UCDAVIS
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The role of Citizen Science Projects in the context of information provided by the New York City Community Air Survey (NYCCAS)

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Overview

- New York City Community Survey (NYCCAS) -- Air surveillance program based on integrated sampling
- NYCCAS Real-time $PM_{2.5}$ Monitoring Network
- Queens College / DOHMH Citizen Science Initiative

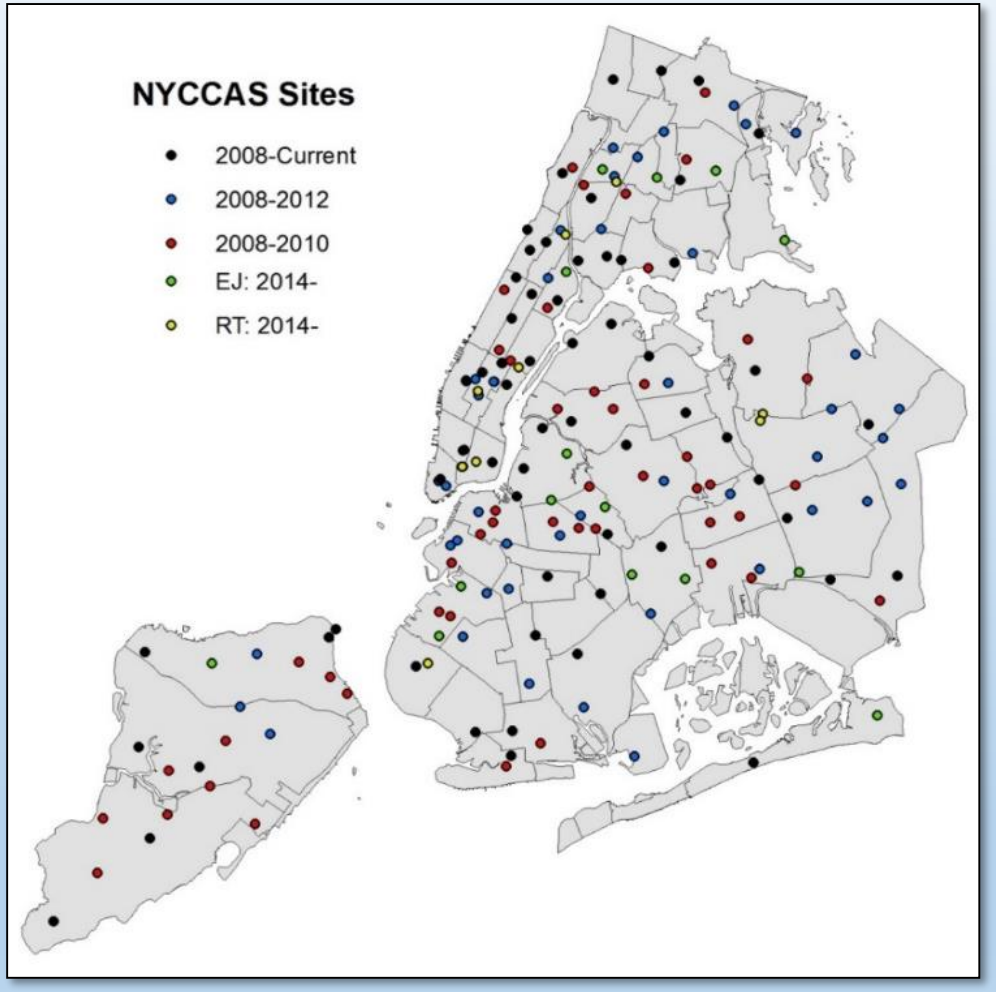
New York City Community Air Survey (NYCCAS)

- 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

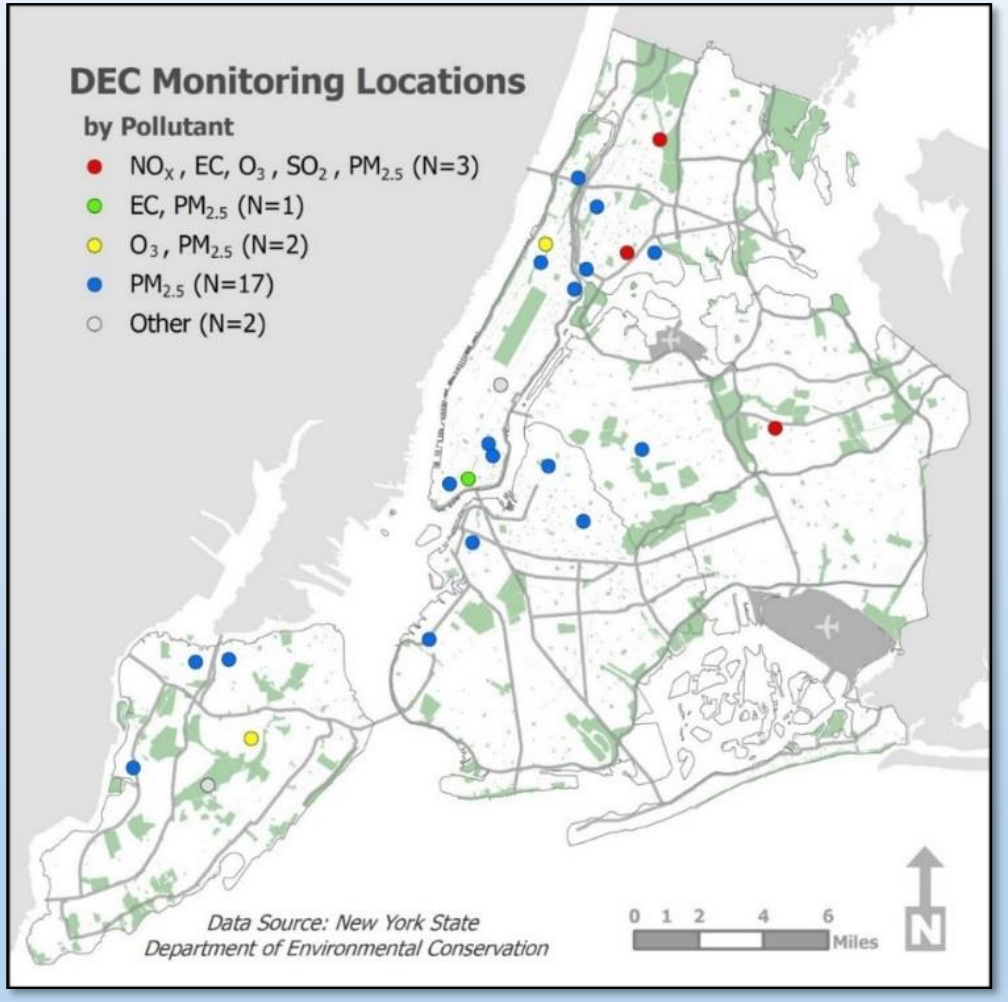
Methods: Site Allocation

- Systematic allocation (120 sites):
  - Divided into 7,595 lattice cells in GIS (300m^2)
  - Over-sampled high traffic, high buildings cells
  - Sites are at street-side or in parks
- Purposeful allocation (30 sites)
  - Fill spatial gaps
  - One per Community District
  - Near sites of concern
- Reference sites (one per borough to track and adjust for seasonal variation (n=5)

NYCCAS: Largest Urban Monitoring Program in the U.S.



