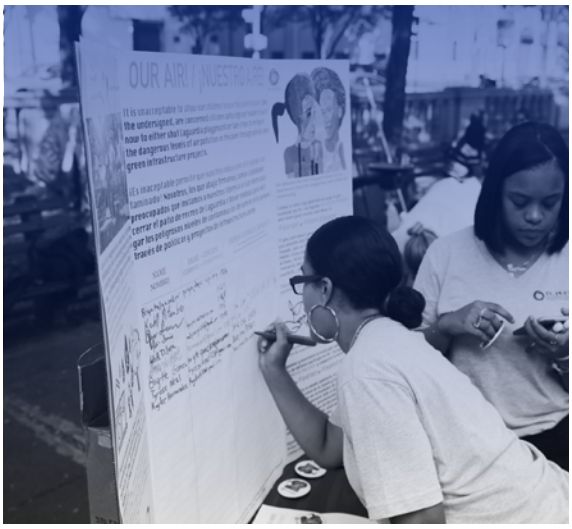
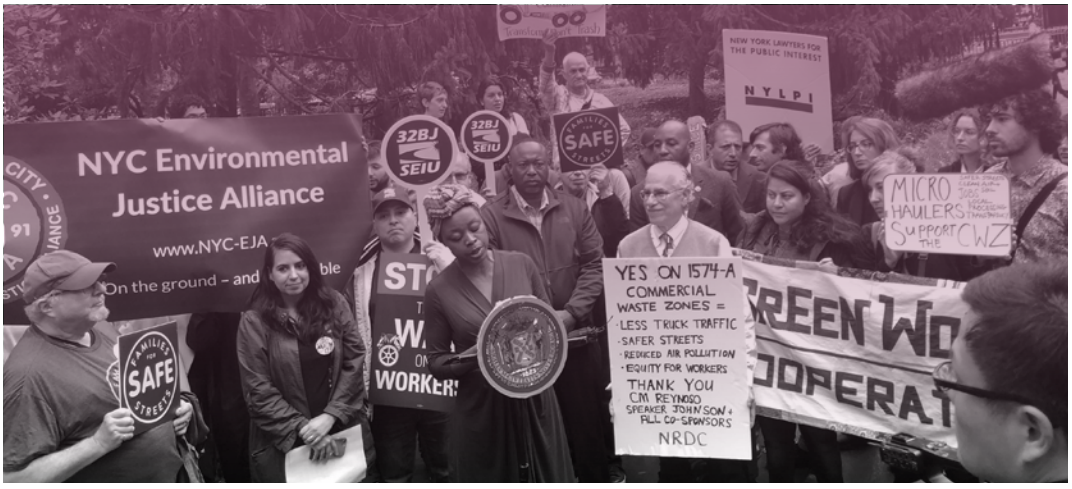
CAMP-EJ

COMMUNITY AIR MAPPING PROJECT FOR ENVIRONMENTAL JUSTICE

FINDINGS & RECOMMMENDATIONS REPORT





NEW YORK CITY ENVIRONMENTAL JUSTICE ALLIANCE

FEBRUARY 2021

New York City Environmental Justice Alliance

Co-authors: Jalisa Gilmore, Priya Mulgaonkar, Tok Michelle Oyewole, and Michael Heimbinder

Contributors: Eddie Bautista and Renae Reynolds

Data Analysis: Chris C. Lim

Design: Priya Mulgaonkar

Community Air Monitoring Team: Eulogia Diaz, Ting Ting Fu, Mark Winston Griffith, Raina Kennedy, Ana Melendez, Dariella Rodriguez, Angela Tovar, Leslie Velasquez, and Cesar Yoc

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Brooklyn Movement Center
375 Stuyvesant Ave
Brooklyn, NY 1123
(718) 771-7000
www.brooklynmovementcenter.org

El Puente
211 South 4th Street
Brooklyn, NY 11211
(718) 387-0404
www.elpuente.us

NYC Environmental Justice Alliance
462 36th St, 3rd Fl.
Brooklyn, NY 11232
www.NYC-EJA.org

Morningside Heights/ West Harlem Sanitation Coalition
100 La Salle Street #19F
New York, NY 10027
(212) 666-6157
www.sanitationcoalition.org

THE POINT CDC
940 Garrison Avenue
Bronx, NY 10474
(718) 542-4139
www.thepoint.org

UPROSE
462 36th St, 3rd Fl.
Brooklyn, New York 11232
(718) 492-9307
www.uprose.org

We Stay/ Nos Quedamos
754 Melrose Avenue
Bronx, NY 10451
(718) 585-2323
www.nosquedamos.org

Youth Ministries for Peace and Justice
1384 Stratford Avenue
Bronx, NY 10472
(718) 328-5622
www.ympj.org

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Cover photos by (left to right): Luke Ohlson, Priya Mulgaonkar, Annel Hernandez, Jalisa Gilmore

Nuestro Aire photos by El Puente. Conclusion cover photo by The Bronx Chronicle.

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EXECUTIVE SUMMARY

Globally, over four million people die prematurely every year as a result of breathing dirty air. In New York City, $PM_{2.5}$ pollution alone is responsible for 2,000 premature deaths and 6,500 emergency department visits annually. The health effects of poor air quality are particularly pronounced in low-income communities and communities of color due to historic discrimination in access to housing and racist land use planning that places polluting infrastructures and facilities in these neighborhoods.

New York City Environmental Justice Alliance (NYC-EJA) member organizations represent environmental justice communities that are disproportionately exposed to $PM_{2.5}$ pollution, and as a result, suffer from higher rates of respiratory illness, heart disease, stroke, lung cancer, negative birth outcomes, and other life-threatening conditions associated with breathing dirty air on a daily basis. The formulation and execution of NYC-EJA's Community Air Mapping Project for Environmental Justice (CAMP-EJ) was informed by our member organization's concerns with air pollution in their neighborhoods and the noticeable everyday impacts on the health of their communities. Led by six community-based organizations (CBOs) in the South Bronx and Brooklyn, CAMP-EJ empowered communities to collect and visualize hyperlocal air quality data and leverage this data to improve air quality, public health, and community development.

Because New York City has only 13 high-performance ambient air monitoring sites, air pollution exposures are poorly characterized at the neighborhood level. To address this data gap, CAMP-EJ utilized dozens of low-cost, portable air quality monitors to measure hyperlocal air quality and characterize air pollution exposures at more refined spatial and temporal scales than is possible using existing City and State data. The results of our air monitoring campaign shed light on the disproportionate public health burdens imposed on environmental justice communities from industrial pollution, trucking, and transportation infrastructure.

