ELPC Air Quality Monitoring Report

Austin • 2018–19

ENVIRONMENTAL LAW & POLICY CENTER

Air Quality Chicago

MAPSCORPS

BUILD
HOPE · LIVES · FUTURES

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 negatively impact 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 (PM2.5) 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 PM2.5 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 PM2.5 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 PM2.5 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.

PM2.5 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 PM2.5 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 nearly12 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 µg/m3	Good 0-50	Little to no risk.	None.
12.1 to 35 µg/m3	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 µg/m3	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+ µg/m3	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 Austin

ELPC works with two community partners in Austin to collect data on particulate matter. MAPSCorps is a Southside-based organization that trains youth to produce high quality data about community assets, and BUILD Inc. is a community organization dedicated to engage at risk youth through civic activism, social mobility, and the arts.

Each year fifteen teens participated in the monitoring program. Those teens were then 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 in Austin, including Austin Boulevard, Central Avenue, Laramie, Cicero, Grand, Division, Lake, Madison, Jackson, Harrison, and Flournoy, as shown in *Figure 2*. The data was collected between May and August, Monday through Thursday, typically between 7:00am and 3:00pm.

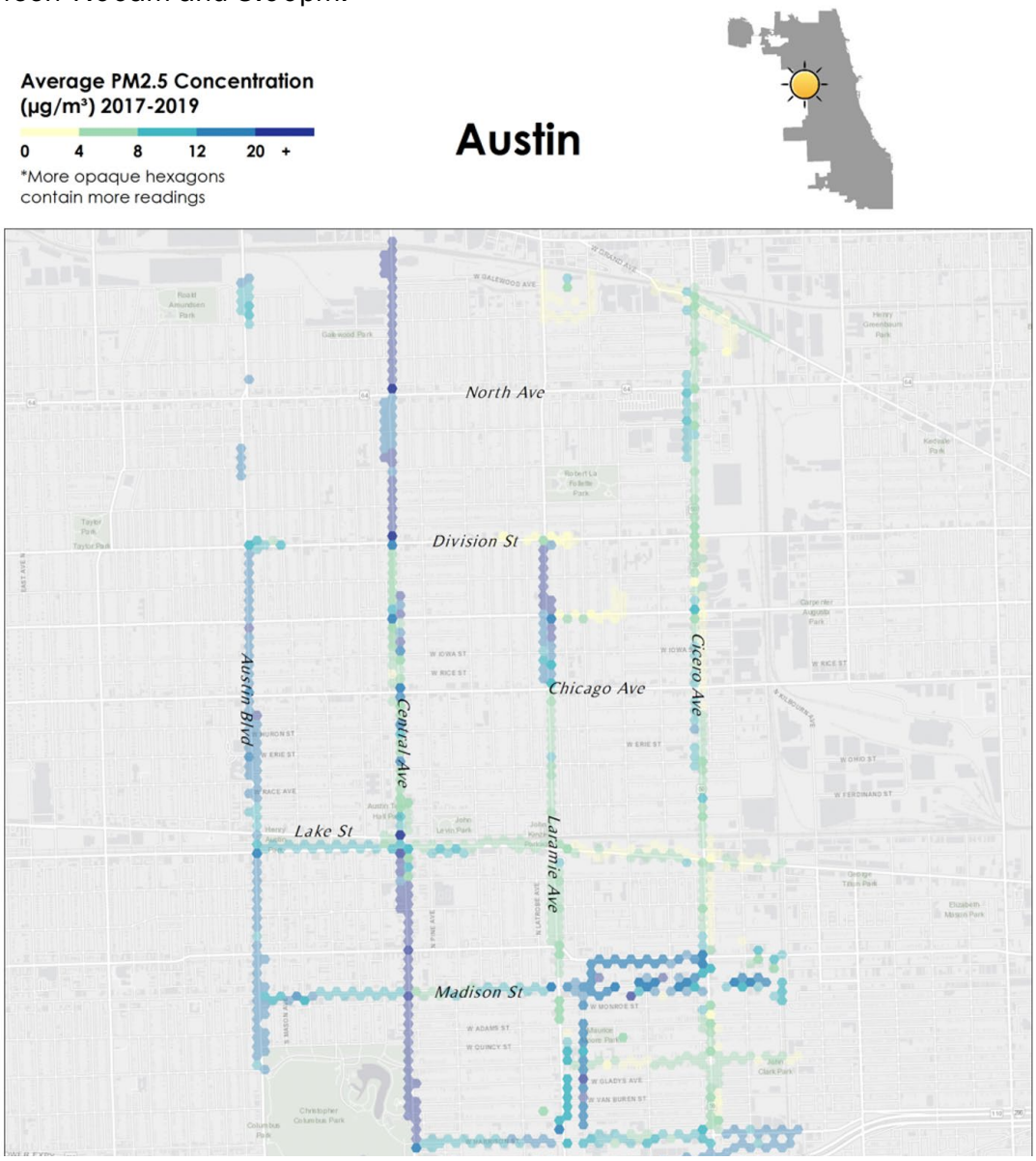
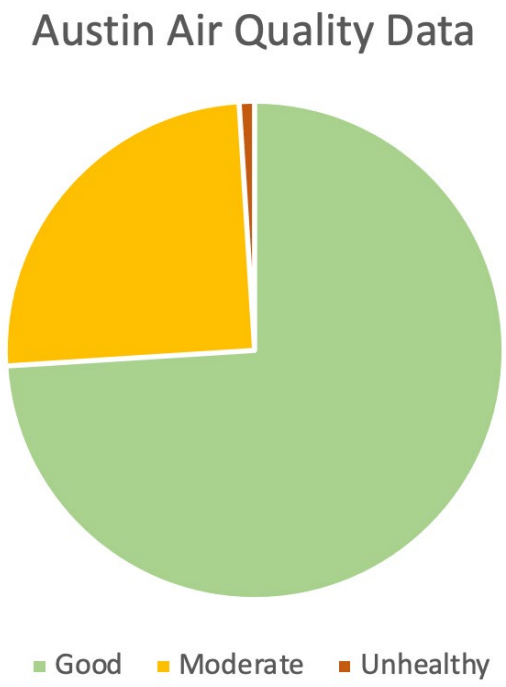


