

# Air Pollution in NYC

Carmelli Leal



# Table of contents

- 01 | About Carmelli
- 02 | Work in Air Pollution
- 03 | Air Pollution in the UES
- 04 | Conclusion



# 01 | About Me!



# About Me: Carmelli

- A senior undergraduate student at Columbia University
- Studying Sustainable Development
- Born in the Philippines
- Grew up in Baltimore, MD
- Moved to Morningside Heights (CB9) in 2021



# 02 | Work in Air Pollution



# Building Climate Justice: Co-Creative Coastal Resilience Planning



## Course Objective:

This course will educate students and support effective coastal resilience planning and climate justice, through social and data science learning and data acquisition and analysis, making use of emerging technologies and best practices for collaboration with environmental and climate justice practitioners.



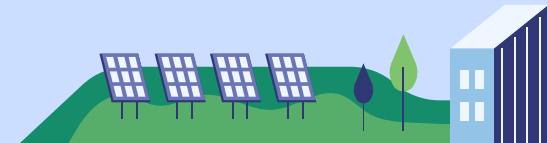
# South Bronx Unite



## Mission Mission

"South Bronx Unite brings together neighborhood residents, community organizations, academic institutions, and allies to improve and protect the social, environmental, and economic future of Mott Haven and Port Morris."