Brooklyn Movement Center, El Puente, THE POINT CDC, UPROSE, We Stay/Nos Quedamos, and Youth Ministries for Peace were the six community-based organizations in NYC-EJA's network that led and organized local CAMP-EJ air quality monitoring campaigns in Brooklyn and the South Bronx. By prioritizing community participation, youth education, and leadership development NYC-EJA member organizations successfully collected thousands of hours of air quality measurements over the course of more than two years. Meetings that brought together NYC-EJA member organizations facilitated best practice exchange and the development of strategies for advancing their communities' short- and long-term goals for improving air quality.

FINDINGS

CAMP-EJ's data analysis focused on three neighborhoods: Hunts Point and Soundview in the Bronx and the Southside of Williamsburg in Brooklyn.

1. LOCAL FACILITIES & EXPRESSWAYS ARE BIG POLLUTERS

Mobile and fixed air quality monitors identified several air pollution hotspots likely contributing to elevated $PM_{2.5}$ levels. In the South Bronx, the Hunts Point Food Distribution Center, the Hunts Point Water Pollution Control Plant, and the "Toxic Triangle"—the area between the Cross Bronx, the Bruckner, and the Sheridan Expressways—were all identified as sources likely contributing to higher $PM_{2.5}$ levels in the community. In Brooklyn, El Puente Headquarters—located at the intersection of the BQE and the Williamsburg Bridge, approximately 100 meters from the MTA Williams Plaza Bus depot—was identified as an air pollution hotspot.

2. TRAFFIC CONGESTION FOULS THE AIR EVERY DAY, TWICE A DAY

As expected, in both the South Bronx and Southside Williamsburg, data collection indicated that air pollution varies throughout the day, spiking in the morning and evening in correspondence with higher traffic volumes. CAMP-EJ data highlights how vehicular traffic congestion and poorly planned and sited transportation infrastructure is a significant contributor to air pollution in environmental justice neighborhoods.

3. HYPERLOCAL MEASUREMENTS SHOW PM2.5 CONCENTRATIONS 20X HIGHER THAN STATE-RUN MONITORS

Mobile monitoring revealed that local, one-minute $PM_{2.5}$ measurements could be twenty times higher than the levels reported by the closest government-run monitor. Stationary monitoring revealed that the measurements from air quality instruments located just blocks from one another could vary by a factor of three. This is consequential to public health, because acute short-term exposures to high concentrations of $PM_{2.5}$ are associated with negative cardiorespiratory health outcomes, like heart attacks.

RECOMMENDATIONS

1. High pollution hot spots in communities need targeted investments and interventions to mitigate air pollution

CAMP-EJ's data collection identified several hot spots: the Toxic Triangle, areas near the Hunts Point Food Distribution Center and the Water Pollution Control Plant in the South Bronx, and the intersection of the BQE, the Williamsburg Bridge, and the Williams Plaza Bus Depot in Williamsburg. Communities can benefit from solutions that are targeted to these specific air pollution hot spots; the following recommendations are opportunities to do so in Hunts Point and Williamsburg.

The Hunts Point Water Pollution Control Plant redesign should develop a plan for the facility to connect biogas into the grid as opposed to methane flaring, create a green transportation plan for vehicles accessing the facility, and integrate green space as a way to attenuate both air and water pollution.

To mitigate air pollution associated with Hunts Point Food Distribution Center operations, we recommend the City electrify all idling-diesel powered refrigerated trucks and establish a larger truck stop electrification program. Additionally, the food distribution center should connect with the THE POINT CDC's Community Solar project to explore opportunities for local, resilient, clean energy generation.

In Williamsburg, air quality can be improved through incorporating more green infrastructure in the redesign of Continental Army Plaza. The addition of green infrastructure would improve air quality and provide a number of other environmental benefits, such as reduced surface temperatures, stormwater capture, and flood mitigation.

2. Adopt city and state policies to reduce pollution from the transportation sector in environmental justice communities

Environmental justice communities should be prioritized for electric vehicle use and interventions that will reduce traffic volumes, relieve traffic congestion, and improve pedestrian safety. For example, prioritizing the use of electric buses on MTA routes that stop at the Williams Plaza Bus Depot in North Brooklyn creates an opportunity to mitigate traffic pollution in the community. Additionally, a new marine terminal at the Hunts Point Food Distribution Center that prioritizes clean mobility options for last mile transport can reduce air pollution by cutting the number of trucks entering and exiting the facility.

3. Prioritize financial and technical support for hyperlocal air monitoring networks managed by environmental justice communities

CAMP-EJ's data collection highlights the importance of hyperlocal air quality data, demonstrating that air pollution measurements can vary significantly over small spaces and short time frames. Hyperlocal air quality data elucidates where pollution is coming from, who is exposed, and when they're exposed, which are all critical questions to answer in crafting air pollution mitigation strategies that are targeted at reducing exposures for the most vulnerable populations. The City and State need to prioritize financial and technical support to local environmental justice organizations, empowering them to build and operate air monitoring networks and carry out grassroots community air monitoring campaigns similar to CAMP-EJ.

CONCLUSION

CAMP-EJ demonstrates the power of community-led participatory research; filling in the data gaps where the network of regulatory air quality monitors falls short and helping communities understand the health impacts of poor air quality. In many ways, the crisis precipitated by COVID-19 foreshadows future risks exacerbated by climate change, where low-income communities of color and other marginalized groups are hit first and worst by the impacts. Decades of environmental racism have led to disproportionately high rates of respiratory and heart disease in frontline communities, and increasing vulnerability to the impacts of viruses like COVID-19. Grassroots air quality monitoring campaigns like CAMP-EJ are essential to provide quality data, to inform policy, and improve health outcomes in frontline communities.

INTRODUCTION

The New York City Environmental Justice Alliance (NYC-EJA) Community Air Mapping Project for Environmental Justice (CAMP-EJ) is a grassroots air quality monitoring campaign led by low-income communities and communities of color in New York City. Since 2018, CAMP-EJ has empowered six community-based organizations (CBOs) in the South Bronx and Brooklyn to measure, map, and understand their exposures to fine particulate matter ($PM_{2.5}$) air pollution. Utilizing low-cost air quality monitors, communities collect and visualize hyperlocal air quality data in real-time and leverage this data to improve air quality, public health, and community development.

