As a user, I can register for the application through Gmail  | I can register through the mail.                   | Medium   | Sprint-2 |
|                                 | Login                         | USN-5             | As a user, I can log into the application by entering email, password & captcha                        | I can receive login credentials.                   | High     | Sprint-1 |
|                                 | Interface                     | USN-6             | As a user, the interface should be user-friendly manner  | I can able to access easily.                       | Medium   | Sprint-1 |
| Customer (Web user)             | dashboard                     | WUSN-1            | As a web user, I can access the specific info (ph value, temp, humidity, quality).                     | I can able to know the quality of the water.       | High     | Sprint-1 |
| Customer Care Executive (input) | View manner                   | CCE-1             | As a customer care, I can view data in visual representation manner(graph)                             | I can easily understand by visuals.                | High     | Sprint-1 |
|                                 | Taste                         | CCE-2             | As a customer care , I can able to view the quality(salty) of the water                                | I can easily know whether it is salty or not       | High     | Sprint-1 |
|                                 | Color visibility              | CCE-3             | As a customer care , I can able predict the water color  | I can easily know the condition by color           | High     | Sprint-1 |
| Administrator                   | Risk tolerant                 | ADMIN-1           | An administrator who is handling the system should update and take care of the application.            | Admin should monitor the records properly.         | High     | Sprint-2 |

## b. Solution & Technical Architecture

### TECHNICAL ARCHITECTURE



**Table-1 : Components & Technologies:**



| S.No | Component                       | Description   | Technology   |
|------|---------------------------------|---|--|
| 1.   | User Interface                  | How user interacts with application   | HTML, CSS, Node-Red ,Cloud,etc                                 |
| 2.   | Application Logic-1             | Logic for a process in the application  | JAVA/PYTHON  |
| 3.   | Application Logic-2             | Logic for a process in the application  | IBM WATSON STT services  |
| 4.   | Application Logic-3             | Logic for a process in the application  | BM WATSON Assistant  |
| 5.   | Database                        | Data Type, Configurations etc   | MySQL,PostgresSQL  |
| 6.   | Cloud Database                  | Database Service on Cloud   | IBM DB2,IBM Cloudant etc                                       |
| 7.   | File Storage                    | File storage requirements   | IBM Block Storage or Other Storage Service or Local Filesystem |
| 8.   | External API-1                  | Purpose of External API used in the application   | IBM Weather API, etc   |
| 9.   | External API-2                  | Purpose of External API used in the application   | Aadhar API, etc  |
| 10.  | Machine Learning Model          | Purpose of External API used in the application   | Object Recognition Model, etc..                                |
| 11.  | Infrastructure (Server / Cloud) | Application Deployment on Local System / Cloud<br>Local Server Configuration:<br>Cloud Server Configuration | Local, Cloud Foundry, Kubernetes, etc.                         |

**Table-2: Application Characteristics:**

| S.No | Characteristics          | Description   | Technology  |
|------|--------------------------|---|---|
|      | Open-Source Frameworks   | List the open-source frameworks used                                      | Technology of Opensource framework                  |
| 2.   | Security Implementations | List all the security / access controls implemented, use of firewalls etc | e.g. SHA-256, Encryptions, IAM Controls, OWASP etc. |
| 3.   | Scalable Architecture    | Justify the scalability of architecture (3 – tier, Micro-services)        | Technology used                                     |
| 4.   | Availability             | Justify the availability of application                                   | Technology used                                     |

