

ELPC Air Quality Monitoring Report

South Chicago • 2019



**ENVIRONMENTAL LAW
& POLICY CENTER**



MAPSCORPS



CLARETIAN ASSOCIATES
Building Community in South Chicago

Introduction

Air pollution is a serious threat to the residents of Chicago, but pollution levels can vary by neighborhood and even block to block. To understand airborne particulate matter pollution at the local level, the Environmental Law & Policy Center (ELPC) and community partners are conducting an air quality monitoring program to better understand neighborhood particulate matter concentrations.

The data in this report was collected in the Austin community on the city's West Side from 2018-2019. Based on this data, we also provide policy recommendations from ELPC and our community partners to improve air quality and protect Chicagoans from dangerous air pollution.

1. What is Particulate Matter and Where Does it Come From?

Particulate matter (PM) is a highly toxic air contaminant composed of a mixture of fine carbon soot particles and gases that cause negative impacts on human health and the environment.

Diesel exhaust is a major source of PM pollution in Chicago. It comes from heavy duty vehicles such as trucks and buses, and equipment such as construction machinery. Diesel combustion pollutes the air with harmful particulates in and around highways, rail yards, ports, intermodal facilities, and construction sites. Other sources of PM include cars, wood burning stoves, industry, agricultural burns, and forest fires.

As a transportation and economic hub for the nation, Chicago has a lot of diesel vehicles and heavy equipment activity. Residents who live and work near areas with high concentrations of particulate pollution are at risk of adverse health effects.

2. Particulate Matter and Health

Fine particulate matter (PM_{2.5}) can affect multiple systems in the human body. These microscopic particles are able to penetrate the natural defenses of the human body, become lodged in the lungs, and enter the bloodstream. Long-term PM_{2.5} exposure exacerbates asthma, chronic obstructive pulmonary disease (COPD), and other serious respiratory illnesses. It also has negative impacts on neurological systems, including impaired cognitive function, neurodevelopmental issues, and the potential for lifelong mental health problems.

The people most vulnerable to PM_{2.5} include children, older adults, and those with respiratory illnesses. Children are at particularly high risk due to their underdeveloped lung function and capacity. Elderly folks are at high risk for aggravation of chronic respiratory and cardiovascular illnesses. Even short-term PM_{2.5} exposure poses a wide variety of health risks, including coughs, headaches, lightheadedness, nausea, aggravated allergies, increased risk of heart attack, and other cardiovascular trauma.

Asthma is the most common chronic condition among children, affecting one in ten nationwide. African American and Latinx children are more likely to be hospitalized or die from asthma related causes than Caucasian children. Children's asthma rates are very high in Chicago, about 45% higher than the Illinois average, and the burden falls even harder on communities of color. In 2015, the rate of emergency room visits among African American children was 75% greater than the citywide rate that year. COPD and other respiratory illnesses and heart problems are also rampant in Chicago.

PM_{2.5} and its associated toxins are also detrimental to the environment, as they contribute to local smog formation and contain greenhouse gases that significantly accelerate climate change. The United States Environmental Protection Agency (USEPA) groups and classifies PM_{2.5} concentration levels by air quality ranges and levels of health concern, as shown in *Figure 1*.

3. ELPC Examines PM2.5 in Chicago's Neighborhoods

ELPC measures short-term PM2.5 using the AirBeam, a low-cost, open-source, handheld monitor manufactured by HabitatMap, a Brooklyn-based environmental health justice non-profit. Despite its low cost, the AirBeam's measurements correlate well with the USEPA federal regulatory monitors (FRM). The AirBeam samples air at 1 second intervals and uses LED light-scattering technology to measure PM2.5 concentrations.