Globally, air pollution is a major public health concern; an estimated 4.2 million premature deaths per year are due to ambient air pollution.[1] $PM_{2.5}$ pollution alone is responsible for 2,000 premature deaths and 6,500 emergency department visits annually in New York City.[2] Yet this pollution does not impact all New Yorkers equally. Low-income communities and communities of color in New York City are disproportionately impacted by poor air quality due to historic discrimination in access to housing, racist land use planning that places polluting infrastructures and facilities in Black and Brown neighborhoods[3] while simultaneously underbuilding parks and open space,[4] and inadequate access to healthcare,[5] among other reasons. In New York City, the $PM_{2.5}$-attributable mortality rate is 28% higher in high poverty neighborhoods compared with low poverty neighborhoods.[6]

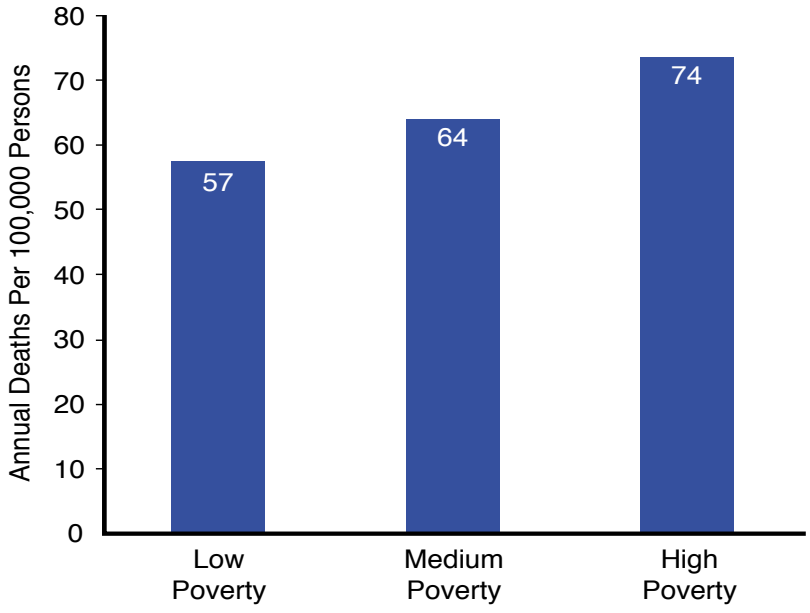


Figure 1: $PM_{2.5}$ Attributable Mortality Rate by Poverty Status.

NYC-EJA's member organizations represent environmental justice communities: low-income people of color who live alongside the most noxious infrastructure in our city, including waste transfer stations, petroleum storage & distribution centers, highways, power plants, concrete batch plants, and other industrial uses. As a result, such communities face higher rates of negative health outcomes linked to $PM_{2.5}$ pollution, including respiratory illness, heart disease, stroke, lung cancer, negative birth outcomes, and other life-threatening conditions.[7,8,9,10] Motivated by a shared concern with disproportionate exposures to toxic air in their communities, NYC-EJA's member organizations—in partnership with academic researchers—have been at the forefront in advancing innovative approaches to community-based air quality monitoring for decades, and CAMP-EJ is a continuation of this work.

THE IMPORTANCE OF HYPERLOCAL AIR QUALITY DATA

The recent proliferation of commercially-available, low-cost, and quick-to-deploy air quality instruments has created opportunities to measure air pollution minute-to-minute and block-by-block. Around the world, networks of low-cost air quality instruments are being established by government agencies, research organizations, and communities—often collaborating together—to augment existing state-run monitoring networks. This offers opportunities for both governments and communities to collect and share real-time air pollution data with higher spatial and temporal resolution than can be achieved with traditional methods that use expensive, fixed-site, regulatory-grade monitors.

Government and regulatory agencies throughout the world have traditionally relied on networks of fixed-site monitors to measure air quality and establish air quality standards. Owing to their high equipment and operational costs, fixed-site monitors tend to be sparsely located even in large metropolitan areas and may be entirely missing from smaller cities and rural areas. New York City has only 13 high-performance ambient air monitoring sites. As concentrations of air pollutants can fluctuate markedly over small distances and short time periods, variations in exposure for the millions of people living and working across the city's 302 square miles cannot be adequately characterized using information from sparse, static networks of air pollution monitors.[11]

Hyperlocal air quality data is essential to understanding the disproportionate public health burdens imposed on environmental justice communities.[12] It can be used to inform policymakers and protect public health by more accurately identifying air pollution sources and quantifying the benefits of targeted source abatement policies.

ELEVATING COMMUNITY-ENGAGED RESEARCH

NYC-EJA's commitment to environmental justice is the lodestar that guides CAMP-EJ's direction and community-based participatory research is the engine that drives it forward. Working hand-in-hand with our member organizations, we recruited and organized dozens of community members and empowered them to be active participants and leaders in collecting and interpreting hyperlocal $PM_{2.5}$ data. By prioritizing community participation, youth education, and leadership development, CAMP-EJ raises community awareness of environmental harms, catalyzes civic action, and builds the capacity of participating communities to sustain the types of multi-year, collaborative advocacy campaigns that can inform new environmental-health policies in New York City.

NYC-EJA organized a series of workshops to familiarize participants with CAMP-EJ's major milestones and goals and gather feedback that informed our study design and data collection practices. In year one, NYC-EJA led the CAMP-EJ community workshops. During the second year, NYC-EJA developed train-the-trainer resources that equipped staff from participating CBOs to independently run the air quality monitoring workshops. This allowed the workshops to be tailored to each community and, with a trained expert now on staff, enabled quicker troubleshooting when technical problems arose during field deployments.

EJ IN ACTION:
THE ROLE OF $PM_{2.5}$ MONITORING IN WINNING WASTE EQUITY FOR NYC

Protest against waste transfer stations in the South Bronx, 2016. Source: Alex Moore

Air quality monitoring at the neighborhood level has been used to improve the City's study of the impacts of the commercial waste industry, with NYC-EJA members and sanitation workers deploying AirBeams to understand the impacts of disproportionate truck miles travelled in EJ communities. Building upon the victory of the Waste Equity law, which curbed the amount of waste that can be routed to three NYC neighborhoods, citizen-collected data on waste trucks and near waste facilities has been used to support the City's Commercial Waste Zone planning process and to provide recommendations for meeting OneNYC's air quality goals.[13]

CAMP-EJ workshops and monitoring sessions 2017-2019. Source: Jalisa Gimore, Priya Mulgaonkar, and Tok Oyewole

The workshops included background information and educational materials centered on "Environmental Justice, Air Pollution, and Health", mapping exercises where participants located neighborhood air pollution sources, and training sessions that taught volunteers how to coordinate their monitoring efforts, deploy the monitors, and interpret the measurements.

