

New York City Community Air Survey: 2009-2015

New York City Metro Area Energy and Air Quality
Workshop

5/25/17

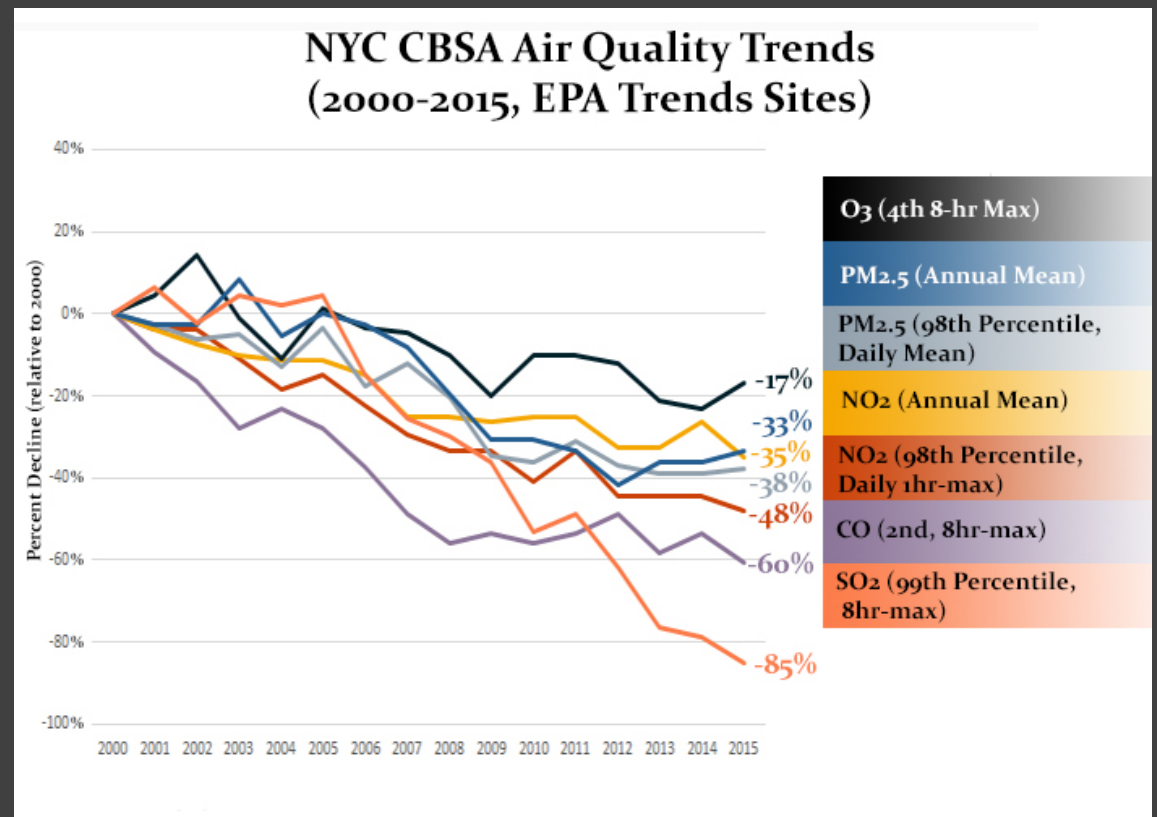
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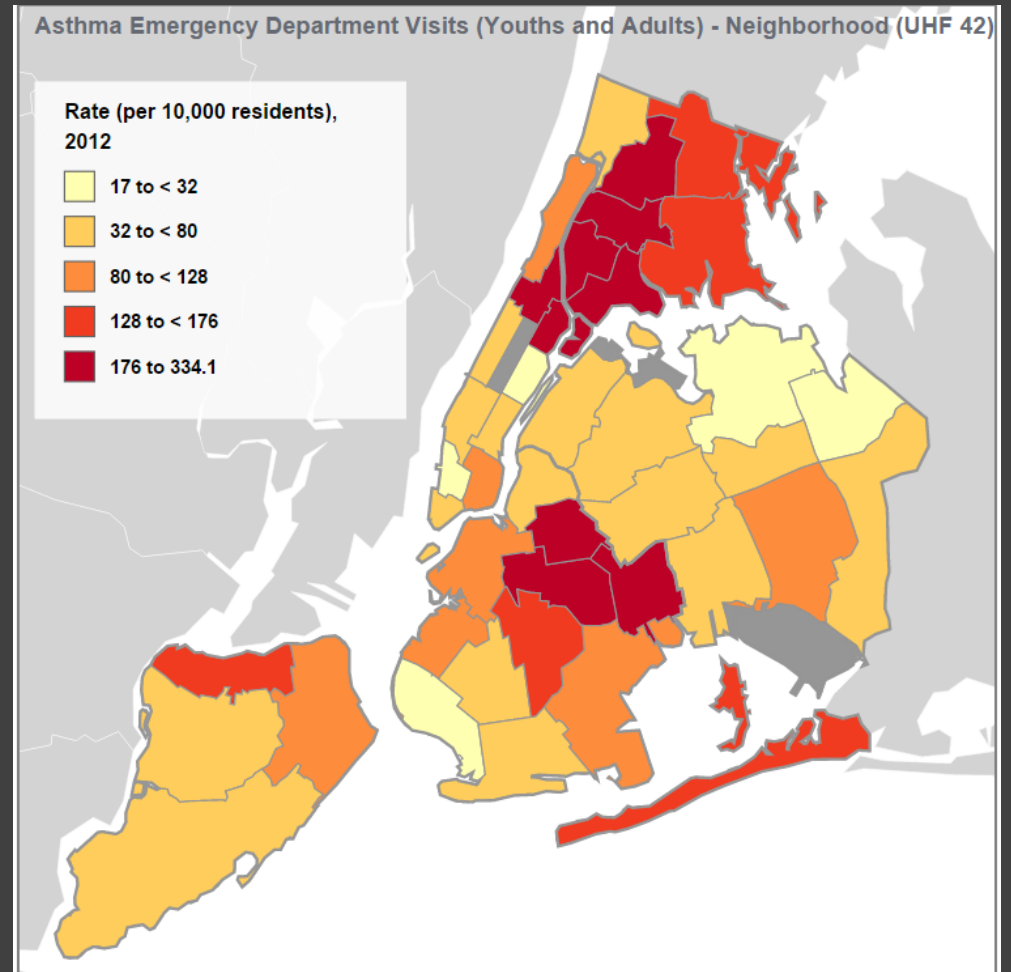
Air Pollution and Public Health in NYC

