

Title: Exploring Hypothesis Testing in Environmental Policy

Subtitle: Leveraging Hypothesis Testing for Data-Driven Environmental Policy

➤ ISSUE / PROBLEM

The environmental think tank, *Repair Our Air (ROA)*, is working to formulate policy recommendations to improve air quality in the United States. To support data-driven decision-making, the project examines air quality using the Environmental Protection Agency's (EPA) *Air Quality Index (AQI)*. The AQI values indicate pollution levels, with higher values representing increased public health risks. This study aims to determine if significant statistical differences exist in AQI values across different locations and conditions, informing where resources should be allocated for maximum impact.

➤ IMPACT

By identifying locations with significantly higher AQI values, ROA can:

- Prioritize high-risk areas for intervention.
- Develop policies focused on regions with the most pressing air quality issues.
- Allocate resources more efficiently to combat pollution.
- Provide scientific evidence to influence legislative actions and environmental reforms.

➤ RESPONSE

This study applies hypothesis testing to analyze AQI data across different locations and assess whether certain areas have significantly worse air quality. The process includes:

- **Data Exploration:** Examining AQI data distribution across California and other locations.
- **Statistical Tests:** Conducting hypothesis tests, such as t-tests and ANOVA, to compare AQI levels.
- **Results and Evaluation:** Determining whether observed differences in AQI are statistically significant.

➤ KEY INSIGHTS

- A two-sample t-test comparing AQI levels in Northern vs. Southern California revealed a statistically significant difference ($p < 0.05$), suggesting air quality disparities between the two regions.
- A one-way ANOVA analyzing AQI across multiple California cities indicated that at least one city had significantly different air quality from the others ($p < 0.05$), warranting further localized intervention.
- Effect sizes suggest meaningful differences, reinforcing the importance of targeted policy efforts in high-AQI areas.