Community-based trainers used interactive lectures and quizzing on basics of $PM_{2.5}$ pollution, including impacts and point sources. Young people working within the CBOs were instrumental in undertaking the trainings themselves and were aided by NYC-EJA and HabitatMap staff when needed. Reviewing handouts with step-by-step guides to using air quality monitors, as well as having a troubleshooting guide for common issues, was helpful in comparison to earlier training session trials without FAQs. Following the training, the most successful CAMP-EJ sites had a dedicated staff person to coordinate mobile or stationary monitors who kept in contact with NYC-EJA and HabitatMap staff for any troubleshooting. Throughout the two years, CAMP-EJ also organized meetings where participants exchanged best practices and brainstormed strategies for advancing their communities' short- and long-term goals for improving air quality.

HOW WE MEASURED AIR QUALITY

CAMP-EJ was coordinated by NYC-EJA with support from HabitatMap, an environmental technology non-profit, and realized via a multi-year, grassroots effort powered by staff and volunteers from NYC-EJA's member organizations in Brooklyn and the South Bronx.* NYC-EJA member organizations participating in the full duration of CAMP-EJ included: Brooklyn Movement Center, El Puente, THE POINT CDC, and Youth Ministries for Peace and Justice. NYC-EJA member organizations, UPROSE and WE Stay/Nos Quedamos also participated in the inaugural year of CAMP-EJ. Additional financial, planning, and technical assistance for air quality monitoring was provided to El Puente and Youth Ministries for Peace and Justice by the Barry Commoner Center for Health and the Environment (BCCHE) at Queens College with the backing of the New York City Department of Health and Mental Hygiene.[14]

Airbeam 2. Source: HabitatMap

To collect air quality data, CAMP-EJ participants used the AirBeam2, a low-cost, palm-sized air quality instrument that measures $PM_{2.5}$, and AirCasting, an open-source environmental data visualization platform that consists of an Android app and online mapping system. Participants collected air quality measurements along designated walking routes and at fixed locations in North Brooklyn, Central Brooklyn, and the South Bronx from July 2018 to September 2019. During this time, 130 hrs of 1-second $PM_{2.5}$ measurements were recorded while volunteers walked their neighborhoods and 183,309 hours of 1-minute $PM_{2.5}$ measurements were recorded at fixed locations.

Mobile AirBeam2 monitoring, recorded while walking, was organized by NYC-EJA member organizations and carried out by paid community members, including Summer Youth Employment Program participants. $PM_{2.5}$ concentrations were measured along predetermined routes of 45 minutes to 1 hour that traversed multiple land uses—e.g. parks, waterfront, industrial districts, residential blocks—and started and ended at NYC-EJA member offices. Air quality measurements were collected over the course of 264 separate sampling sessions.

El Puente CAMP-EJ workshop and monitoring sessions 2019. Source: Jalisa Gimore.

HOW WE MEASURED AIR QUALITY (CONT'D)

Fixed location AirBeam2s were set up outdoors at NYC-EJA member organization's offices and paid community members' apartments. The deployment and runtime of fixed location AirBeam2s at offices and apartments was limited due to siting requirements, including a secure outdoor location and access to a power outlet and WiFi Internet. Building on their experience running the New York City Community Air Survey, BCCHE successfully deployed dozens of fixed location AirBeam2s—powered by swappable lead-acid battery packs and transmitting data over the 2G cellular network—on light poles in the South Bronx and Williamsburg's Southside. The locations of these fixed AirBeam2s was selected by BCCHE according to their study design and in consultation with El Puente and Youth Ministries for Peace and Justice.

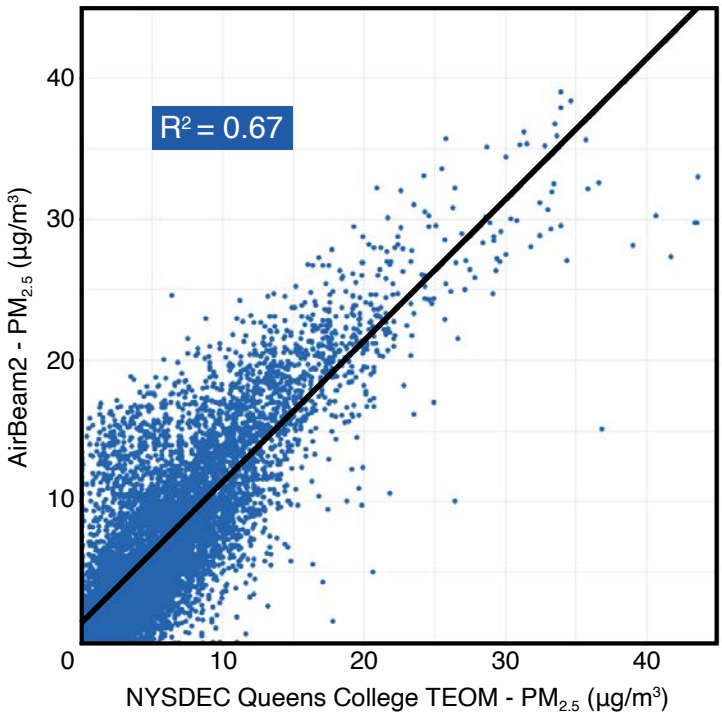


Figure 2: Regression analysis of the AirBeam2 and DEC's $PM_{2.5}$ reference monitor.

The AirBeam2's $PM_{2.5}$ measurements are "quite accurate" according to a performance evaluation conducted by South Coast Air Quality Management District, which compared the performance of the AirBeam2 to reference monitors.[15] To further evaluate the performance of the AirBeam2, we compared hourly $PM_{2.5}$ measurements from fixed location AirBeam2s with measurements from nearby government-run air quality monitors operated by the New York State Department of Environmental Conservation (DEC). AirBeam2 $PM_{2.5}$ measurements, though generally higher, tracked the state-run monitors closely, effectively capturing long-term temporal trends and patterns. For the duration of CAMP-EJ, two AirBeam2 monitors were co-located with reference instruments at DEC's Queens College air quality station. A regression analysis of the resulting data (Figure 2) shows good agreement between the AirBeam2 and DEC's $PM_{2.5}$ reference monitor.