Since 2017, we have been using AirBeam monitors to teach residents to track air pollution, gain a better understanding of their exposure to PM2.5, and make better-informed decisions to protect their health. Our program documents neighborhood air conditions by systematically collecting data in Chicago, primarily focusing on the South and West Sides. With the help of amazing local partners we have been able to collect over nearly 12 million PM2.5 data points that are analyzed and displayed on a community developed dashboard, AirQualityChicago.org

PM2.5	Air Quality Index	PM2.5 Health Effects	Precautionary Actions
0 to 12.0 $\mu\text{g}/\text{m}^3$	Good 0-50	Little to no risk.	None.
12.1 to 35 $\mu\text{g}/\text{m}^3$	Moderate 51 to 100	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
35.1 to 55 $\mu\text{g}/\text{m}^3$	Unhealthy for Sensitive Groups 51 to 100	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.
55.1+ $\mu\text{g}/\text{m}^3$	Unhealthy 151+	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion; everyone else should limit prolonged exertion.

Figure 1. U.S. EPA particulate matter concentration level classifications.

Monitoring in South Chicago

ELPC works with two community partners in South Chicago to collect particulate matter data in the summer. MAPSCorps is a Southside-based organization that trains youth to produce high quality data about community assets, and Claretian Associates is a community organization dedicated to providing affordable housing and resources to Southeast Side neighborhoods.

In 2019, fifteen teens participated in the monitoring program. Those teens were divided into three groups; each group was given an AirBeam monitor to collect data while asset mapping and answering research questions about their communities. Groups walked down sidewalks on busy streets on the Southeast Side, including 79th, 80th, 83rd, 87th, 91st, 92nd, 95th, S. Chicago, S. Bennett, S. Jeffery, S. Crandon, S. Yates, S. Commercial, S. Shore, and S. Lake Shore Dr., as shown in Figure 2. In 2019, data was collected in July, typically between 8:00am and 4:00pm.