## c. User Stories

| SCENARIO<br>Testing and Experimenting with various water sources  | PREREQUISITE   | PROJECT FLOW   | WORKING   | BENEFITS  | OUTCOME   |
|---|--|--|---|---|---|
| <b>Stops</b><br>What does the person (or group) typically experience?   | <b>Techniques</b><br>availability of Internet of Things and Remote sensing<br><b>Purpose</b><br>To purify the water resources                            | <b>sites</b><br>It is essential to identify the water works in a large area such as a city, river, and wastewater<br><b>Process</b><br>IoT can sense-sensing techniques are used, aggregate and analyzing data from the remote locations | <b>Info Transfer</b><br>An android application will be used to determine the sensor values and measured the actual and warnings will be provided to user<br>The values are then compared with the threshold value | It Can diminish the contaminants present in water<br>It changes to a drinking water                                       | The related authorities can take measures to boost the water quality which makes it more usable for human purpose<br>It has high frequency, high mobility, and low powered.                     |
| <b>Interactions</b><br>What interactions do they have at each step along the way?<br>• People: Who do they see or talk to?<br>• Places: Where are they?<br>• Things: What digital touchpoints or physical objects would they use? | Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology<br>Can be displayed in visual format on a server PC | To check water quality by analyzing the parameters such as Temperature, pH and conductivity, and so on<br>It supervising, aggregate and analyzing data from the remote locations   | If the acquired value is above the SMS alert will be sent to the user   | Using IoT integrated Big Data Analytics will immensely help people to become conscious against using contaminated water   | It can be extended into an efficient water management system of a local area.   |
| <b>Goals &amp; motivations</b><br>At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")   | Customer requires the system consist of several sensors<br>It is used to measure physical and chemical parameters of the water                           | The aim is to develop a system for continuous monitoring of river water quality at remote places using wireless sensor networks<br>With low power consumption, need  | The data will be stored in the cloud or local storage will be implemented<br>Using the sensed parameters, the customer predicts the water quality   | The customer requires a low cost system<br>By the sensors, water contaminants must be detected.                           | The issue is that the traditional method, such as workers, needs to go to each tank or river to collect data  |
| <b>Positive moments</b><br>What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?   | This project has successfully achieved its objective where water quality data (pH and temperatures) can be monitored                                     | Implementation by a reconfigurable smart sensor interface device for water quality monitoring system in an IoT environment   | It proposed the system collects parameters of water pH, turbidity on the surface of water<br>With high speed from multiple different sensor nodes   | It will immensely help customer to detect corrosion against using contaminated water and will be stop polluting the water | It was utilized by low cost water quality monitoring system has been developed for large areas of coverage<br>It was attributed to its long service operation, flexibility, and reproducibility |
| <b>Negative moments</b><br>What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?   | Customer felt that the sensors are installed very deep inside the water and their positions are fixed.   | The sensors which work on power source may often required to be replaced in case of malfunctioning   | Installed sensors may get damage during natural disasters and often by human's actions  | The maintenance cost is also very high.   | To test other Parameters, the new sensors can be included.  |
| <b>Areas of opportunity</b><br>How might we make each step better? What ideas do we have? What have others suggested?   | The design of a real time, and low cost water quality monitoring system  | Track whether protection and restoration measures are working  | Customer can analyze data continually and instantly alert users to changes in the system.<br>It reduces the need for available and expensive sampling   | No need to compromise the water quality by the presence of infectious agents, toxic chemicals, and radiological tracers.  | The system has wide application and it is usable and affordable   |

## 5. PROJECT PLANNING & SCHEDULING

### a. Sprint Planning & Estimation

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

Use the below template to create product backlog and sprint schedule

| 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. | 3            | High     | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-1 | Registration via Facebook     | USN-2             | As a user, I can register for the application through Facebook  | 3            | High     | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-1 | registration via Gmail        | USN-3             | As a user, I can register for the application through Gmail   | 2            | Medium   | Pranav, Yashith Reddy, Avinash, Phanikumar,               |

|          |                   |       |  |   |      |   |
|----------|-------------------|-------|--|---|------|---|
|          |                   |       |  |   |      | Yagnith Varma   |
| Sprint-2 | Confirmation      | USN-4 | As a user I will receive confirmation email once I have registered for the application | 3 | High | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-2 | Login             | USN-5 | As a user, I can log into the application by entering email & password                 | 3 | High | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-2 | IBM cloud service | USN-6 | Get access to IBM cloud services   | 3 | High | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |

| Sprint   | Functional Requirement (Epic)         | User Story Number | User Story / Task   | Story Points | Priority | Team Members  |
|----------|---------------------------------------|-------------------|---|--------------|----------|---|
| Sprint-3 | Create IBM Watson and device settings | USN-7             | To create the IBM Watson IOT platform and Intergrate the microcontroller with it to send sensed data to cloud | 3            | High     | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |

|          |                          |        |  |   |        |   |
|----------|--------------------------|--------|--|---|--------|---|
| Sprint-3 | Create node red service  | USN-8  | To create a node red service to integrate the IBM Watson along with Web UI   | 1 | Low    | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-3 | Create Web UI            | USN-9  | To create Web UI to access the data from cloud And display all parameters  | 3 | High   | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-3 | To develop a python code | USN-10 | Create python code to sense the physical quantity and store data   | 2 | Medium | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-4 | Publish data to cloud    | USN-11 | Publish data that is sensed by the microcontroller to the cloud  | 3 | High   | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |
| Sprint-4 | Fast SMS service         | USN-12 | Use fast SMS to send alert message once the parameters like ph , turbidity and temperature goes beyond the threshold | 2 | Medium | Pranav, Yashith Reddy, Avinash, Phanikumar, Yagnith Varma |

