

Air Pollution and Environmental Justice in Southwest Detroit, Michigan

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Introduction

Air pollution respects no boundaries and impacts those who live adjacent to or downwind of the emitting sources. Since the industrial revolution, socially constructed laws and systems created urban environments where the most vulnerable in our society, those of low income and disenfranchised minorities, bear the costs of air pollution in our modern society. Detroit is no exception.

In Detroit, air pollution is a by-product of a city forged by the industrial revolution and the creation of the automobile. The concentration of manufacturing, refining, traffic, and waste management within the city limits contributes to contaminated air.

Air pollution has been linked to health impacts such as cancer, asthma, difficulty breathing, and more. It typically impacts the most vulnerable in our society, children and elderly. However, while it is common knowledge that air pollution is bad for human and environmental health, it has been difficult to draw a meaningful connection between air pollutant emitters and health outcomes due to the multiple types of exposure communities often face. For example, a neighborhood might be adjacent to both a manufacturing plant and a highway that are both contaminating the air. The residents in the surrounding neighborhood have developed asthma. It is difficult to parse out the responsibility for poor air quality. Is it the manufacturing plant? Or the highway? Or both? Often, these heavily polluted areas are communities of color.

Southwest Detroit has long been recognized for poor air quality, particularly Detroit zip code 48217, which remains among the most polluted in the state. It has the highest asthma hospitalization rates in the State of Michigan. More than two dozen major industrial facilities surround the neighborhoods in 48217. This community is 82% Black and has a median household income of \$24,000, which is 35% lower than the state of Michigan's average. Roughly 44% of the people in 48217 live below the poverty line, according to the latest U.S. Census data, compared to 14% for the state of Michigan.

This indicator report presents a summary of selected air quality trends and issues in Southwest Detroit, which borders the Detroit River, highlights of next steps, and what Detroiters Working for Environmental Justice (DWEJ), a nonprofit in Detroit, Michigan, is doing to promote environmental justice for all.

Environmental Justice

Communities of color are disproportionately exposed to polluted air, water, and soil. Many of these communities of color that encounter toxic work conditions, environmental hazards, or polluted neighborhoods are also poor. Environmental justice shines a spotlight on the role that race and economics play in pollution.

Detroiters Working for Environmental Justice (DWEJ) is a voice for cleaner, safer, healthier neighborhoods. It is dedicated to providing all Detroit residents with the tools they need

to address environmental concerns in their own neighborhoods. DWEJ isn't seeking to simply redistribute environmental harms, but to abolish them.

Established in 1994, DWEJ has grown from a grassroots volunteer organization to a major voice recognized locally, statewide, and nationally for its innovative programs and projects that create sustainable, livable communities. As the first environmental justice organization in Michigan, its work is woven into the fabric of every Detroit neighborhood.

Examples of DWEJ activities and leadership include:

- In 2017, after many years of working with representatives from nonprofit, educational, business, and governmental organizations, as well as people in all our neighborhoods, DWEJ wrote and published the city's first climate action plan.
- After years of advocacy by DWEJ and others, an Office of Sustainability was established within Detroit City government in 2017.
- DWEJ provided key leadership for, and participated in, the development of the Detroit Sustainability Action Agenda in 2019.
- To help demonstrate action, DWEJ has established Future Build Construction Group to help break the cycle of poverty by giving Detroit residents the skills to work in living-wage jobs with a focus on repairing and protecting the environment.
- For decades DWEJ has been promoting environmental justice through education, building relationships, and shaping policy.

Status and Trends of Air Pollution

Southwest Detroit has a long history of air pollution stemming from industry and transportation. According to the U.S. Environmental Protection Agency (2017), particulate matter is a complex mixture of extremely small particles and liquid droplets and particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. These small particles can accumulate in the lungs and impact heart and lung health. Exposure to particulate matter can trigger asthma attacks, result in abnormal births, impact lung function, result in negative heart health, cause cancer, and result in death. Children, teenagers, and the elderly are particularly vulnerable to high particulate matter exposure. Atmospheric particulate matter has been monitored in Southwest Detroit for over 40 years.

