

Project Report

Project Title: Air Quality Monitoring Dashboard

Objective:

The goal of this project was to create an interactive dashboard to monitor air quality data for cities around the world. The application provides visualized air quality metrics, such as temperature, humidity, and pollutant levels, using charts and a 3D globe.

Tools and Technologies Used:

1. Programming Languages:

- HTML
- CSS
- JavaScript

2. APIs:

○ OpenWeatherMap API:

- Used to fetch real-time weather and air quality data for cities.
- Endpoints utilized:
 - `/weather` for city weather data (latitude, longitude, temperature, humidity, etc.).
 - `/air_pollution` for air quality data (AQI and pollutant levels).

3. Libraries:

○ Chart.js:

- Used to visualize data in line, bar, and doughnut charts.
- Provided dynamic and responsive charts for pollutant levels and trends.

○ Globe.gl:

- Used to render a 3D interactive globe that displays city locations and points of interest.

4. Tools:

- **Code Editor:** Visual Studio Code
 - **Version Control:** Git and GitHub for repository management.
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Features Implemented:

1. Interactive 3D Globe:

- Displays city locations with labels.
- Moves to the selected city when searched.

- Dynamically updates based on user interaction.
 - 2. **Search Functionality:**
 - Users can search for any city to fetch its weather and air quality data.
 - Displays temperature, humidity, AQI (Air Quality Index), and AQI quality (e.g., Good, Fair, Moderate).
 - 3. **Dynamic Data Visualization:**
 - **Line Chart:** Shows trends for temperature and humidity over time.
 - **Bar Chart:** Displays levels of pollutants (PM2.5, PM10, NO2, NH3, SO2).
 - **Doughnut Chart:** Visualizes pollutant distribution.
 - 4. **Section Navigation:**
 - Users can navigate between the globe, data visualization, rankings, and the about section.
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Successes:

1. The **3D Globe** successfully displays cities and interacts with user inputs.
 2. Data from the OpenWeatherMap API is fetched correctly for weather and air quality metrics.
 3. The **charts** (line, bar, and doughnut) are responsive, clean, and display the data effectively.
 4. The overall application layout is intuitive and visually appealing.
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Challenges and Failures:

1. **Ranking System:**
 - The ranking feature, which was supposed to list the most polluted cities based on their AQI, failed to work.
 - Issue: API requests for multiple cities (for rankings) were not reliable, and some requests failed to return results.
 - Despite attempts to debug, the API limitations caused the ranking system to remain non-functional.
2. **API Limitations:**
 - Some data retrievals failed due to rate limits and incomplete responses from the OpenWeatherMap API.
 - This caused delays and occasional errors when fetching real-time data.
3. **Responsiveness:**
 - Initially, the charts were too large and did not align well on smaller screens.
 - Adjustments were made to make the layout compact and responsive.

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I was primarily focused on designing and implementing the interactive globe feature, which required significant time and effort to get working correctly. Due to the complexity and the time investment needed for this part of the project, I was unable to dedicate as much attention to the other sections of the website as I would have liked. As a result, some other parts of the web application, such as the charts and ranking functionality, are not as polished or appealing to me compared to the globe feature.

<https://bkhongorzul.github.io/project-code/>