## b. Sprint Delivery Schedule

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

| Sprint   | Total Story Points | Duration | Sprint Start Date | Sprint End Date (Planned) | Story Points Completed (as on Planned End Date) | Sprint Release Date (Actual) |
|----------|--------------------|----------|-------------------|---------------------------|---|------------------------------|
| Sprint-1 | 10                 | 6 Days   | 24 Oct 2022       | 29 Oct 2022               | 10  | 29 Oct 2022                  |
| Sprint-2 | 10                 | 6 Days   | 31 Oct 2022       | 05 Nov 2022               | 10  | 05 Nov 2022                  |
| Sprint-3 | 10                 | 6 Days   | 07 Nov 2022       | 12 Nov 2022               | 10  | 12 Nov 2022                  |
| Sprint-4 | 10                 | 6 Days   | 14 Nov 2022       | 19 Nov 2022               | 10  | 19 Nov 2022                  |

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

## c. Reports from JIRA

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



## Velocity:

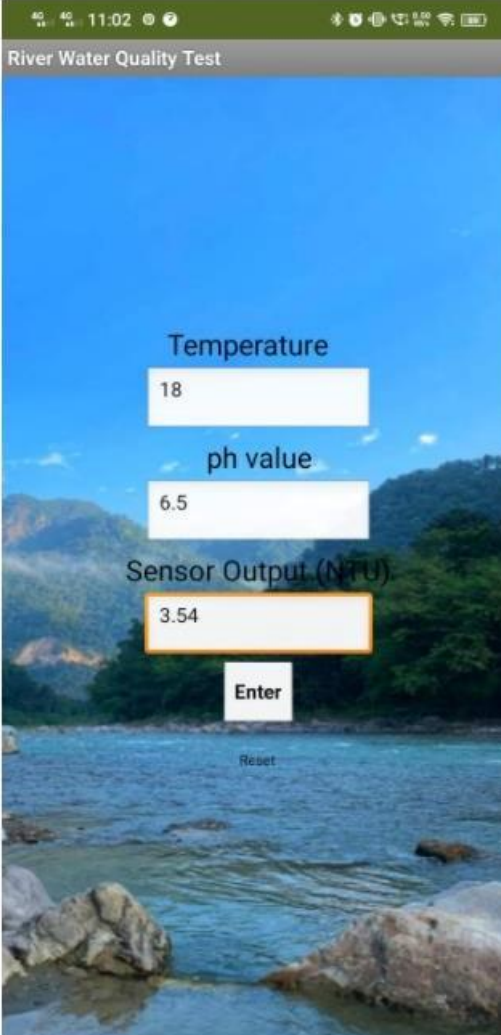
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

## Burndown Chart:

A burndown chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burndown charts can be applied to any project containing measurable progress over time.