90-150 monitoring sites per year
$PM_{2.5}$, NO_2, SO_2, EC, O_3



17 $PM_{2.5}$ sites, 3 NO_2 Sites, 1 EC site, 2 O_3 sites and 3 multiple pollutant sites

Methods: Collection of monitoring data and geo-spatial analysis

- 2-Week, street-level, integrated samples taken once per site/season
  - $PM_{2.5}$-metals constituents, EC, NOx, O_3, SO_2
- Sampling protocol: 15 min./hr * 336 hrs * 4 LPM = 5040 min (84 hrs.) runtime, yielding 20160 Liters (20.16 m^3) sample volume
- 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)

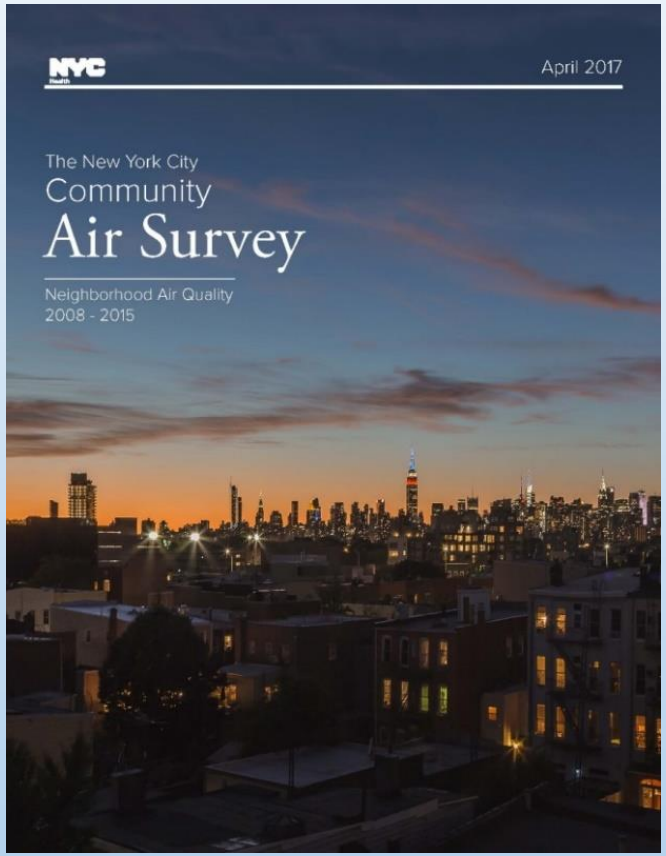
NYCCAS (PAAS-201) Filter-based Sampling Unit

Temperature/RH sensor data logger records temperature and relative humidity

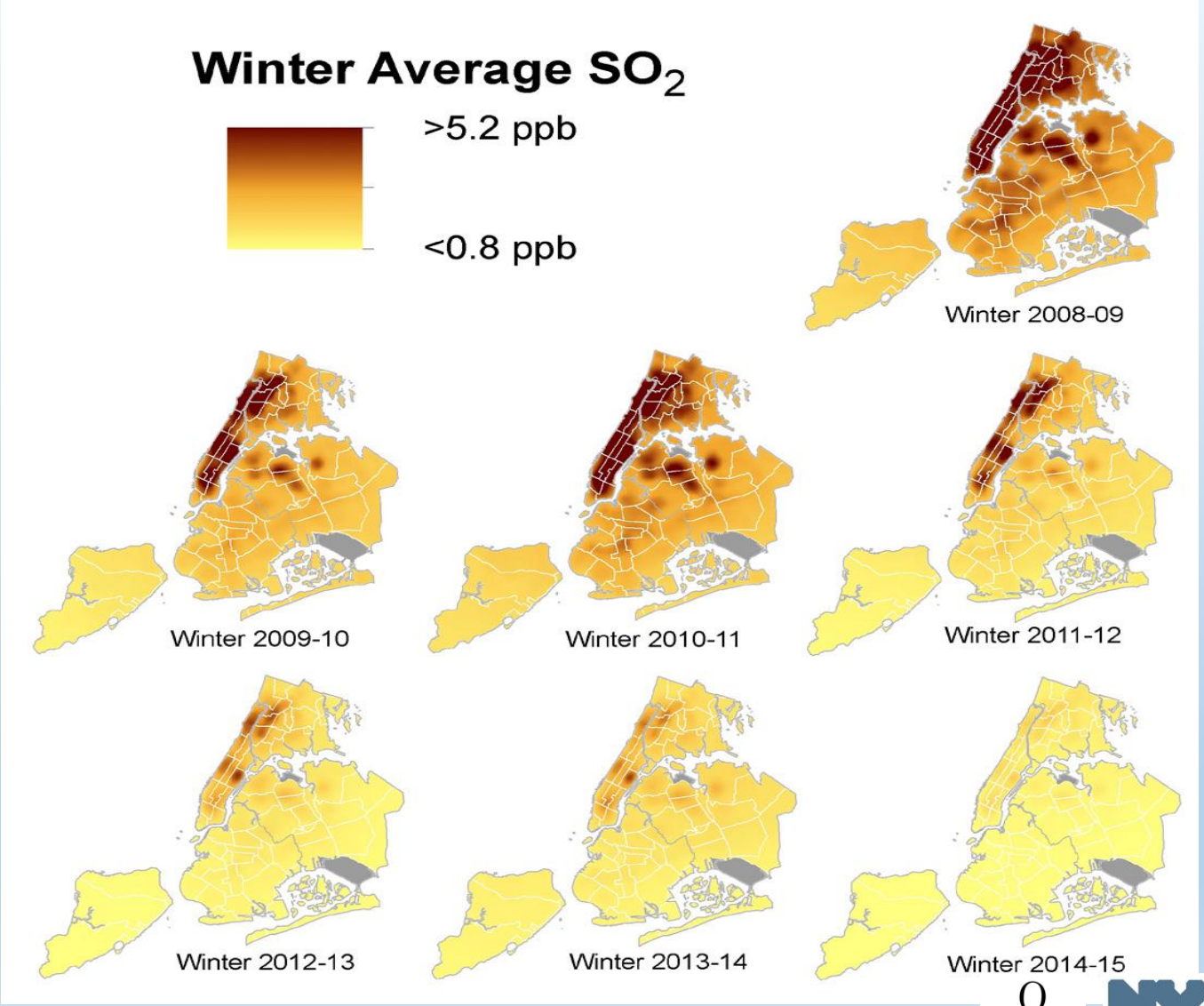
NO_x, NO_2, SO_2, and O_3 are collected with passive monitors in a protective housing

