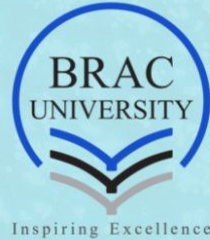


# Final Year Design Project- C

## Progress Presentation (Fall-2022)

### Group: 8

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### ATC Panel-2


Chair- Prof.Dr.A.H.M.Abdur Rahman  
Tasfin Mahmud  
Md.Rakibul Hasan  
Md.Mehedi Hasan Shawon



Inspiring Excellence

# Water Quality **Monitoring System** With Parameter-Based Water Usage Suggestion

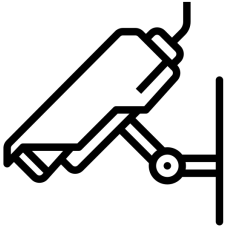


The background of the slide is a photograph of a river. On the left, a small wooden boat is on the water. On the right, the riverbank is heavily littered with plastic waste, including bags, bottles, and other debris. The water is dark and calm.

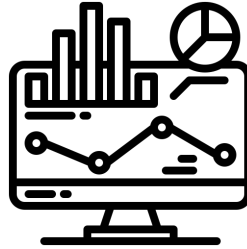
**“River pollution in Bangladesh  
will be unbearable by 2050”  
– The Daily Star**



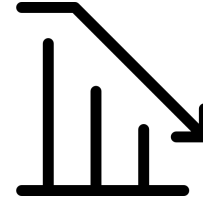
## Objective



Allow regulatory authorities to remotely **monitor** water health parameters.



**Analyze** the parameters to determine toxicity of the water and suggest a usage accordingly.



**Reduce** reliance on ineffective manual sampling and lab testing.

**Reduce** water pollution in the long run.

# Weighted Arithmetic Water Quality Index

The water quality index,  $WQI = \sum Qi \times Wi / \sum Wi$

The quality rating scale ( $Qi$ ) for each parameter is calculated by using this expression:

$$Wi = K / Vs$$

The quality rating scale ( $Qi$ ) for each parameter is calculated by using this expression:

$$Qi = [(Va - Vi) / (Vs - Vi)] \times 100$$

Where,  $Wi$  is Unit weight of factor  $K$  is proportionality constant. Values of  $K$  were calculated as:

$$K = 1 / \sum (1 / Vs)$$

“

*No limitation on number of parameters.*



## WQI range, status and possible usage of the water sample

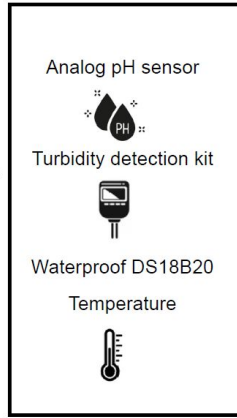
WQI	Water Quality Status(WQS)	Possible Uses
0-25	Excellent	Drinking, irrigation and industrial
26-50	Good	Drinking, irrigation and industrial
51-75	Poor	Irrigation and industrial
76-100	Very Poor	Irrigation
>100	Unsuitable for drinking and fish culture	Proper treatment required before use

1.

## Data Acquisition Subsystem



Water Body



Sensor Module



Nodemcu ESP-32

2.

## Data Transmission Subsystem



Nodemcu ESP-32



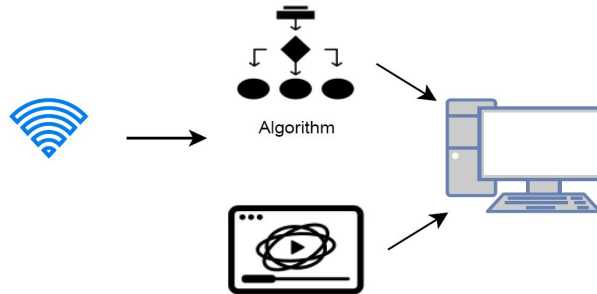
power supplied

Sent to cloud

## Communication Module

3.