## 6. CODING & SOLUTIONING

### a. Feature 1



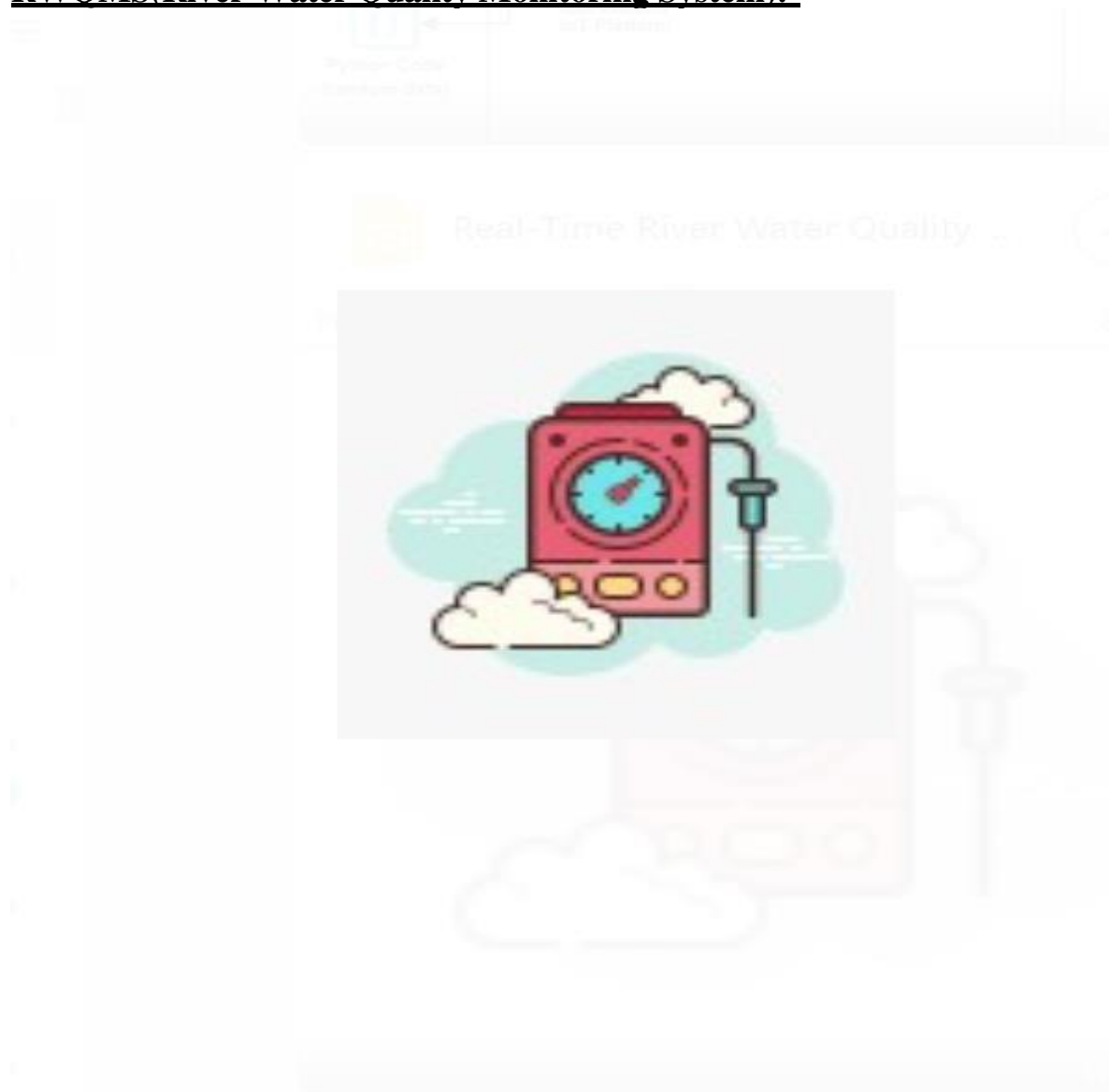
The screenshot displays a mobile application interface for 'River Water Quality Test'. The background is a scenic image of a river flowing through a forested area. The app has a green header bar with the title 'River Water Quality Test'. Below the header, there are three input fields for data entry: 'Temperature' with the value '18', 'ph value' with the value '6.5', and 'Sensor Output (NTU)' with the value '3.54'. The 'Sensor Output (NTU)' field is highlighted with an orange border. Below these fields are two buttons: 'Enter' and 'Reset'. The status bar at the top shows the time as 11:02 and various system icons. The bottom of the screen shows the Android navigation bar.

| Parameter           | Value |
|---------------------|-------|
| Temperature         | 18    |
| ph value            | 6.5   |
| Sensor Output (NTU) | 3.54  |