FINDINGS

CAMP-EJ measured air quality in several different neighborhoods, but our data analysis was restricted to three: Hunts Point and Soundview in the Bronx and the Southside of Williamsburg in Brooklyn. In these neighborhoods, a sufficient number of measurements were recorded over the 2-year study period that our findings are representative of prevailing patterns of $PM_{2.5}$ concentration and distribution.

1. LOCAL FACILITIES & EXPRESSWAYS ARE BIG POLLUTERS

The following maps (Figures 3 & 4) depict the results of CAMP-EJ's mobile monitoring efforts in the South Bronx and Southside Williamsburg.** The maps also identify some of the sources that likely contributed to higher mobile $PM_{2.5}$ measurements along with the fixed location AirBeam2s in each area that consistently recorded the highest $PM_{2.5}$ measurements.

Mobile and fixed location AirBeam2 sampling identified several air pollution hotspots. In the South Bronx, mobile monitoring revealed consistently higher measurements proximate to the Hunts Point Food Distribution Center —the second largest food distribution center in the world, generating an astounding 15,000 truck trips daily[16]—and the Hunts Point Water Pollution Control Plant—the largest point source emissions facility in the neighborhood,[17] responsible for releasing noxious odors that have been a nuisance in the neighborhood for decades.[18] Fixed location monitoring in the South Bronx identified the area between the Cross Bronx, the Bruckner, and the Sheridan Expressways—locally referred to as the "Toxic Triangle"—as another $PM_{2.5}$ pollution hotspot.

In Brooklyn, identification of $PM_{2.5}$ hotspots using mobile monitoring was less clear, but lower concentrations are observed along the de-industrialized waterfront and the highest concentrations along the BQE. Fixed location monitoring in Williamsburg identified a hotspot at El Puente headquarters, which sits at the intersection of the BQE and the Williamsburg bridge, about 100 meters from the MTA Williams Plaza Bus depot.

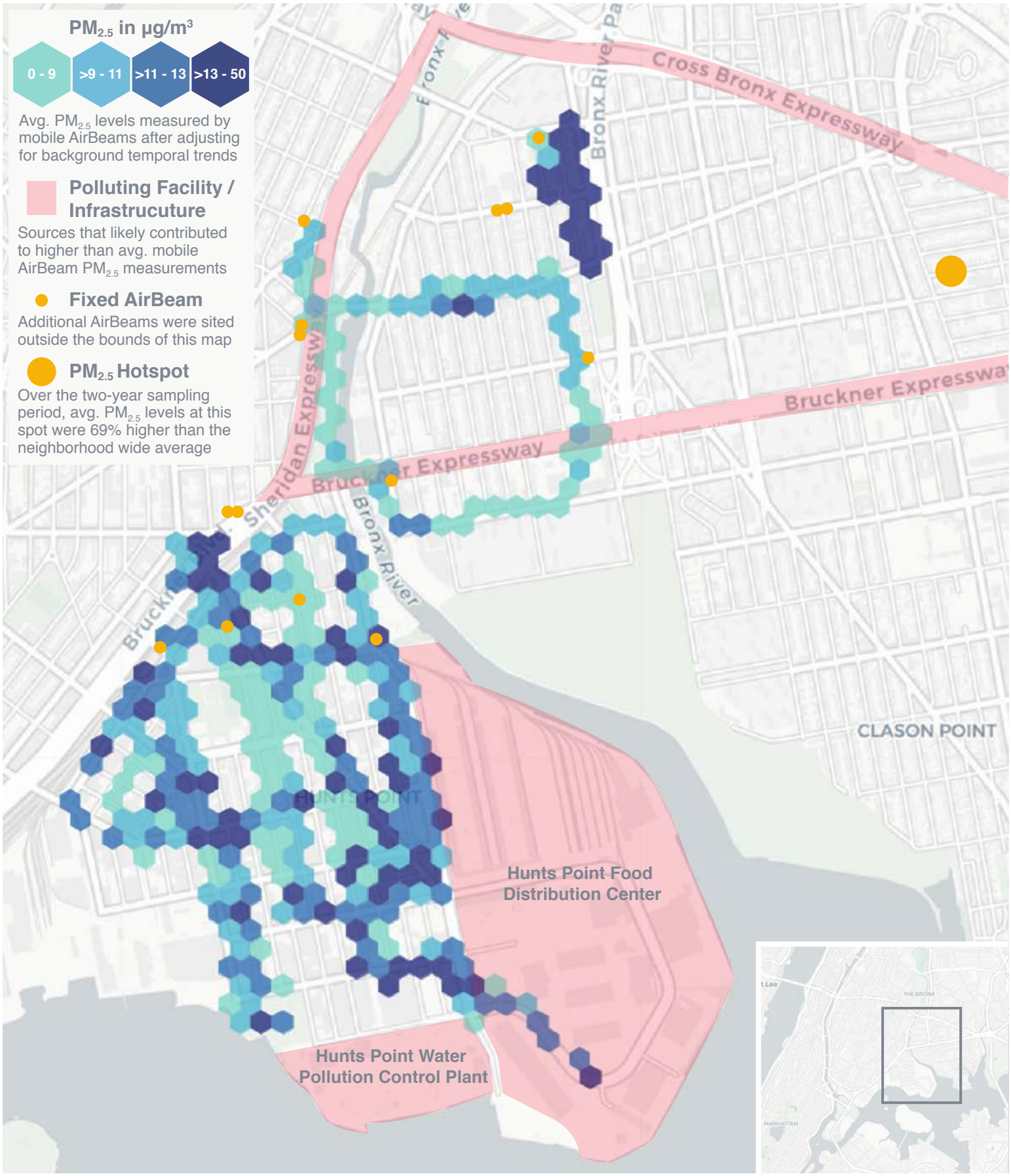


Figure 3: South Bronx CAMP-EJ Mobile Monitoring Map.

Figure 4: Williamsburg, Brooklyn CAMP-EJ Mobile Monitoring Map.

