Project Report

of

ULTIMATE ENGINEERS

Project Competition

on

‘Water Pollution Monitoring Boat’

Department of Applied Science and Humanities

Ganga Institute of Technology and Management, Kablana

Water Pollution Monitoring Boat

Team No.

No. of Team Members: 2

Detail of Team:

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Water Pollution Monitoring Boat

INTRODUCTION

Water is a vital source for human life but due to population growth and the rate of civilization have resulted in environmental degradation especially ground water. Around 40% of deaths are caused due to contaminated water in the world. Recent developments in the field of sensor network have been useful in monitoring water quality. Programs such as National Lake Conservation Plan, National Wetland Conservation Programme are hosted by Government of India and are based on laboratory-analysed results.

This proposed project involves a system where water quality can be assessed and monitored on real-time basis, integrated with a LCD Display on boat.

Parameters that influence water quality are Turbidity, Total Dissolved Solids (TDS), pH and conductivity. These parameters are acquired using Turbidity, TDS, pH and Temperature Sensor, respectively.

The acquired Analog data is converted into digital before sending to the microcontroller using ADC. These data are communicated to Arduino UNO for processing the information regarding water quality and is showing on LCD Display. Hence the data acquired from the sensors can be used to study the status of water body.

The proposed system results will be very useful in saving the environment, and thus, improving the health of living creatures on Earth.

OBJECTIVE

The objectives of project are

(a) To create a hassle-free system implemented on a boat to keep track of water pollutants.

(b) To have minimal/no human intervention in maintaining the system.

(c) To provide updates on data on LCD Display placed on boat.

METHODOLOGY

Water Pollution Monitoring System:

The main parameters that play a vital role in monitoring water is its pH, turbidity, dissolved solids, and temperature. Therefore, water Pollution Monitoring system consists of four sensors viz. Turbidity, Total Dissolved Solids (TDS) sensor, pH, and temperature Sensor.

The parameters that are being sensed from the water bodies by the sensors are in Analog form, and hence need to be converted into Digital format for Processor to process the data. Hence a 16bit ADC converter is used to achieve the same. ADC is generally built in Arduino uno. The data once processed in the Processor is displaying on LCD display on boat.

Monitoring water pollution involves various methods and techniques to collect data on water quality, assess the presence and concentration of pollutants, and analyze the data to inform decision-making and management

actions. Some common methods and techniques used in water pollution monitoring include:

Sampling-

•**Water sampling:** Collecting water samples from various points in a water body to assess its quality. Samples can be collected from the surface, at different depths, or at specific locations like wastewater treatment plant discharges.

•**Sediment sampling:** Collecting and analyzing sediment samples to understand the presence of pollutants that accumulate in the sediment.

•**Biological sampling:** Collecting samples of aquatic organisms or other biological indicators to assess the health of ecosystems and the potential impacts of pollutants.

Testing and analysis:

