NEW JERSEY CLEAN AIR COUNCIL
April 5, 2017 Public Hearing
What Can Be Learned from Low Cost Air Quality Monitors?
Best Uses and the Current State of Technology.
Trenton, NJ 08625

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Summary

Chairman Opiekun and members of the committee, thank you for allowing me the opportunity to give an overview of the New York City Community Air Survey (NYCCAS) and the planned Commoner Center/DOHMH citizen science project.

My name is Holger Eisl and I am a Research Associate Professor at the Barry Commoner Center for Health and the Environment (Commoner Center). The Commoner Center (http://commonercenter.org/index.html) is an environmental and occupational health research institute at Queens College, City University of New York. The mission of the Center is to identify and help rectify environmental and occupational threats to human health. Areas of current research include urban air pollution, immigrant occupational health, lung cancer screening and World Trade Center health effects. The Commoner Center was established in 1966 at Washington University in St. Louis by Barry Commoner, the eminent ecologist and one of the founders of the modern environmental movement. I have worked at the Center for 30 years, addressing and responding to environmental and resource problems and their policy implications.

New York City Community Air Survey (NYCCAS)

In 2007, the Commoner Center and the New York City Department of Health and Mental Hygiene (DOHMH) developed the methodology and ambient monitoring technology for a collaborative air quality study to monitor and model neighborhood-level air quality across New York City. This project has become known as the New York City Community Air Survey

(NYCCAS). I am the Principal Investigator at the Commoner Center and oversee all activities related to the design, collection, and analysis of ambient air monitoring sampling for the NYCCAS project. A 29 slide PowerPoint presentation, entitled: "New York City Community Air Survey (NYCCAS): The largest urban air monitoring program in the U.S." will be presented during the New Jersey Clean Air Council—Public Hearing on April 5, 2017. This document summarizes the main features of the program and, in reference to the topic of this public hearing, discusses our plan to add a citizen science program to the NYCCAS program.

The creation of the NYCCAS program relates to one of the signature accomplishments of former New York City Mayor Michael Bloomberg—the development and implementation of New York City's first sustainability plan: PlaNYC 2030. The city administration saw projections of New York's population growth and realized that environmental goals, such as improvements in air quality, needed to be integrated into the city's economic development goals. While air quality in NYC has been improving over the past several decades, air pollution remains a major cause of illness and death, particularly among vulnerable populations. The initiative to develop the NYCCAS program came out of the recognition that routine air monitoring, performed by New York State Department of Environmental Conservation (DEC), provides data to assess urban scale temporal variation in pollution concentrations in relation to regulatory standards, but is not well suited to characterizing intra-urban spatial variation in pollutant concentrations from local sources. In 2007, the Commoner Center in partnership with DOHMH launched NYCCAS, a high-density street-level monitoring network designed to assess spatial variation in longer term exposures (seasonal and annual average) at the neighborhood-level. The key objectives of the program are:

- Assess year-round variation in multiple air pollutants across NYC neighborhoods;
- Identify local emission sources contributing to intra-urban pollution patterns;
- Inform the public and city officials on air pollutant levels and efforts to improve air quality;
- Provide high quality air pollution exposure estimates for health surveillance and research.

The NYCCAS program targets pollutants that are of considerable public health concern, which include fine particles ($PM_{2.5}$), black carbon (BC), oxides of nitrogen (NO_X), sulfur dioxide (SO_2) and ozone (O_3). The Commoner Center developed less expensive filter-based monitoring technology than those that meet federal requirements for NAAQS-attainment determination (Federal Reference Methods), to meet the unique needs of the NYCCAS program. The instruments have undergone extensive quality assurance and testing and have been demonstrated to provide accurate and reproducible results. The street-level (sampling height of 10-12 feet above ground) monitoring data from currently 75 (initially 150) city-wide sampling sites are analyzed using a "land-use regression" model, a proven method to characterize air pollution exposure and health effects for individuals residing within urban areas.

The NYCCAS program is the largest urban air monitoring program in the nation and has become a valuable and cost-effective source of information for city officials and the public to understand the current status and historic trends of the variation in pollution exposure within NYC. On November 4, 2015, the NYCCAS program was signed into law (Local Law 103) and has become part of the NYC Charter. Information on the design of the NYCCAS program and results have been published in scientific journals. All scientific publications, annual NYCCAS reports and periodic online data updates are accessible on DOHMH's website at https://www1.nyc.gov/site/doh/data/data-publications/air-quality-nyc-community-air-survey.page. Neighborhood level data and detailed neighborhood air quality reports are available on DOHMH's "Environment & Health Data Portal at http://a816-dohbesp.nyc.gov/IndicatorPublic/.

Planned Commoner Center / DOHMH Citizen Science Project

In the context of NYC's evolving sustainability policy, PlaNYC was instrumental for the launch of the NYCCAS program in 2007. The new sustainability plan for NYC (One New York: The Plan for a Strong and Just City), launched in 2014, considers community engagement an important factor in identifying air quality strategies towards the goal of improving citywide air quality. The Commoner Center supports this effort by the City and recognizes that the new portable low-cost sensors offer an enormous opportunity to measure air quality with enhanced spatial and temporal resolution and to involve community residents in generating and

understanding these new data. We will explore this challenge by developing the "NYCCAS Citizen Science Program," in consultation with DOHMH, over a two-year pilot period. The goal of this project is to work with citizens and communities to use sensors in combination with existing data to understand the air quality in their neighborhoods and to empower them with data to support air quality improvement actions. This project will also provide the opportunity to explore whether high exposures on a fine geographic scale are adequately captured using current assessment techniques. The NYCCAS monitoring network combined with land-use regression modeling generates smooth surfaces of exposure for NYC. While these exposure surfaces do an excellent job of characterizing sub-neighborhood trends in air pollution, there is uncertainty about whether these surfaces, based on 75-150 monitors spread across an area of 790 square kilometers, adequately capture the fine-scaled variation that occurs, for example, in a traffic congestion zone. The project activities will involve:

- Consultation with academic, government, industry and community groups on best practices and strategies for increased community engagement around air quality monitoring.
- Review of existing low cost air quality sensors for $PM_{2.5}$, NO_2, BC and total VOC (air toxics) for suitability in citizen operation and community/academia/government partnership research projects.
- Design and implementation of two pilot studies (e.g. high traffic zone, marine transfer station) to assess neighborhood air quality levels with a community partner (e.g. We ACT).
- Creating citizen science toolkits.
- Working with community partners to integrate community monitoring with existing networks (e.g. NYCCAS, DEC).
- Development of data portals for communities to view citizen science data (including database development, data analysis tools and data visualization).
- Development of outreach materials.

Our goal is to help to ensure that all communities benefit from actions that can be taken to reduce the threat to human health caused by air pollution.

Thank you for the opportunity to testify.