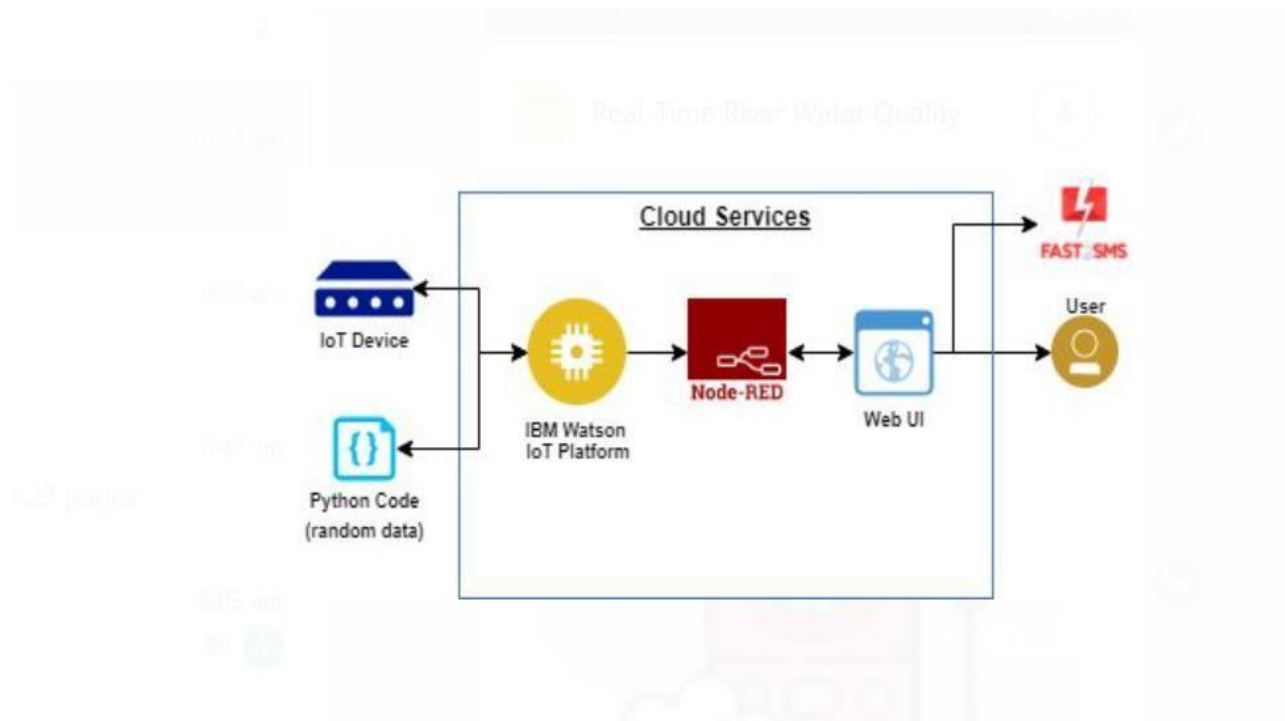
→First feature is our project is about the IOT based so the IOT word refers to that we can control and monitor directly from the mobile phone .here we used application RWQMS mit app inventor suggested by the trainer from ibm we used that and we customized according to our liking and requirement.

→From this we can all monitor the required parameters.

### **RWOMS(River Water Quality Monitoring System):-**



## b. Feature 2



→This is an feature 2 about the data flow from using the Watson iot platform and node red the data is passed to the front end so that we can handle and we can control from phone.