- Despite improvements, NYC air quality still remains at levels harmful to public health
- Concentration-response relationships for these health effects are observed at levels below clean air standards.
- Ongoing City efforts to improve levels beyond State/Federal action



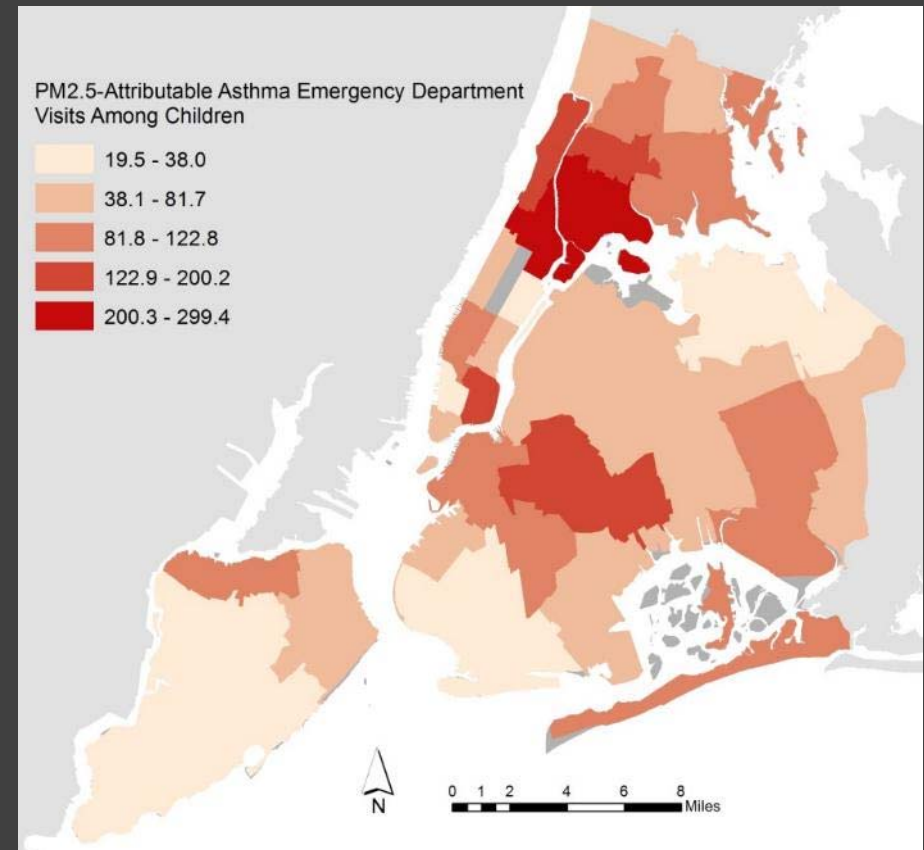
Air Pollution and Health Disparities

- Demographic and geographic variation in populations susceptible to air pollution effects.
- Regulatory network not designed to capture spatial variation in air quality
- Several prior single-neighborhood studies showed elevated levels in some neighborhoods



Public Health Burden of PM_{2.5} and O₃

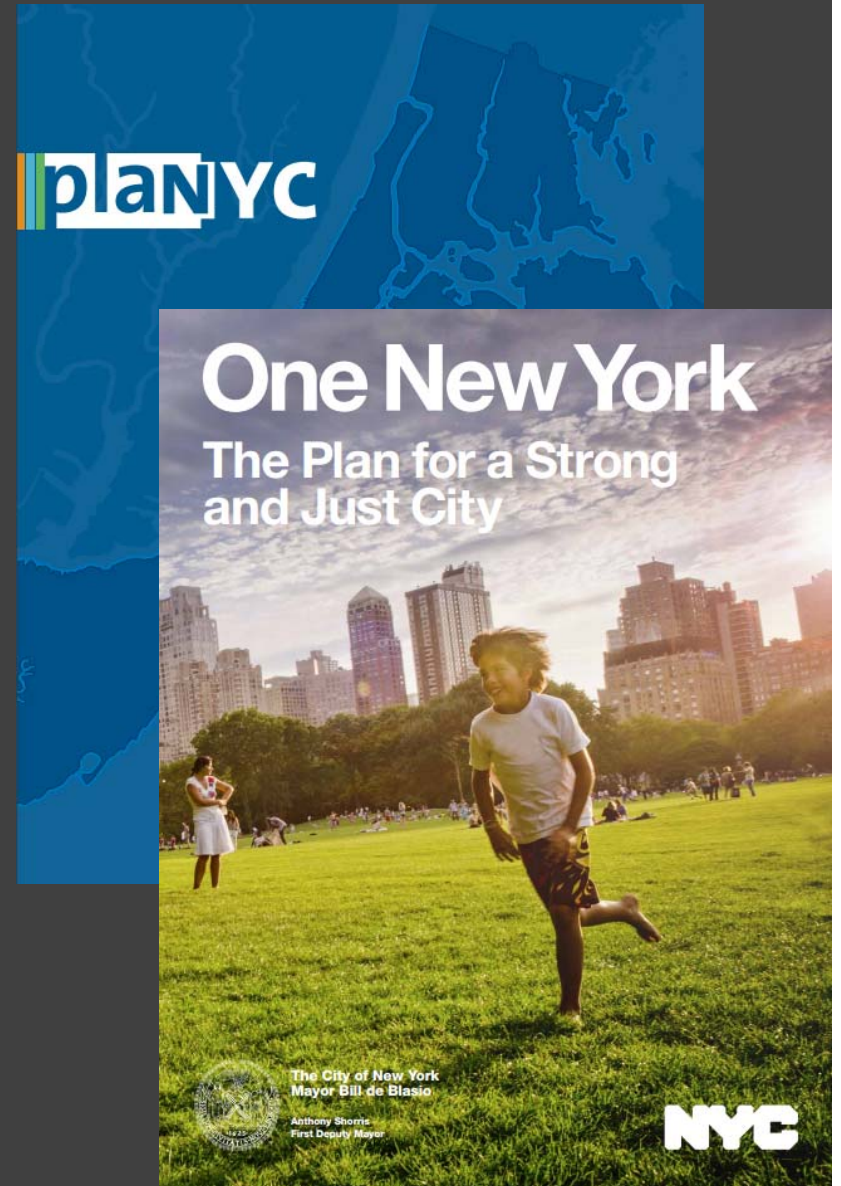
- **PM_{2.5}**: Contributes to 2,000 premature deaths and 6,000 ED visits and hospitalizations each year, (2009-2011)
- **Ozone**: Contributes to 400 premature deaths and 5,900 respiratory hospitalizations each year, (2009-2011)
- Higher share of burden in low SES communities, areas with higher underlying rates of disease