$PM_{2.5}$ samples are collected with a Harvard Impactor

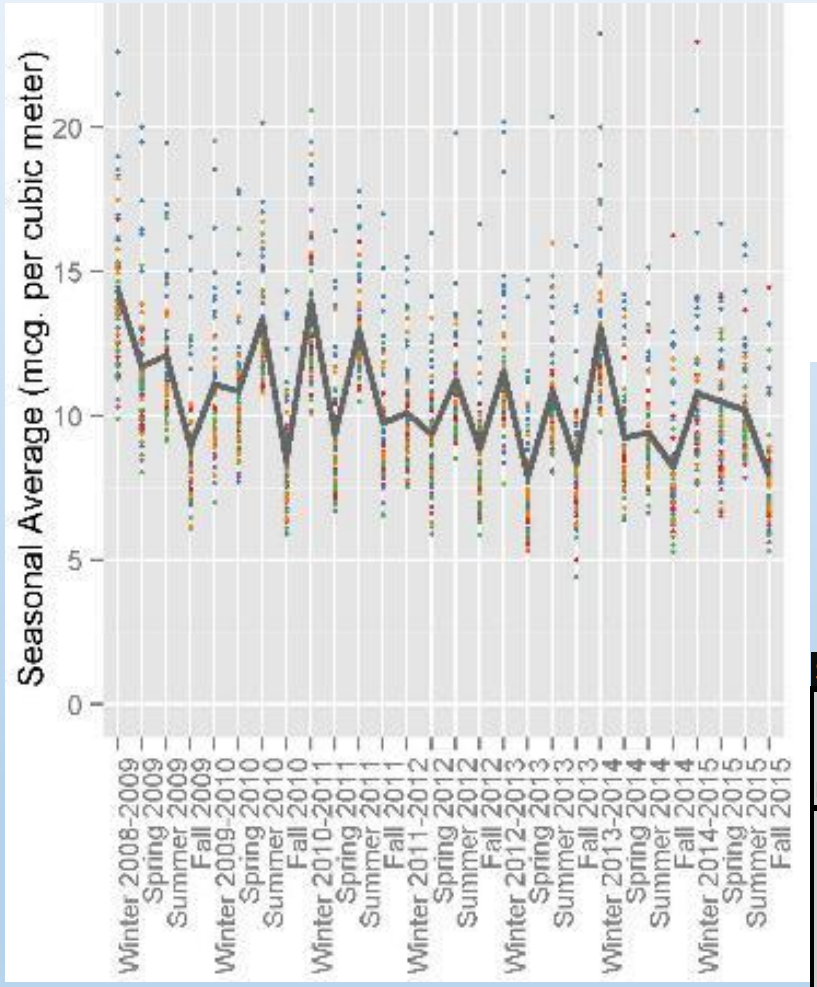
Air Pollution in New York City



New York Community Air Survey
2008 - ongoing

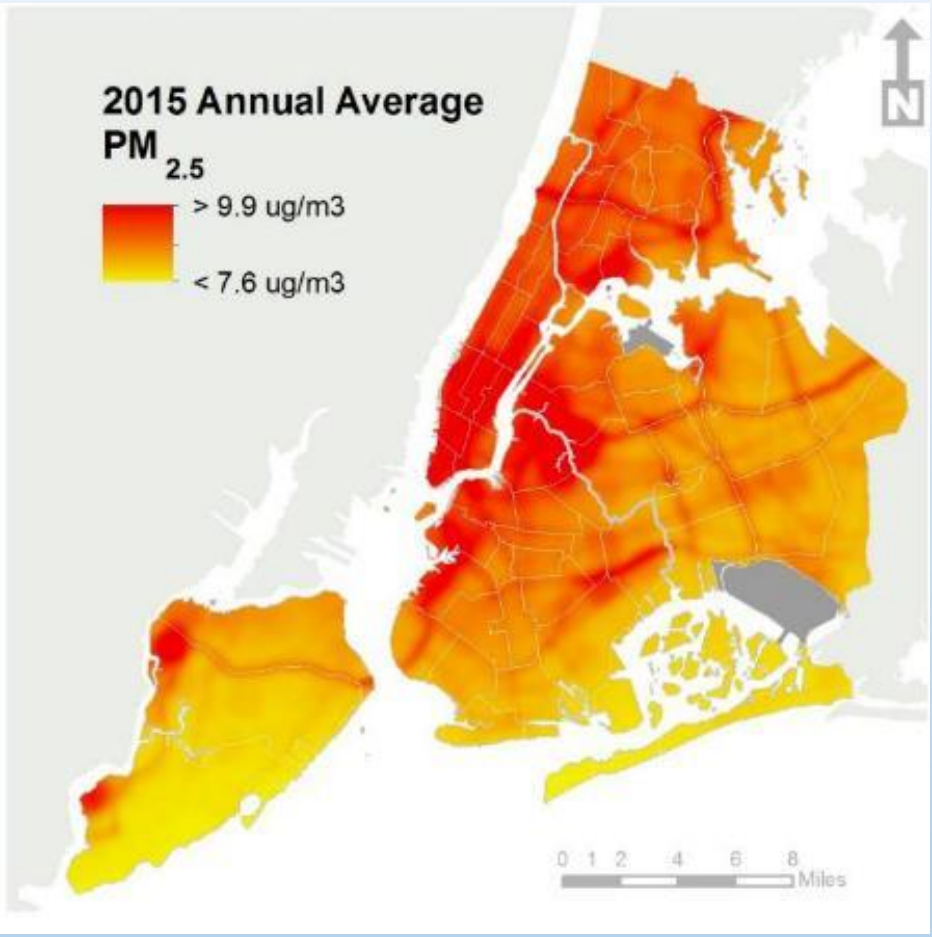


Results: $PM_{2.5}$



Δ-18%

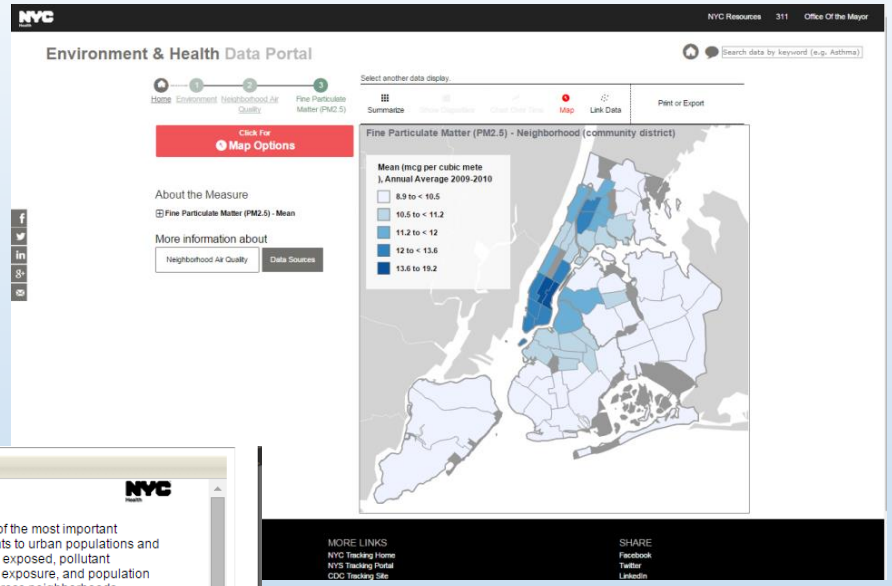
Source	Spatial Indicator
Buildings-related emissions	$PM_{2.5}$ emissions from buildings heat and hot water boilers within 1000 m
Traffic-related emissions	Area of industrial land use within 1000 m
	Traffic density, weighted by relative $PM_{2.5}$ emissions rates by vehicle type (car, truck, bus) within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