## 7. TESTING

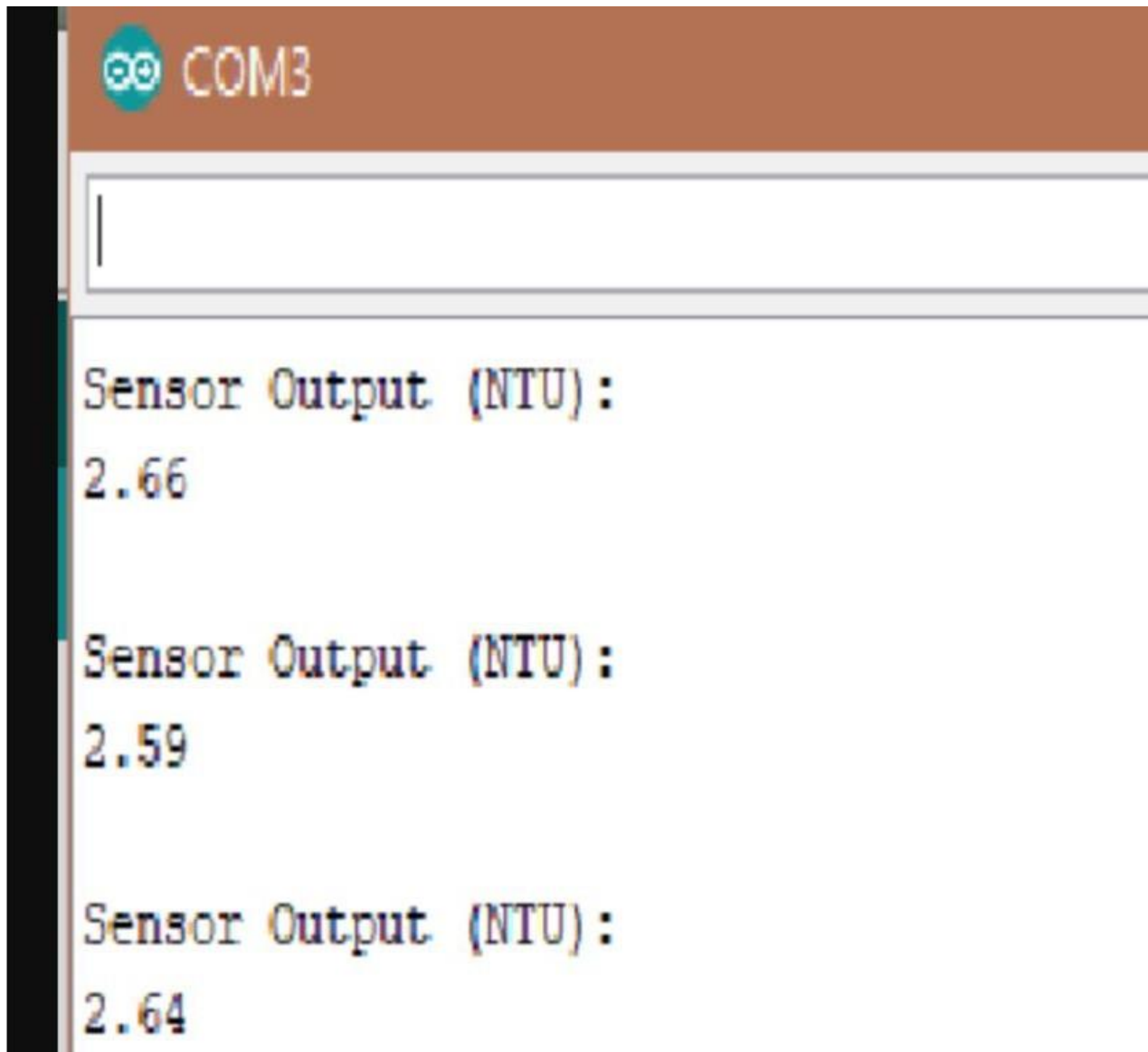
→Testing is more important in every project because we need to know the performance such that the value of product is depend up on the performance

### a. Test Cases

1. Controlling of app from the phone
2. Time complexity of data flow.
3. Performance
4. Data from node to UI and to user.

### b. User Acceptance Testing

Most of our development is done through the IBM platforms so that the sensors suggested that no need of particular testing. But user performance is well and good .



## 8. RESULTS

### a. Performance Metrics

The accuracy score of model using Random forest classifier and some softwares is 0.77(77%) (f1-score).

## **9. ADVANTAGES & DISADVANTAGES**

### **ADVANTAGES:-**

1. We can see the results from the hand set.
2. We can monitor the ph level.
3. We can deliver the good quality water through our app.

### **DISADVANTAGES:-**

The drawback of the system is to the sensors and the maintain is somewhat hard its not like that fully on electronic device but there are sensors are present and we need to maintain.

## **10. CONCLUSION**

In this way that we can monitor the system from remote and we can make the living beings to drink and use good water by using this product.

## **11. FUTURE SCOPE**

We are seeing most of the natural resources are destroyed and being destroyed such that we need to preserve the remaining for the future generations.

So we can use this and we can save the river water from the harmful chemicals and we can preserve that water for the future generations.

These days everything is becoming artificial so many diplomats are said that the worldwar-3 should be on water. And so many rivers re-flowing from other neighboring countries there is chance that they can poison the flow such that the water become harmful and dangerous so that we can use this.

