



Smart Air Quality Alert System

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Summary

Introduction

- Implemented an IoT system integrating air quality monitoring and GPS tracking.
- M5StickC Plus devices with specialized sensors for real-time insights.

Importance:

- Simultaneous monitoring of air quality and location for comprehensive understanding.
- Informed decision-making for individuals and communities.



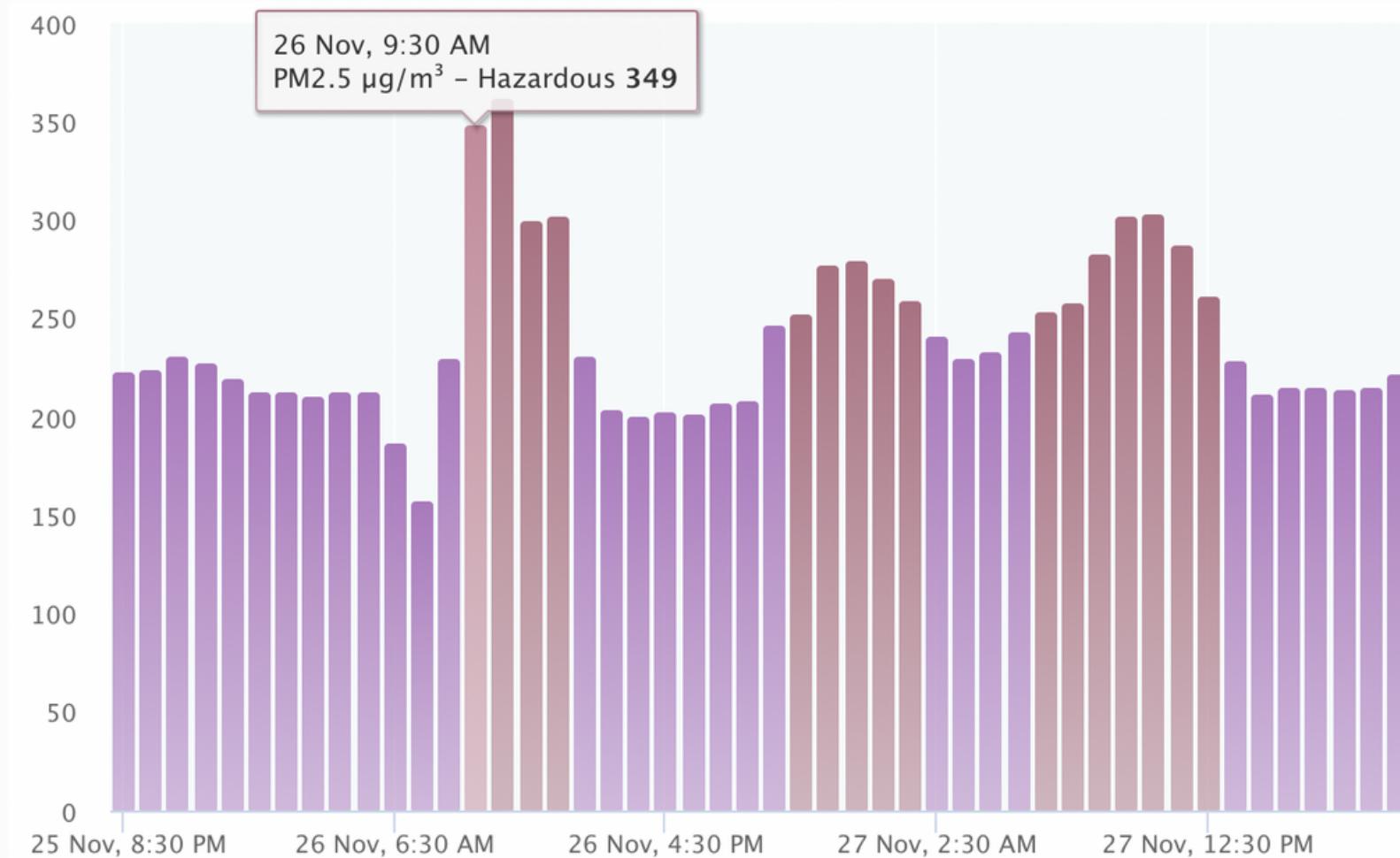
Pollutants

Concentration

HOURLY

DAILY

PM2.5

222.2 $\mu\text{g}/\text{m}^3$ 

!