Source: South Bronx Unite

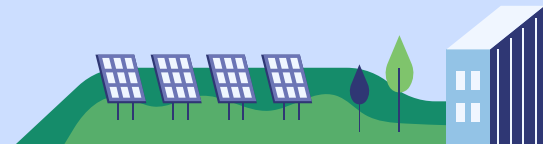




# South Bronx Unite

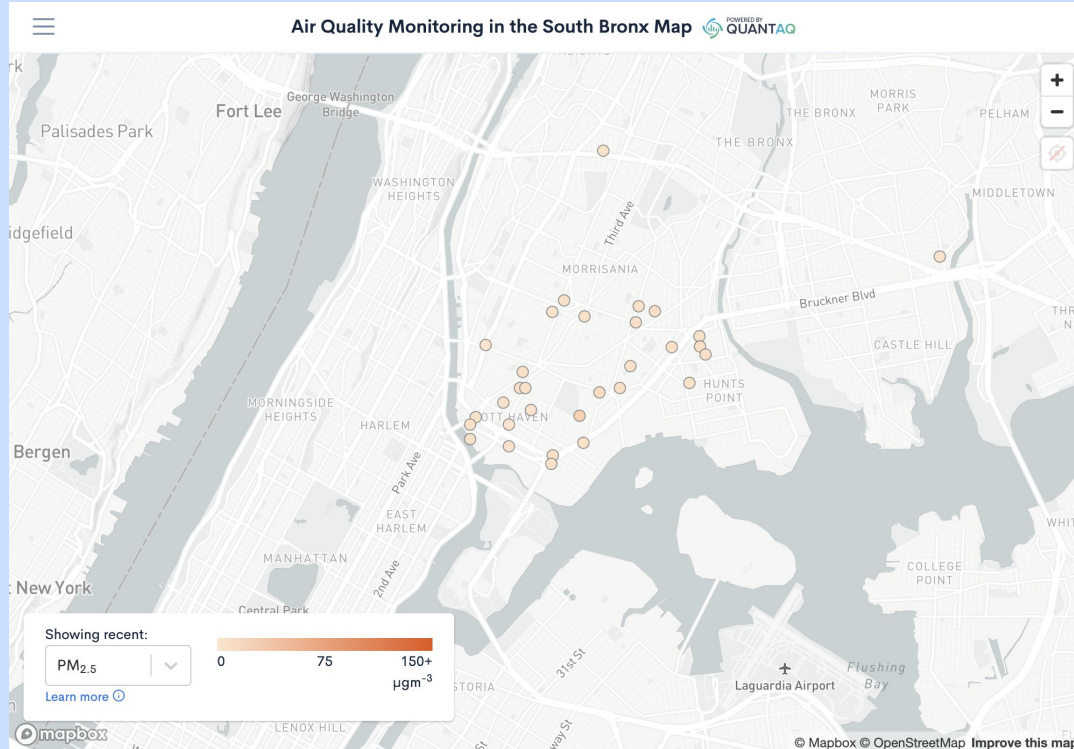


Source: South Bronx Unite

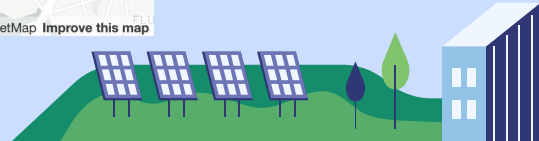




# South Bronx Unite: Air Quality Monitoring



Source: South Bronx Unite



# Environmental Air Quality

## Polluted air is a threat to our health

*The health impacts of breathing polluted air accumulate over the course of a lifetime and go far beyond respiratory conditions.*



### Prenatal

Prenatal harms include preterm birth, low birth weights and harm to brain development.



### Children

Throughout childhood, exposure to air pollution leads to new and worsening cases of childhood asthma, damage to brain development and lung function, and increased risk for heart and lung disease later in life.



### Adults

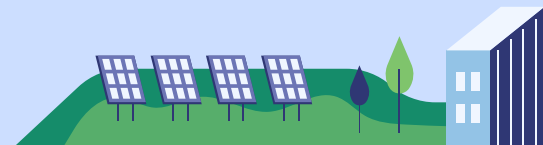
In adults, air pollution is linked to incidences of stroke, heart and lung disease, diabetes, worsened asthma, heart attack and premature death.



### Elderly

And in the elderly, exposure to air pollution can lead to cognitive decline, dementia and heart and lung failure.

Source: South Bronx Unite



# Our Task

## 1. Illustrate Air Pollution Burden in the South Bronx

### 3 Profiles

- Child with asthma
- Working adult
- Older adult

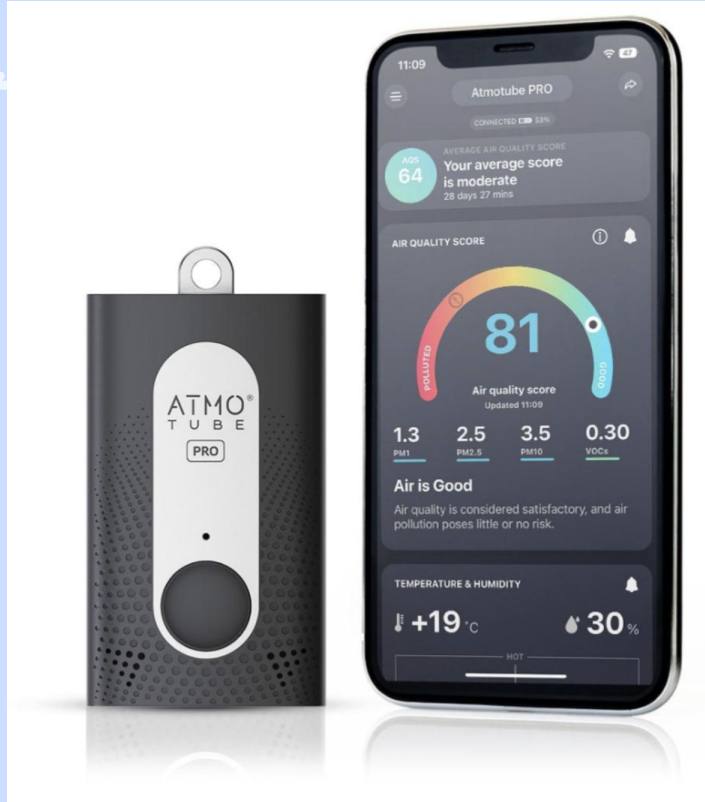
## 2. Provide Recommendations For Air Quality Monitor Placement