Figure 2. Average PM2.5 Concentration (µg/m³) in Austin, 2018-2019

Topline Results

As of Spring 2020, volunteers with MAPSCorps, BUILD, and other city partners have collected 93,885 PM2.5 data points along major corridors in Austin. Of that data, 74% fell into the "good" air quality range (0-12 µg/m³), 25% was in the "moderate" range (12-35 µg/m³), and 1% was in the "unhealthy" categories.

This means that, for the majority of the time that volunteers were monitoring, the air was safe and posed little to no health risk. However, there were frequent instances of elevated particulate levels in the moderate and unhealthy categories, meaning volunteers and local residents were breathing in air that was harmful to health during those times, especially for those with a respiratory illness like asthma.



Box plots and line graphs below illustrate the PM levels that volunteers encountered while monitoring. Box plots are used to 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 hour.

2019 Hourly Breakdown

In 2019, volunteers collected data in May, July, and August typically between 7:00am and 4:00pm (16:00). The box plot illustrates the range of PM2.5 concentrations that volunteers encountered while collecting data and when they experienced PM2.5 levels that reached the unhealthy categories. Unhealthy levels of PM2.5 were recorded at the corner of LeClaire & Homer in the 1:00pm hour and again during the 3:00pm hour.

Overall hourly exposures throughout the day were low and well within the healthy PM2.5 range until the 3:00pm hour (15:00) when PM concentrations peaked, with an average reading of 17.65µg/m3.

