

Part 2 - Extension Plan for Wildfire Smoke Impact Analysis on Peoria, AZ

MOTIVATION

After completion of Part 1: Common Analysis, it is evident that in recent years, Peoria, AZ, has experienced increasing levels of wildfire smoke. This overall seems to be resulting in poorer air quality and imposing potential health risks for the working residents of the city. The growing threat raises concerns not only about public health but also about the city's economic resilience in the face of frequent and severe wildfire smoke events. Wildfire smoke has the potential to disrupt daily operations and lead to lost productivity, increased absences of workers, and additional operational costs. For a city like Peoria, understanding the full scope of these economic impacts is vital for proactive planning.

This project extension seeks to bridge the gap between the environmental impacts uncovered in part 1 of the analysis, with the economic outcomes. Such project extension emphasizes the need for actionable data to support local businesses, operations, and the workforce. By quantifying the economic consequences of wildfire smoke on Peoria's primary industries, this study will aim to provide a foundation for policymakers to make informed decisions about resource allocation, emergency planning, and potential mitigation strategies.

PROBLEM STATEMENT

The economic impact of wildfire smoke in Peoria remains largely unquantified, leaving decision makers with limited information to guide economic and public health policy. While Part 1 of this project focused on estimating the smoke impact (acres burned divided by the squared distance to Peoria), it did not address how the smoke impact specifically affects Peoria's economy (primarily in key sectors such as healthcare, retail, and construction). This lack of insight could affect the city's ability to create effective policies to support its industries and workforce during future smoke events.

Hence, the problem that this analysis seeks to solve has two parts. First, the project aims to quantify the economic impact of wildfire smoke on Peoria's primary industries, including aspects such as production slowdowns and worker absences, all affecting a local company's health. Secondly, this analysis seeks to provide decision makers with data-driven projections on future economic vulnerabilities related to the wildfire smoke issue. These findings will equip Peoria's leadership with the information needed to best allocate funding, implement contingency plans, and minimize the economic strain on the city during high smoke probability periods.

IMPACT FOCUS

Economics. As mentioned in the previous section, this analysis will assess the impact of wildfire smoke on worker productivity, absenteeism, and lost revenue in Peoria's primary industries, including healthcare, retail, and construction. By studying these sectors, we can provide a comprehensive look at how smoke events may affect the city's overall economic health.

ADDITIONAL DATA SOURCES

To refine the current smoke impact model, additional data is needed in order to quantify the economic impact of wildfire smoke on Peoria's primary industries. This data will include metrics related to workforce productivity, employment status, and worker absences due to environmental factors, specifically targeting Peoria, AZ, and relevant industries in the region. Below are data sources which will potentially be able to address my needs for this analysis:

(1) American Community Survey (ACS) - [ACS Work Status in the Past 12 Months](#)

This dataset from the American Community Survey provides detailed information on employment status, including workforce participation rates and trends in worker absenteeism, specifically for non-agricultural wage and salary workers. This data will be used to measure any notable increases in absenteeism during wildfire smoke events, helping us assess workforce productivity loss in Peoria.

Dataset Summary: Includes data on employment status, work hours, and absenteeism for non-agricultural workers. It provides data specific to Peoria, AZ, through the U.S. Census Bureau's 1-Year Estimates Subject Tables.

Adaptation Requirements: This data will need to be aligned with historical wildfire smoke levels from Part 1 of the project. The data is provided on a yearly basis so some joining, and aggregation processes are needed in order to fit it to my application of usage for this analysis. Also, additional analysis will be required to identify correlations between smoke impact levels and absence rates.

Terms of Use: Open data provided by the U.S. Census Bureau for public use. The data is licensed under the U.S. Government Work license, allowing free access and use for research purposes.

(2) U.S. Bureau of Labor Statistics (BLS) - [Productivity and Work Hours Data for Key Industries](#)

The BLS data provides insight into productivity levels, worker hours, and percent change in productivity for various sectors, including manufacturing, retail trade, and healthcare. Since

these are some of Peoria's primary industries, this data will help in assessing how smoke events correlate with reductions in productivity and work hours, potentially leading to economic losses.

Dataset Summary: Includes data on productivity, work hours, and rate of change in productivity for multiple sectors relevant to Peoria's economy. Specific data points on industries impacted by smoke events will be extracted to identify patterns.