Figure 1 presents a more than 40-year time series for particulate matter at the old Detroit Southwestern High School on West Fort Street. In 1971, the U.S. Environmental Protection Agency promulgated an annual and 24-hour particulate standard based on total suspended particulates (TSP). In 1987, the U.S. Environmental Protection Agency changed the standard to PM₁₀. Health studies indicated that particles smaller than 10 microns affect respiration. In 1997, the U.S. Environmental Protection Agency added an additional National Ambient Air Quality Standard for a smaller particle fraction size, PM_{2.5}, which can get deeper into the lungs and possibly into the blood stream. In 2006, the U.S. Environmental Protection Agency revoked the PM₁₀ annual standard, but kept the PM₁₀ 24-hour standard. The PM_{2.5} 24-hour standard was also reduced from 65 µg/m³ to 35 µg/m³. In 2012, the U.S. Environmental Protection Agency reduced

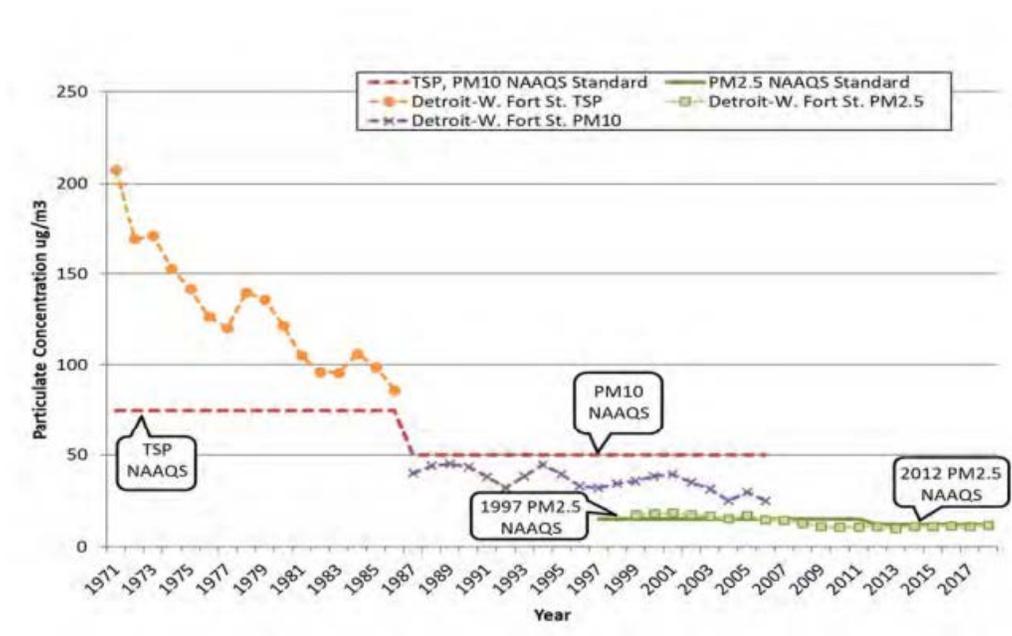


Figure 1. Particulate matter in air samples collected from the West Fort Street Station (near former Southwestern High School) in Detroit, 1971-2018 (Michigan Department of Environment, Great Lakes, and Energy, 2018).

the annual standard from $15 \mu\text{g}/\text{m}^3$ to $12 \mu\text{g}/\text{m}^3$. In general, there has been a decrease in particulate air pollution over this time period; however, this Southwest Detroit monitoring station continues to have nonattainment issues for $\text{PM}_{2.5}$ at certain times of the year.

The American Lung Association (2019) reported that despite improvements in air quality the Metropolitan Detroit Region (i.e., Detroit-Warren-Ann Arbor) is still ranked the 12th most polluted city in the United States based on year-round particle pollution. The region also experienced more days with dangerous spikes in short-term particle pollution. Particulate air pollution is undoubtedly worse in Southwest Detroit.