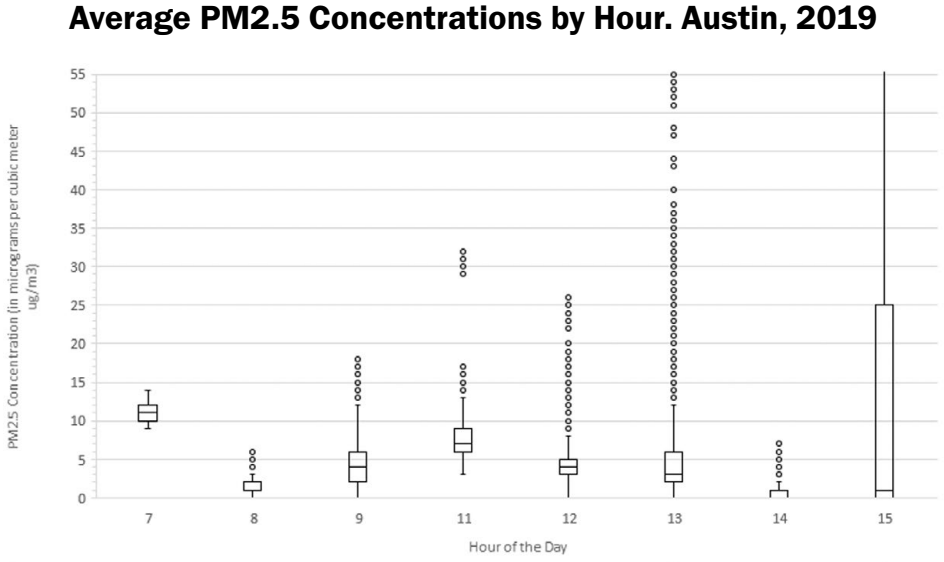


Figure 3. **Summary box plots of PM2.5 concentrations (µg/m3) by hour of the day.**