### Points of Focus

- Vulnerable communities
- Polluting facilities
- People centers



# Method of Data Collection



# Findings

## World Health Organization Air Quality Standards

Annual Average Limit for PM2.5: 5 micrograms per cubic meter

Daily Average Limit for PM2.5: 15 micrograms per cubic meter

### Morning:

- Annual: over the annual limit 100% of the time
- Daily: over the daily limit 97.1% of the time

### Afternoon:

- Annual: over the annual limit 93.5% of the time
- Daily: over the daily limit 33% of the time





# Recommendations for Air Quality Monitors

1. St. Ann's Avenue
2. 162nd St Between Teller & Morris Ave
3. Brook Ave Between 137th & 139th St
4. 139th St Between St Ann's & Cypress Ave
5. 149th St Between Park & Morris Ave

# 03 | Air Pollution in the UES



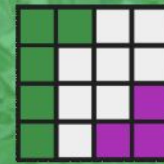


# What does this look like in the UES?



Zip Codes:

- 10021
- 10028
- 10044
- 10065
- 10075
- 10128
- 10162








Environment & Health  
**Data Portal**

# What does this look like in the UES?

## Outdoor Air Pollutants

Estimated annual average concentrations calculated from a model that used NYC Community Air Survey measurements.

Topic	Compared to other neighborhoods 	All neighborhoods
<b>Ozone</b>	Better	
<b>PM2.5 (Fine particles)</b>	Worse	
<b>Black carbon</b>	Worse	
<b>Nitrogen dioxide</b>	Worse	

# What does this look like in the UES?

## Ozone (O<sub>3</sub>) (2022)

Ozone is a common air pollutant that can harm breathing and worsen asthma and other respiratory conditions.

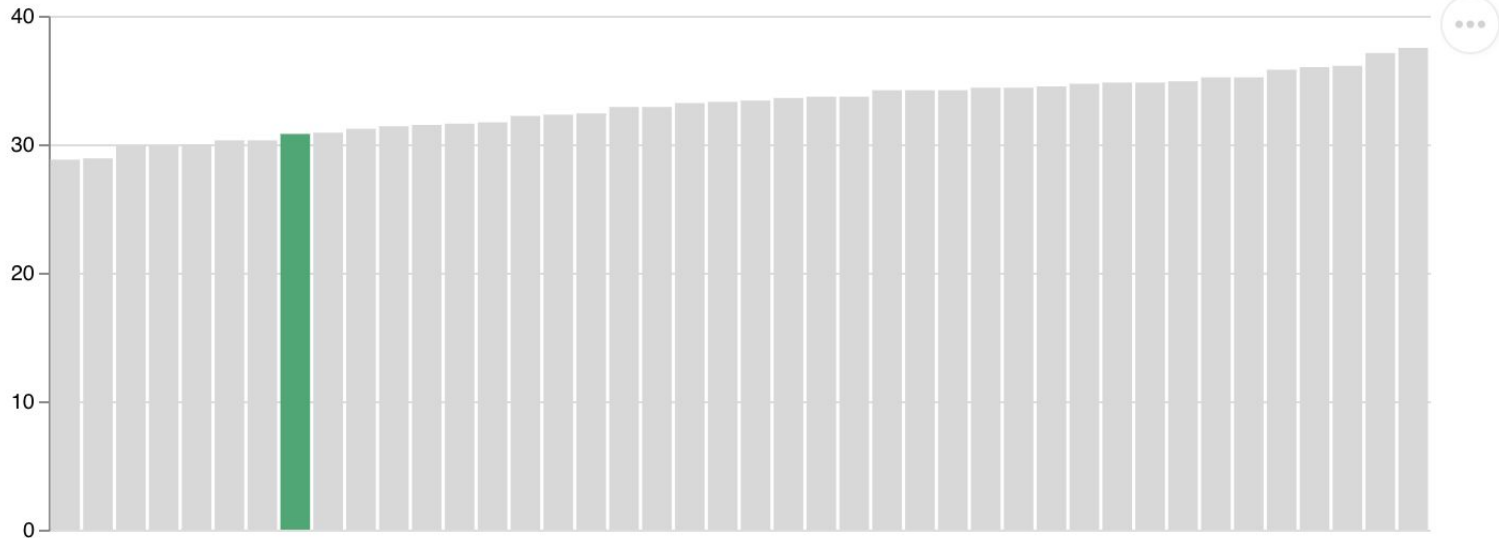


# What does this look like in the UES?

## COMPARISON

For ozone (o3), **Upper East Side** is better than most neighborhoods.