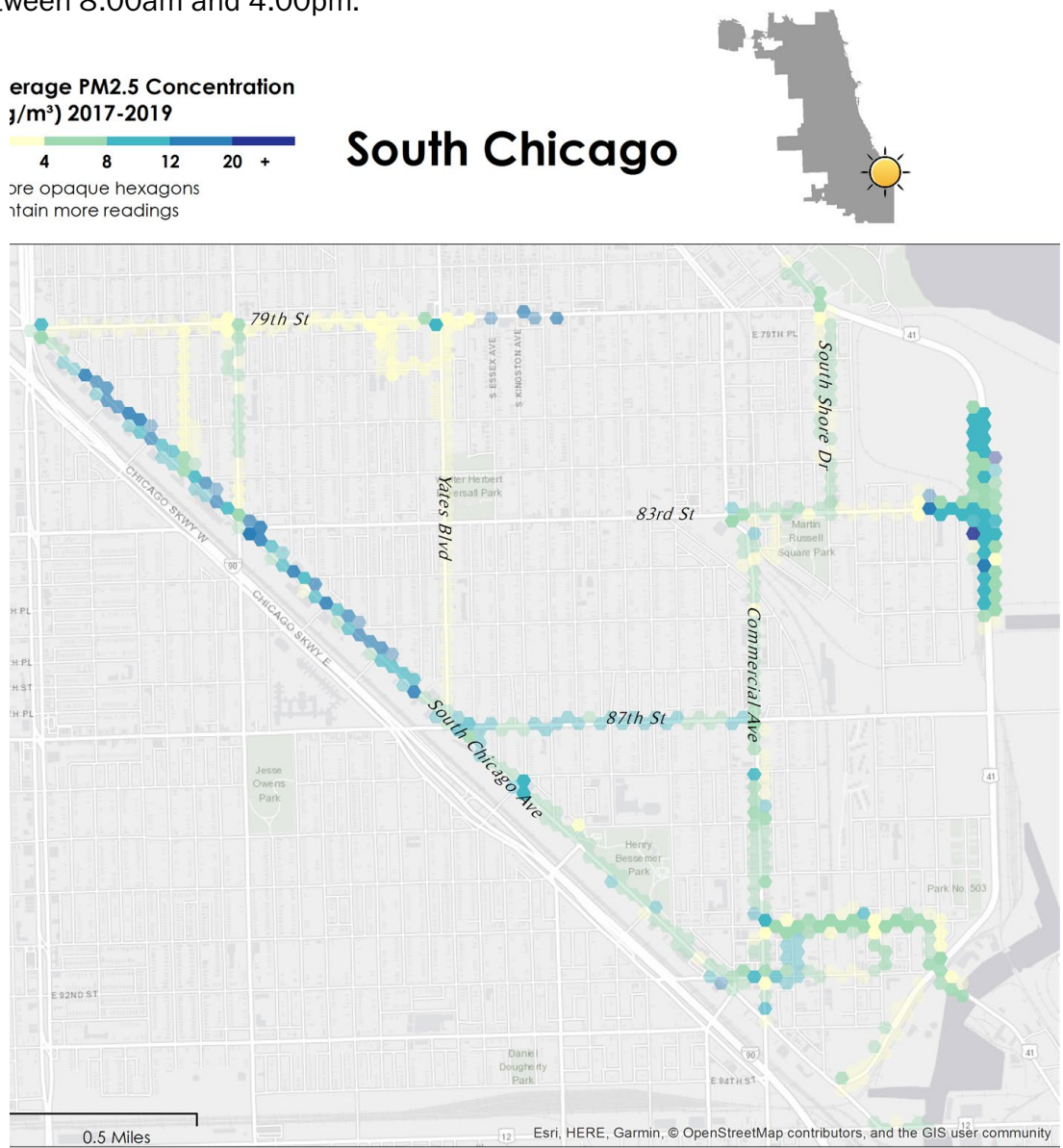


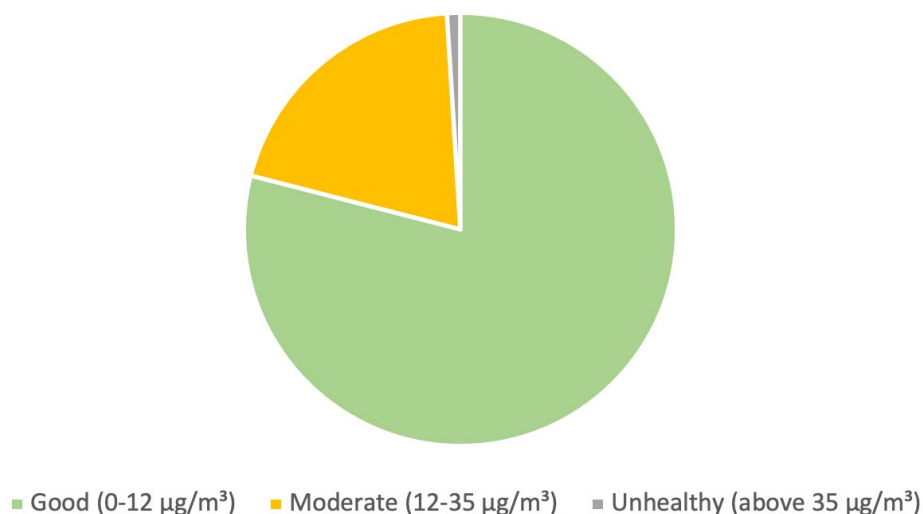
Figure 2. Average PM2.5 Concentration ($\mu\text{g}/\text{m}^3$) in South Chicago 2018-2019

Topline Results

As of Spring 2020, volunteers have collected 92,508 PM_{2.5} data points in South Chicago. Of that data, 92% fell into the “good” air quality range (0-12 µg/m³), 9% was in the “moderate” range (12-35 µg/m³), and none was in the “unhealthy” categories (above 35 µg/m³).

This means that, for the majority of the time volunteers were monitoring, the air was safe and posed little to no health risk. There were few instances where volunteers encountered moderate air quality which could have affected them and local residents if they had a respiratory illness such as asthma.

South Chicago Air Quality Data



The box plots and line graphs below (Figures 3-6) illustrate the PM levels that MAPSCorps and Claretian Associates volunteers documented while monitoring. Box plots show the range of PM encountered during an hour. Outliers (the dots) depict moments when PM levels exceeded the typical range (the box) for that hour. The line graphs illustrate the average PM levels experienced by the hour.