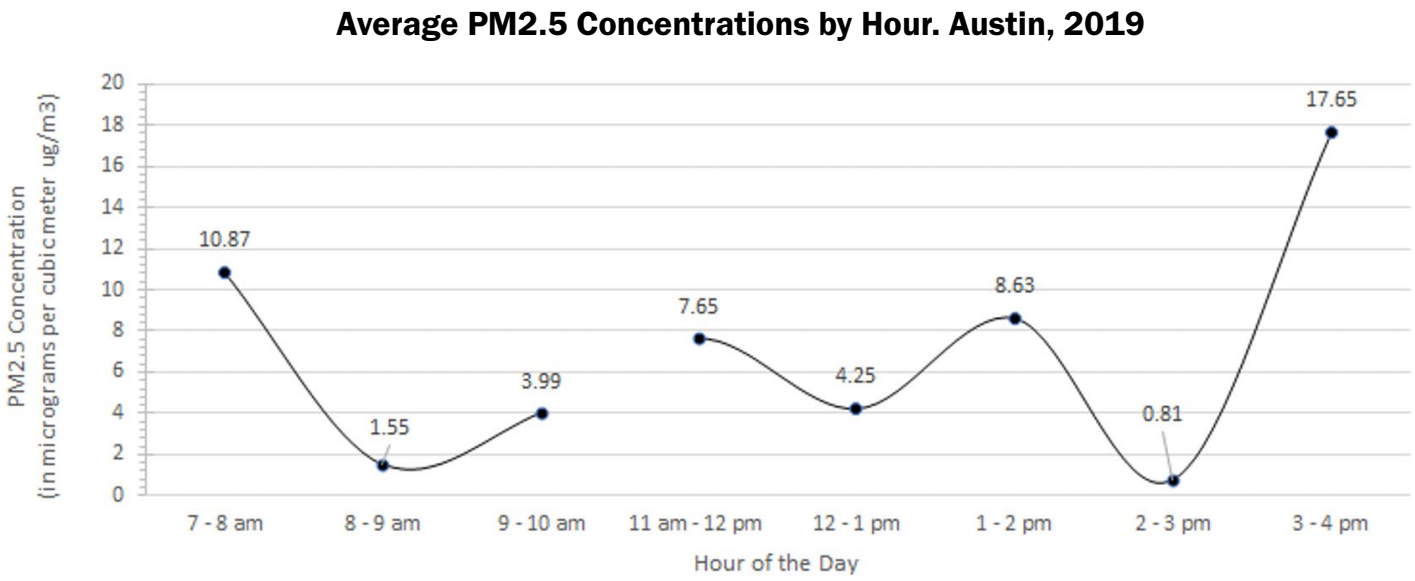


Figure 4. Average PM2.5 concentrations in Austin, 2019 by hour of the day

2018 Hourly Breakdown

Volunteers collected data between May and August, typically between 7:00am and 4:00pm (16:00). The box plot illustrates the range of PM2.5 concentrations that volunteers encountered while collecting data and when they experienced PM2.5 levels that reached the unhealthy categories. PM concentrations were higher in the beginning of the day with unhealthy readings recorded in the 7:00am, 9:00am, 10:00am, 11:00am, and 12:00pm hours, primarily at intersections along Central, Laramie, Madison, and Harrison.

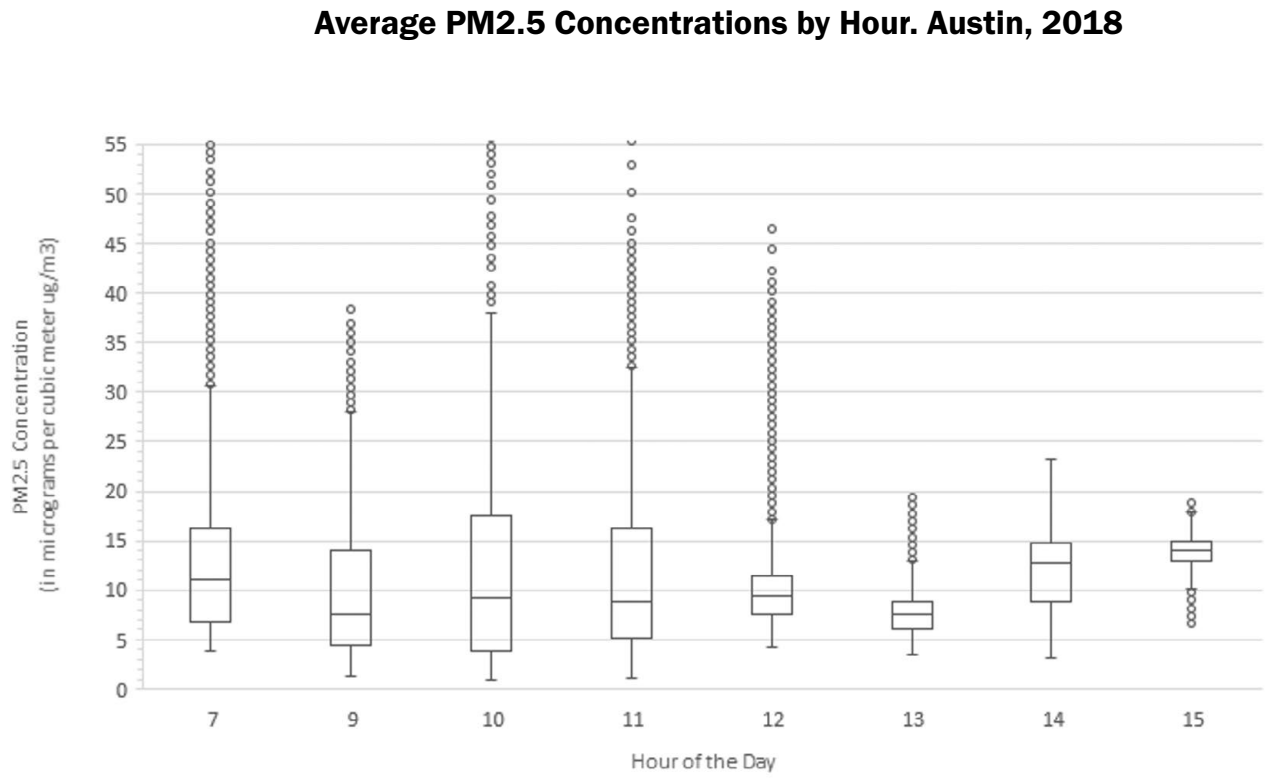


Figure 5. Summary box plots of PM2.5 concentrations (µg/m3) by hour of the day.