PM2.5
x44.4

PM2.5 concentration in Delhi is currently 44.4 times the WHO annual air quality guideline value

FORECAST

Delhi air quality index (AQI) forecast

Day	Pollution level	AQI US	Weather	Temperature	Wind
Friday, Nov 24	Hazardous	341 AQI US		78.8° 64.4°	2.2
Saturday, Nov 25	Very unhealthy	283 AQI US		78.8° 60.8°	2.2
Sunday, Nov 26	Very unhealthy	294 AQI US		77° 66.2°	4.5
Today	Very unhealthy	272 AQI US		75.2° 64.4°	8.9
Tuesday, Nov 28	Unhealthy	167 AQI US		77° 64.4°	4.5
Wednesday, Nov 29	Unhealthy	170 AQI US		78.8° 66.2°	2.2
Thursday, Nov 30	Unhealthy	171 AQI US		78.8° 68°	4.5

How many people die from air pollution?

7 Millions

Deaths every year as a result of exposure to fine particles in polluted air.

Source: World Health Organization

How many people breathe unhealthy air?

91%

Of the world's population live in places where air quality exceeds WHO guideline limits.

Source: World Health Organization

<https://www.iqair.com/us/india/delhi>

LIVE AQI CITY RANKING

World major city air quality ranking ⓘ

#	CITY	US AQI
1	Lahore, Pakistan	476
2	Delhi, India	349
3	Karachi, Pakistan	234
4	Kolkata, India	176
5	Shanghai, China	173
6	Chengdu, China	156
7	Wuhan, China	154
8	Dubai, United Arab Emi...	154
9	Dhaka, Bangladesh	153
10	Jakarta, Indonesia	153

Index Category	Index Value	TVOC (ppb)
Good	0 - 50	0 - 220
Moderate	51 - 100	221 - 660
High	101 - 150	661 - 1430
Very High	151 - 200	1431 - 2200
Very High	201 - 300	2201 - 3300
Very High	301 - 500	3301 - 5500

Technological Components

M5StickC PLUS ESP32-PICO Mini IoT Development Kit

Mini GPS/BDS Unit (AT6558)

TVOC/eCO₂ Gas Sensor Unit (SGP30)

Qubitro Data Platform



Objectives

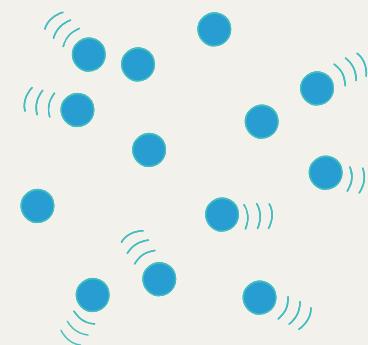
To gather real-time TVOC data from the location and alert the user of any abnormality in the surroundings

Gps Data



GPS tracking for spatial context

TVoc Data



Capture VOC readings of the surroundings

ALert



Trigger an alert when the readings cross the threshold

Data Transfer



Transfer the data in real-time to a data platform

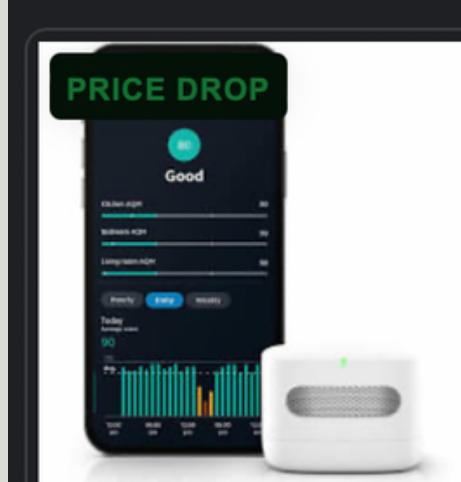
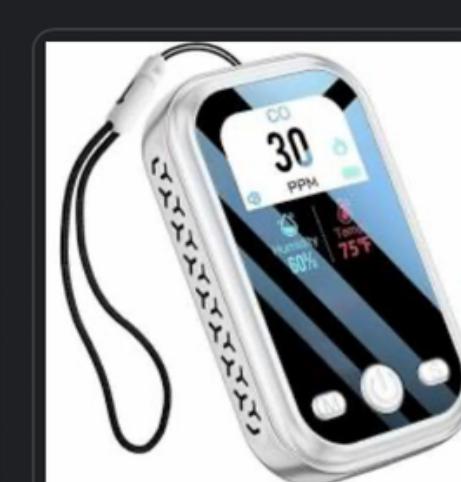
mapping