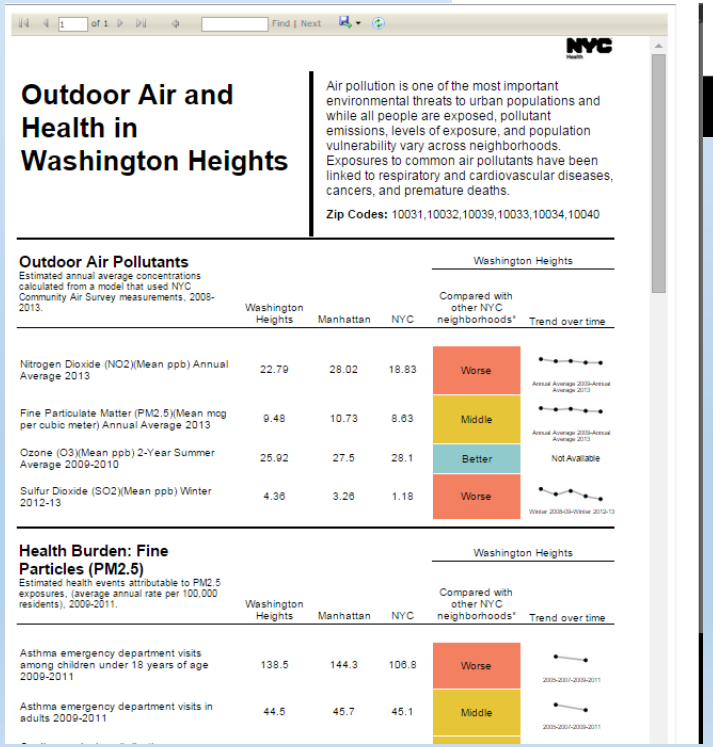


- Seasonal average range in monitoring sites in 2015: 5.3 – 23.0 mg/m^3

Public Reporting of Results

- Periodic public reports
- Scientific manuscripts
- Publically available data on web portal
- Research datasets





NYCCAS: Street-level, Real-time $PM_{2.5}$ Monitoring Network

15 units will be deployed in NYC neighborhoods by Spring 2019

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Citizen Science Project

- Air Quality in New York City

OneNYC

Originally released in 2007 under the name “PlaNYC,” One New York: The Plan for a Strong and Just City (OneNYC) is a groundbreaking effort to address New York City’s long-term challenges.