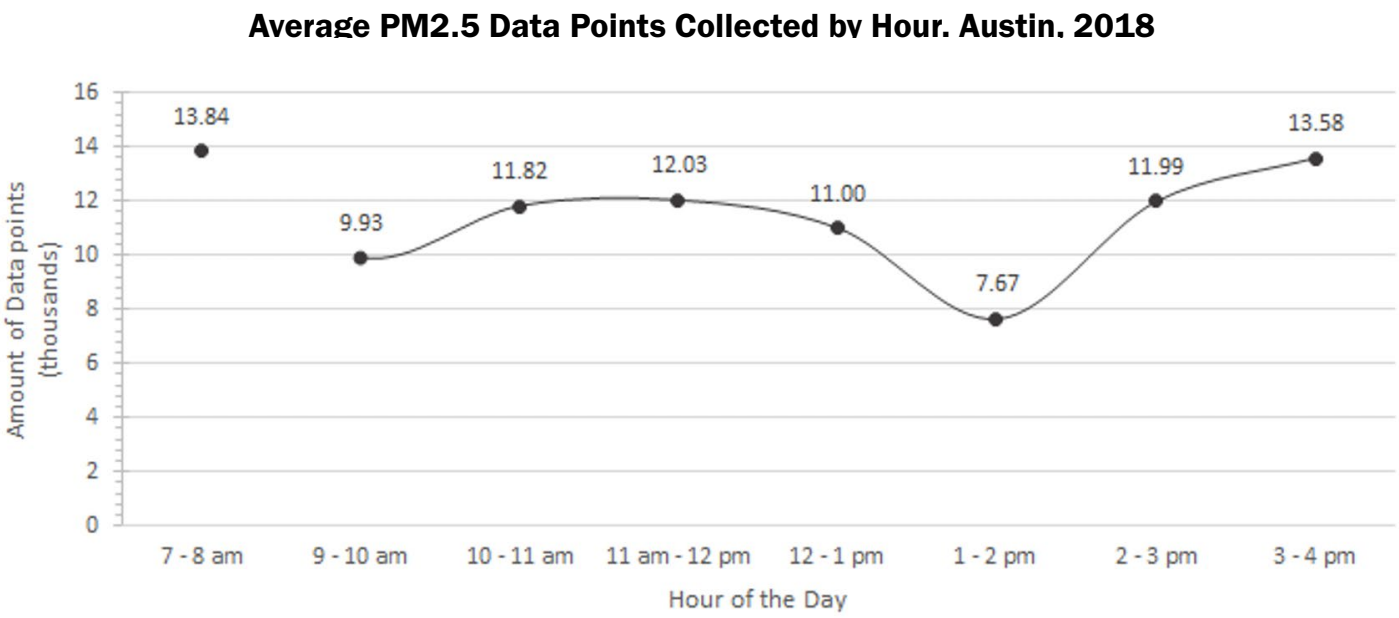


Figure 6. Average PM2.5 concentrations in Austin, 2018 by hour of the day.

Data summary

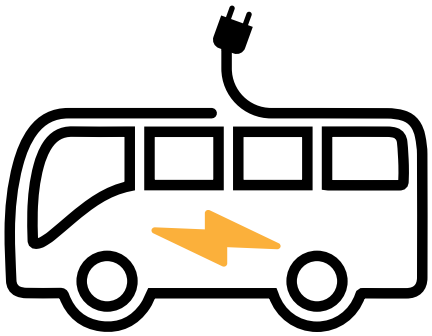
PM2.5 levels were higher in 2019 than 2018. However, in both years, hourly concentrations remained relatively low throughout the day until consistently spiking in the afternoon. Some corridors experienced frequent elevated levels of PM, primarily those in South Austin along Madison, Jackson, Flournoy, and Roosevelt Road.