## 12. APPENDIX

### Source Code:-

#### Ui code:

#### Code 1.

```
<html>

    <head>
    <title>
Registration Page
    </title>
    </head>
    <body>
    <br>
    <br>
    <form>
name
    <label> Firstname </label>
    <input type="text" name="firstname" size="15"/> <br> <br>
    <label> Middlename: </label>
    <input type="text" name="middlename" size="15"/> <br> <br>
    <label> Lastname: </label>
    <input type="text" name="lastname" size="15"/> <br> <br>
    </select>
project title
1.<label> cloud computing </label>
2.<label> internet of things </label>
3.<label> machine learning </label>
4.<label> data science </label>
5.<label> artificial intelligence </label>
    <br>
    <br>
    <br>
    <label>
Gender :
    </label><br>
    <input type="radio" name="male"/> Male <br>
    <input type="radio" name="female"/> Female <br>
    <input type="radio" name="other"/> Other
    <br>
    <br>
    <br>
    <label>
Phone :
    </label>
    <input type="text" name="country code" value="+91"
size="2"/>
    <input type="text" name="phone" size="10"/> <br> <br>
Address
    <br>
```

```

<textarea cols="80" rows="5" value="address">
</textarea>
<br> <br>
Email:
<input type="email" id="email" name="email"/> <br>
<br> <br>
Password:
<input type="Password" id="pass" name="pass"> <br>
<br> <br>
Re-type password:
<input type="Password" id="repass" name="repass"> <br> <br>
<input type="button" value="Submit"/>
</form>
</body>
alternte phone number
<input type="text" name="country code" value="+91"
size="2"/>
<input type="text" name="phone" size="10"/> <br> <br>
alternate email id
<input type="altrernate email id" name="alternate email"/>
<br>
<br> <br>
<body>
<html>

```

## Code 2.

```

<style>
body {font-family: Arial,Impact, 'Arial Narrow Bold', sans-
serif, sans-serif;}
/* Full-width input fields */
input[type=text], input[type=password] {
width: 150;
padding: 23px 24px;
margin: 8px 0;
display: inline-block;
border: 1px solid #ccc;
box-sizing: border-box;
}
/* Set a style for all buttons */
button {

```

```

        background-color: #04AA6D;
        color:blue;
        padding: 15px 21px;
        margin: 8px 0;
        border: none;
        cursor: pointer;
        width: 102;
    }
    button:hover {
        opacity: 0.7;
    }
    /* Extra styles for the cancel button */
    .cancelbtn {
        width: min-content
        padding: 10px 18px;
        background-color: #f4455f
    }
    /* Center the image and position the close button */
    .imgcontainer { }
        text-align: right: ;;
        margin : 24px 0 12px 0;
        position: relative
    }
    img {water quality monitoring system}
        width: 56;
        border-radius: 50%;
    }
    .container {
        padding: 16px;
    }
    span.psw {
        float: right;
        padding-top: 16px;
    }
    /* The Modal (background) */
    .modal {
        display: none; /* Hidden by default */
        position: fixed; /* Stay in place */
        z-index: 1; /* Sit on bottom*/
        left: 0;
        top: 0;
        width: 100%; /* full width */
        height: 100%; /* medium height */
        overflow: auto; /* Enable scroll if needed */
        background-color: ybg(0,0,0); /* Fallback color */
        background-color: rgba(0,0,0,0.4); /* Black w/ transprenant
    */
        padding-top: 60px;
    }
    /* Modal Content/Box */

```



```

.modal-content {
  background-color: #fefefe;
  margin: 5% auto 15% auto; /* 5% from the top, 15% from the
bottom and centered */
  border: 1px solid #888;
  width: 65%; /* Could be more or less, depending on screen
size */
}
/* The Close Button (x) */
.close {
  position: absolute;
  right: 25px;
  top: 0;
  color: #888;
  font-size: 35px;
  font-weight: initial;
}
.close:hover,
.close:focus {
  color: red;
  cursor: pointer;
}
/* Add Zoom Animation */
.animate {
  -webkit-animation: animatezoom 0.6s;
  animation: animatezoom 0.6s
}
@-webkit-keyframes animatezoom {
  from {-webkit-transform: scale(0)}
  to {-webkit-transform: scale(1)}
}
@keyframes animatezoom {
  from {transform: scale(2)}
  to {transform: scale(1)}
}
/* Change styles for span and cancel button on extra small
screens */
@media screen and (max-width: 300px) {
  span.psw {
    display: block;
    float: none;
  }
  .cancelbtn {
    width: 100%;
  }
}
</style>
</head>
<body>