2019 Hourly Breakdown

Volunteers collected data in July 2019, typically between 8:00am and 4:00pm (16:00). The box plot illustrates the range of PM_{2.5} concentrations that volunteers encountered while collecting data. No monitoring data reached the unhealthy categories (above 35 µg/m³). The highest readings of 34ug/m³ were recorded at the corner of 83rd and S. Mackinaw near William K. New Sullivan Elementary School.

Overall hourly exposures throughout the day were low and well within the healthy PM_{2.5} range. PM levels were higher in the morning, began dropping around 11am and remained very low thereafter.

Average PM_{2.5} Concentrations by Hour. South Chicago, 2019

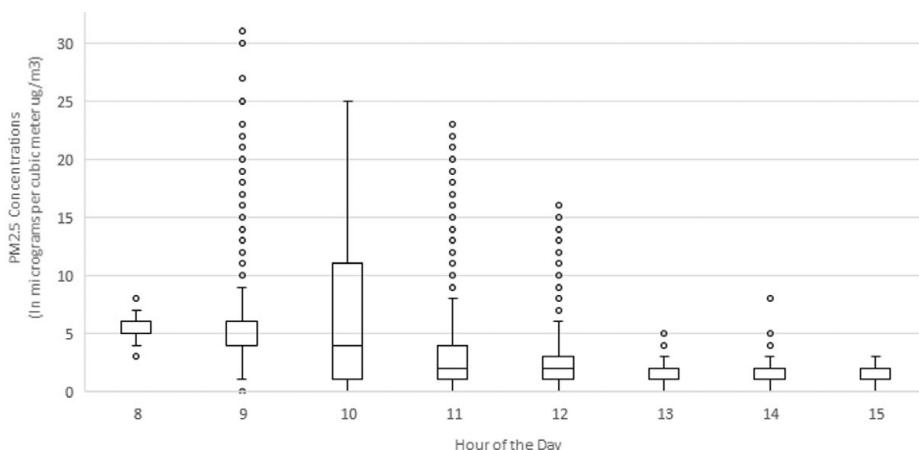


Figure 4. Summary box plots of PM_{2.5} concentrations (µg/m³) by hour of the day.