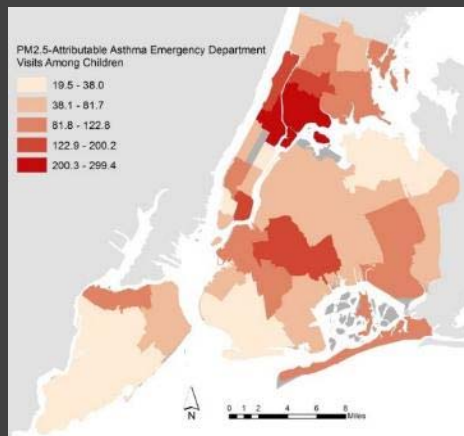
Rate per 100,000

New York City's Sustainability Plans

- PlaNYC (2007), OneNYC (2015)
- Include ambitious sustainability and equity strategies
- Air sections, overall goal to reduce emissions from:
 - On-Road vehicles and other transportation
 - Buildings, energy, area sources
 - Capture benefits of greenhouse gas reduction strategies
- Understand the scope of the challenge
 - Collaborative local air quality study: New York City Community Air Survey (NYCCAS)
 - Understand the public health impacts of air pollutants



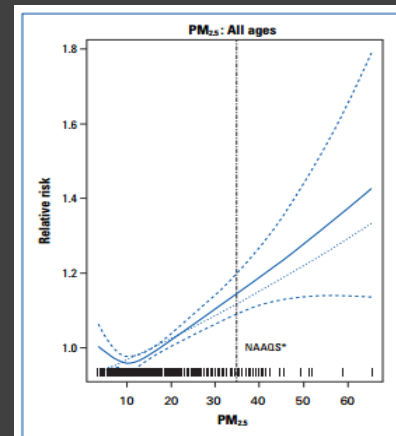
DOHMH air quality activities: Using data to inform public/stakeholders



Public health
burden analysis



NYCCAS:
Exposure assessment



Epidemiologic
studies
of risk



Quantify impacts
of local sources,
benefits of control

New York City Community Air Survey (NYCCAS)

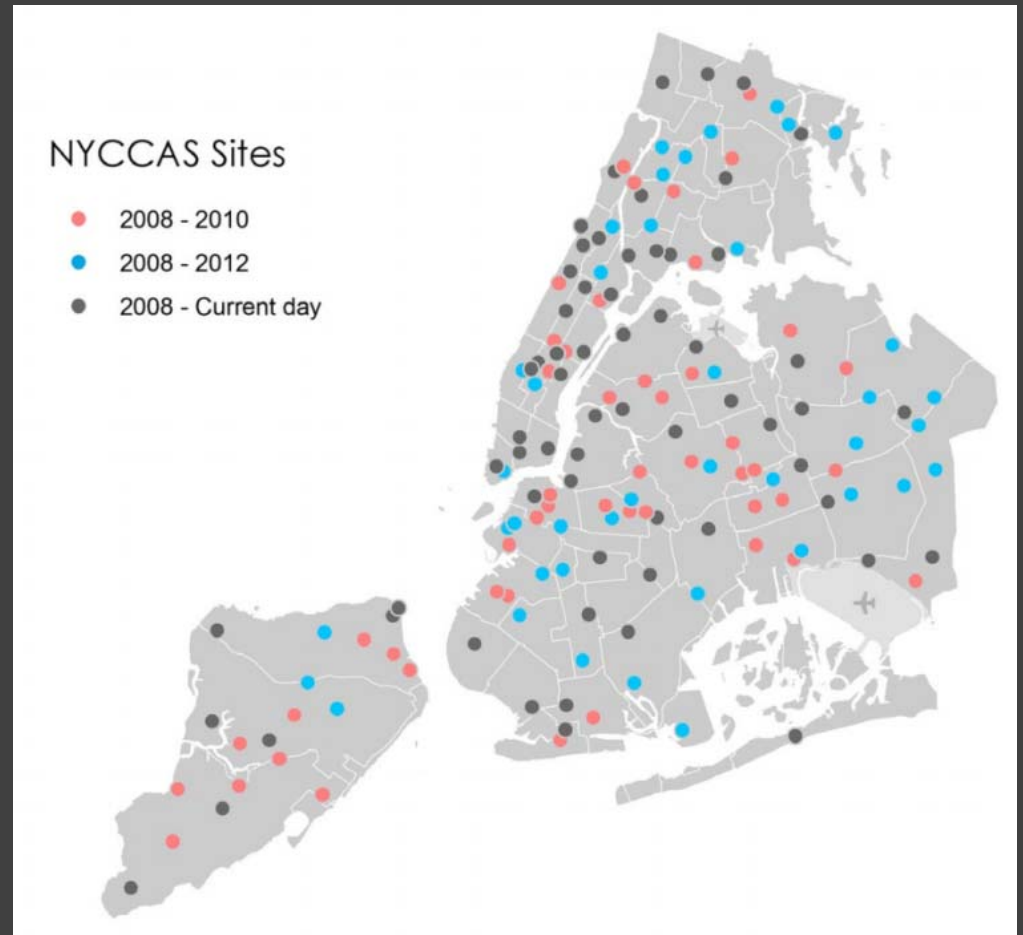
- Launched in 2007 as part of PlaNYC: first comprehensive NYC survey of street-level AQ
- Assess year-round variation in multiple air pollutants across NYC neighborhoods.
- Identify sources contributing to intra-urban pollution patterns
- Inform City efforts to improve air quality and provide data to the public and stakeholders
- Provide air pollution exposure estimates for health surveillance and research

NYCCAS goals are different from those of regulatory monitoring

- Regulatory –rooftop locations
 - Track hourly, daily and yearly trends across the metro area
 - Does not measure place-to-place differences within the city
 - Determine attainment with NAAQS
- NYCCAS – many street-side locations
 - Measure average place-to-place differences
 - Does not track daily variation
 - Assess relation of concentrations to population and vulnerability