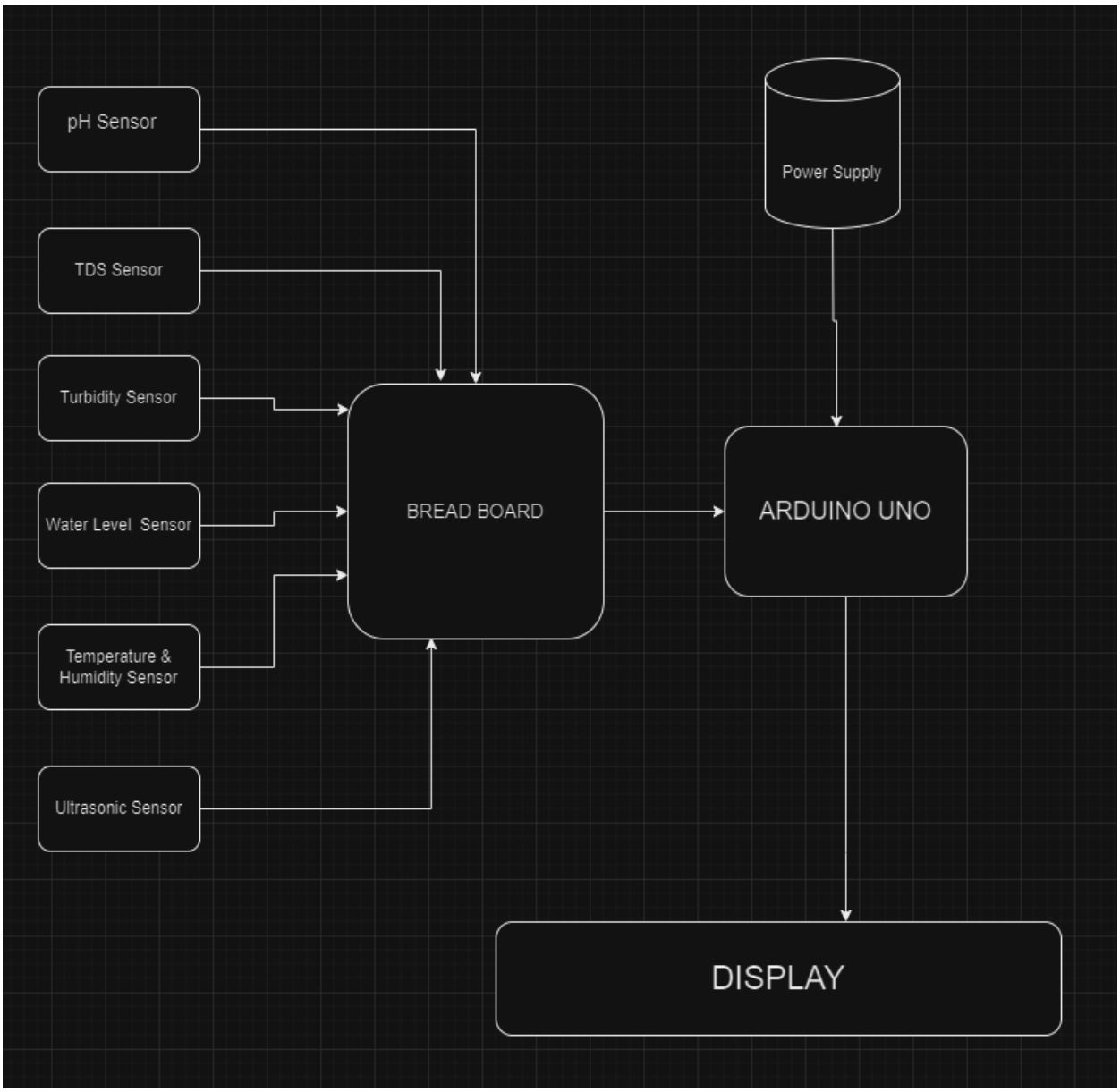
•**Laboratory analysis:** Analyzing water samples in a laboratory using various methods, such as chemical analysis to measure nutrient levels, pH, and dissolved oxygen; microscopic analysis to identify biological organisms; and spectrometry to detect heavy metals and other contaminants.

•**On-site testing:** Using portable testing equipment or sensors to measure certain water quality parameters like pH, dissolved oxygen, or turbidity in the field.

