FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE

SUSTAINABILITY ANALYTICS

The Metro Valley Light Rail Effect in Phoenix-Mesa

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Introduction:

- Phoenix-Mesa is in 9th place as the most polluted city annually by PM2.5 (American Lung Association).
- The city of Phoenix-Mesa built the Metro Valley light rail in 12/27/2008, with the purpose of helping reduce the amount of particle pollution in the cities by reducing vehicle emissions (City of Phoenix).
- We compare daily PM2.5 levels 4 years before and after the opening date to see the impact of light rails.

Research Question:

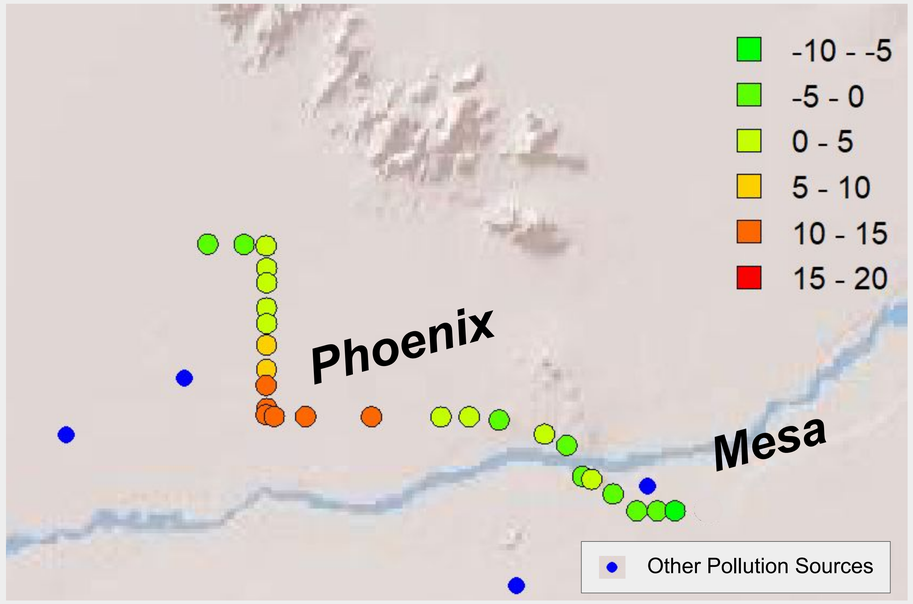
- What is the effect of the Metro Valley Light Rail on the PM2.5 pollution levels in Phoenix-Mesa, AZ?

Regression Results

Log(PM2.5)			
	Model 1	Model 2	Model 3
Metro Open	-0.073***	0.012***	0.031***
Day of Week	x	x	x
Month	x	x	x
Meteorology		x	x
Construction		x	x
Time Trend			x
Holiday			x

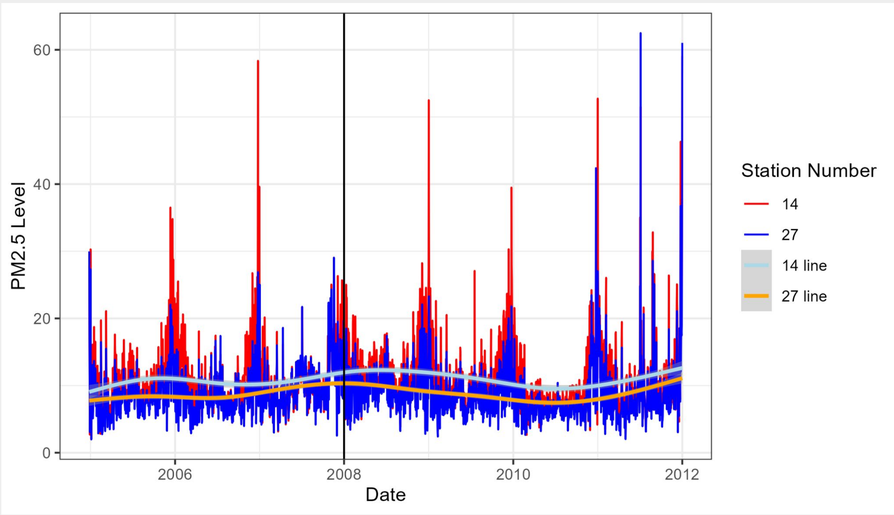
- Our regression model is a Discontinuity Based - Ordinary Least Square (DB-OLS) model. The aim is to see if there is a decrease in pollution levels after the opening date of the Metro, while holding everything else constant.
- In Model 1, a negative relationship between light rail opening and PM2.5 levels is observed, but a positive relation is shown in columns Model 2 and 3.
- Our results saw an average of 3% increase after the opening of the Valley Metro light rail.

Results:
Change in PM2.5 due to Light Rails in Phoenix-Mesa (in Percents)



- The topological map shows an increase in PM2.5 pollution levels at stations in Phoenix, while the remaining stations exhibit a decrease or no change.
- The pollution levels are notably higher in the regions between mountains.

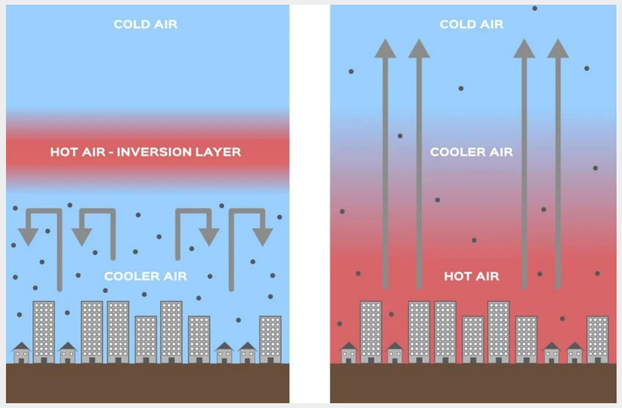
Change in PM2.5 over time



- Station 8 near Central Phoenix consistently shows higher PM2.5 levels than Station 27 outside the valley.

Conclusion:

- Phoenix saw a 14% increase in pollution while Mesa saw a 13% decrease. An average 3% increase in pollution was present since the opening of the Valley Metro.The disparity in pollution levels was caused by inversions in Phoenix's air.



(Photo Credit : gritsalak karalak/Shutterstock)

- Inversions occur when air at ground-level cools faster than the air above mountains. This creates a "lid" of hotter air, and pollutants can't rise to this upper layer, staying trapped.

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References

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