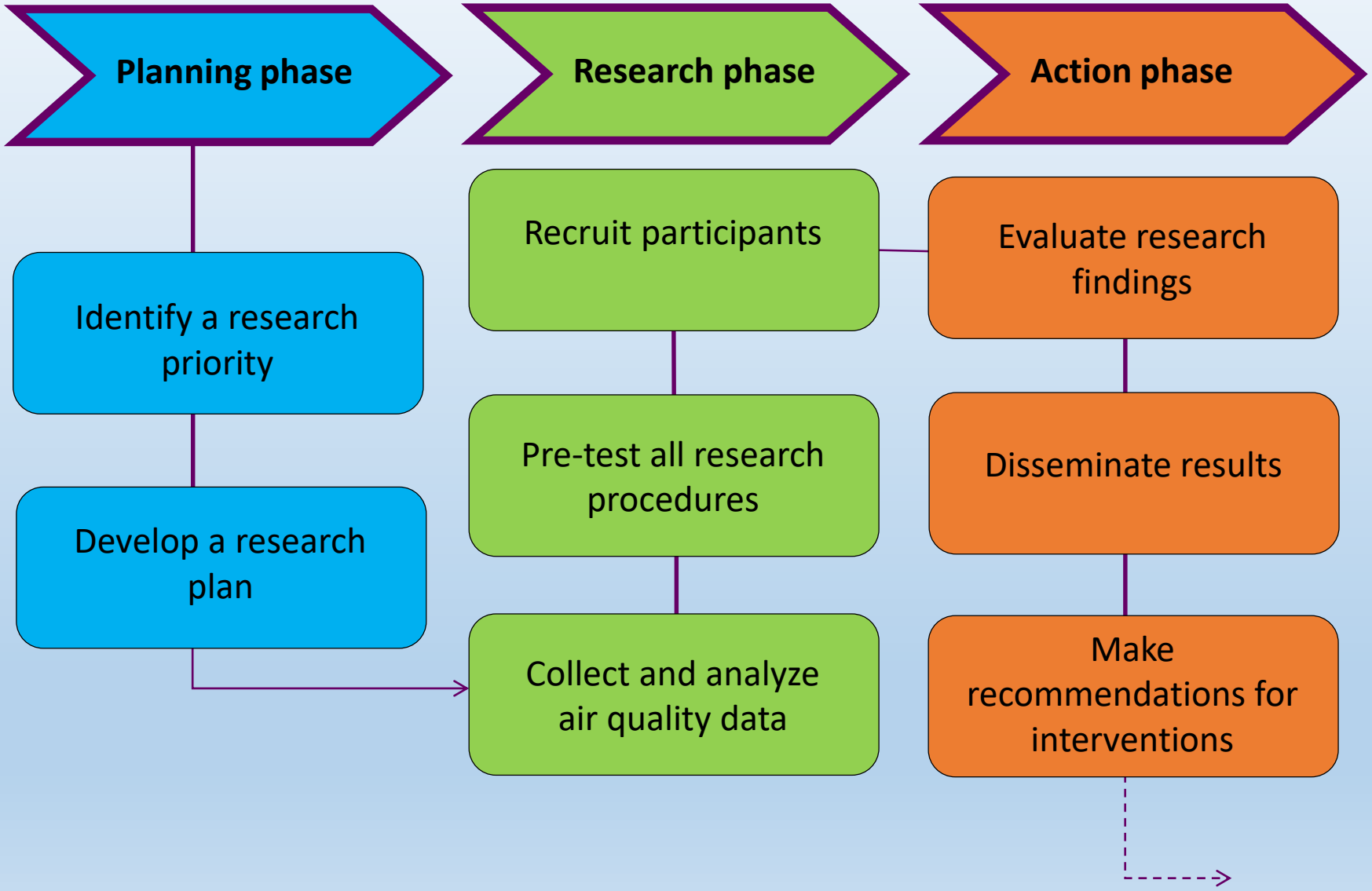
Vision 3: Our Sustainable City

Air Quality

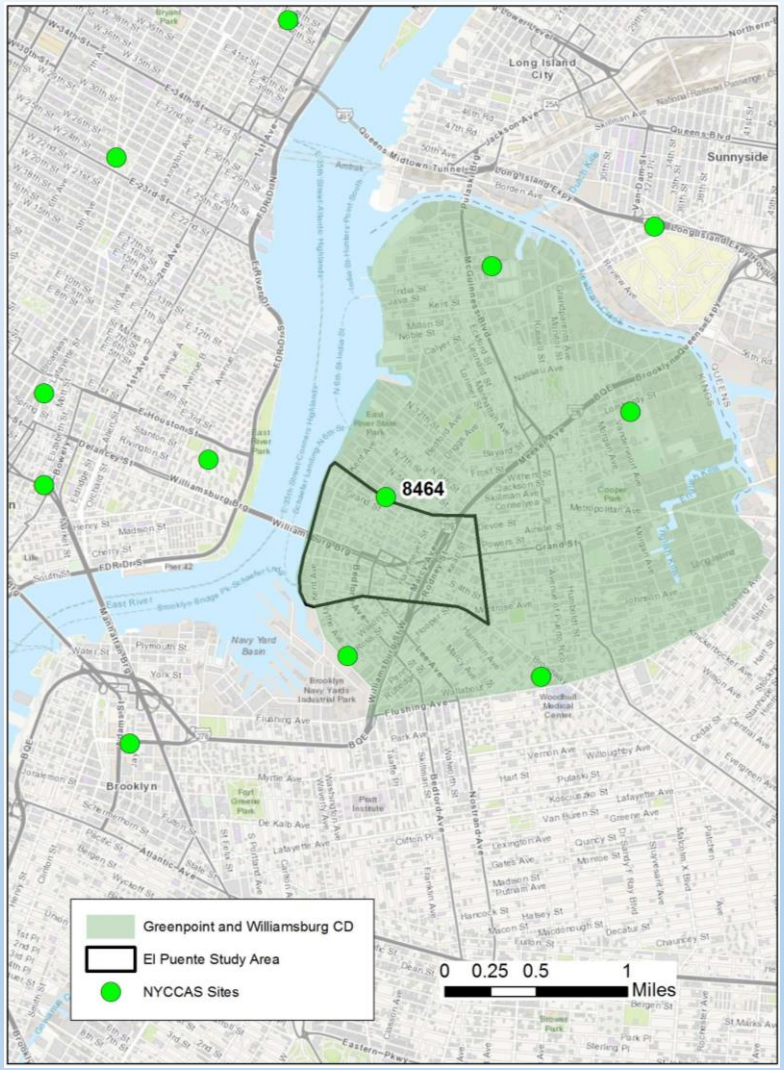
Initiative 2: Identify additional targeted air-quality improvements through data analysis and community engagement

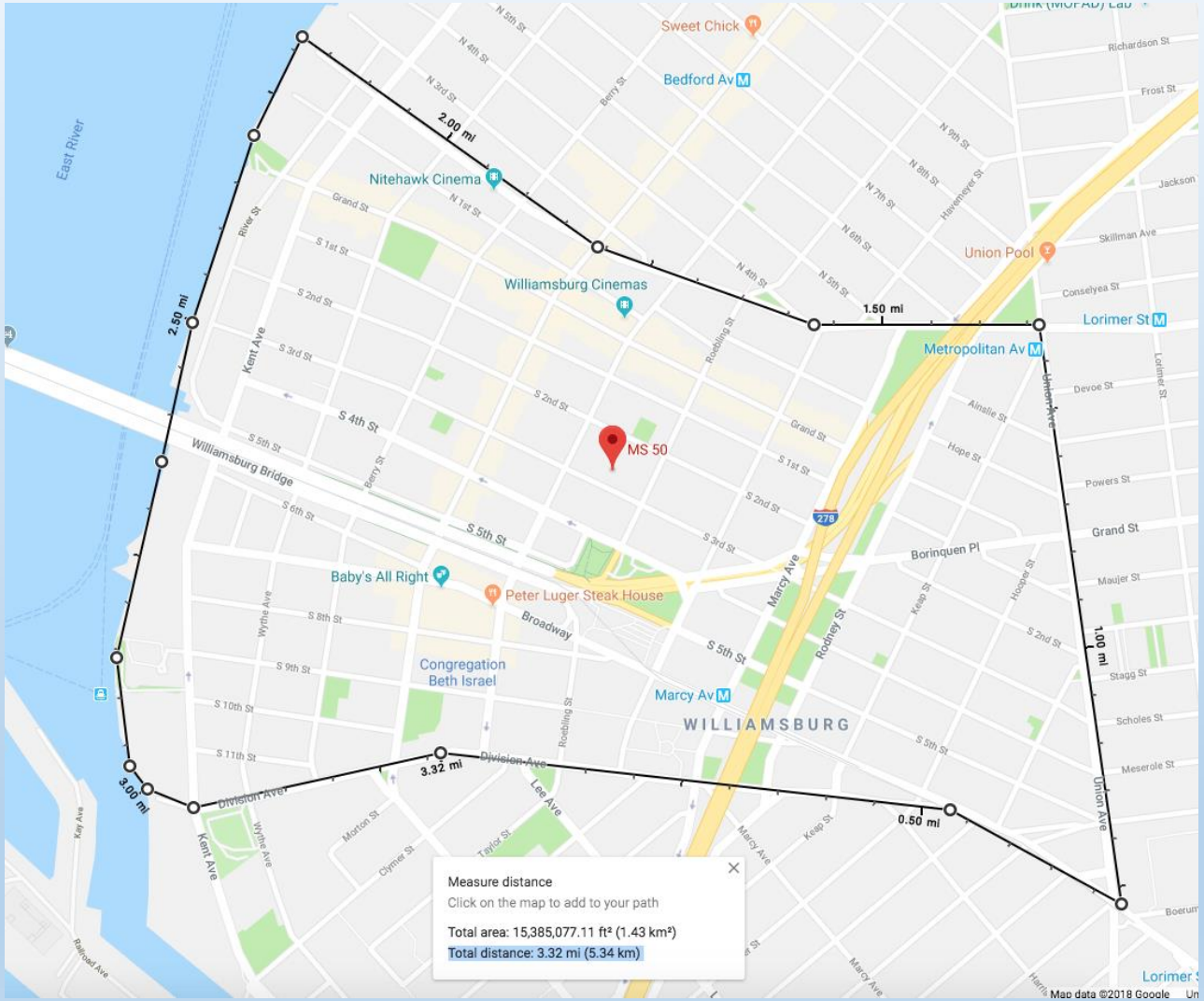
- Commoner Center received funding to set up two pilot Community Air Quality Monitoring Networks in NYC
- Solicit project proposals from Community groups interested in participating in the pilot Community Air Quality Monitoring Network initiative
- Two proposals were accepted (El Puente, Brooklyn; Youth Ministries for Peace and Justice, Bronx)
- El Puente project design and implementation will start October 1, 2018
- Youth Ministries for Peace and Justice project is scheduled to start in Spring 2019
- Duration of each project ~6 months