## Data Management and Analysis Subsystem

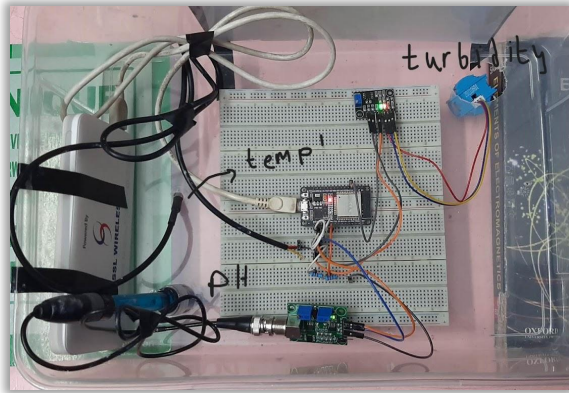


Data visualisation





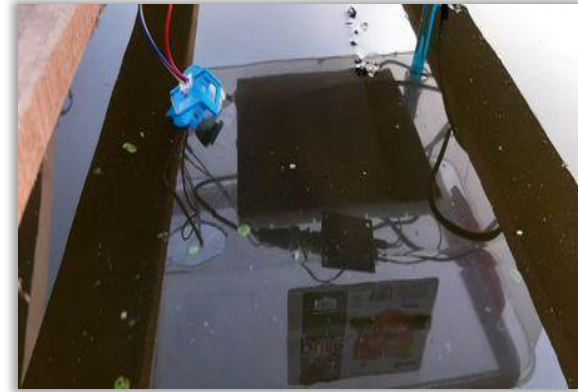
## Prototype



Primary Circuit



Entire Prototype



Sensors In Contact With Water



1

# Calibration of sensors



Analog pH Sensor  
Measuring pH range: 0-14  
Accuracy :  $\pm 0.01\text{pH}$  (25 °C)



## pH Sensor Calibration Method



pH	Volt (V)
4.01	1.41
6.86	1.36



$$\text{pH} = -57V + 84.38$$



## pH Sensor Calibration Verification



COM5	
pH:	2.67
pH:	2.67
pH:	2.67
pH:	2.67

pH of Coco-Cola is 2.6-2.7



Turbidity Sensor Suspended Turbidity Value Detection Module Kit  
Measuring Range: 0-1000 NTU  
Accuracy =  $\pm 0.01$  NTU



## Turbidity Sensor Calibration Method



	Turbidity (NTU)	Volt (V)
Tap-Water	0.8	3.01
Coco-cola	2.2	2.66
Milk	107.2	2.21

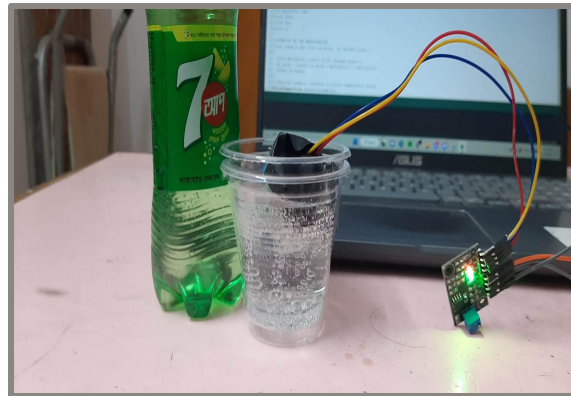


$$\text{turbidity} = 2308.065 - 1629.4V + 286.6667V^2$$





## Turbidity Sensor Calibration Verification



COM5
Turbidity: 1.82 NTU
Turbidity: 1.82 NTU
Turbidity: 1.82 NTU
Turbidity: 1.82 NTU

