

AirWatch Insight: Air Quality Monitoring Project Report

1. Introduction

1.1 Background

The Air Quality and Traffic Monitoring (AQI) project is a comprehensive initiative designed to offer valuable insights into air quality, traffic conditions, and meteorological parameters within the Los Angeles area. The project caters to the needs of city officials from the Traffic and Air Quality Monitoring Department and the general public. It integrates data from Purple Air sensors for AQI measurements, traffic data from the Los Angeles County Department of Public Works, and meteorological data for a thorough analysis.

1.2 Motivation

Urban areas face challenges related to air pollution and traffic congestion. Monitoring air quality alongside traffic patterns and meteorological conditions is crucial for informed decision-making. The AQI project integrates multiple datasets to create a holistic view of environmental factors.

2. Users and Use Cases

2.1 City Officials

City officials leverage the project to gain comprehensive insights into air quality, traffic conditions, and meteorological parameters. The interactive dashboard provides a map with sensor locations and a slider to select a specific week. Dots on the map represent sensor locations, with the color of each dot corresponding to the mean AQI at that sensor during the selected week. The map slider also incorporates a pie chart, visually representing the percentage distribution of AQI color zones, enhancing the officials' ability to grasp overall air quality trends quickly. The radar chart compares AQI with meteorological parameters like temperature, dew, wind speed, humidity, precipitation, and cloud cover, enabling officials to correlate environmental factors.

2.2 Public Users

Public users benefit from an interface that features small multiples. Each sensor location (Long Beach, Downtown LA, Santa Monica) has a pie chart within the map slider representing the percentage of time spent in different AQI color zones over a month. **Small multiples, like bar**

charts, display the AQI distribution for every sensor during the selected week. Users can further filter data by weekends or weekdays.

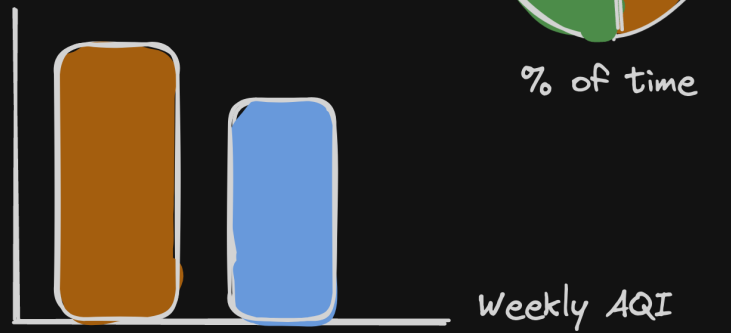
Rough Wireframes (final design may vary)