Community-engaged air quality science



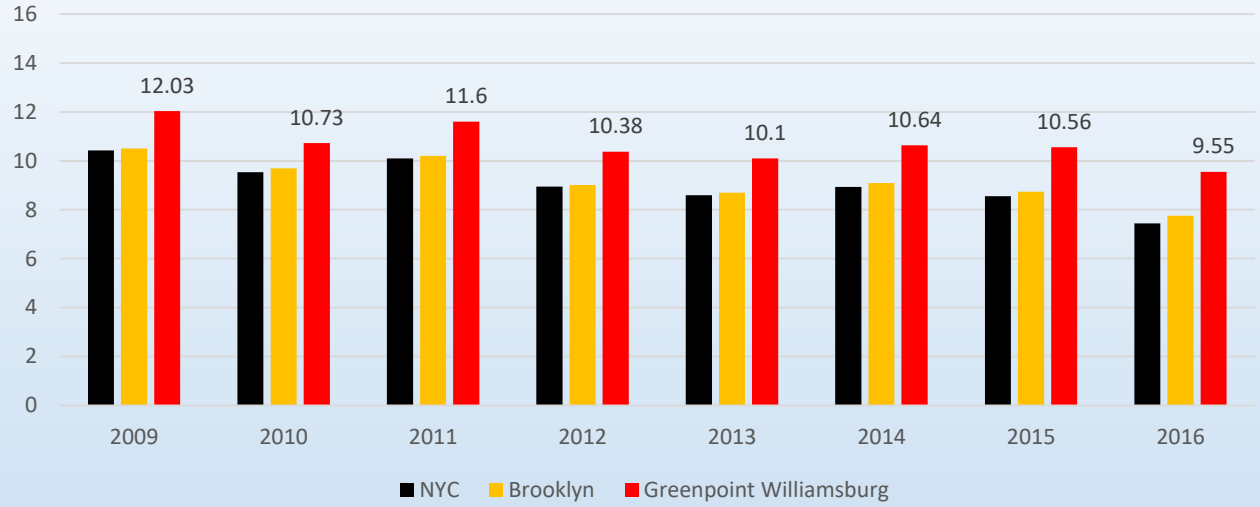
El Puente neighborhood in Brooklyn, NY



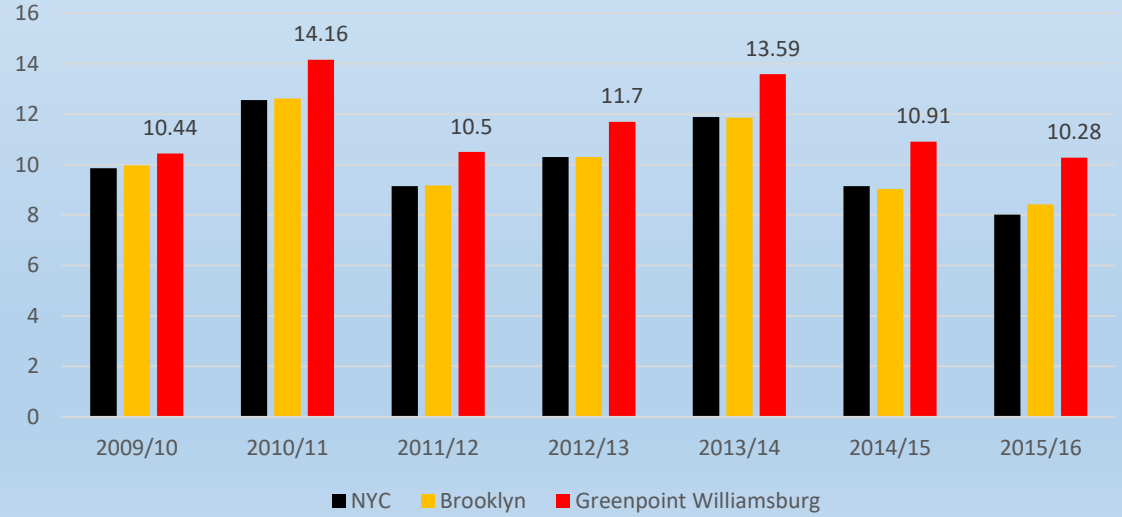


NYCCAS monitoring sites in proximity to the project area

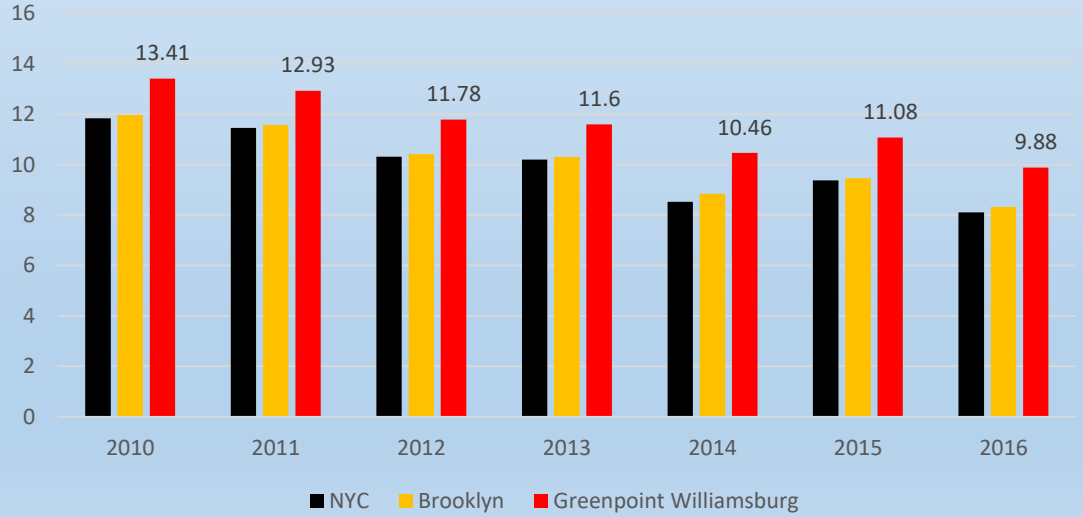
Average Ambient Annual $PM_{2.5}$ Concentrations ($\mu g/m^3$)



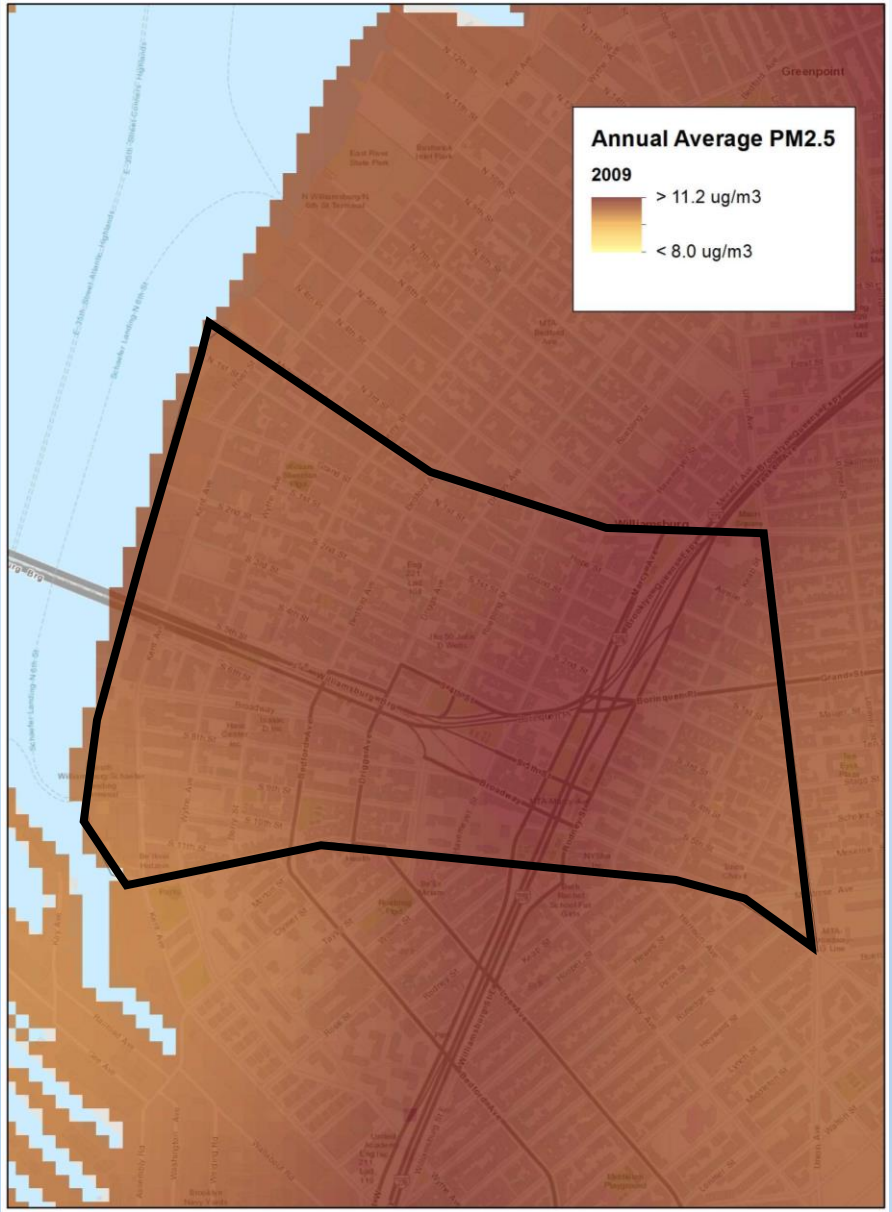
Average Ambient Winter $PM_{2.5}$ Concentrations ($\mu g/m^3$)

