

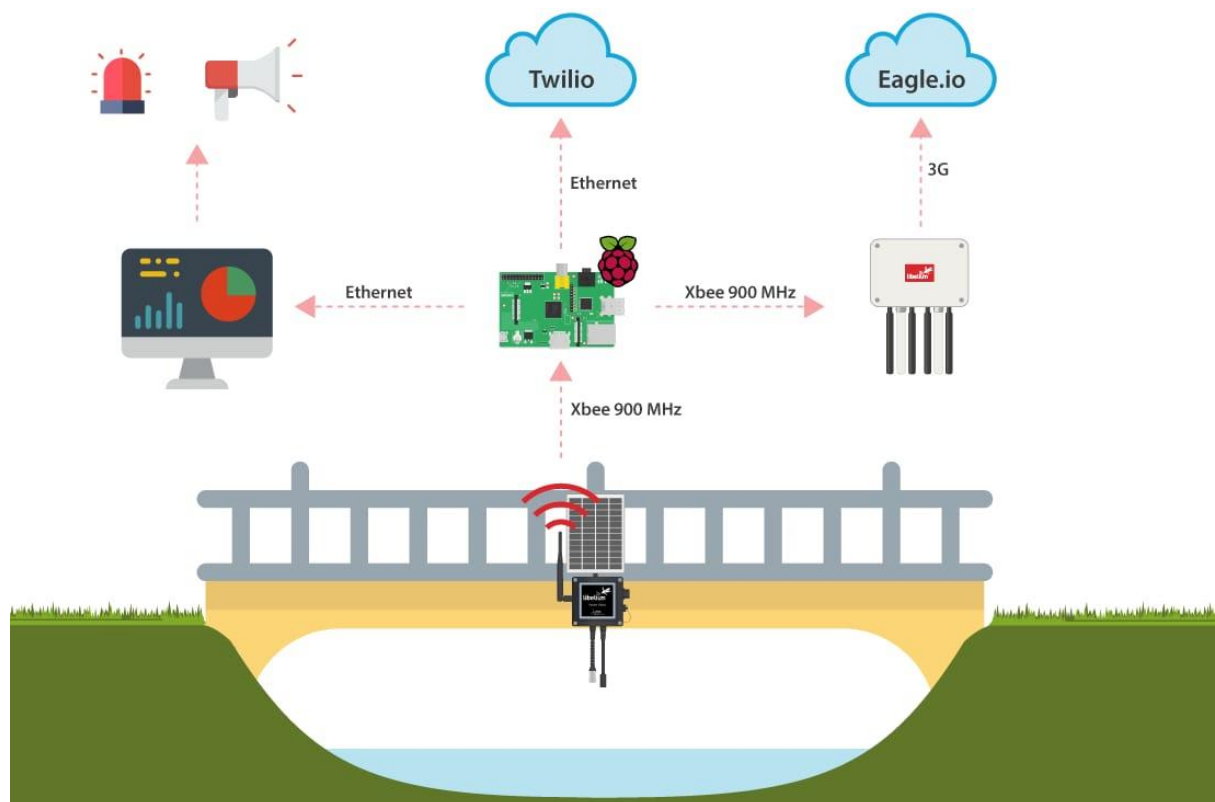
# FLOOD MONITORING AND EARLY WARNING SYSTEM

## PHASE 5 : PROJECT DOCUMENTATION & SUBMISSION

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### Project Objectives:

The project's main objectives are to establish a real-time flood monitoring and early warning system to enhance public safety and emergency response coordination. This involves:

### 1. IoT Sensor Deployment:

- ❖ Install a network of IoT sensors in flood-prone areas and along waterways.
- ❖ These sensors should measure various environmental parameters, including water levels, rainfall, and temperature.
- ❖ They transmit data wirelessly to a central server for analysis.

### 2. Platform Development:

- ❖ Create a web-based platform for data collection, analysis, and dissemination of warnings.
- ❖ The platform should include user-friendly interfaces for administrators, emergency services, and the public.
- ❖ Implement data analytics to detect flood conditions and trigger alerts.

### 3. Code Implementation:

- ❖ Develop firmware for IoT sensors to ensure accurate data collection and transmission.
- ❖ Build server-side applications to receive, process, and store sensor data.
- ❖ Develop algorithms for flood prediction and early warning.

## **Enhancing Public Safety and Emergency Response:**

A real-time flood monitoring and early warning system offers several key benefits in terms of public safety and emergency response coordination:

#### ● **Timely Alerts:**

By continuously monitoring environmental data, the system can promptly detect abnormal conditions such as rising water levels. This enables authorities to issue timely flood alerts to the public.

#### ● **Preventive Measures:**

Early warnings allow individuals and communities to take preventive measures, such as evacuations and protecting property, reducing the risk of injuries and damage.

- **Improved Coordination:**

Emergency services can use the real-time data to coordinate their response efforts effectively. They can allocate resources where they are most needed and plan evacuation routes efficiently.

- **Public Awareness:**

Providing access to the platform for the public allows individuals to stay informed about local flood conditions. Informed citizens are better equipped to make decisions that enhance their safety.