NYCCAS: Saturation Sampling

- Partnership between DOHMH and Queens College
- City-wide saturation sampling:
 - Years 1-2: 150 Sites
 - Years 3-4: 100 Sites
 - Years 5-7: 75 Sites
- Site selection
 - Stratified random sampling (80%) and purposeful allocation (20%)
 - Balance of spatial and source coverage



NYCCAS: Sampling Methods

- 2-Week, street-level, integrated samples taken once per site/season
 - $PM_{2.5}$, BC, NO_x , O_3 , SO_2 , $PM_{2.5}$ -metals constituents
- Analyze by land use regression (LUR):
 - predict at unmonitored locations
 - assess sources
- Year-round sampling, updated trend/maps issued each year (Local Law 103 of 2015)



NYCCAS Sampling Unit



Pre-installed mounting plate for rapid deployment and retrieval.



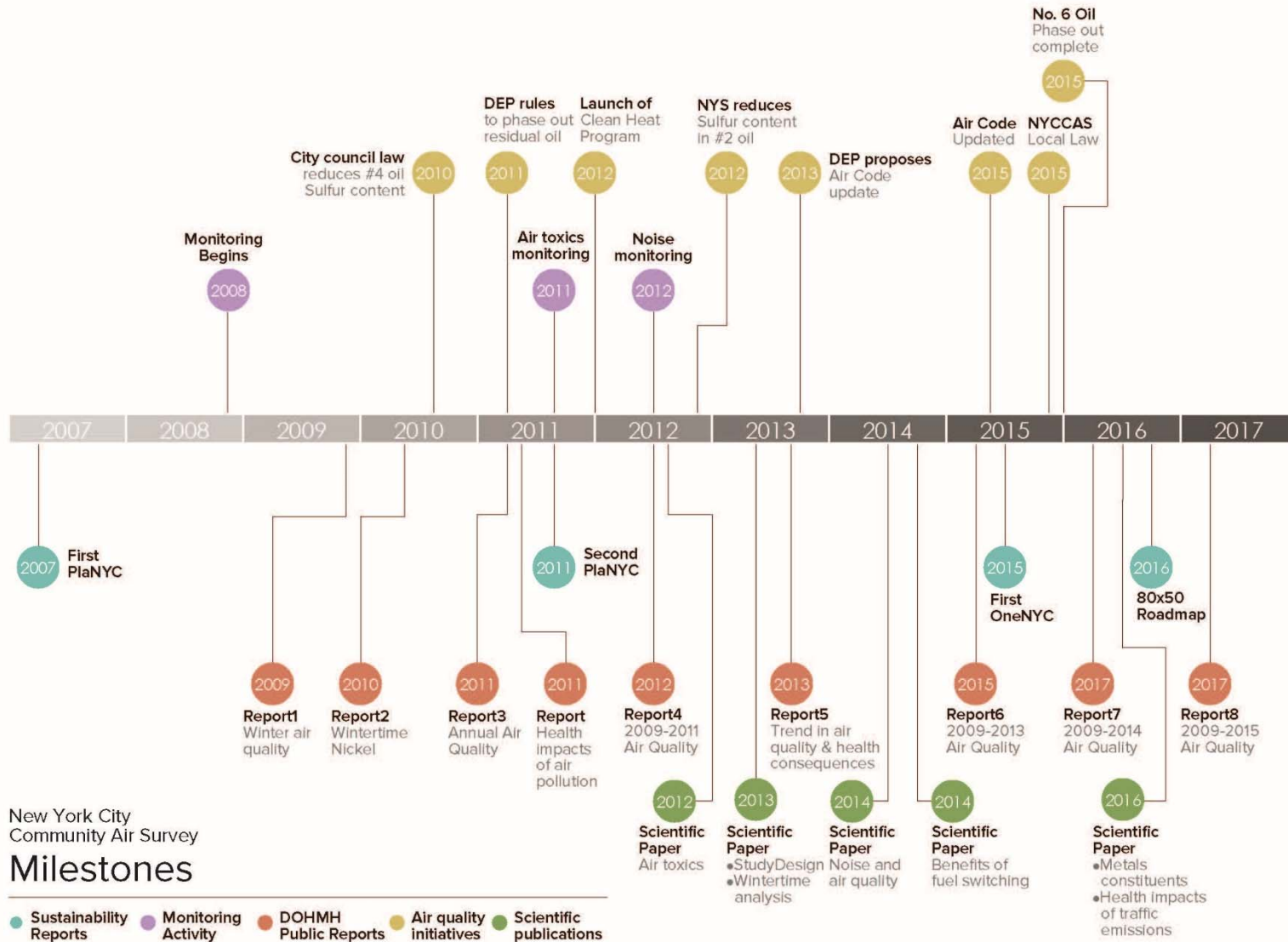
Temperature/RH sensor data logger records temperature and relative humidity.

NO_x, NO₂, SO₂, and O₃ are collected with passive monitors in a protective housing

