REAL TIME ENVIRONMENTAL MONITORING AND AIR QUALITY SENSING

TEAM MEMBERS:

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AIM:

The aim of this project is to **design and implement a real-time environmental monitoring and air quality sensing system** that continuously measures key atmospheric parameters such as temperature, humidity, particulate matter (PM2.5/PM10), and harmful gases (CO, CO_2, NH_3, etc.), and provides instant feedback through display, alarms, or IoT-based data visualization. This system helps in assessing air pollution levels, ensuring environmental safety, and supporting smart city and health applications.

COMPONENTS REQUIRED:

1. ESP32 / Raspberry Pi Pico (MicroPython compatible board).
2. MQ135 Gas Sensor Module (with analog output).
3. OLED Display (SSD1306, I2C, 128×64 pixels)**.**
4. Active Buzzer Module**.**
5. Jumper wires & Breadboard.
6. USB cable (for programming & power).

1. ESP32 / Raspberry Pi Pico (Microcontroller Board)

1. Acts as the **brain** of the system – reads sensor data, processes it, and controls outputs.
2. Supports **MicroPython**, making programming simple and beginner-friendly.
3. Provides **ADC pins (for MQ135)** and **I2C pins (for OLED)** for sensor and display interfacing.

2. MQ135 Gas Sensor Module

1. Detects multiple harmful gases like **CO_2, NH_3, benzene, smoke, and alcohol vapors**.
2. Provides an **analog voltage output** proportional to gas concentration.
3. Commonly used for **air quality monitoring** and pollution detection systems.

3. OLED Display (SSD1306, I2C, 128×64 pixels)

1. Displays **real-time sensor readings** and system status (Good Air / Bad Air).
2. Uses **I2C protocol**, needing only 2 pins (SDA, SCL) for communication.
3. Small, low-power, and high-contrast screen, suitable for portable IoT projects.

4. Active Buzzer Module

1. Produces a **sound alert** when activated by the microcontroller.
2. Works with simple **HIGH/LOW digital signals** (no complex driving required).
3. Used here as a **warning system** when air quality goes beyond safe limits.

5. Jumper Wires & Breadboard

1. Allow **easy and quick connections** without soldering.
2. Breadboard makes the project **modular and reusable** for experiments.
3. Essential for **prototyping and testing circuits** in early development.

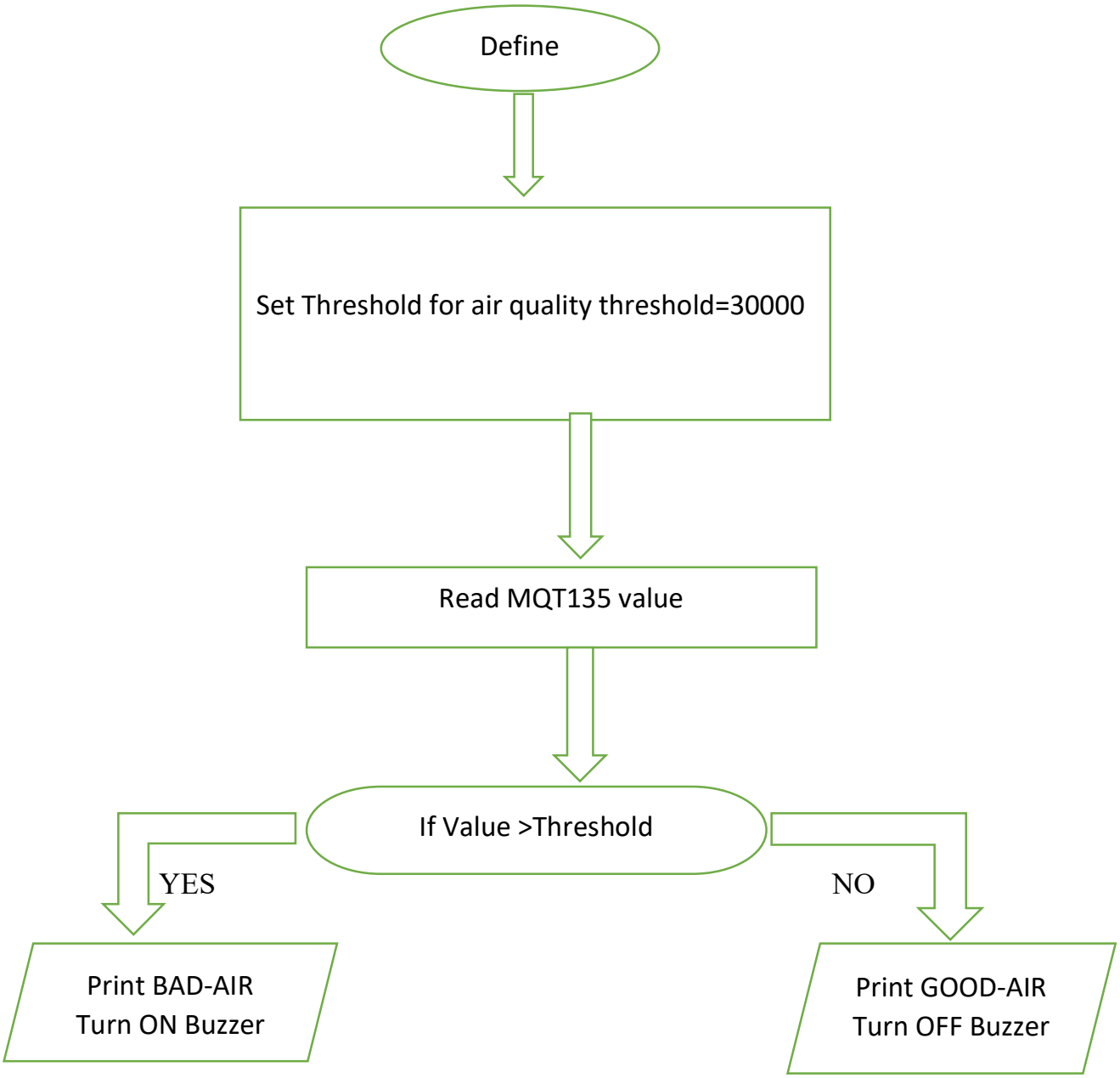
6. USB Cable (for Programming & Power)

1. Provides **power supply** to the microcontroller and connected components.
2. Used to **upload code** from a computer to ESP32 / Pico.
3. Enables **serial communication** for debugging and monitoring sensor data.

PIN TABLE:

COMPONENTS	PIN ON MODULE	CONNECTED TO BOARD PIN
MQ135 Gas Sensor	VCC	3.3V OR 5V
	GND	GND
	A out	GP26
Buzzer	VCC	GP15
	GND	GND
OLED SSD1306	VCC	3.3V
	GND	GND
	SCL	GP5
	SDA	GP4

FLOWCHART :


Define
Set Threshold for air quality threshold=30000
Read MQT135 value
If Value >Threshold
YES
NO
Print BAD-AIR
Turn ON Buzzer
Print GOOD-AIR
Turn OFF Buzzer

EXECUTION :