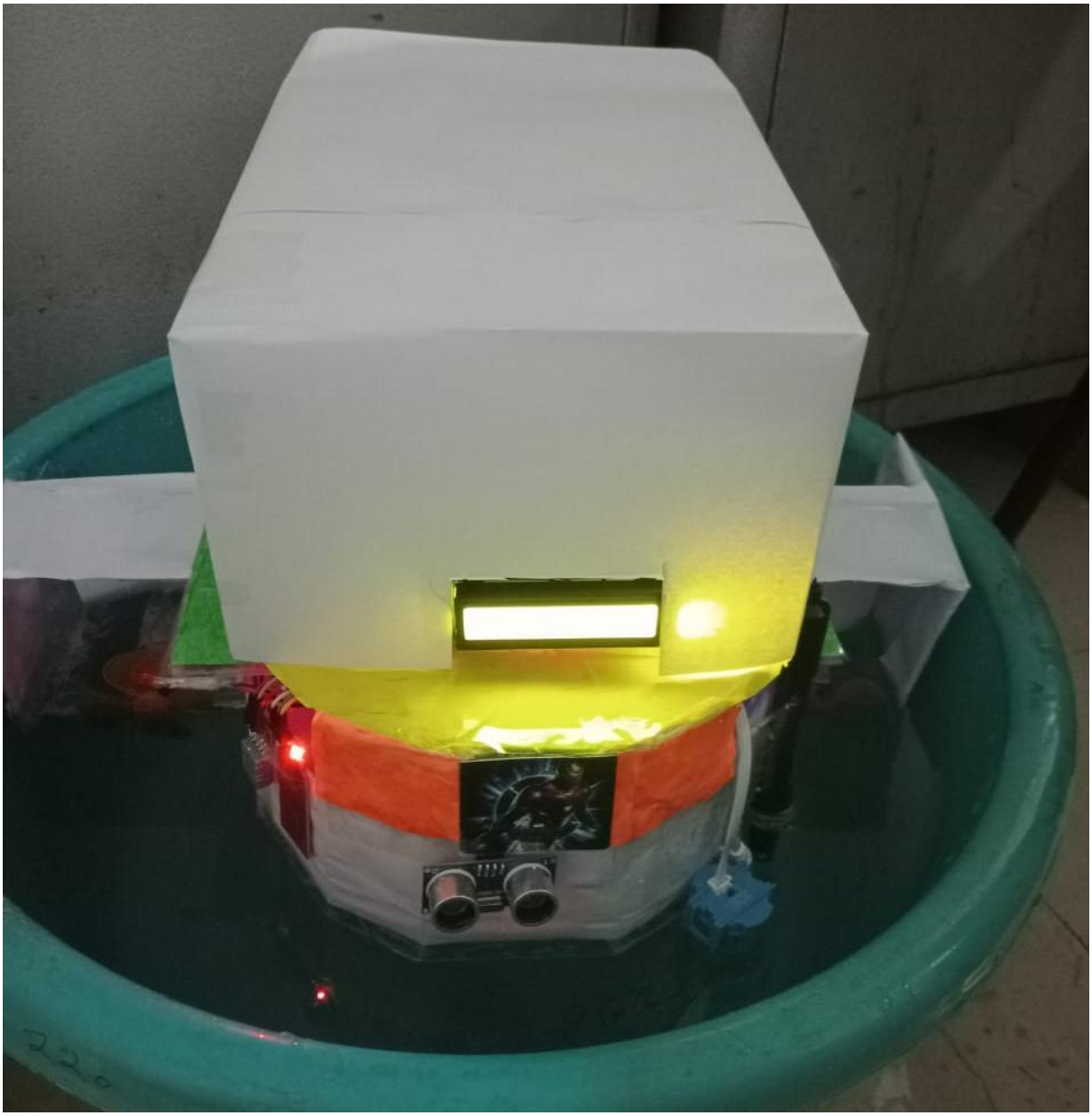
•**Remote sensing:** Using satellite or drone imagery to monitor large water bodies, detect algal blooms, and assess water quality parameters like chlorophyll concentration or turbidity.

Water pollution monitoring is crucial for understanding the current state of water resources, identifying pollution sources, assessing the effectiveness of management actions, and protecting human health and aquatic ecosystems. Data collected through monitoring efforts inform decision-making processes and support the development of policies and regulations aimed at reducing water pollution.

FLOW CHART



WATER POLLUTION MONITORING BOAT



ARDUINO CODE

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <DHT.h>

#define pH_SENSOR_PIN A2            //ph sensor
#define TDS_SENSOR_PIN A1           //tds sensor
#define WATER_LEVEL_SENSOR_PIN A3   //water level sensor
#define DHTPIN 10                   //temperature and humidity sensor
```

```
#define DHTTYPE DHT11
#define TURBIDITY_SENSOR_PIN A0      // Define the pin for the
turbidity sensor
#define trigPin 12                   //ultrasonic sensor
#define echoPin 11
float pHValue;
float tdsValue;
int turbidityValue;

LiquidCrystal_I2C lcd(0x27, 16, 2);  // 16x2 display
DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  dht.begin();
  pinMode(pH_SENSOR_PIN, INPUT);
  pinMode(TDS_SENSOR_PIN, INPUT);
  pinMode(WATER_LEVEL_SENSOR_PIN, INPUT);
  pinMode(TURBIDITY_SENSOR_PIN, INPUT); // Initialize the turbidity
sensor pin
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);

  // Initialize the LCD
  lcd.init();
  // Turn on the backlight
  lcd.backlight();
  // Set a default contrast level (you may need to adjust this)
  lcd.setContrast(50);  // You can try different values (0-100) to get the
desired contrast
  // Set cursor to the first column of the first row
  lcd.setCursor(0, 0);