2. TRAFFIC CONGESTION FOULS THE AIR EVERY DAY, TWICE A DAY

The following plots (Figures 5 & 6) depict the results of CAMP-EJs fixed monitoring efforts in the South Bronx and Southside Williamsburg.*** As expected, visible within-day, diurnal temporal trends are observed from the collected data, with the highest levels being observed around 7-8 am during the morning rush hour, highlighting that air pollution levels, and associated health effects, are prominently impacted by the vehicular traffic congestion. The lowest levels are observed around 3-4 pm in the afternoon, while around 8-9 pm the air pollution levels rise again due to nighttime vehicular traffic congestion, although not as much when compared to morning rush-hour traffic. It should be noted that the boundary layer, the layer of the atmosphere closest to the earth, also plays a role in exacerbating pollution from traffic congestion. In the early morning and late evening, the boundary layer is tight against the Earth, which concentrates air pollution in the breathing zone. During the day, as the sun warms the atmosphere, the boundary layer expands upwards reducing pollutant concentrations as they are diluted within a greater volume of air.

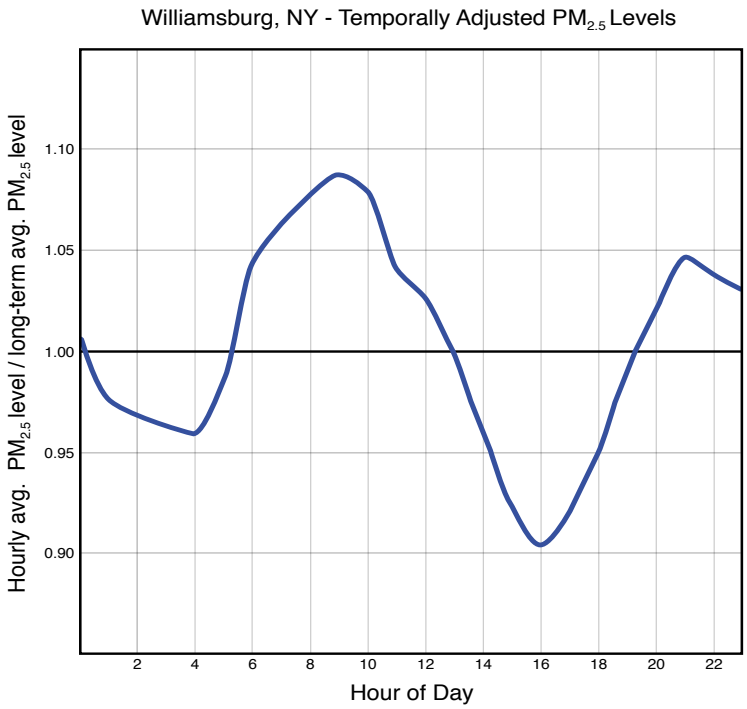


Figure 5: Willimsburg, Brooklyn CAMP-EJ Fixed Monitoring $PM_{2.5}$ Pollution levels.

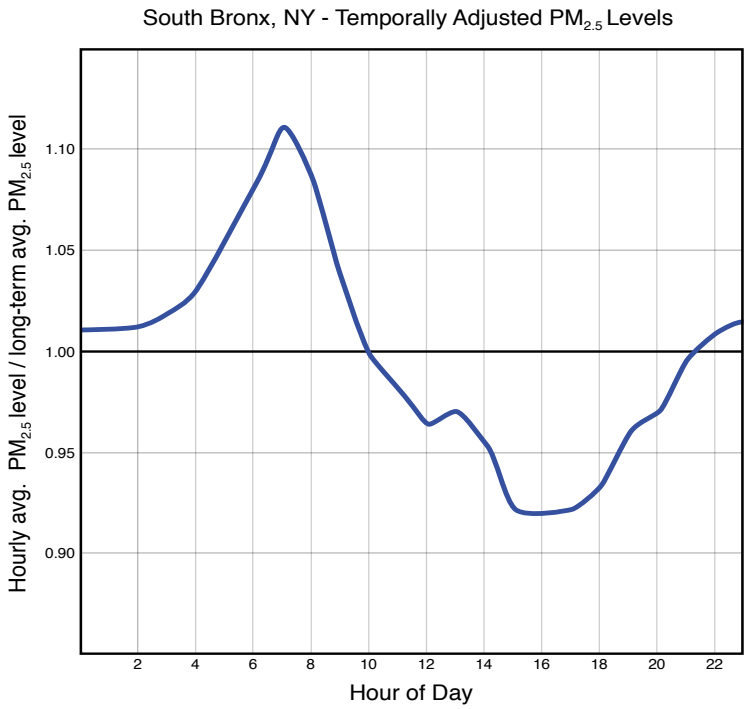


Figure 6: South Bronx CAMP-EJ Fixed Monitoring $PM_{2.5}$ Pollution levels.

3. HYPERLOCAL $PM_{2.5}$ CONCENTRATIONS 20X HIGHER THAN STATE-RUN MONITORS

$PM_{2.5}$ concentrations can fluctuate significantly from minute-to-minute and block-by-block. This variability is not accurately represented by the government-run air quality monitoring network because it is both spatially sparse (there are only 13 $PM_{2.5}$ monitors covering New York City's 302 square miles), and temporally sparse (reporting measurements at intervals of 1 hour or longer). Mobile $PM_{2.5}$ measurements revealed that 1-minute AirBeam2 measurements could be more than twenty times higher than the values reported by the nearest government-run monitoring station, while stationary $PM_{2.5}$ measurements revealed that 1-hour measurements from AirBeam2s located just blocks from one another could vary by a factor of three.

This is an important public health finding, as acute, short-term exposures to high concentrations of $PM_{2.5}$ are associated with adverse cardiorespiratory health effects, like heart attacks, in vulnerable populations.[19] In addition, prior research has demonstrated the negative health effects of breathing $PM_{2.5}$ at levels well below regulatory thresholds, as well as a growing body of evidence that indicates there is no safe level of exposure to $PM_{2.5}$, especially for the most hazardous components, like diesel exhaust.[20,21] Exposure to $PM_{2.5}$ pollution is both hazardous and highly variable; hyperlocal air pollution data is required to properly characterize exposures in the most vulnerable communities.