*Mean ppb*



# What does this look like in the UES?

## Outdoor Air Pollutants

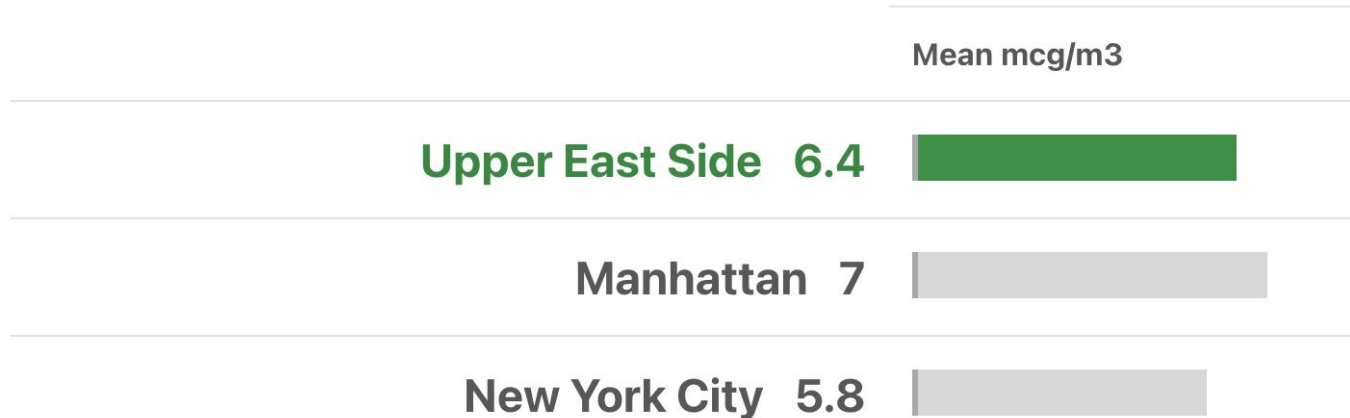
Estimated annual average concentrations calculated from a model that used NYC Community Air Survey measurements.

Topic	Compared to other neighborhoods 	All neighborhoods
<b>Ozone</b>	Better	
<b>PM2.5 (Fine particles)</b>	Worse	
<b>Black carbon</b>	Worse	
<b>Nitrogen dioxide</b>	Worse	

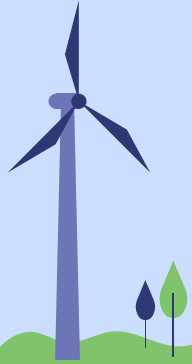
# What does this look like in the UES?

## Fine particles (PM 2.5) (2022)

Fine particles are emitted by vehicles, building boilers, and other combustion - and are a major form of air pollution that harms health.



worse










# What does this look like in the UES?

## Outdoor Air Pollutants

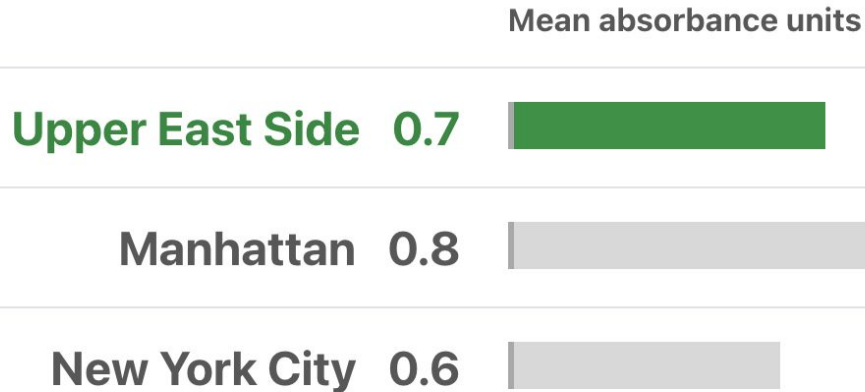
Estimated annual average concentrations calculated from a model that used NYC Community Air Survey measurements.