Adaptation Requirements: This dataset will be cross-referenced with smoke impact data to identify specific economic losses in productivity and output for Peoria's key industries. Custom calculations may be needed to isolate and attribute productivity changes to smoke levels.

Terms of Use: Data from the BLS is publicly available under open data licensing for educational and research purposes.

By incorporating economic multipliers and absenteeism adjustments layers, the model will extend beyond simply measuring smoke levels, which estimates smoke impact based on geographic and fire size factors. Instead, it will quantify how smoke days translate into direct economic losses, absenteeism costs, and healthcare strain, providing Peoria's policymakers with actionable insights. These enhancements make the model more human-centered, equipping Peoria's policymakers with precise projections of smoke-related costs and guiding them in resource allocation for smoke mitigation and community support.

UNKNOWNNS AND DEPENDENCIES

- **Data Availability**

Absence and productivity data are subject to annual reporting and may not reflect real-time impacts for every wildfire smoke event. Hence, dependence on publicly available datasets may lack granularity for Peoria or the wildfires impacts specifically.

- **Model Accuracy**

Economic factors outside the model's scope, such as industry-specific productivity rates, may lead to approximation errors. Predicting economic impact accurately relies on having robust correlations between air quality indices, productivity, and absence.

- **Assumptions about Economic Sensitivity**

Economic models may require assumptions about the sensitivity of various industries to air quality. For example, healthcare and retail may respond differently to poorer air quality, introducing variability into projections.

TIMELINE

Dates	Task	Milestone
11/2 - 11/4	<ul style="list-style-type: none"> - Review feedback on the extension plan and make any necessary adjustments. - Outline specific goals for the economic impact model related to Peoria's primary industries. 	Finalize Project Extension Plan
11/5 - 11/9	<ul style="list-style-type: none"> - Download and preprocess datasets from ACS, BLS, and EPA AQS (Done) to ensure compatibility. - Clean and format datasets, focusing on aligning time ranges and units of measure. - Calculate initial correlations between smoke levels and economic indicators. 	Data Collection Completed
11/10 - 11/14	<ul style="list-style-type: none"> - Adapt the smoke impact model from Part 1 to incorporate economic metrics (e.g., productivity, absenteeism). - Set up calculations for economic losses during smoke events using available workforce metrics. 	Preliminary Model Implemented
11/15 - 11/26	<ul style="list-style-type: none"> - Run initial tests on the adapted model to identify potential issues or adjustments. - Analyze model output, focusing on identifying trends or significant economic impacts. - Refine model based on initial results to ensure consistent predictions aligned with observations. 	Data Analysis Completed
11/23 - 11/26	<ul style="list-style-type: none"> - Create visualizations (graphs, charts) to illustrate correlations between smoke events and economic impacts. - Draft an outline for the final report, including key findings, model methodology, and limitations. 	Visualizations/Report Draft Completed
11/27 - 12/01	<ul style="list-style-type: none"> - Develop slides and talking points for the final presentation. - Make any final adjustments to the model and visualizations based on peer feedback. 	Presentation Prepared
12/02	Final Presentation	Presented
12/3 - 12/4	<ul style="list-style-type: none"> - Make final edits to the report, ensuring all documentation is clear and complete. - Submit the completed GitHub repository with the code, model, visualizations, and final report. 	Repository Submitted

Works Cited

- U.S. Census Bureau. *Work Status in the Past 12 Months - Table S2303*. American Community Survey, 1-Year Estimates, 2023. U.S. Department of Commerce. Accessed 31 Oct. 2024, <https://data.census.gov/table/ACSST1Y2023.S2303?g=160XX00US0454050>.
- U.S. Bureau of Labor Statistics. *Office of Productivity and Technology, Work Hours, and Productivity Metrics*. U.S. Department of Labor, 2024. Accessed 31 Oct. 2024, <https://www.bls.gov/>.
- U.S. Environmental Protection Agency. *Air Quality System (AQS) Data API*. Accessed 31 Oct. 2024, https://aqs.epa.gov/aqsweb/documents/data_api.html.
- U.S. Geological Survey. *National Wildland Fire Perimeter Data*. U.S. Department of the Interior, 2024. Accessed 31 Oct. 2024, <https://www.sciencebase.gov/catalog/item/61aa537dd34eb622f699df81>.