Turbidity of 7up is 1.80 NTU



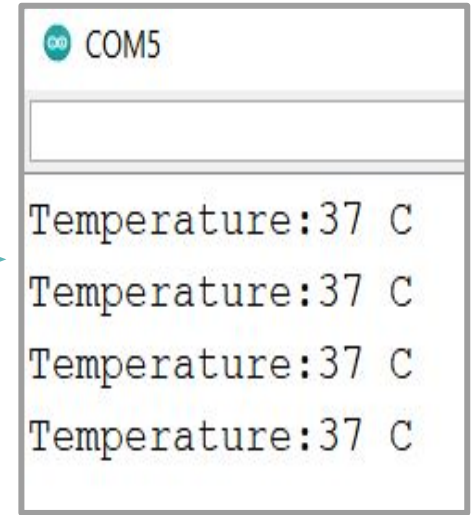
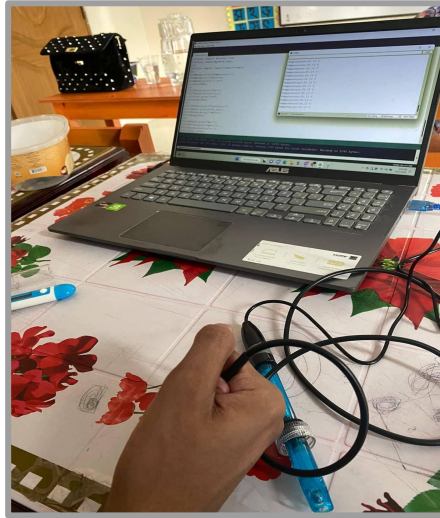
DS18B20

Usable temperature range:  $-55$  to  $125^{\circ}\text{C}$

$\pm 0.5^{\circ}\text{C}$  Accuracy from  $-10^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



