



# HackHeritage 3.0

The technical solutions for capturing AQI values  
through other forms of station

(HH311)

- **PS Category- Hardware**
- **Team Name: VAYU**
- **Team Members:**
  - **Ajay Gupta**
  - **Soumyadeep Dey**
  - **Aditya Basu Mahto**
  - **Ayushi Mittal**

# IDEA TITLE

## Brief about the Idea

Central Pollution Control Board(CPCB) is using different stations at fixed sites([966](#)) for measurement of AQI and other pollution parameters. These fixed stations suffered from various limitations and generally do not give representative values e. g. station located near an industrial area will give higher readings due to proximity to such industrial area which may not be representative of the wider area. Similarly, a temporary construction site/activity near these fixed sites give higher pollution reading due to local reasons. The technological solutions may be required for capturing AQI values through other forms of stations.

## How it addresses the problem?

Our device is mounted on public vehicles, enabling it to collect real-time pollution data while moving across the city. Unlike fixed monitoring stations that capture air quality only at specific static points, our mobile approach provides widespread spatial coverage by gathering readings from many different locations throughout the day. Each data point is linked to GPS coordinates, allowing us to identify pollution hotspots that traditional fixed stations might overlook and effectively fill monitoring gaps across the city.

## Innovation and Uniqueness

- Better spatial coverage for urban air pollution
- Identification of localized pollution hotspots
- Scalable and cost-effective deployment by leveraging existing public vehicles
- User-friendly data visualization with GPS-tagged timelines on a dedicated web dashboard

## ➤ Technologies to be used

### • Software

#### Programming languages:

1. C/C++
2. Typescript

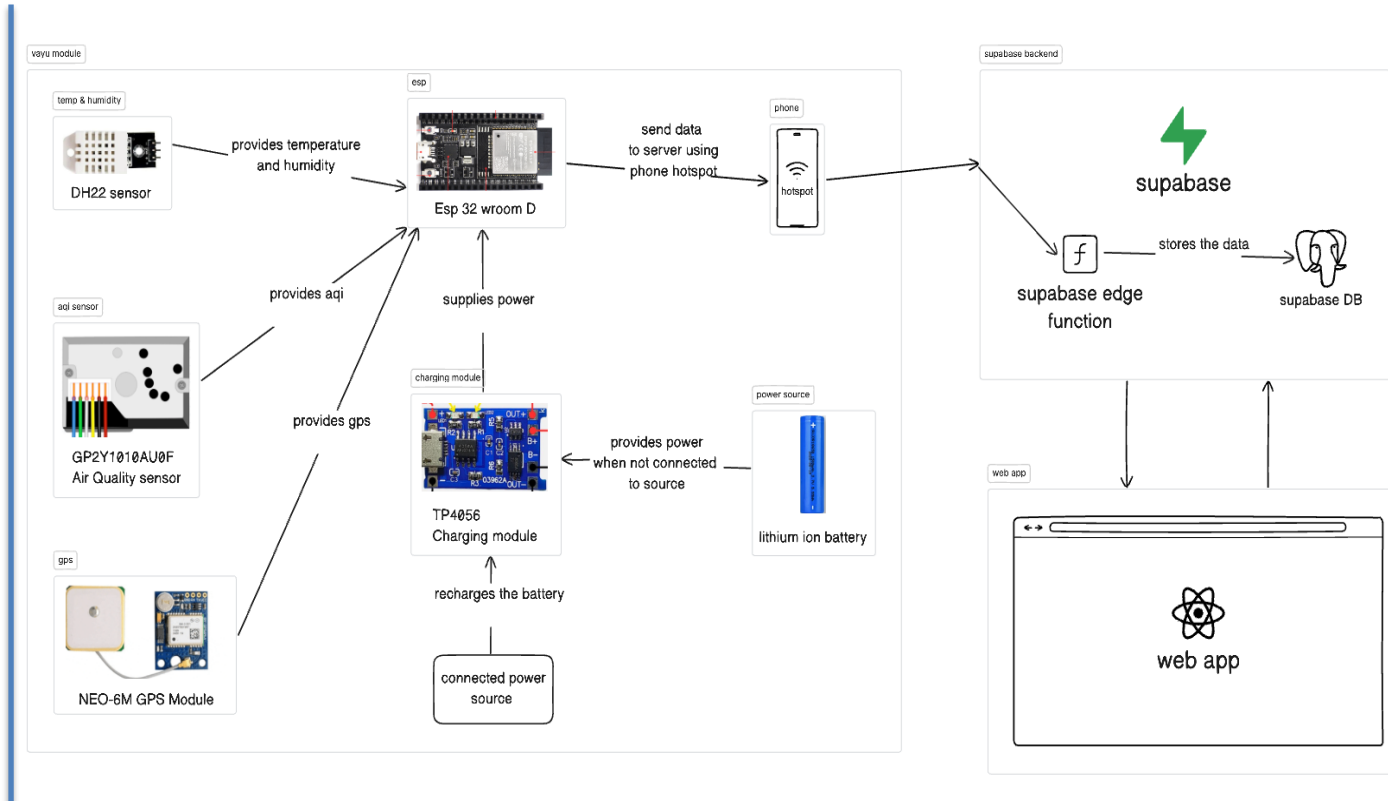
#### Libraries:

1. React
2. Leaflet
3. Supabase
4. Redux
5. Tanstack Query
6. React Router
7. DHT sensor library by Adafruit
8. Adafruit Unified Sensor by Adafruit
9. TinyGPSPlus by Mikal Hart
10. ArduinoJson by Benoit Blanchon

### • Hardware

1. ESP32 Wroom D
2. GP2Y1010 for AQI reading
3. Neo 6M for GPS
4. DHT22 for temp & humidity
5. TP4056 (charging module)
6. Lithium ion battery

## ➤ Process for implementation





## Feasibility Analysis

- Practical use of existing public vehicles for data collection
- Cost-effective and scalable deployment
- Enables better spatial coverage of urban pollution
- Uses widely available sensor and GPS technology

## Potential Challenges and Risks

- Sensor calibration and data accuracy on moving vehicles
- Spatial bias due to fixed vehicle routes
- Maintenance and durability of devices
- Data integration complexities

## Strategies to Overcome Challenges

- Regular sensor calibration and quality checks
- Optimize route selection to cover diverse areas
- Use rugged, vibration-resistant sensor housings
- Implement data cleaning and anomaly detection algorithms
- Establish clear data privacy and governance policies
- Conduct pilot studies before full deployment



## Potential Impact on the Target Audience

- Real-time air quality information for city residents
- Enables authorities to quickly identify and address pollution hotspots
- Empowers communities with localized pollution data
- Supports informed decision-making for health and travel
- Increases public awareness about air quality issues

## Benefits of the Solution

- ***Social:*** Improved public health outcomes by reducing exposure to pollution; greater transparency with citizens
- ***Economic:*** Cost-effective monitoring using existing vehicles; potential reduction in healthcare costs related to air pollution
- ***Environmental:*** Enhanced ability to monitor, manage, and reduce urban air pollution; better identification of high-risk areas for targeted interventions



- Problem Statement Inspiration : [SIH Problem Statements](#) PS Number : SIH1616
- Official audit finds fixed monitoring stations often fail to represent real area exposure, highlighting the need for mobile solutions. [CAG Audit on Air Quality Monitoring \(India, PDF\)](#)
- Mobile IoT-based sensors fill gaps left by traditional static monitors, providing cost-effective, real-time urban air quality data. [Manx Technology Group on Mobile Air Quality](#)