AQI Dashboard

AQI Analysis
Climate Condition Analysis
Traffic Analysis

LA County Weekday/Weekend/Monthly Analysis

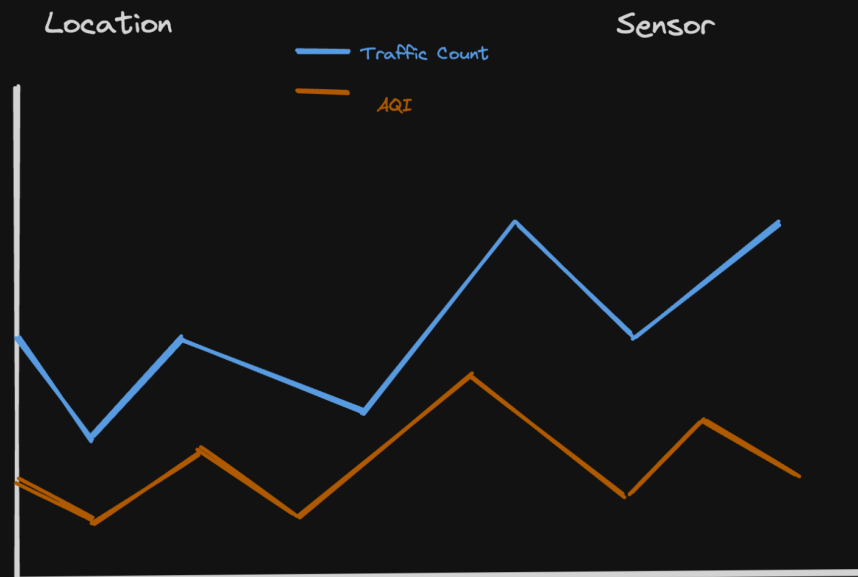
LA County Map

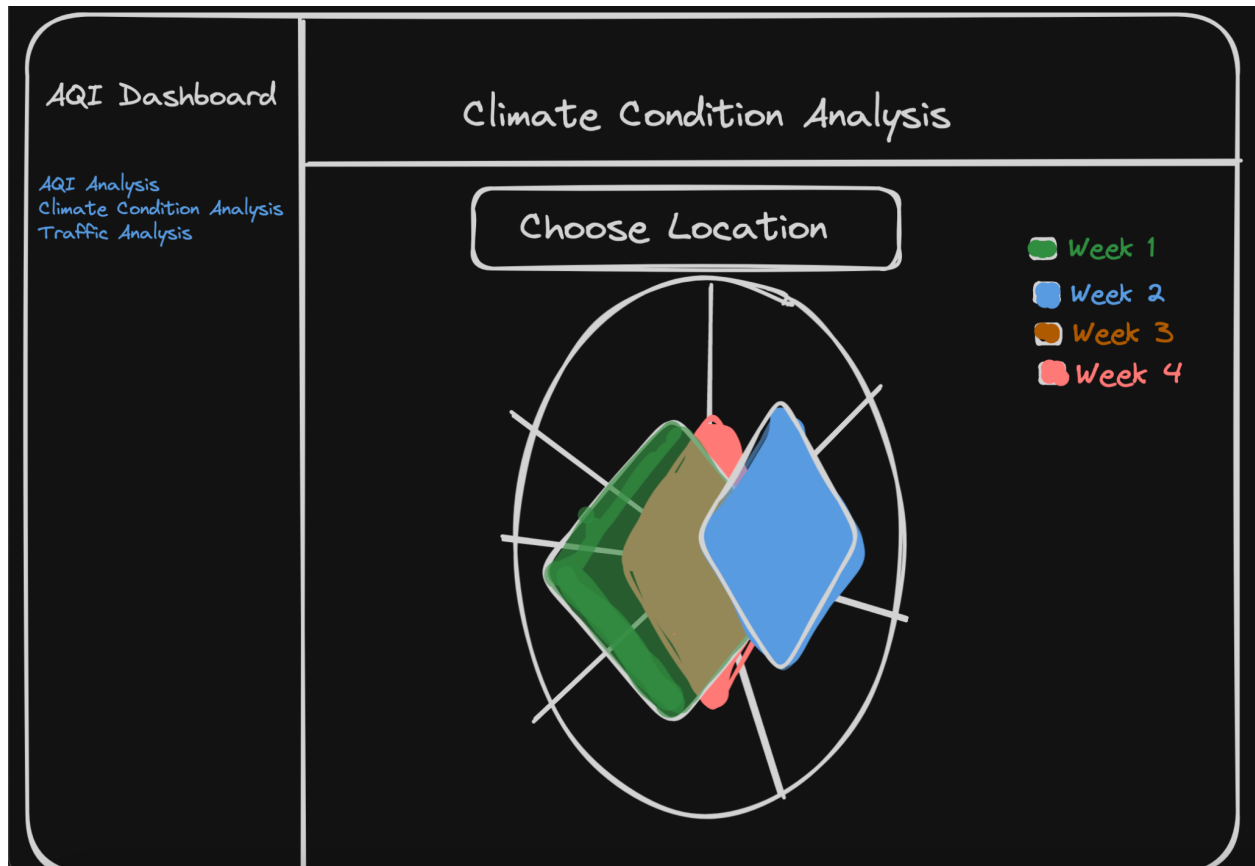


AQI Dashboard

AQI Analysis
Climate Condition Analysis
Traffic Analysis

AQI and Traffic Count Comparison





3. Technical Implementation

3.1 Data Sources

AQI Data: Obtained from Purple Air sensors located in Long Beach, Downtown LA, and Santa Monica.

Traffic Data: Provided by the Los Angeles County Department of Public Works, offering machine counts of vehicles from the closest intersection to sensor locations.

Meteorological Data: Includes parameters such as temperature, dew, wind speed, humidity, precipitation, and cloud cover. Got this data from visual crossing.

3.2 Dashboard Features

Vue.js Implementation: The project uses Vue.js, enabling seamless integration of map sliders, pie charts, and small multiples on a single page.

Map with Slider: Allows users to select a specific week and visualizes sensor locations with colored dots based on mean AQI. The slider includes a pie chart displaying the percentage distribution of AQI color zones for the selected week.

Small Multiples: For each sensor location, small multiples present bar charts representing AQI distribution for every sensor during the selected week.

Meteorological Analysis: Compares AQI with meteorological parameters, providing a visual correlation.

Traffic Analysis: Show a line chart for traffic data and how AQI varies over the past month for that data.

How we have used Vue to our advantage: (could not include in paper because of space constraints):

Vue's component-based architecture fosters modular development, encapsulating functionality and UI elements in components like MapComponent, PieChart, and AQIBarChart. This approach ensures code reusability and maintainability as each component can be developed independently.

The reactivity system in Vue automatically updates the UI with changes in the application's state, promoting a seamless user experience. The event bus facilitates communication between components, ensuring consistent updates when a map dot is clicked.

Vue's two-way data binding simplifies data synchronization between components. Clicking a map dot triggers efficient updates across components like PieChart and AQIBarChart, maintaining UI consistency with the underlying data.

Vue.js emphasizes a component-based structure, enabling the encapsulation of AQIBarChart logic and UI into a modular component. This modularity streamlines code reuse, allowing easy replication of small multiples for different locations without unnecessary code duplication.

4. Conclusion

The Air Quality and Traffic Monitoring project, enriched with meteorological data, provides a holistic view of environmental conditions in urban areas. By addressing city officials' and public needs, the project contributes to informed decision-making and empowers individuals to make environmentally conscious choices. Future enhancements promise a more sophisticated and comprehensive understanding of air quality, traffic dynamics, and the intricate relationship with meteorological parameters. The use of Vue.js ensures a seamless and interactive user experience.