## Temperature Sensor Verification





## Functional Verification



Mirpur DOHS Pond

Date: 13/12/2022

Time: 13:45 – 14:08



Diabari Lake

Date: 13/12/2022

Time: 14:40 – 14:51



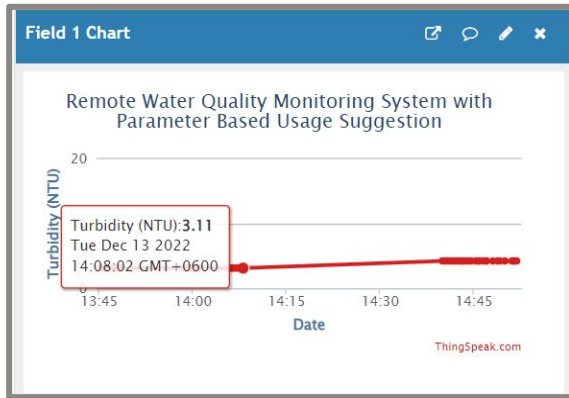
## Test Case-1: Mirpur DOHS Pond

video

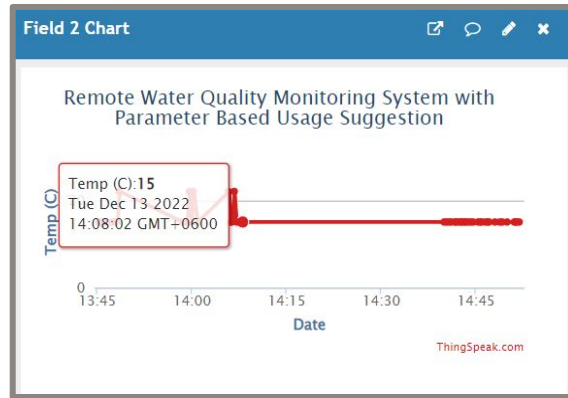




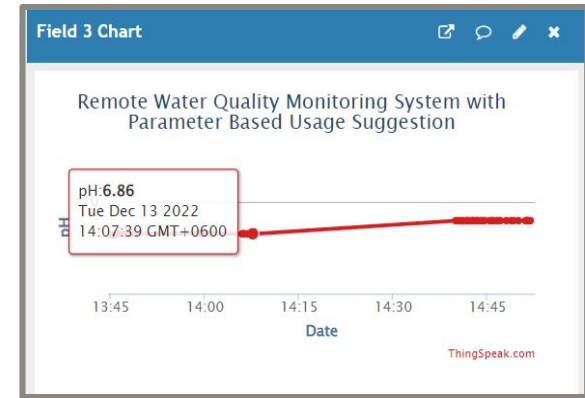
## Turbidity, Temperature, pH



Turbidity (NTU): 3.11



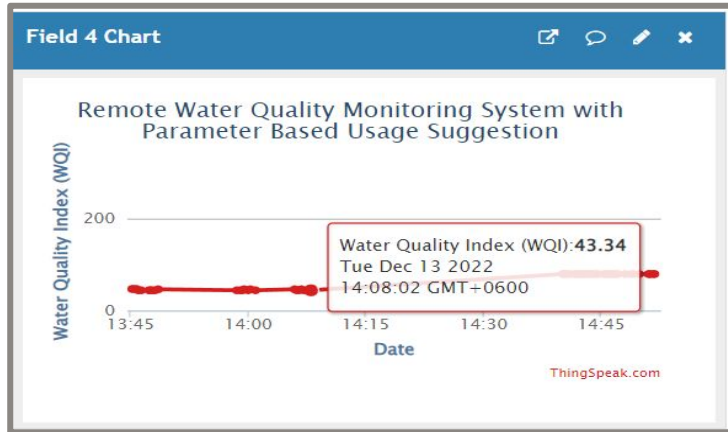
Temperature (C): 15



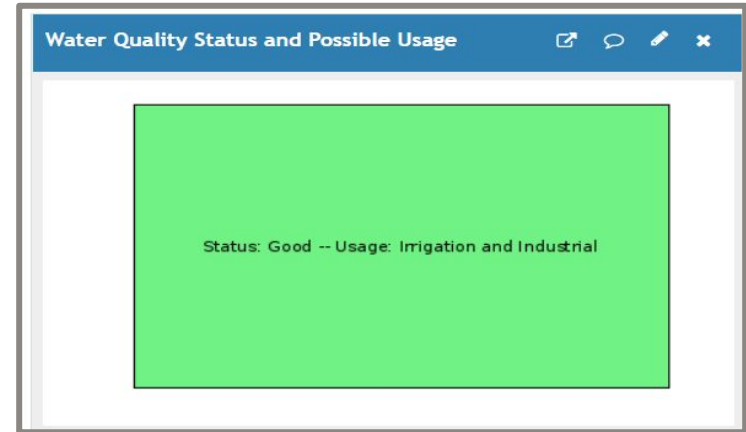
pH: 6.86



## WQI, Status and Usage



Water Quality Index (WQI): 43.34



Status: Good - Usage: Irrigation and Industrial

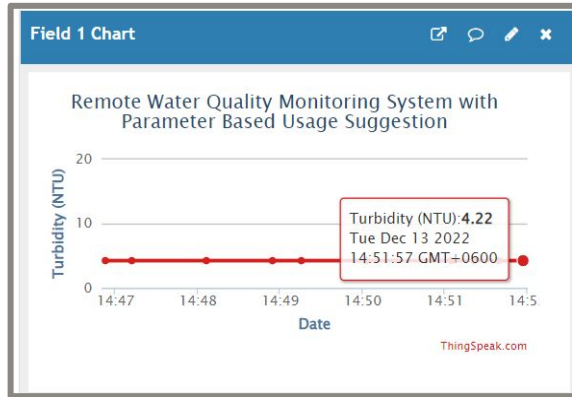


## Test Case-2: Diyabari Lake

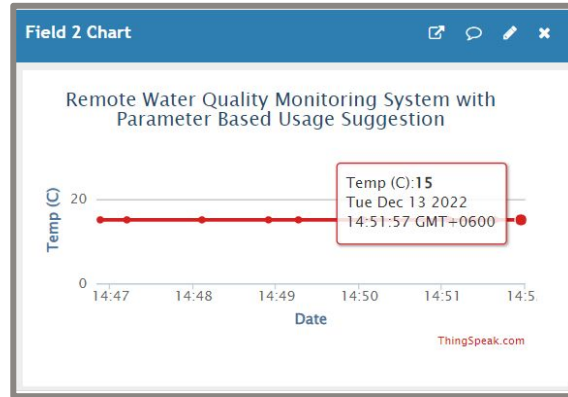
video



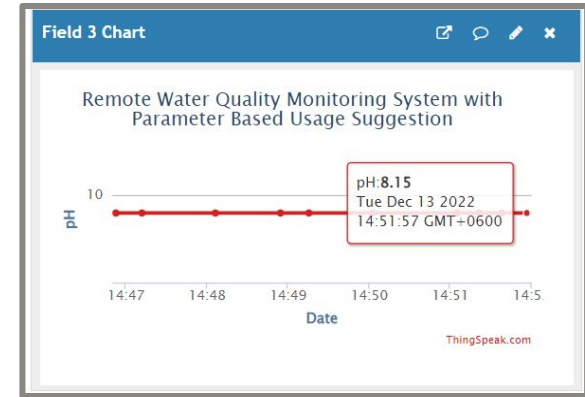
## Turbidity, Temperature, pH



**Turbidity (NTU): 4.22**



**Temperature (C): 15**

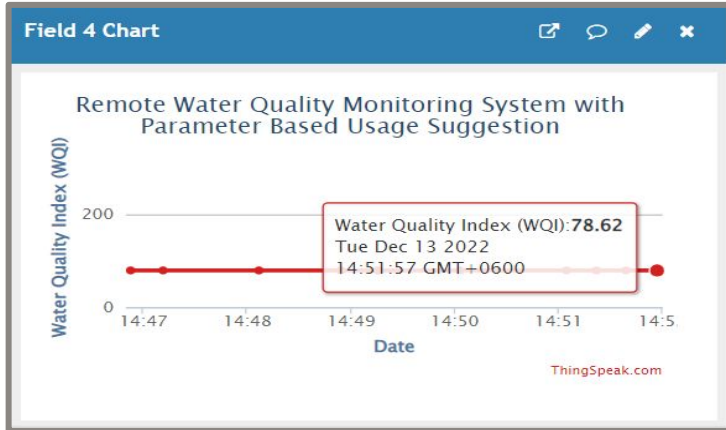


**pH: 8.15**

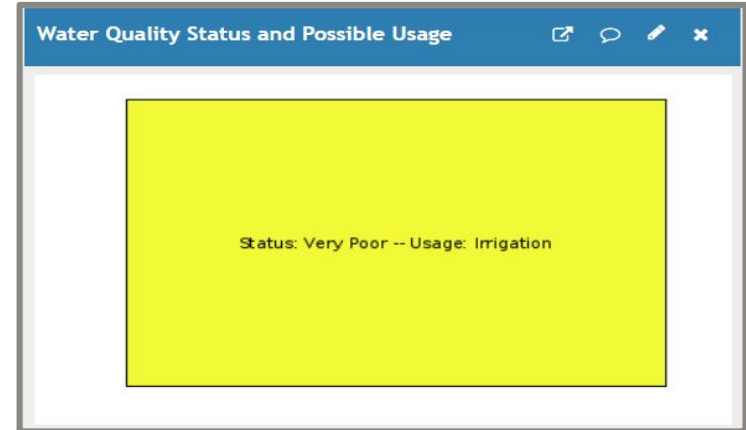




## WQI, Status and Usage



Water Quality Index (WQI): 78.62



Status: Very Poor – Usage: Irrigation

## Challenges Faced and Solutions



1. Data Transmission was unstable
2. Data readings were fluctuating initially
3. Body was not floating

1. Replaced ESP-8266 with Nodemcu ESP-32