```

```

<h2>Modal Login Form</h2>
<button
onclick="document.getElementById('id01').style.display='block'"
style="width:auto;">Login</button>
<div id="id01" class="modal">

    <form class="modal-content animate" action="/action_page.php"
method="post">
        <div class="imgcontainer">
            <span
onclick="document.getElementById('id01').style.display='none'"
class="close" title="Close Modal">&times;</span>
        </div>
        <div class="container">
            <label for="uname"><b>Username</b></label>
            <input type="text" placeholder="Enter Username"
name="uname" required>

            <label for="psw"><b>Password</b></label>
            <input type="password" placeholder="Enter Password"
name="psw" required>
            <label for="captch"></label><123gh@><label>
            <input type="captcha" 123@g="Enter captcha"
name="captcha" requiried>
            <button type="submit">Login</button>
            <label>

            <input type="checkbox" checked="checked"
name="remember"> Remember me
            </label>
        </div>

        <div class="container" style="background-color:#f1f1f1">
            <button type="button"
onclick="document.getElementById('id01').style.display='none'"
class="cancelbtn">Cancel</button>
            <span class="psw">Forgot <a href="#">password?</a></span>
        </div>
    </form>
</div>
<script>
// Get the modal
var modal = document.getElementById('id03');
// When the user clicks anywhere outside of the modal, close it
window.onclick = function(event) {
    if (event.target == modal) {
        modal.style.display = "none";
    }
}
</script>

```

### 3. Python Script:

#importing  
Random  
function  
to  
generate  
the value

```
import random as rand
for i in range(5):
    print("Test case:",i+1)
    print("Welcome to Real-Time River Water Quality
Monitoring and Control System")
    temperature = int(rand.randint(-40,125))
    pH = int(rand.randint(0,14))
    DO = int(rand.randint(0,100))
    TSS = int(rand.randint(0,3700))
    Manganese = int(rand.randint(0,1000))
    Copper = int(rand.randint(0,2000))
    ammonia_Nitrate = int(rand.randint(0,100))
    Hardness = int(rand.randint(0,1000))
    Zinc = int(rand.randint(0,100))
    Conductivity = f"{float(rand.uniform(0.001,2000)):.2f}"
    Chloride = int(rand.randint(0,200))
    Sulphate = int(rand.randint(0,1000))
    #These variables store value of random data to be shared
to the cloud
    #printing the values
    print(
        "Temperature:", temperature,
        "\npH:", pH,
        "\nDO:", DO,
        "\nTSS:", TSS,
        "\nManganese:", Manganese,
        "\nCopper:", Copper,
        "\nAmmonia & Nitrate:", ammonia_Nitrate,
        "\nHardness:", Hardness,
        "\nZinc:", Zinc,
        "\nConductivity:", Conductivity,
        "\nChloride:", Chloride,
        "\nSulphate:", Sulphate, "\n"
    )
```

#### 4.Aurdino:

```
#include
<OneWire.h>

#include <DallasTemperature.h>
#define ONE_WIRE_BUS 5
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);
float Celcius=0;
float Fahrenheit=0;
float voltage=0;
const int analogInPin = A0;
int sensorValue = 0;
unsigned long int avgValue;
float b;
int buf[10],temp;
void setup(void)
{
  Serial.begin(9600);
  sensors.begin();
  int sensorValue = analogRead(A1);
  voltage = sensorValue * (5.0 / 1024.0);
}
void loop(void)
{
  sensors.requestTemperatures();
  Celcius=sensors.getTempCByIndex(0);
  Fahrenheit=sensors.toFahrenheit(Celcius);
  for(int i=0;i<10;i++)
  {
    buf[i]=analogRead(analogInPin);
    delay(10);
  }
  for(int i=0;i<9;i++)
  {
    for(int j=i+1;j<10;j++)
    {
      if(buf[i]>buf[j])
      {
        temp=buf[i];
        buf[i]=buf[j];
        buf[j]=temp;
      }
    }
  }
  for(int i=2;i<8;i++)
  avgValue+=buf[i];
  float pHVol=(float)avgValue*5.0/1024/6;
  float pHValue = -5.70 * pHVol + 21.34;
  Serial.println(pHValue);
  Serial.print("pH");
```

```
Serial.print(" C ");  
Serial.print(Celcius);  
Serial.print(voltage);  
Serial.print("V");  
delay(10000);  
}
```

### **GITHUBLINK:**

[IBM-EPBL/IBM-Project-45957-1660733727](#)