Topic	Compared to other neighborhoods 	All neighborhoods
<b>Ozone</b>	Better	
<b>PM2.5 (Fine particles)</b>	Worse	
<b>Black carbon</b>	Worse	
<b>Nitrogen dioxide</b>	Worse	

# What does this look like in the UES?

## Black carbon (2021)

Black carbon is a major component of fine particles in the air. Fine particles are easily inhaled and contribute to both short-term acute health effects, as well as long-term chronic illness.

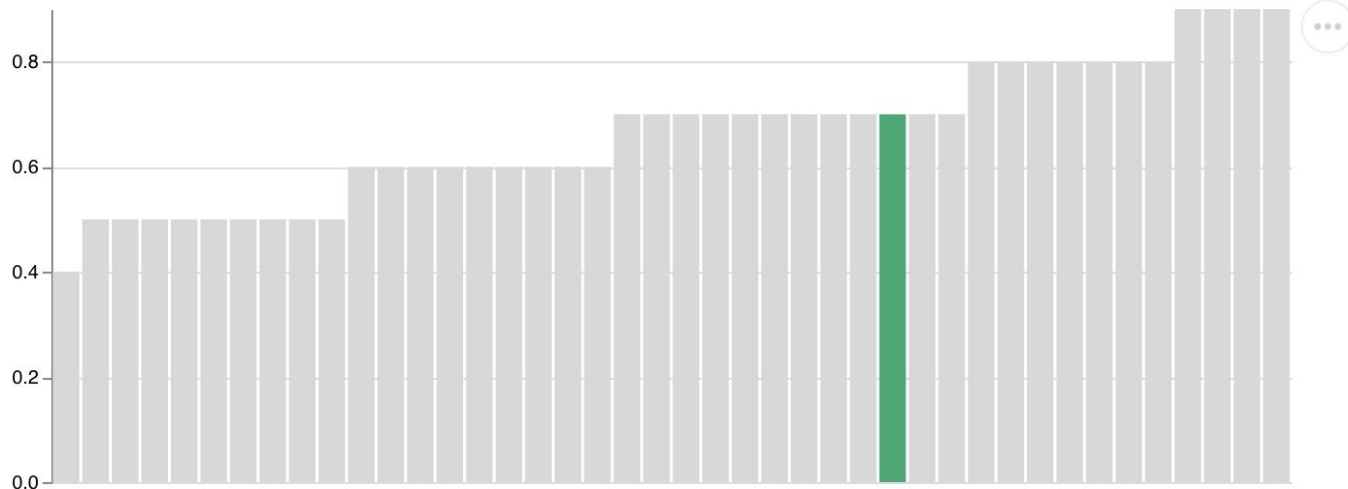


# What does this look like in the UES?

## COMPARISON

For black carbon, **Upper East Side** is worse than most neighborhoods.






*Mean absorbance units*



# What does this look like in the UES?

## Outdoor Air Pollutants

Estimated annual average concentrations calculated from a model that used NYC Community Air Survey measurements.

Topic	Compared to other neighborhoods 	All neighborhoods
<b>Ozone</b>	Better	
<b>PM2.5 (Fine particles)</b>	Worse	
<b>Black carbon</b>	Worse	
<b>Nitrogen dioxide</b>	Worse	

# What does this look like in the UES?

## Nitrogen dioxide (NO<sub>2</sub>) (2022)

Nitrogen dioxide is a pollutant formed by combustion that damage lung tissue, cause breathing problems, and contribute to smog and acid rain.