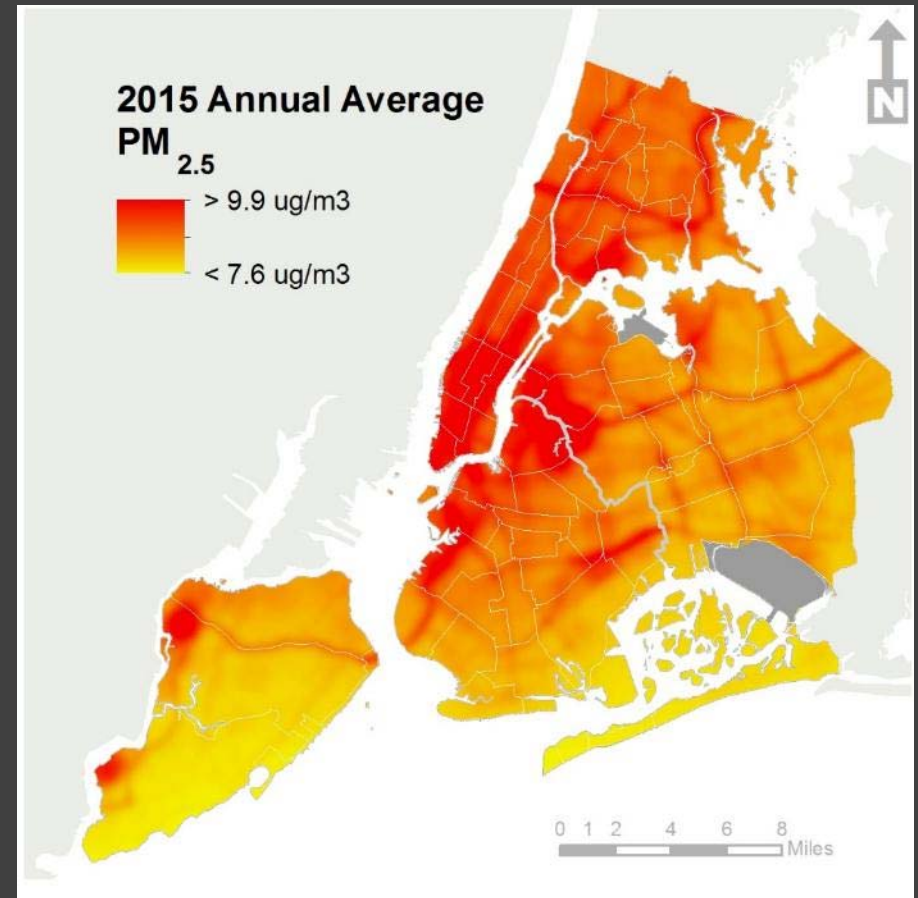
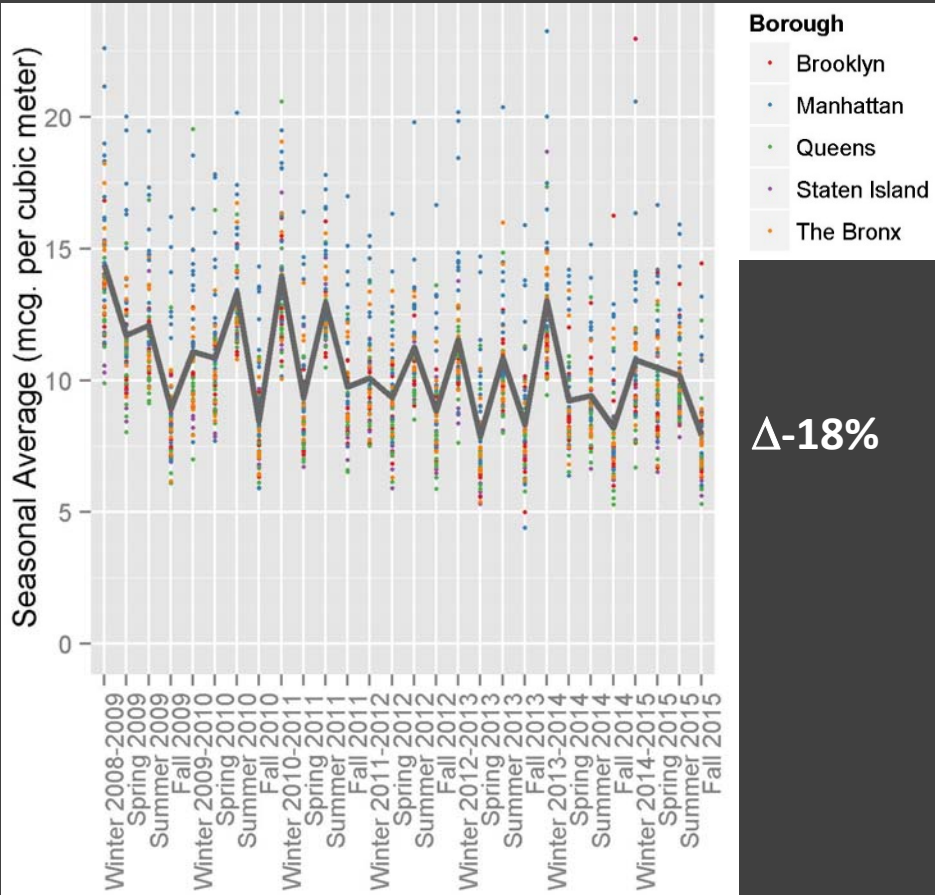
Harvard Impactor intake



