Water Quality Monitoring Project – Sensor and Microcontroller Features

# Microcontroller: ESP32

## Overview:

The ESP32 is a powerful microcontroller with built-in Wi-Fi and Bluetooth, widely used in IoT and embedded systems. It can handle multiple tasks and sensor inputs simultaneously.

## What It Can Do:

- Connects to Wi-Fi for real-time cloud communication.  
- Reads data from multiple analog and digital sensors.  
- Displays readings on an OLED or sends to Firebase.

## Role in Project:

- Serves as the brain of the system.  
- Collects data from the pH, TDS, turbidity, and temperature sensors.  
- Sends data to a Firebase Realtime Database for remote monitoring.

# Sensors: pH, TS-300B Turbidity, TDS, DS18B20 Temperature

# 1. pH Sensor

## Overview:

The pH sensor measures the hydrogen ion concentration in water, which indicates its acidity or alkalinity. It’s essential for assessing water suitability for various uses.

## What It Can Do:

- Detects pH levels on a scale from 0 (acidic) to 14 (basic).  
- Provides an analog voltage output proportional to pH level.

## Role in Project:

- Monitors water pH to ensure it's within safe limits for drinking or usage.  
- Helps identify chemical imbalances or contamination.

# 2. TS-300B Turbidity Sensor

## Overview:

The TS-300B turbidity sensor detects the cloudiness or haziness of a fluid, caused by particles in the water. It’s used to measure water clarity.

## What It Can Do:

- Measures suspended solids in water in NTU (Nephelometric Turbidity Units).  
- Outputs an analog signal based on light scattering caused by particles.

## Role in Project:

- Indicates the presence of pollutants or sediments.  
- Detects if water needs further filtration or treatment.

# 3. TDS Sensor

## Overview:

The Total Dissolved Solids (TDS) sensor measures the concentration of dissolved substances like minerals and salts, indicating water purity.

## What It Can Do:

- Outputs a ppm (parts per million) reading of dissolved content.  
- Measures water conductivity through analog voltage output.

## Role in Project:

- Helps determine if water is pure, polluted, or overly mineralized.  
- Monitors the effectiveness of water filtration systems.

# 4. DS18B20 Temperature Sensor

## Overview:

The DS18B20 is a digital temperature sensor commonly used in environmental and industrial applications. Its waterproof design allows for direct submersion in water.

## What It Can Do:

- Measures temperatures between -55°C and +125°C.  
- Provides accurate digital readings with minimal wiring using 1-Wire protocol.

## Role in Project:

- Tracks water temperature, which affects pH, TDS, and turbidity readings.  
- Detects abnormal temperature variations that could indicate issues in the environment.