As our monitors take a reading every second, they mimic the pattern of breathing. The map of Austin (Figure 2) highlights areas where 14% of the data ("hotspots" - the darkest blue) recorded was in the unhealthy category of 35ug/m3. Thinking in terms of breathing, this means that in those dark blue areas, about one out of seven breaths were harmful to not only those who were monitoring but to those who work and live there as well.

Our monitoring volunteers noted that additional PM spikes also occurred near garbage and recycling trucks, construction sites, CTA buses, and people smoking. While monitoring in those areas, volunteers reported that the air caused aggravated asthma symptoms, coughing, wheezing, chest tightening, and tiredness.

Recommendations to Improve Air Quality

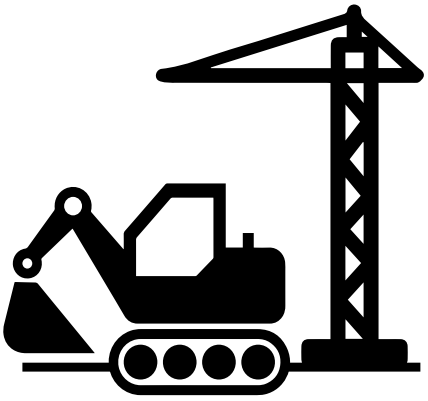
Monitoring air quality is just the first step in targeting opportunities for effective air improvement. After conducting focus groups with those who monitored and holding meetings with our community partners, we learned that most community members' concerns are about idling trucks, truck traffic, high 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 will reduce harmful particulate matter pollution and 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 BUILD and other community partners to ensure that the Chicago Transit Authority (CTA) carries out the citywide goal swiftly.

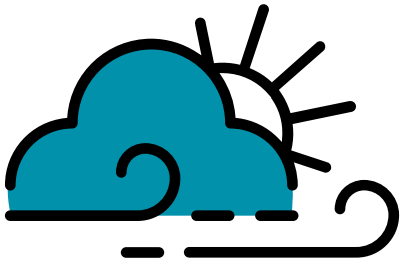
Electric buses could be especially beneficial on routes where the data shows elevated PM levels. ELPC is now sharing our air quality data with CTA officials, to prioritize air quality and human health impacts in decisions regarding electric bus rollouts. Also, ELPC policy fellow Lucas Stephens testified at the latest CTA budget hearing to emphasize the importance of electric buses for clean air across Chicago.



Clean Construction

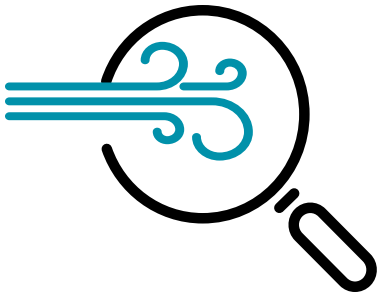
Most construction sites continue to rely on heavy-duty diesel vehicles, which emit toxic compounds and particulate matter, posing a great threat to respiratory health. Changing construction practices can reduce street level particulate matter levels, benefiting both the workers and community residents. Clean construction utilizes cleaner equipment and idling limits to lower pollution at and near work sites. 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 from both city and private developments.

BUILD and the youth volunteers have identified a priority in building a new safe space for youth in the Austin community. ELPC plans to support this work to advocate for clean construction at the potential new youth center and various upcoming INVEST South/West projects.



Federal Advocacy

Particulate Matter is a nationwide problem, which the U.S. 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 monitoring with BUILD to keep the community informed of air quality and potential hotspots. 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 PM2.5 between 2016 and 2018, 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 affecting 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 construction equipment or transportation vehicles, 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

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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.

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