RECOMMENDATIONS

NYC has made steady progress towards improving air quality citywide; however, not enough has been done to address air quality disparities among communities. Even modest reductions in $PM_{2.5}$ pollution in New York City can lead to substantial improvements in health; a 10% reduction from 2010 $PM_{2.5}$ levels could prevent hundreds of premature deaths and thousands of emergency department visits annually.[22]

Furthermore, NYC can achieve big improvements in air quality and public health, especially in areas overburdened with polluting sources, if the City of New York's 80x50 Roadmap (the de Blasio administration's plan to reduce greenhouse gas emissions 80% by 2050) is fully implemented. The clean air policies advanced by the 80x50 plan include building-specific performance targets to reduce fossil fuel use in buildings larger than 25,000 square feet, shifts in commuter trips to public and active transportation, implementation of congestion pricing, improved freight efficiency, increased zero and low emission vehicle adoption, and transition to a low-carbon intensity energy grid. If all these measures were implemented successfully, it's predicted that approximately 25,000 asthma related emergency department visits in "very high poverty" neighborhoods could be avoided annually.[23]

New York City and New York State should implement targeted air pollution abatement strategies beginning in environmental justice communities, where air quality is worst and interventions are predicted to have the greatest public health impact. CAMP-EJ's data collection efforts have yielded several findings that can inform advocacy for policies, programs, and practices to reduce $PM_{2.5}$ pollution in environmental justice communities and improve air quality monitoring regimes.

Environmental justice youth leading from the South Bronx and North Brooklyn at the Peoples Climate March in 2014. Source: WelcomeTotheBronx and El Puente

1. HIGH POLLUTION HOT SPOTS IN COMMUNITIES NEED TARGETED INVESTMENTS AND INTERVENTIONS TO MITIGATE AIR POLLUTION

The Toxic Triangle and the areas near the Hunts Point Food Distribution Center and Water Pollution Control Plant in the South Bronx, and the intersection of the BQE, the Williamsburg Bridge and the Williams Plaza Bus Depot in Williamsburg are air pollution hotspots. These hotspots are characterized by highways, industry, intense trucking activity, and a lack of green space. Cleaner transportation technologies, green infrastructure and other nature-based solutions need to be prioritized in these areas to help mitigate the harmful effects of this pollution on the community. The following are opportunities to do so in Hunts Point and Williamsburg:

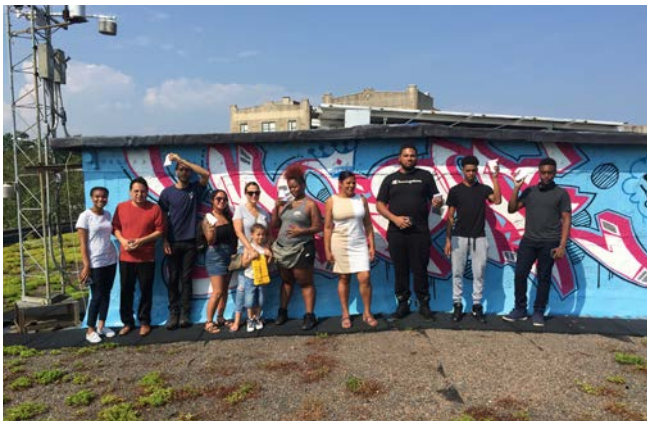
The Hunts Point Water Pollution Control Plant is slated for improvements that were originally set to begin in Spring 2020 and be completed in Fall 2024. Planned improvements include more compact buildings, more efficient sludge production, increased vegetation, and new anaerobic digesters, among others.[24]

We recommend that the facility create a transparent plan to connect biogas generated through anaerobic digestion into the grid to fuel local buildings, as opposed to flaring or otherwise releasing methane biogas into the atmosphere. Such a plan should power the facility as well, supporting closed-loop biogas use on site. The Hunts Point plant can decrease its negative impact on surrounding neighborhoods by ensuring that nuisances such as noxious odors and pests are controlled, and by putting forth a green transportation plan, such that vehicle use is minimal, and only zero- and low-emissions vehicles using renewable fuels can access the plant, while following other high standards of air quality control (no idling, efficient truck routes, alternative modes of transportation, etc.). Facility planning should continue to operate in consultation with local community members, and the redesign should include goals of reducing pollutant emissions and increasing public access to open, green space.

As a result of the Hunts Point Resiliency Feasibility Study, the City will advance the Hunts Point Energy Resiliency project, which calls for resilient energy generation and storage solutions to protect the flood vulnerable Hunts Point Food Distribution Center. The project also calls for electrifying a portion of the idling, diesel-powered refrigerated trucks at 100 Food Center Drive.[25] Given the elevated levels of $PM_{2.5}$, the City should prioritize electrifying all idling, diesel-powered refrigerated trucks to reduce air pollution at the Food Distribution Center, and establish a larger truck stop electrification program, similar to the Hunts Point Truck Stop Electrification Program pilot.[26] THE POINT CDC's Community Solar project could potentially support by providing local, resilient, and clean energy to yield further air quality benefits.

YMPJ Earth Day Event at Concrete Plant Park. Source: Jalisa Gilmore & Tok Oyewole

Another example of how air quality can be improved through targeted investment includes the proposed redesign for Continental Army Plaza, located at the base of the Williamsburg Bridge adjacent to El Puente's office. El Puente is advocating for more green infrastructure in the redesign of Continental Army Plaza, which has been put on hold due to the COVID-19 pandemic. The addition of green infrastructure would improve air quality, reduce surface temperatures, mitigate flooding, and improve the overall experience of the plaza for this environmental justice community.



South Bronx CAMP-EJ Workshop in 2018 Source: Priya Mulgaonkar

2. ADOPT CITY AND STATE POLICIES TO REDUCE POLLUTION FROM THE TRANSPORTATION SECTOR IN ENVIRONMENTAL JUSTICE COMMUNITIES

Our air quality data lends additional evidence to the fact that vehicular traffic congestion substantially contributes to poor air quality in environmental justice communities. We recommend policies that will mitigate pollution from transportation sources such as the implementation of Congestion Pricing to raise revenue for mass transit investments, accelerating the transition to electric public buses, incentivizing medium and heavy duty vehicle fleets to transition to electric vehicles (with specific priority on those that operate in environmental justice communities), investing in electric vehicle charging infrastructure and redesigning roadways to support electric bus-only routes and cycling infrastructure.

In addition, we must ensure the energy used to power electric vehicles comes from clean, renewable energy sources. Moreover, we must aim to reduce our reliance on private vehicles by encouraging multi-modality transit and increasing access to micro-mobility options.

In addition to citywide policies, EJ communities should be prioritized for electric vehicle use. For example, the MTA should prioritize the use of electric buses on MTA routes that stop at the Williams Plaza Bus depot in North Brooklyn. As a community lacking in quality green space and overburdened by traffic from the BQE and nearby bus depots, all-electric buses will help mitigate $PM_{2.5}$ pollution in the area.