### **CIRCUIT DIAGRAM :**

**PROGRAM :**

```
# Define GPIO pins

TRIG_PIN = machine.Pin(2, machine.Pin.OUT)

ECHO_PIN = machine.Pin(3, machine.Pin.IN)

BUZZER_PIN = machine.Pin(4, machine.Pin.OUT)

DHT_PIN = machine.Pin(5)

LED_PIN = machine.Pin(6, machine.Pin.OUT)


def distance_measurement():

    # Trigger ultrasonic sensor

    TRIG_PIN.on()

    time.sleep_us(10)

    TRIG_PIN.off()


    # Wait for echo to be HIGH (start time)

    while not ECHO_PIN.value():

        pass

    pulse_start = time.ticks_us()


    # Wait for echo to be LOW (end time)

    while ECHO_PIN.value():

        pass

    pulse_end = time.ticks_us()


    # Calculate distance

    pulse_duration = time.ticks_diff(pulse_end, pulse_start)

    distance = pulse_duration / 58 # Speed of sound (343 m/s) divided by 2
```

```
    return distance
```

```
def read_dht_sensor():
```

```
    d = dht.DHT22(DHT_PIN)
```

```
    d.measure()
```

```
    return d.temperature(), d.humidity()
```

```
buzz_start_time = None # To track when the buzzer started
```

```
while True:
```

```
    dist = distance_measurement()
```

```
    temp, humidity = read_dht_sensor()
```

```
    # Check if the distance is less than a threshold (e.g., 50 cm)
```

```
    if dist < 50:
```

```
        # Turn on the buzzer and LED
```

```
        BUZZER_PIN.on()
```

```
        LED_PIN.on()
```

```
        status = "Flooding Detected"
```

```
        buzz_start_time = time.ticks_ms()
```

```
    elif buzz_start_time is not None and time.ticks_diff(time.ticks_ms(), buzz_start_time) >= 60000: #  
1 minute
```

```
        # Turn off the buzzer and LED after 1 minute
```

```
        BUZZER_PIN.off()
```

```
        LED_PIN.off()
```

```
        status = "No Flooding Detected"
```

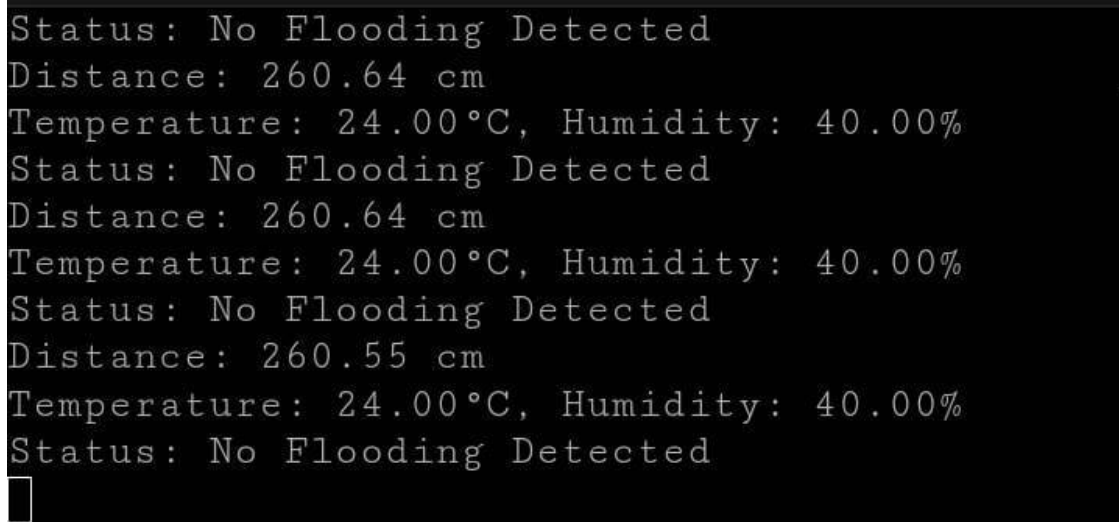
```
    else:
```

```
status = "No Flooding Detected"

print(f"Distance: {dist:.2f} cm")
print(f"Temperature: {temp:.2f}°C, Humidity: {humidity:.2f}%")
print("Status:", status)

time.sleep(2)
```

### **OUTPUT :**





## **Future Enhancement**

This project can be made useful in various purposes when the system is enhanced as per the requirement of the relevant field. But here the main concern is to enhance the system so that it can be highly applicable for the determination of water level in river and warn the people in real time. The further enhancement which can be carried out may be:

- ✓ The temperature and the humidity sensor having higher operating range can be used for the application various regions.
- ✓ The distance sensor having higher range of operation can be used for larger system.
- ✓ The water flow sensor can be used to determine the discharge of water which also aids on early detection of flood.
- ✓ The system can be implemented in various places and the data of one system can be used to alert the other interconnected system so that the system become more feasible, fast and effective.
- ✓ The web API can be made more advanced to handle the overall data of the different connected system.
- ✓ Along with SMS the people can be alerted through phone calls, android app, web pages etc.
- ✓

## **DISCUSSION AND CONCLUSION**

Finally, it is concluded that, the system can detect and hypothesize the flood earlier. The project is based on embedded system and close loop control system. System consists of hardware and software applications to detect water level of rivers, dams etc. System automatically detects the change in level of water and alerts the system when it crosses the threshold value(less than 20cm). The system include ultrasonic sensor to detect the rise in water level and alert if distance between water and sensor is less than 20 cm. DHT11 sense the temperature and humidity which help to analysis the environmental factor for flooding. If the water level crosses the

threshold value than Raspberry pi turns the buzzer and led turn on which symbolizes the warning for early flood.