}
void loop() {
  // Read the analog value from the pH sensor
  int pH_sensor_value = analogRead(pH_SENSOR_PIN);
```

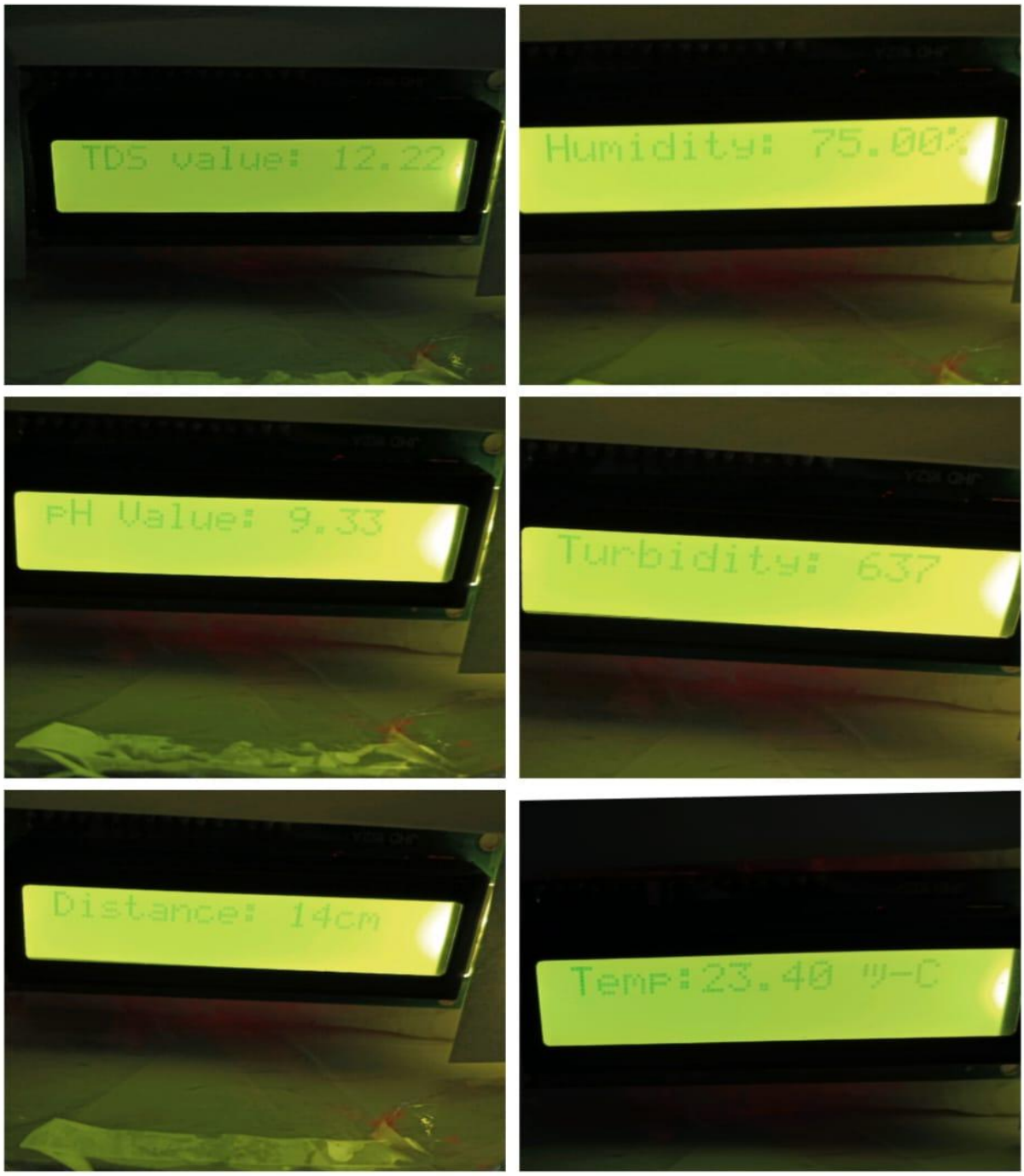
```
  float pH_voltage = pH_sensor_value * (5.0 / 1024.0);
  pHValue = 3.5 * pH_voltage;

  // Read the analog value from the TDS sensor
  int tds_sensor_value = analogRead(TDS_SENSOR_PIN);
  float tds_voltage = tds_sensor_value * (5.0 / 1023.0);
  tdsValue = tds_voltage * 1000 / 2.0;