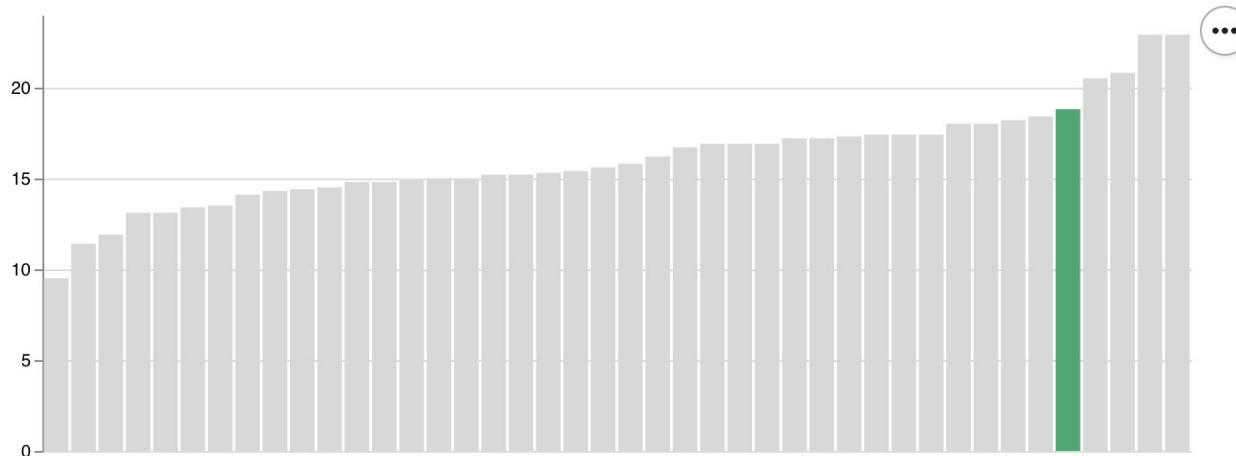


# What does this look like in the UES?

## COMPARISON

For nitrogen dioxide (no2), **Upper East Side** is worse than most neighborhoods.


*Mean ppb*



# What does this look like in the UES?

## Traffic Density

Estimated millions of annual vehicle miles traveled per km<sup>2</sup>. Vehicle miles traveled is an indicator of emissions from automobile exhaust, brake wear and tire wear.







Topic	Compared to other neighborhoods ?	All neighborhoods
<b>Traffic</b>	Worse	
<b>Car traffic</b>	Worse	
<b>Truck traffic</b>	Worse	



# What does this look like in the UES?

## Health Burden: Fine Particles (PM2.5)







Estimated health events attributable to PM2.5 exposure over natural background levels in NYC (average annual rate per 100,000 residents).

Topic	Compared to other neighborhoods 	All neighborhoods
PM2.5 asthma ED visits (children)	Better	
PM2.5 health burden (lungs)	Better	
PM2.5 health burden (heart)	Better	
PM2.5 asthma ED visits (adults)	Better	
Deaths from PM2.5	Middle	

# What does this look like in the UES?

## Health Burden: Ozone (O3)

Estimated health events attributable to ozone exposure over natural background levels in NYC (average annual rate per 100,000 residents).

Topic	Compared to other neighborhoods 	All neighborhoods
<b>Deaths from ozone</b>	Better	
<b>Ozone asthma ED visits (children)</b>	Better	
<b>Ozone asthma hospitalizations (children)</b>	Better	
<b>Ozone asthma ED visits (adults)</b>	Better	
<b>Ozone asthma hospitalizations (adults)</b>	Better	



# Conclusions

1. Congestion Pricing
2. Empowering Communities with Information
3. Individual Impact on Air Pollution
4. Protect Against Poor Air Quality



# Thanks!

Do you have any questions?

[cll2189@columbia.edu](mailto:cll2189@columbia.edu)

**CREDITS:** This presentation template was created by [Slidesgo](#), and includes icons by [Flaticon](#), and infographics & images by [Freepik](#)

Please keep this slide for attribution