2. Recalibrated the circuit wrt to nodemcu
3. Changed to pipes of 3 inch



## Future Works

- Install Solar Panel.Will Make Project “Greener”.
- A Data-Set Could Be Prepared In The Long-Run. Useful for ML Applications.
- Install More Sensors. Will Give Better WQI Score.

*Thank You!*  
*Any Questions?*



“



## Reference

- Weighted Arithmetic Water Quality Index Method (Brown et al. 1972)
- Md. Galad Uddin, S. Nash and A. I. Olbert, “A review of water quality index models and their use for assessing surface water quality,” *Ecological Indicators*, vol. 122, 2021, doi: <https://doi.org/10.1016/j.ecolind.2020.107218>.
- Dr. Eugene, “Calculation of Water Quality Index,” *YouTube*, Date video uploaded: 16/7/2022, Available: [Calculation of Water Quality Index](#). [Accessed: 27/7/2022]
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- <https://www.youtube.com/watch?v=LtXfIYYb8F4&t=3s>
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- <https://store.roboticsbd.com/>
- <https://edu.rsc.org/soundbite/coca-cola/2021233.article#:~:text=How%20acidic%20is%20Coke%3F,little%20contribution%20to%20the%20acidity>.



## Reference

Water Quality Parameters	Bangladesh Standards
pH	6.5-8.5
Total Dissolved Solids(TDS)	1000 mg/L
Temperature	20-30 °C
Turbidity	1-5 NTU