

Technical report

1. Introduction

This project aims to reduce water pollution in Egypt by designing a smart system that consists of sensors and a buzzer. The system measures temperature, TDS, and pH—three important water quality parameters—in real time using Internet of Things (IoT) sensors. These factors are essential for making sure that the water released into the Nile doesn't surpass pollution levels, which could have a detrimental effect on the environment and public health.

2. System overview:

The system consists of:

- two sensors (pH sensor and precision digital TDS total dissolved solids and temperature water sensor) that are used to measure water parameters
- Arduino UNO, which works as a microcontroller that works to process data.
- Accuracy of all sensors is ± 0.05 pH and ± 2 ppm.

3. Sensors and Measurement Principles

The smart system uses three types of sensors to monitor the following parameters:

1. pH Sensor:

- **Purpose:** Measures the acidity or alkalinity of the water.
- **Measurement Range:** 0 to 14 PH.
- **Accuracy:** ± 0.05 PH.
- **Alert Condition:** If the pH falls below 6.0 or rises above 9.0, the system triggers an alert and activates the buzzer.

2. TDS (Total Dissolved Solids) Sensor:

- **Purpose:** Measures the concentration of dissolved solids in the water, which indicates pollution levels.
- **Measurement Range:** 0 to 5000 ppm.

- **Accuracy:** $\pm 2\%$ of the reading or ± 2 ppm (whichever is greater).
- **Alert Condition:** If TDS exceeds 1200 ppm, the system triggers an alert and activates the buzzer.

3. Temperature Sensor:

- **Purpose:** Measures the temperature of the water to detect thermal pollution, which can harm aquatic life.
- **Measurement Range:** -55°C to 125°C .
- **Accuracy:** $\pm 0.5^{\circ}\text{C}$.
- **Alert Condition:** If the temperature exceeds 30°C , the system triggers an alert and activates the buzzer.

4. Threshold

Threshold values were added according to Egyptian environmental standards.

- **PH threshold:** when be not between (6–9)
- **TDS threshold:** when exceed 1200 ppm
- **Temperature:** when exceed 30 degrees

5. Data storage and dashboard

Data will be stored in a CSV file by using the Python programming language. This data will be converted to graphs. There is one graph for each parameter and one graph for all parameters with a function of time.

If one or more parameters reach their threshold, the buzzer will be turned on, and the line in the graph on the dashboard will be converted to red. This change in color in the dashboard will make a non-technical user able to know that a change has been made.