NYCCAS To Date



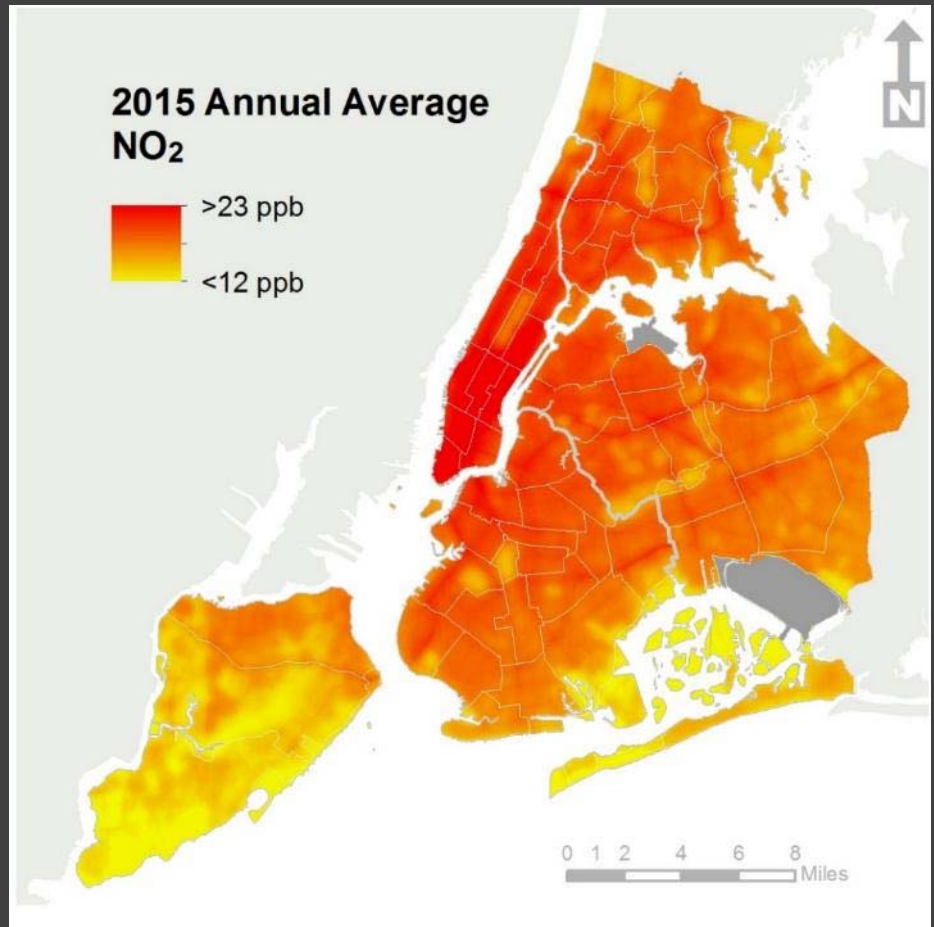
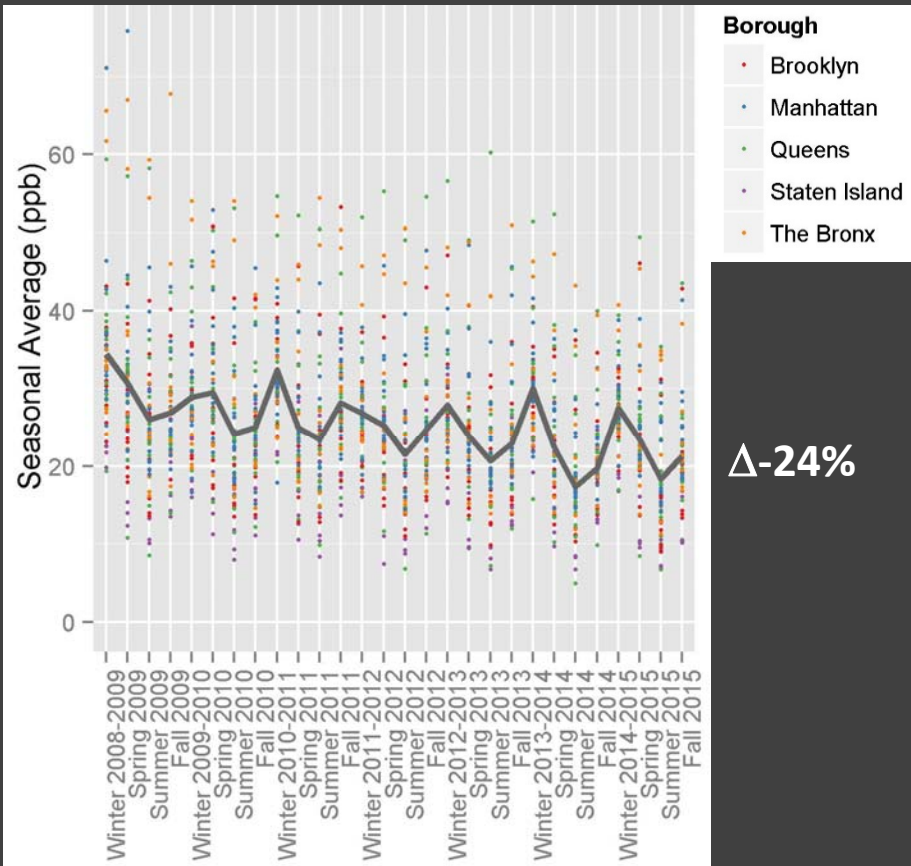
Results: PM_{2.5}



Source	Spatial Indicator
Buildings-related emissions	PM _{2.5} emissions from buildings heat and hot water boilers within 1000 m
Traffic-related emissions	Area of industrial land use within 1000 m
	Traffic density, weighted by relative PM _{2.5} emissions rates by vehicle type (car, truck, bus) within 250 m

