

# Indus Delta Capital - Delta Blue Carbon - I, Internet of Things Project

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# 1 Project Overview

## 1.1 Description

Welcome to the Mangroves Monitoring System Documentation, a vital component of the [Delta Blue Carbon - I](#) (DBC-I) project under the umbrella of Indus Delta Capital. DBC-1 integrates the Internet of Things (IoT) to revolutionize environmental insights. Our goal is to implement a real-time analysis across a spectrum of environmental factors. We're dedicated to tracking mangrove growth and its ecosystem, conducting robust research and data analysis to reveal growth patterns.

Our system covers an extensive range of measurements: pressure, altitude, atmospheric and aquatic temperature, methane levels, humidity, and tidal height. Powered by rugged, waterproof industrial-grade sensors, our solution thrives even in the harshest conditions, ensuring accurate and dependable data collection.

## 1.2 Key Features

- Real-time temperature, humidity, and pressure monitoring with the BME280 sensor.
- Accurate temperature measurements in water and soil using the DS18B20 waterproof sensor.
- Detection of methane gas concentrations with the MQ-4 gas sensor.
- Precise distance measurements with the JSN-SR04 ultrasonic sensor.
- Reliable humidity and temperature data collection with the DHT22 sensor.

# 2 System Architecture

## 2.1 Hardware

The Environmental Monitoring System comprises the following hardware components:

- Arduino Uno
- BME280 Sensor
- DHT22 Sensor
- DS18B20 Waterproof Sensor
- JSN-SR04 Ultrasonic Sensor
- MQ-4 Gas Sensor
- AJ-SR04M Ultrasonic Sensor

## 2.2 Software

The software components of the system include:

- Arduino IDE for code development
- Libraries for sensor communication (e.g., OneWire, DallasTemperature)
- Custom code modules for data collection and analysis
- Cloud integration (future work)

### Gas Sensor (MQ-4) - 19th July, 2023

Implemented the MQ-4 Gas Sensor, which provides a range between 150-400 at room levels. The sensor's sensitivity increases if it detects perfume, alcohol, or smoke. On 20th July, 2023, fixed the MQ4 code and circuit, setting the threshold at 500 ppm. If the gas concentration exceeds 500 ppm, the buzzer starts beeping, and a message displays that gas has been detected.

### Temperature and Humidity Sensor (DHT22) - 21st July, 2023

Implemented the DHT22 (AM2302) sensor, capable of measuring temperatures from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  with an accuracy of  $\pm 0.5^{\circ}\text{C}$ . The DHT22 sensor can also measure relative humidity from 0

### BME280 Sensor - 26th July, 2023

Encountered issues with the BME280 sensor, but managed to get it working by providing a direct 3.3V line and a direct ground connection. Additionally, soldered the BME280 as per specifications, but it still provides strange values.

### BME280 Sensor Continued - 27th July, 2023

Continued troubleshooting the BME280 sensor. Successfully resolved previous issues, but the sensor is still giving unexpected values. Further investigation and calibration are required.

### Code Modularization - 31st July, 2023

Worked on modularizing the code to manage its increasing size effectively. Each sensor now has its own header (.h) and implementation (.cpp) files, all combined in the main .ino file for better organization and readability.

## **DS18B20 Temperature Sensor - 1st August, 2023**

Started working on the DS18B20 temperature sensor. Procured the waterproof variant, which requires a power supply of 3.3V to 5V and a 4.7k pull-up resistor between the data line and the microcontroller.

## **AJ-SR04 Ultrasonic Sensor - 7th August, 2023**

The AJ-SR04M is a waterproof ultrasonic sensor efficient for using outside in harsh conditions. We are using it to measure the tidal height of the water. I have implemented AJSR04 as of today, it is working efficiently. Now, I have one more sensor left to implement. The future work also includes, PCB designing, cloud and networking integration.