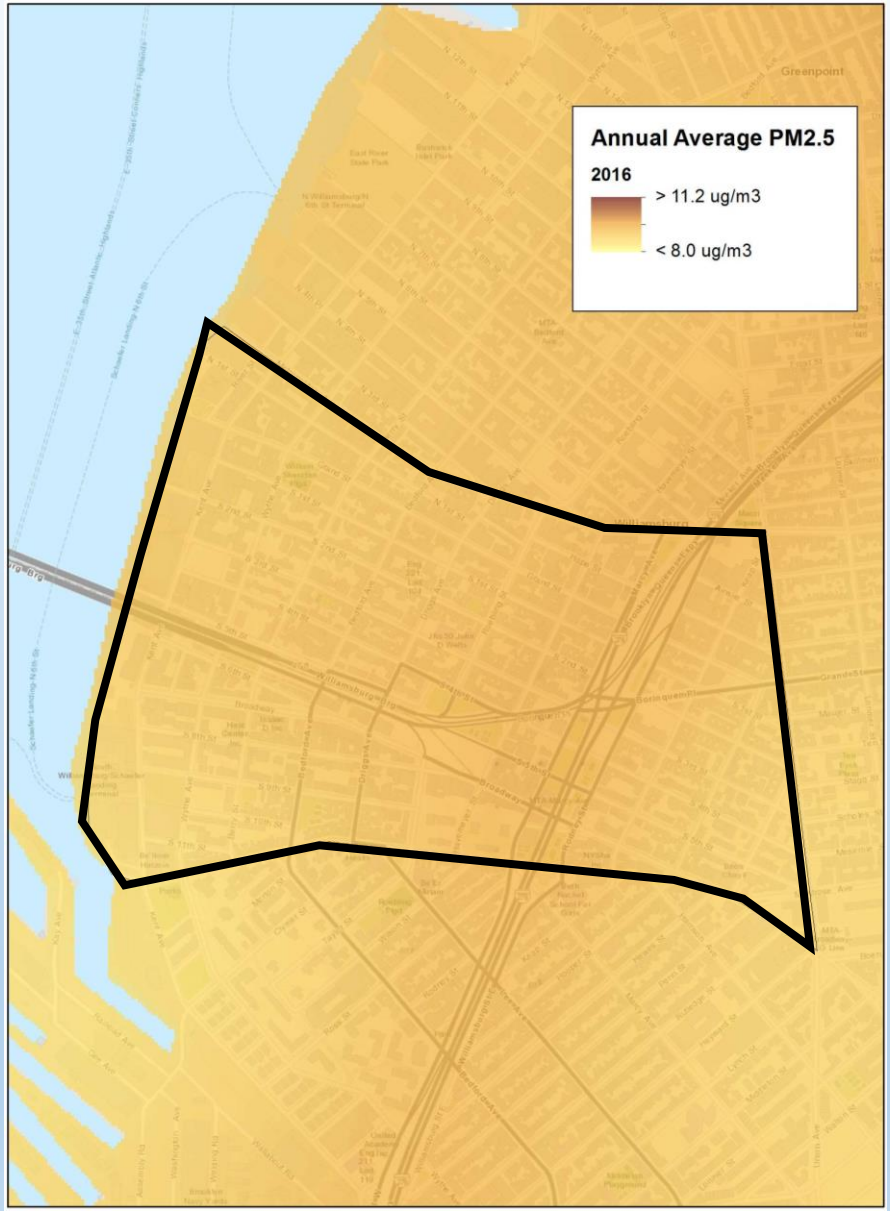


Average Ambient Summer $PM_{2.5}$ Concentrations ($\mu g/m^3$)



NYCCAS $PM_{2.5}$ Air Pollution Maps for Greenpoint Williamsburg: Comparison between 2009 and 2016





Key concerns of the El Puente community:

- Air pollution exposure at play grounds / open space areas
- Exposure to diesel exhaust from truck traffic
- Exposure from a nearby bus depot
- Need for assessment of fine scale special and temporal gradients not captured by NYCCAS

➔ **El Puente: Development of study objective**

Scope of project support provided by Commoner Center/DOHMH

- Educational, instrument training (Airbeam, Dylos and Purpleair) and data management workshops
- Assisting in site selection process for fixed site real-time PM2.5 monitoring network
- Access to city infrastructure (using lamp post as platform for real-time instruments)
- Integrating low cost sensor into battery-powered (2 week power supply) sampling unit suitable to be mounted on lamp posts (sampling height 10-12 feet)
- Instrument deployment, maintenance and repair
- Data management, QA/QC, data analysis and visualization

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Conclusion/Expectations

- Increasing community awareness: making air pollution visible
- Education, e.g. providing support for student citizen-science projects
- Assessing possibilities for air-quality improvements based on targeted intervention strategies (e.g. traffic calming measures, relocation of playgrounds)
- Assessment of NYCCAS model output based on data derived from low cost sensor networks
- . . .