- Seasonal average range in monitoring sites in 2015: 5.3 – 23.0 μg/m³

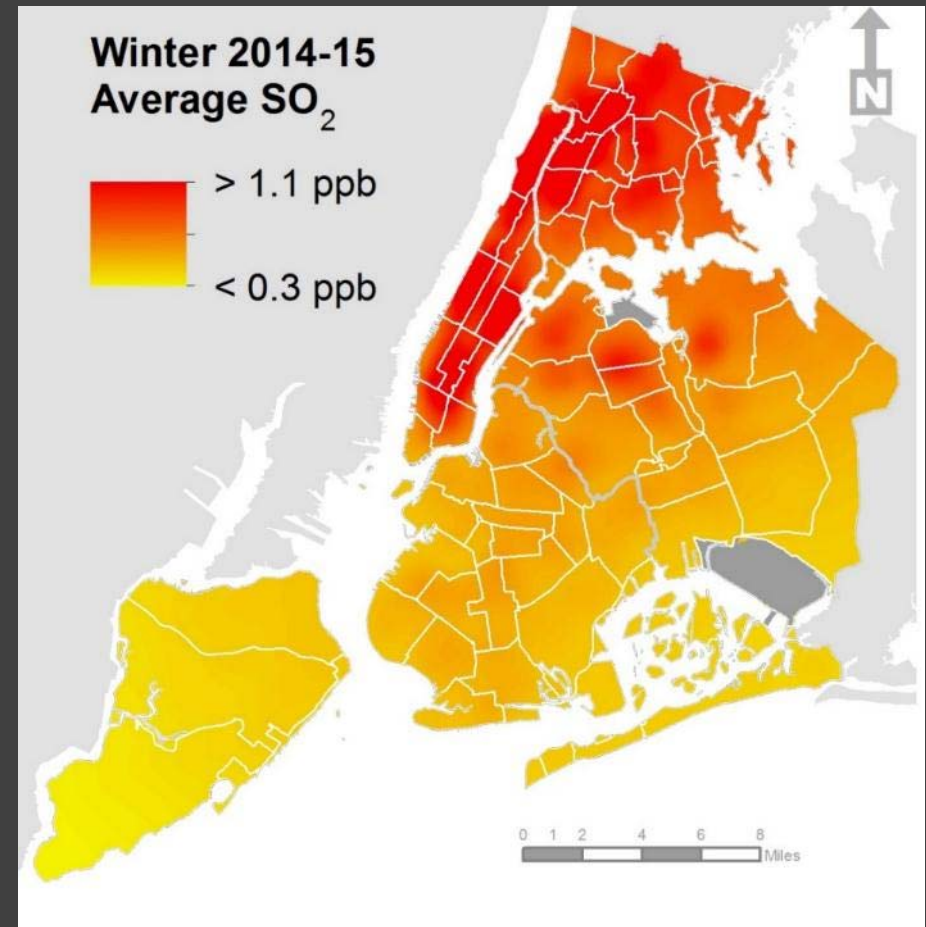
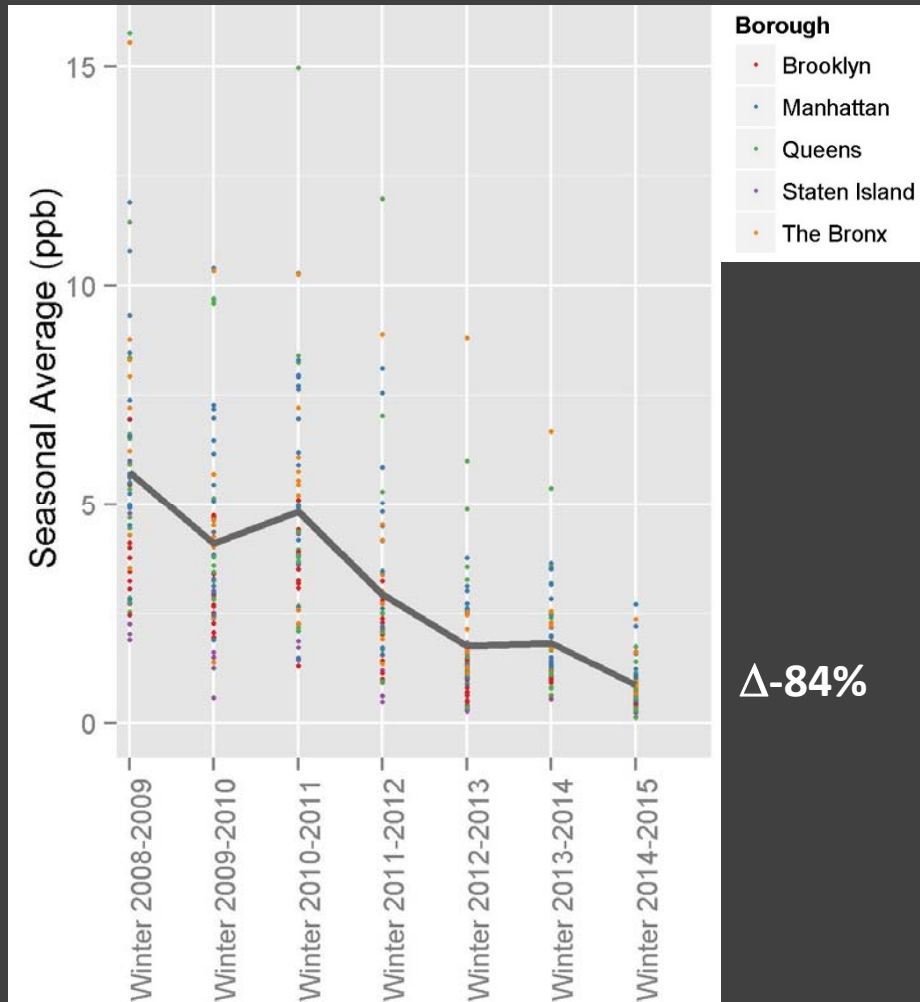
Results: NO₂



Source	Spatial Indicator
Buildings-related emissions	Area of interior built space.
	Traffic density, weighted by relative NOx emissions rates by vehicle type (car, truck, bus) within 250 m
	Percent impervious surface within 100 m
Traffic-related emissions	Location on a bus route (compared to non-bus route locations)