Average PM2.5 Concentrations by Hour. South Chicago, 2019

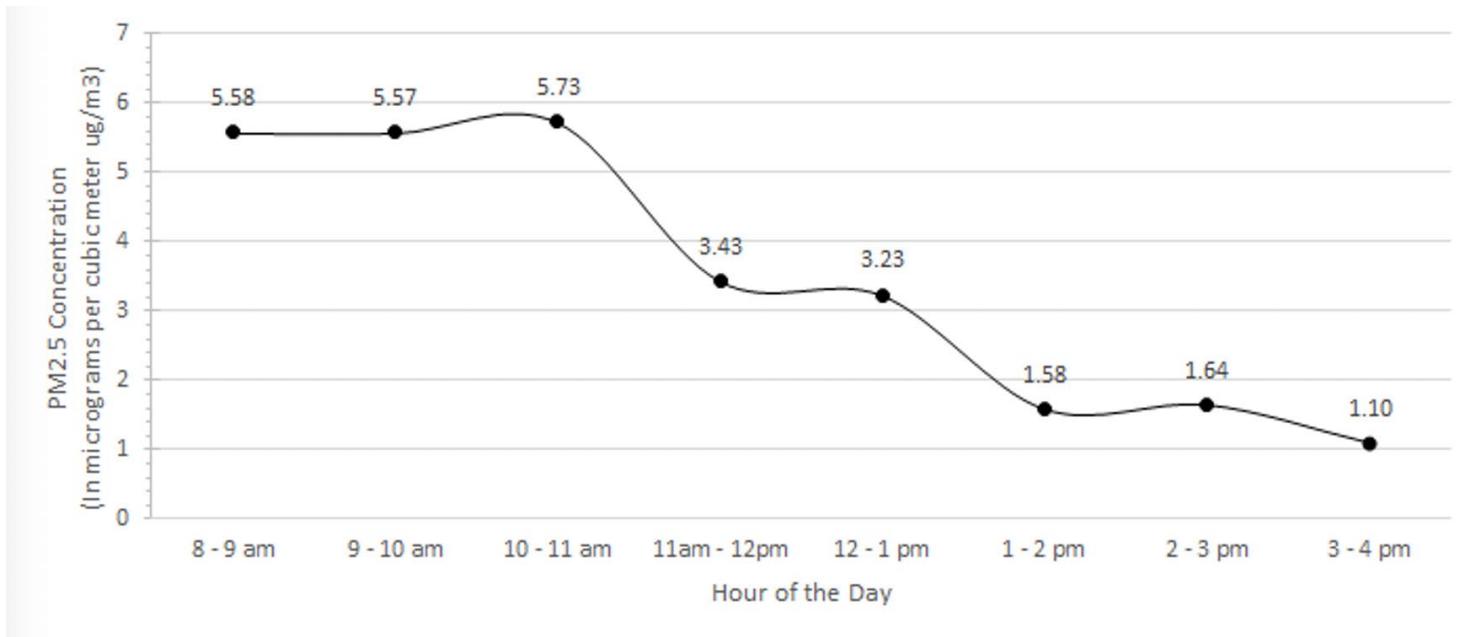


Figure 5. Average PM2.5 concentrations in South Chicago, 2019 by hour of the day.

Data summary

Hourly concentrations of PM2.5 remained very low during the times that volunteers monitored air quality in South Chicago. The Figure 2 map highlights areas with more PM concentrations in dark blue, indicating 79th Street, South Chicago Avenue, and 83rd Street around South Lakeshore Drive as areas where the PM2.5 levels were the highest. In front of William K. New Sullivan High School volunteers captured the highest readings readings of up to 34ug/m³.

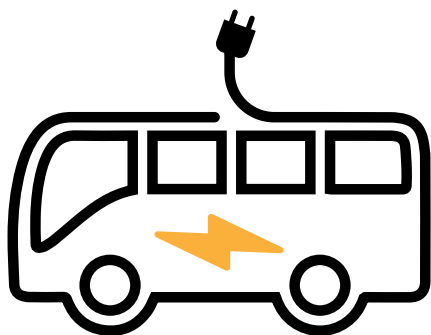
As our monitors take a reading every second, one can imagine it as mimicking the pattern of breathing. This means that in front of the school and in the other the hotspot locations, nearly one in seven breaths were harmful to not only those who were monitoring but to those who learn, work, and live there as well.

Volunteers found a greater prevalence of commercial vehicles in the late morning and early afternoon, an observation that lines up with the elevated PM levels documented during those times. Volunteers also noted that additional PM spikes occurred near industrial facilities and factories, construction sites (especially when cement or asphalt was being laid), weed whacking, CTA buses, garbage and recycling trucks, and when the wind was blowing from Indiana. While monitoring in those areas, volunteers reported that the air caused aggravated asthma symptoms, coughing/wheezing, watery eyes, and the urge to go inside.

Recommendations to Improve Air Quality

Monitoring air quality is just the first step in targeting opportunities for effective air improvement. After conducting focus groups with those who monitored and holding meetings with our community partners, we learned that most community members' concerns are about idling trucks, truck traffic, high asthma rates, and noxious odors near trucking facilities. Based on this feedback and our preliminary data, ELPC suggests the following actions towards improving local air quality.

CTA Electrification



Replacing diesel-powered buses with electric engines reduces not only harmful particulate matter pollution, but also greenhouse gas emissions. The City of Chicago has committed to electrify its fleet of 1800 buses by 2040, but the rollout so far has been slow. ELPC will work with Claretian Associates, MAPSCorps and additional interested community partners such as the South East Environmental Task Force (SETF) to ensure that the Chicago Transit Authority (CTA) carries out the citywide goal swiftly.