Visualize the combined data over a map

Existing Solutions

As of January 2023

			
<p>Amazon Smart Air Quality Monitor – Know your air,...</p> <p>\$48.99</p> <p>Amazon.com</p> <p>Was \$69.99</p> <p>Free shipping</p>	<p>Moyic Mini CO2 Detector, Multi-Function CO2...</p> <p>\$26.99</p> <p>Walmart</p>	<p>Temtop M2000 2nd CO2 Monitor Portable Air Qualit...</p> <p>\$179.98</p> <p>Temtopus.com</p> <p>Free shipping</p>	<p>Air quality Monitor for Home TVOC HCHO PM2.5...</p> <p>\$68.63</p> <p>Bosean official</p> <p>Free shipping</p>

Current air quality monitoring solutions often consist of standalone sensors or mobile applications.

Examples: Devices like the PurpleAir sensor network and mobile apps like AirVisual provide real-time air quality data. However, limited integration with GPS for mobile users is observed.



Interactive Map of Air Quality

Current

Forecast

Loo

Arch

Info

4

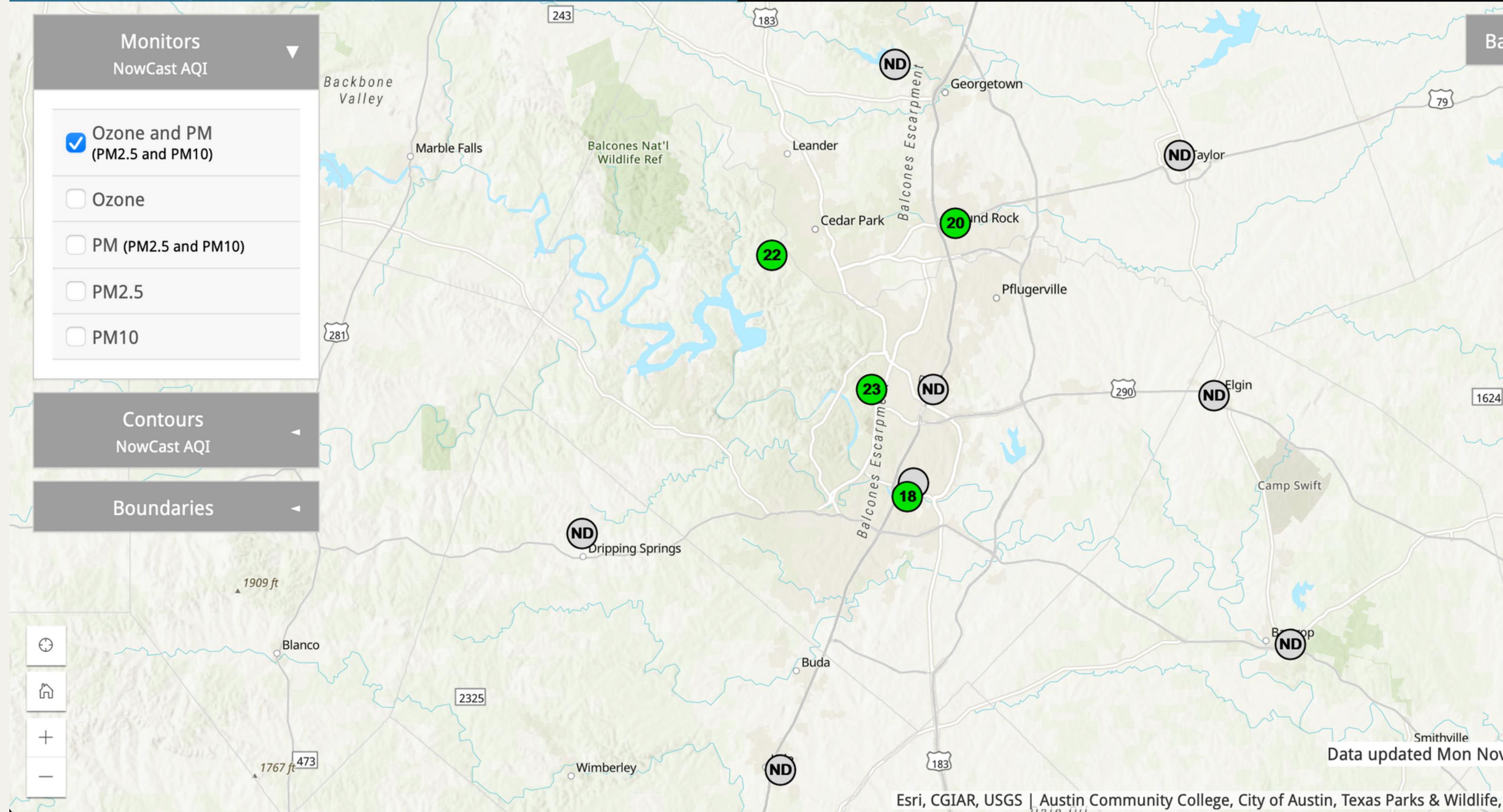
Monitors

NowCast AG

- Ozone and PM
(PM2.5 and PM10)
 - Ozone
 - PM (PM2.5 and P
 - PM2.5
 - PM10

Contours NowCast AQI

Boundaries



Technological Gaps in Existing Solutions

Identified Gaps: Existing solutions may face challenges in seamless integration of diverse sensor data, real-time user guidance based on location, and comprehensive data visualization.

Opportunities for Improvement: There is room for improvement in addressing the limitations of current solutions, particularly in enhancing user interaction, data accuracy, and the integration of diverse environmental parameters.

Room for Innovation

Integration and Interoperability: Opportunities exist to create a more integrated solution where GPS and air quality data are seamlessly combined and communicated to a centralized platform.

User Interaction: Innovations in user interfaces can improve the accessibility and usability of the system for a broader audience.

Scalability: There is room for innovation in creating a scalable system capable of handling a large number of connected devices and processing data efficiently.