Thank you

NYCCAS Team

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DOHMH: Carolyn Olson, Sarah Johnson, Kazuhiko Ito, Christopher Huskey, Margaret Rice

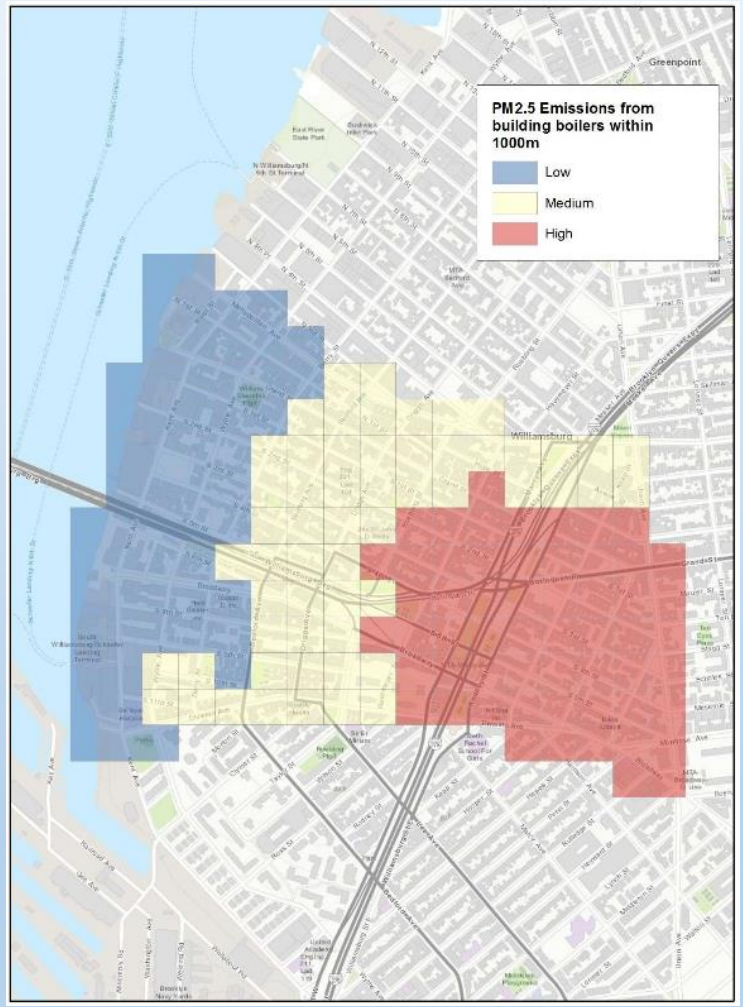
C40 Cities: Iyad Kheirbek

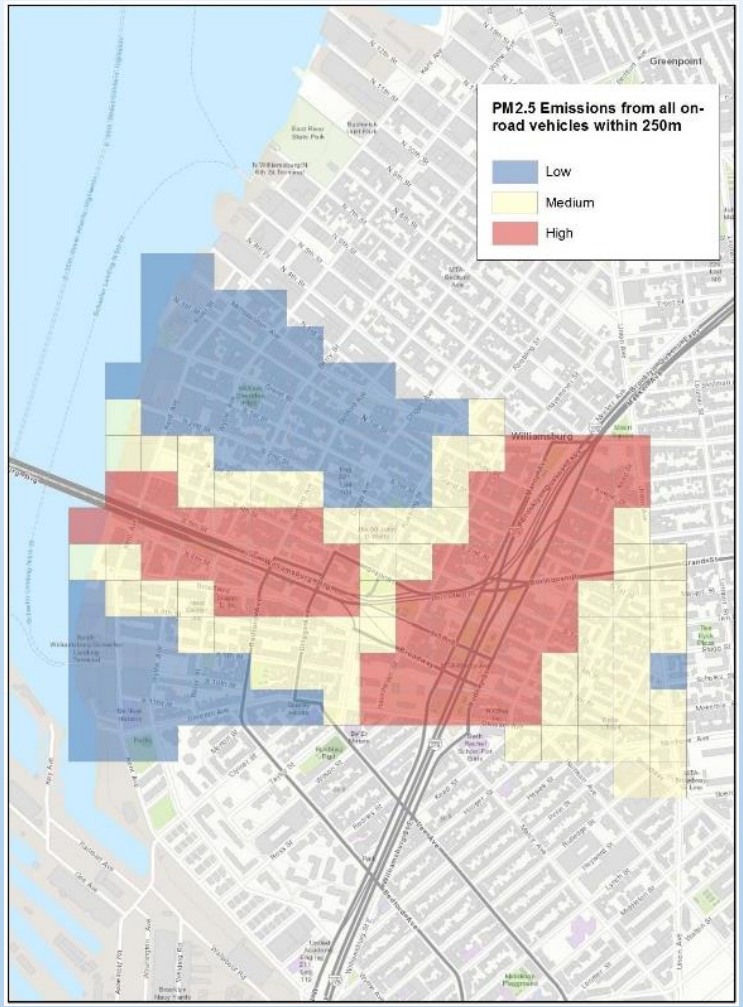
CONSULTANT: Zev Ross Spatial Analysis

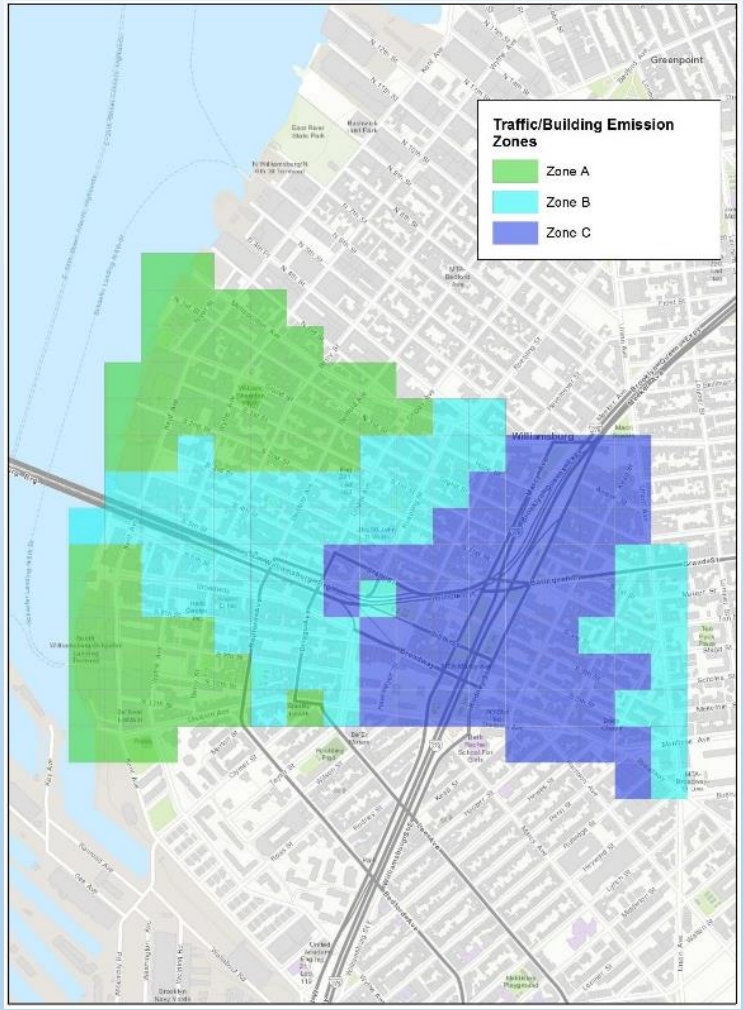
For more information about NYCCAS, visit:
http://www.nyc.gov/health/nyccas

To download air quality and other environmental health data visit:
http://www.nyc.gov/health/tracking

NYCCAS-based Emissions Inventory







Zone A = Low
Zone B = Medium
Zone C = High