

Research Question: How does urban development in Vietnam's metropolitan cities correlate with air pollution levels, and what are the associated health risks for residents?

Motivation: Vietnam's rapid urbanization has driven economic growth but also intensified environmental challenges, particularly air pollution. Cities such as Hanoi and Ho Chi Minh City regularly report high levels of PM2.5 and AQI readings that exceed international safety standards. Prolonged exposure to air pollution poses serious health risks, including respiratory diseases and reduced life expectancy, which disproportionately affect vulnerable populations. Investigating the relationship between urban development, air pollution, and health outcomes is essential for designing sustainable growth policies. This project aims to provide evidence-based insights that can inform government action on balancing economic development with environmental health and public well-being.

Proposed Data Sources

- Air Quality Data: World Air Quality Index datasets with daily AQI and pollutant concentrations for major cities.
- Urban Development Data: Vietnam General Statistics Office (GSO) datasets on population density, GDP by province, and urbanization rates.
- Health Data: WHO Global Health Observatory, Ministry of Health reports, or academic sources on respiratory disease prevalence, hospital admissions, or mortality rates linked to air quality.

Methodology: This project will begin by collecting and cleaning data on air quality, urban development, and health outcomes across selected Vietnamese cities such as Hanoi, Ho Chi Minh City, Da Nang, and Hai Phong. Air pollution data will be collected from open sources, while urban development indicators such as GDP, population density, and urbanization rates will be gathered from the General Statistics Office and satellite imagery. Health-related data, focusing on respiratory illness prevalence and mortality, will be drawn from the Ministry of Health, WHO databases, and secondary academic reports. Once assembled, the dataset will be analyzed to identify patterns and relationships. Exploratory analysis will involve visualizing pollution levels over time, comparing highly urbanized cities with less urbanized ones, and mapping pollution hotspots. Statistical methods, such as correlation and regression analysis, will then be applied to evaluate the links between urban development, pollution levels, and health outcomes. Finally, the results will be presented through visualizations, including maps, scatter plots, and time-series charts, to clearly illustrate the interplay between city development, air quality, and associated health risks.

Challenges: The main challenge lies in data accessibility and quality. Health data, especially city-level statistics on hospital admissions or mortality, may not be fully available or recent. Air quality data may have gaps or inconsistent measurement frequencies. Additionally, separating the effects of pollution from other health determinants (e.g., lifestyle, healthcare access) is complex. To overcome these obstacles, the project will combine open-source datasets with secondary reports and apply approximations where necessary. Despite these limitations, the analysis will still highlight meaningful patterns between urban development, air pollution, and health risks in Vietnam.