  // Read water level sensor data
  int waterLevel = digitalRead(WATER_LEVEL_SENSOR_PIN);

  // Read temperature and humidity
  float temperature = dht.readTemperature();
  float humidity = dht.readHumidity();

  // Read the analog value from the turbidity sensor
  turbidityValue = analogRead(TURBIDITY_SENSOR_PIN);

  // Read distance of objects using ultrasonic sensor
  long duration, distance;

  digitalWrite(trigPin, LOW);        //clear the trigpin
  delay(2);
  digitalWrite(trigPin, HIGH);       //set the trigpin high
  delay(10);
  digitalWrite(trigPin, LOW);        //set the trigpin low

  duration = pulseIn(echoPin, HIGH);  //Read the echopin, and calculate the
duration of the pulse
  distance = (duration*0.034/2);      //calculate the distance

  // Print pH value to serial monitor
  Serial.print("pH Value: ");
  Serial.println(pHValue);

  // Print TDS value to serial monitor
  Serial.print("TDS Value: ");
```

```
  Serial.println(tdsValue);

  // Print turbidity value to serial monitor
  Serial.print("Turbidity: ");
  Serial.println(turbidityValue);

  // Print water level status to serial monitor
  if (waterLevel == HIGH) {
    Serial.println("नाव डूब रही है "); // Hindi: "Boat is sinking"
  } else {
    Serial.println("Water level is normal ");
  }

  // Print temperature and humidity to serial monitor
  Serial.print("Temperature: ");
  Serial.print(temperature);
  Serial.println(" °C");
  Serial.print("Humidity: ");
  Serial.print(humidity);
  Serial.println(" %");


  // Print the distance value on serial monitor
  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println("cm");

  Serial.print("\n");

  // Display pH value on LCD
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("pH Value: ");
  lcd.print(pHValue);
  delay(2000);

// Display tds value on LCD
```

```
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("TDS value: ");
  lcd.print(tdsValue);
  delay(2000);

  // Display turbidity value on LCD
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Turbidity: ");
  lcd.print(turbidityValue);
  delay(2000);

// Display temperature value on LCD
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Temp:");
  lcd.print(temperature);
  lcd.print(" °C");
  delay(2000);

  // Display humidity value on LCD
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Humidity: ");
  lcd.print(humidity);
  lcd.print("%");
  delay(2000);

  //Display distance of object on lcd display
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Distance: ");
  lcd.print(distance);
  lcd.print("cm");
  delay(2000);
}
```

RESULT

The sensor's successfully worked and generated output of water pollution parameters data.



CONCLUSION

To check the quality of water, the current method is to sample the water manually. These samples were sent to the laboratories to test the quality which takes extra human effort, cost and time. In our proposed system it will give the properties of the water automatically on the screen without any extra effort. This IoT pollution monitor boat provides the following advantages:

- pH & Turbidity Sensing
- Total Dissolved Solids (TDS) Level Sensing
- Temperature Sensing
- Long Range Operation
- Data Logging as well as LCD Operation
- Obstacle and Water Level Detection
- Efficient Propeller Driven Navigation system
- Easy to Operate

. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on.

FUTURE SCOPE

Looking to the future, there are numerous opportunities to enhance water pollution monitoring efforts and maximize their effectiveness in protecting water resources. Some of these opportunities include:

1. **Improved Methods:** Advances in analytical techniques, sensor technology, and data analysis could lead to more accurate and cost-effective methods for monitoring water pollution. Developing faster, more sensitive and more efficient methods for detecting and quantifying pollutants could provide more timely and actionable data for decision-makers.
2. **Data Sharing:** Sharing water quality data among stakeholders, including regulatory agencies, environmental organizations, academia, and the general public, can increase collaboration and leverage collective knowledge to better understand and address water pollution issues.
3. **Integration with other Monitoring Efforts:** Integrating water pollution monitoring with other environmental monitoring efforts, such as weather and climate monitoring could provide a more comprehensive understanding of how different environmental factors interact and impact water quality.
4. **Citizen Science:** Engaging the public in water pollution monitoring efforts, such as through volunteer monitoring programs or the use of

crowd sourced data collection can increase data collection capacity, raise awareness, and foster community stewardship of water resources.

REFERENCE

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