Sulfur dioxide, or SO_2 , is a colorless gas with a strong odor, similar to a just-struck match. It is formed when fuel containing sulfur, such as coal and oil, is burned, creating air pollution. SO_2 can harm the human respiratory system and make breathing difficult. People with asthma, particularly children, are extremely sensitive to these effects of SO_2 .

Air quality monitoring for SO_2 has been performed at the West Fort Street Station for 45 years. Figure 2 shows the SO_2 trend for both the old annual standard (National Ambient Air Quality Standard) and the new 1-hour standard for West Fort Street in Detroit. In 2010, when the U.S. Environmental Protection Agency changed the standard from an annual average to a 1-hour standard, a portion of Wayne County (the county within which Detroit resides) was designated nonattainment. The trend data in Figure 2 show that air samples at the West Fort Street Station were not in compliance in 2010-2012, but were in compliance from 2013-2018.

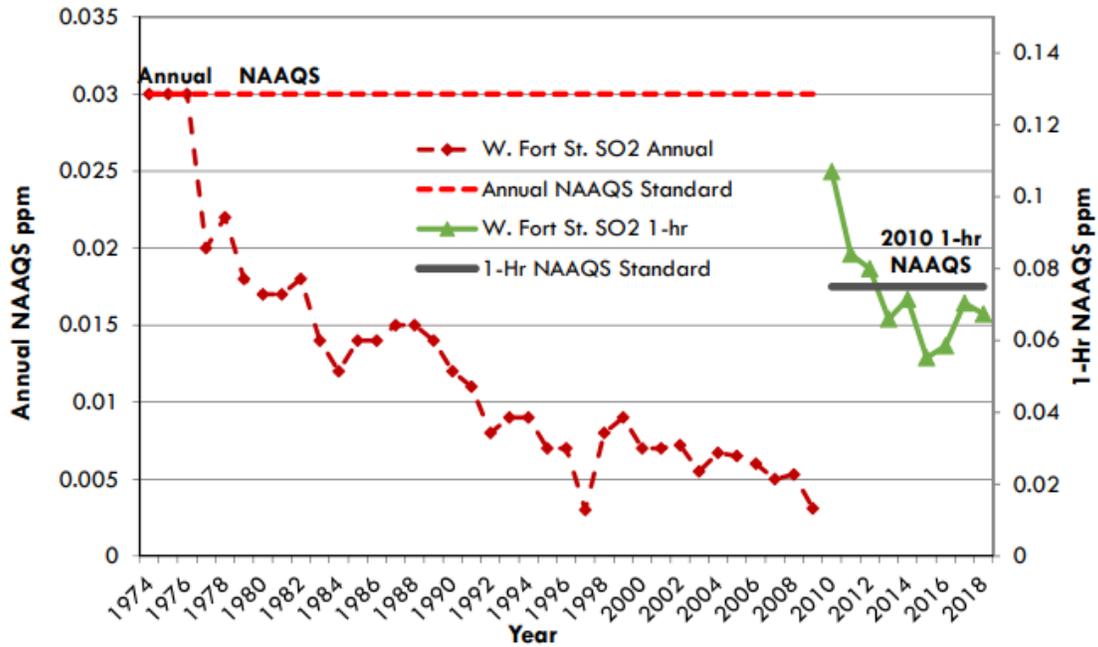


Figure 2. Historical annual and 1-hour SO₂ averages at West Fort Street Station (near former Southwestern High School) in Detroit, 1974-2018 (Michigan Department of Environment, Great Lakes, and Energy, 2018).

Ozone in the air we breathe can harm our health. People most at risk from breathing air containing ozone include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers. In addition, people with certain genetic characteristics, and people with reduced intake of certain nutrients, such as vitamins C and E, are at greater risk from ozone exposure.

Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and airway inflammation. It also can reduce lung function and harm lung tissue. Ozone can worsen bronchitis, emphysema, and asthma, leading to increased medical care.

Long-term trend data for ozone were not available, but 48217 is known to be in noncompliance during certain times of the year.

Both SO₂ and ozone are associated with asthma and other respiratory and cardiac diseases, which are huge concerns in 48217. Indeed, residents suffer from high rates of asthma and other respiratory illnesses. American Lung Association (2019) reported that during 2015-2017, Wayne County had 18 high ozone days where the Air Quality Index values were 101-150, reflecting unhealthy conditions for sensitive groups. As a result, American Lung Association (2019) recommended that children, active adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.

A 2010 risk assessment of air toxics found nine pollutants and diesel particulates in the Detroit area exceeding the state's health-based cancer risk of one in one million (Department of Natural Resources and Environment, 2010a). Cancer risk reached as high as 10-100 in one million for benzene and formaldehyde during 2006 and 2007. Monitoring performed at a new community air monitoring station in 48217 confirmed exceedances of sulfur dioxide and also

found naphthalene, arsenic and hexavalent chromium at levels of concern for cancer risk, though lower than previously measured in the 2000s (Michigan Department of Environmental Quality, 2018).

The above trend data, however, do not give the full picture. Federal and state regulations fail communities of color like 48217 because they weren't designed to account for multiple pollutant exposures. Simply put, the pollutant-by-pollutant regulatory approach does not adequately address the unique issues of having a cluster of major sources of pollution in a highly concentrated area like 48217. Neither the U.S. Environmental Protection Agency nor Michigan's Department of Environment, Great Lakes, and Energy require cumulative assessment of exposures. DWEJ has long advocated for this approach.

Human Health Impacts from Air Pollution in Detroit

In 2017, the University of Michigan's School of Public Health and Detroiters Working for Environmental Justice, a nonprofit in Detroit, Michigan, partnered on a study of human health impacts on residents in Southwest Detroit resulting from exposure to air pollution (Martenies et al., 2017). This study examined the diseases and health disparities attributable to air pollutants for the Detroit urban area.

Based on current levels, Martenies et al., (2017) showed that exposures to fine particulate matter (PM_{2.5}), ozone (O₃), sulfur dioxide (SO₂), and nitrogen dioxide (NO₂) are responsible for more than 10,000 disability-adjusted life years (DALYs) per year, causing an annual monetized health impact of \$6.5 billion. This burden is mainly driven by PM_{2.5} and O₃ exposures, which cause 660 premature deaths each year among the 945,000 individuals in the study area. NO₂ exposures, largely from traffic, are important for respiratory outcomes among older adults and children with asthma, e.g., 46% of air-pollution related asthma hospitalizations are due to NO₂ exposures. Based on quantitative inequality metrics, the greatest inequality of health burdens results from industrial and traffic emissions. These metrics also show disproportionate burdens among Hispanic/Latino populations due to industrial emissions, and among low income populations due to traffic emissions. Attributable health burdens are a function of exposures, susceptibility and vulnerability (e.g., baseline incidence rates), and population density.

Next Steps

Clearly, continuous and vigorous citizen oversight and advocacy are needed to ensure environmental justice for all. Key next steps include:

- Development of an environmental justice screening tool that assesses environmental burden and vulnerability based on human population characteristics and health conditions;
- Assessment of cumulative exposure to pollutants;
- Commitment to a long-term community air monitoring program;
- Full adoption of the precautionary principle that states that when human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm;
- Full adoption of the Canada-U.S. Great Lakes Water Quality Agreement goals of zero discharge and virtual elimination of persistent toxic substances;

- Implementation of the Detroit Climate Action Plan;
- Implementation of the Detroit Sustainability Action Agenda; and
- Full recognition and adoption of the Principles of Environmental Justice as defined by the First National People of Color Environmental Leadership Summit convened in Washington, D.C. in 1991.

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