Innovative Features

Provides real-time alerts when reads a high concentration of harmful gases in the surroundings

- GPS tracking for spatial context.
- Real-time monitoring of TVOC and eCO₂ levels.
- Data integration and visualization via the Qubitro platform.

Unique Value Proposition: Our project introduces a unique value proposition by combining GPS and air quality data to provide real-time guidance to users.

Potential Enhancements: Future enhancements may include integrating additional environmental sensors, creating personalized user profiles, and expanding the system's capabilities for broader environmental monitoring.

System Architecture

- Two M5StickC Plus devices serving distinct functions.
 - Device 1 is equipped with a GPS sensor for precise location tracking.
 - Device 2 is equipped with an SGP30 sensor for real-time air quality monitoring.
-

INTEGRATION HUB

- Qubitro platform acts as the central hub for data integration and analysis.
- Facilitates seamless communication between devices and data storage.

Data Flow

Step 1

M5StickC devices collect real-time data.

Step 2

Data is transmitted to the Qubitro platform for storage and processing.

Step 3

Users can access integrated data for visualization and analysis.

Benefits

- Accurate tracking of user movement.
- Early detection of air quality issues.
- Seamless integration for a user-friendly experience.

DEMO

Challenges Faced

Connectivity
Issues

Transmitting
Data to Qubitro

Inconsistent
Sensor
Performance

Initialization
Time

Summary

Guiding Users: Beyond data analysis, our project practically guides users to areas with better air quality, enhancing their daily choices.

Environmental Research: The project's potential extends to broader environmental research, contributing valuable data for scientific investigations.

Community-Driven Data Collection: Emphasizing a community-driven approach, users actively contribute to a collective understanding of air quality.

Thank You!