In focus groups, both youth and adult community members indicated that they would like to see more electric buses in the area, because most of the CTA buses they experience are old and emit huge plumes of exhaust. Electric buses could be especially beneficial on routes like 79th and South Chicago Ave, where the data shows elevated PM levels. As the 79th street bus is the city's busiest bus line, ELPC strongly encourages CTA to prioritize this route for early electrification.

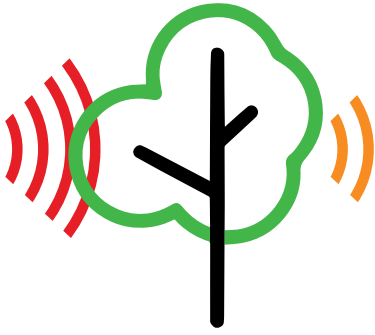
ELPC is now sharing our air quality data with CTA officials, to prioritize air quality and human health impacts in decisions regarding electric bus rollouts. Also, ELPC policy fellow Lucas Stephens [testified](#) at a CTA budget hearing to emphasize the importance of electric buses for clean air across Chicago.

Anti-Idling



Diesel exhaust is a significant contributor to PM pollution. Idling diesel vehicles expose communities to unnecessary PM. Chicago has an anti-idling ordinance that limits idling of diesel vehicles to 3 minutes per hour, however it is rarely enforced.

ELPC will work with Claretian Associates and community partners to push for anti-idling enforcement in their community by 1) Enabling idling violations to be reported to 311, Aldermen, and State Representatives; and 2) Advocating for indoor spaces where drivers can wait to alleviate the need for idling.



Vegetative/Sound Buffer and Tree Planting

Living, working, or going to school near highways and major transportation corridors can be harmful to respiratory, endocrine, and cardiovascular health. Children in schools in these areas are especially at risk due to underdeveloped lungs and prolonged exertion outdoors. Studies show a combination of thick, tall, full coverage vegetation and sound barriers can significantly lower pollution around schools near highways.

ELPC will work with Claretian Associates and community partners to collect data and advocate for effective vegetative barriers around schools and daycare facilities within 500 feet of the highway and near busy trucking corridors where fitting. This could include schools such as St. Francis De Sales High School, South East Area Elementary, Orville T. Bright, Saint Kevin, William T. New Sullivan, and daycare facilities such as Shining Star Child Development and Dalia's Busy Bee Academy. Such an effort would include contacting and working with local, state, and federal officials. ELPC is now actively engaged with Morton Arboretum, USEPA, and others to assess these and other sites' viability for vegetative buffers to effectively reduce PM levels.

In addition to advocating for vegetative buffers, which may be a more long-term goal, ELPC also suggests applying for community tree planting grants through Openlands to add trees around the community, by schools, and/or in vacant lots.



Clean Construction

Most construction sites continue to rely on heavy-duty diesel vehicles, which emit nitrogen oxides, toxic compounds and particulate matter and threaten respiratory health. Changing construction practices can reduce street level particulate matter and other air pollutant levels, benefiting both the workers and community residents. Clean construction utilizes cleaner equipment and idling limits to lower pollution at and near work sites. Zero emission electric equipment and trucks are also available and coming to market. Chicago has a clean construction ordinance that applies to a subset of city government projects, but neighborhoods could benefit from advocating for clean construction practices at both city and private developments.

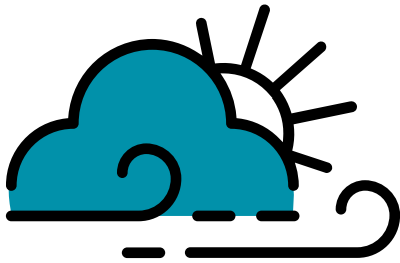
ELPC will work with Claretian Associates and other interested community partners to advocate for clean construction on new community development and proposed INVEST South/West projects.