As part of Freight NYC, a new marine terminal at the Hunts Point Food Distribution Center has the potential to reduce truck traffic and improve air quality.[27] However, any development of a marine terminal needs to include a traffic impact study to understand the potential impact of localized air pollution from trucks and marine vehicles where the freight transfers take place. Additionally, vehicles transporting goods to and from the marine terminal should use clean mobility options for last mile transport such as e-bikes and scooters.

EJ IN ACTION: OUR AIR! / ¡NUESTRO AIRE!

One ongoing initiative in NYC that could benefit from City and State support is Our Air! / ¡Nuestro aire!. Led by El Puente, Our Air! / ¡Nuestro aire! is a grassroots campaign with a 5-Point Action Platform that engages youth organizers, community members, elected leaders, academic partners, local organizations, artists, and schools to address the environmental crisis of toxic air quality in the South Williamsburg community. The platform target improvements in clean air and community wellness, including policies and practices to mitigate truck traffic, improve access to quality green and open space, and holistically improve the economic and environmental health of the community.[28]

FIVE POINT PLATFORM

1. The Right to Breathe Clean Air
2. A Public Health Emergency Taskforce
3. Health as a Human Right
4. Cultural Organizing, Awareness Raising & Education
5. Greening for a Safe Future

At the same time, the City and State should be wary of false solutions, including the Transportation Climate Initiative (TCI), an umbrella policy development process for multi-state engagement to establish a regional cap-and-trade system that would "regulate" transportation emissions in Northeast and Mid-Atlantic states. NYC-EJA, the Climate Justice Alliance-Northeast, and other climate justice advocates oppose TCI due to concerns that it would undermine the economy-wide emissions reduction mandate set by the NYS Climate Leadership and Community Protection Act. TCI's attempt to regulate mobile source emissions using a framework previously designed for stationary source emissions would not directly address the localized emissions from on-road vehicles in environmental justice communities. The policy lacks the comprehensive lens necessary to solve the causality of air pollution. Therefore, even if overall transportation emissions went down, the disproportionate impacts in environmental communities would persist.[29]

3. PRIORITIZE FINANCIAL AND TECHNICAL SUPPORT FOR HYPERLOCAL AIR MONITORING NETWORKS MANAGED BY ENVIRONMENTAL JUSTICE COMMUNITIES

CAMP-EJ's air quality data demonstrates how air quality can vary significantly over space and time. We cannot improve air quality if we do not have an accurate picture of where pollution is coming from and which communities are most impacted by poor air quality. Grassroots community air quality monitoring campaigns, such as CAMP-EJ, are essential as they not only collect the hyper-local information needed to craft data informed policy, they also raise community awareness of environmental harms and empower communities to take action to reduce pollution exposures. It is equally important that New York City and State prioritize financial and technical support to local community-based organizations to improve air quality and health in environmental justice communities. One progressive example, which should serve as a model for the City and State's efforts, is California's Community Air Protection Program, which provides resources for community air monitoring in environmental justice communities while simultaneously advancing community developed air emissions reduction programs and increasing the accessibility of air quality data.

NYC-EJA and our allies in NY Renews successfully achieved a commitment to expand air quality testing in EJ communities through the NYS Climate Leadership and Community Protection Act. This commitment must lend direct support to grassroots organizations leading local air quality monitoring campaigns.

CONCLUSION

The COVID-19 pandemic has thrown into stark relief the compounding effects of environmental racism on low-income Black and Brown communities. We have observed disproportionately high rates of illness and death in low income Black and Brown communities with long legacies of toxins in the air, including within New York City, with neighborhoods near polluting infrastructure in the Bronx, Brooklyn, and Queens hit particularly hard.

With new research indicating fossil fuel particle pollution is responsible for nearly twice as many deaths as previously believed and with concern growing that hobbled public transit systems will lead to a resurgence in commuter-related traffic congestion, understanding how federal, state, and city policies are impacting hyperlocal air quality has never been more urgent.[30,31]

The ability to locally and flexibly collect this data therefore holds increasing relevance, and is likely to continue to be the case as illnesses exacerbated by a changing climate continue to spread and intersect with disparities in air quality.[32] Sharing best practices in community air quality monitoring is essential to design studies that provide quality data to inform policy and improve health outcomes in frontline communities.

CAMP-EJ has demonstrated the power of community-led participatory research in the struggle for environmental justice. Hyperlocal community air quality monitoring plays a vital role in filling the gaps between city, state, and federal monitoring systems. Community science will continue to be an important component in our understanding and prevention of the adverse health outcomes arising from exposure to poor air quality.

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APPENDIX

*Appendix A. Site Selection and Monitoring: While our study was focused on environmental justice communities where our members live and work, future studies specifically designed to make comparisons (e.g. near a transfer station versus not; near a park versus not; Manhattan versus Brooklyn) would be helpful in elucidating trends relevant to policy making. For comparisons at discrete locations or times, background atmospheric and neighborhood information—such as wind direction, wind speed, and traffic conditions—may also help to directly compare air quality between locations of interest. Additionally, the time periods for mobile and stationary sampling did not always overlap and addressing this in the future would improve the ability to make comparisons.

**Appendix B. Temporal Adjustments: Temporal adjustment is needed for mobile monitoring to disentangle the spatial and temporal influences on air pollution concentration levels. Without temporal adjustment, it is difficult to determine whether the measurements are high or low due to location or time. To account for background temporal trends, we first transformed the one-second AirBeam2 $PM_{2.5}$ measurements into one-minute averages. Then, using data from all the state-run $PM_{2.5}$ monitors located in New York City, we calculated a temporal adjustment factor, defined as the ratio of the average $PM_{2.5}$ concentration level during the entire sampling period to the corresponding $PM_{2.5}$ concentration for the hour in which the one-minute AirBeam2 measurement was taken. Finally, we multiplied the one-minute AirBeam2 $PM_{2.5}$ measurements by the temporal adjustment factor to generate the $PM_{2.5}$ values displayed on the maps in this report.

***Appendix D. Temporal Adjustments Standardized Plots: Again, we temporally adjusted the data, this time to highlight how $PM_{2.5}$ concentrations vary throughout the day. In the standardized plots, hourly mean concentrations from all fixed location AirBeam2s in the neighborhood are divided by the average value during the entire sampling period. For example, a ratio value of 1.2 means the concentration at that hour is 1.2 times higher than the normal, long-term value for all AirBeam2s in the neighborhood.


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