- Seasonal average range in monitoring sites in 2015: 6.8 – 49.4 ppb

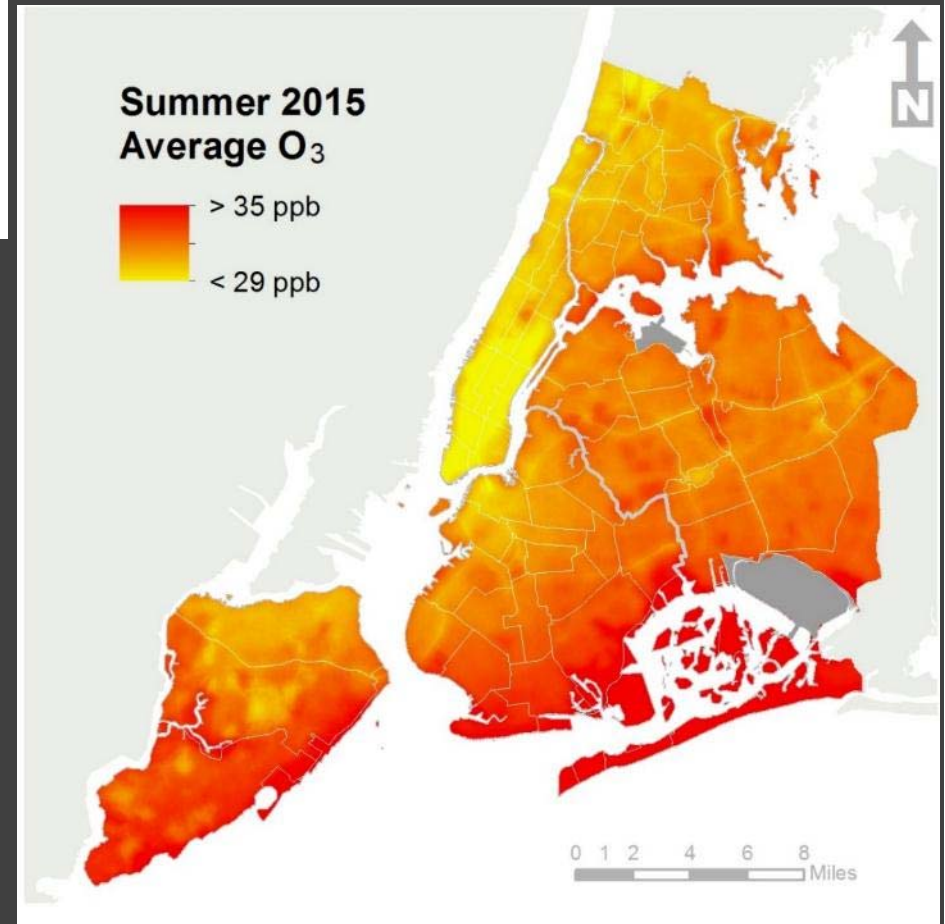
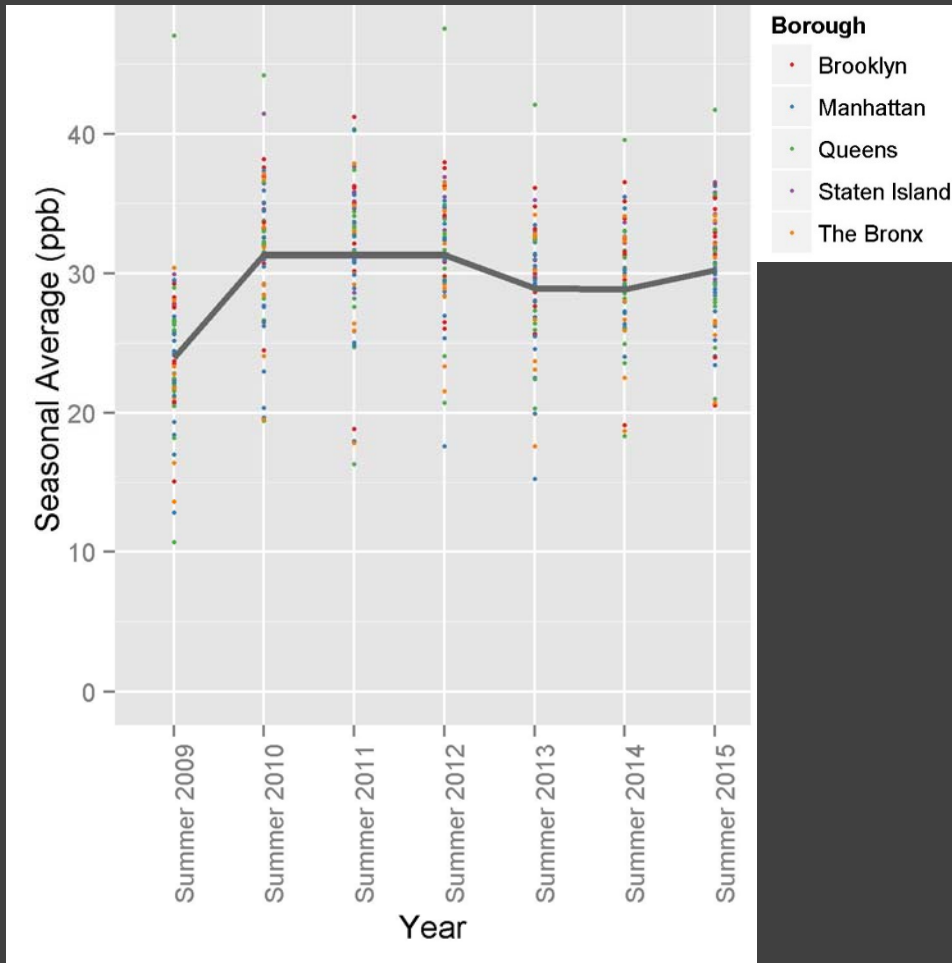
Results: SO₂



Source	Spatial Indicator
Residual oil combustion	Time varying counts of boilers burning No. 4 and No. 6 oil within 1000m
Building heating	Nighttime population within 1000m

- Seasonal average range in monitoring sites in 2015: 0.1 – 2.7 ppb

Results: O₃



Indicator (inverse relationship)	Spatial Indicator
NO _x scavenging	Level of NO ₂ measured at the same location
Tree cover	Tree cover within 50m

- Citywide: Minimal variation year to year
- Seasonal average range in monitoring sites in 2015: 20.6 – 41.7 ppb

Neighborhood Scale AQ/Public Health Modeling

- Goal: Develop methods to evaluate the air quality-related public health burden of local sources and benefits of control at a neighborhood-level
- Methods
 - Improve local-scale emissions inventories
 - Estimate emissions reductions associated with policy implementation, or zero-out for burden analyses
 - Model air quality benefits (CMAQ/WRF 1-km resolution)
 - Model public health benefits, by neighborhood (local health/risk data)
- Findings used to support and develop city policy
 - Clean Heat
 - Traffic Burden
 - 80x50 - ongoing

Ongoing work

- Improving current and future year microscale inventories
 - Energy outlook in 2050
 - Distributed generation
 - Generators and other non-road equipment
- Street-level real-time PM_{2.5} monitoring
- Increased community based participatory research (citizen science) with low cost sensors

Public Reporting of Results

- Periodic public reports
- Scientific manuscripts
- Publically available data on web portal
- Online infographics
- Research datasets available by request

Environment & Health Data Portal

Search data by keyword (e.g. Asthma)

Home Environment Neighborhood Air Quality Fine Particulate Matter (PM2.5)

Select another data display: Summarize Show Data on Map Map Link Data Print or Export

Click For Map Options

About the Measure: Fine Particulate Matter (PM2.5) - Mean

More information about: Neighborhood Air Quality Data Sources

Outdoor Air and Health in Washington Heights

Air pollution is one of the most important environmental threats to urban populations and while all people are exposed, pollutant emissions, levels of exposure, and population vulnerability vary across neighborhoods. Exposures to common air pollutants have been linked to respiratory and cardiovascular diseases, cancers, and premature deaths.

Zip Codes: 10031, 10032, 10039, 10033, 10034, 10040

Outdoor Air Pollutants

Estimated annual average concentrations calculated from a model that used NYC Community Air Survey measurements, 2008-2013.

	Washington Heights	Manhattan	NYC
Washington Heights	Washington Heights	Manhattan	NYC
Compared with other NYC neighborhoods*	Washington Heights	Manhattan	NYC
Trend over time	Washington Heights	Manhattan	NYC



PM_{2.5} pollution from traffic contributes to adverse health effects

PM_{2.5} pollution from traffic sources in the region contributes to **320 premature deaths** and **870 emergency department (ED) visits and hospitalizations** each year. The largest impacts are from **trucks and buses**.

■ Trucks and buses in NYC
■ Cars in NYC
■ All motor vehicles outside NYC



Thank you very much.

Air Team:

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For more information about NYCCAS, visit:

<http://www.nyc.gov/health/nyccas>

To download air quality and other environmental health data visit:

<http://www.nyc.gov/health/tracking>