Preventing Serial Polluters from Neighborhood

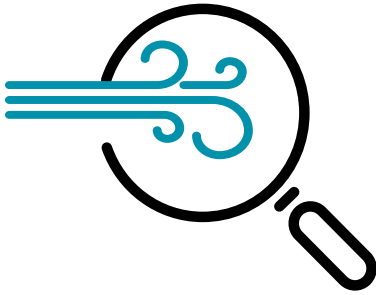
South Chicago and the South East Side are environmental justice communities that already bear an undue burden of air pollution and other environmental threats. Thus, it is important to continue to work with the community to oppose the addition of facilities that will add to the existing environmental burden in the area.

ELPC, environmental organizations, and community groups have been fighting the city on the proposed move of metal recycler and serial polluter General Iron, which is planning to move and expand its facility from Lincoln Park into the South East Side community by the end of this year. As neighbors of South Chicago, several South East Side community organizations overlaELPC Staff Attorney Kiana Courtney has testified and spoken out multiple times against the move and urged the city and IEPA to shut down the facility, due to its long-standing history of repeat violations.



Federal Advocacy

Particulate Matter is a [nationwide problem](#), which the Environmental Protection Agency is tasked with regulating as part of its mission “to protect human health and the environment.” The EPA is required to update PM standards regularly, to reflect the latest scientific research, which continually shows more evidence of the dangers of PM exposure. Unfortunately, this year the EPA decided not to strengthen the PM2.5 annual and 24-hour standards, despite the findings of career scientists and the recommendations of an independent 20-member panel of experts. ELPC field organizer Tiffany Werner [testified](#) before the EPA in June 2020 to highlight the impact of PM pollution on the Midwest and advocate for stronger standards.



Continued monitoring and community outreach

ELPC planned to continue work with GAGDC in 2020, expanding coverage to 76th Street and 95th Street, with focused data collection and note-taking around buses due to the high levels of PM frequently recorded around bus stops. However, in light of the COVID-19 situation, our air quality monitoring program had to function differently in 2020. Under Illinois' stay-at-home order, we could not ask our traditional partners to leave their homes for non-essential trips, and youth could not gather in groups for collective air quality monitoring days, as in prior years.

For the 2020 monitoring season, we shifted to individual volunteer monitoring, encouraging safe social distancing, mask usage, and home-based air quality advocacy. Moving forward, should COVID-10 remain a threat to our communities, we are exploring other ways to collect data. We might work towards stationary monitoring networks or providing volunteers with planned routes focused on areas that need the most monitoring. With many of our long-standing partners, we are also working with them to analyze data, examine neighborhood hazards, and educate additional neighbors.

In Conclusion

Air pollution is an invisible killer. In a [recent study](#), researchers documented a 5% increase in PM_{2.5} between 2016 to 2018 nationwide, after years of decline. This increase in PM was also associated with 9,700 additional premature deaths in the United States. As the world faces a respiratory pandemic that has been disproportionately effecting communities with higher levels of particulate matter, leading to higher coronavirus death rates, it is even more important to understand and tackle the sources of air pollution that plague our city. While it may seem expensive to alter vehicles or construction equipment, it costs us far more to do nothing. ELPC remains committed to protecting clean air and healthy communities in Chicago and across the Midwest.



ENVIRONMENTAL LAW & POLICY CENTER

The Environmental Law & Policy Center is the Midwest's leading environmental legal advocacy organization. We drive transformational policy changes with national impacts. We show that environmental progress and economic development can be achieved by putting sustainability principles into practice. We advance climate solutions effectively, by accelerating clean renewable energy alternatives to conventional power plants and advancing clean transportation solutions.

We protect the Great Lakes and defend the Midwest's wild and natural places, and we fight for safe, clean water and healthy air for all. We combine effective public interest litigation with strategic policy advocacy, sound science, and economic analysis. ELPC produces strong results for the environment in the courtrooms, boardrooms, and legislative hearing rooms across the pivotal Midwest and in Washington, D.C.

Headquarters

35 East Wacker Drive, Suite 1600
Chicago, IL 60601
(312) 673-6500
ELPC.org, elpcinfo@elpc.org

Social

Facebook & Twitter: @ELPCenter

Regional Offices

Columbus, OH
Des Moines, IA
Grand Rapids, MI
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Minneapolis, MN
Washington, DC

