

Clearing the Air: Empowering Communities with PurpleAir Sensors

Air Quality Planning Branch



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PurpleAir Lending Program



It's completely free!!!!

Why are we doing this?

Understanding Air Quality at the Neighborhood Level

- Deploy sensors in communities, particularly near schools, where there are identifiable gaps in DOEE's network.
- The sensors will be used to measure particulate matter, or PM_{2.5}.
- Create a comprehensive sensor map of the District.
- Use collected data to identify pollution sources and pinpoint pollution hotspots.
- Empower residents to be more aware of their air quality.
- Work toward building more resilient communities.

What are PurpleAir Sensors?

Introduction:

- PurpleAir sensors are low-cost air quality monitors that measure PM2.5 (fine particulate matter) in the air.
- They provide real-time data on air pollution levels, making it easier to track air quality in different locations.

Key Features:

- **Affordable:** More accessible than traditional air quality monitoring systems.
- **Real-Time Data:** Provides instant updates on air quality conditions.
- **Portable:** Can be set up anywhere, including homes, schools, and community centers.

How They Help:

- Enable communities to monitor local air quality.
- Help track pollution trends and identify areas with higher pollution levels.



This image depicts what a PurpleAir sensor looks like after setup.

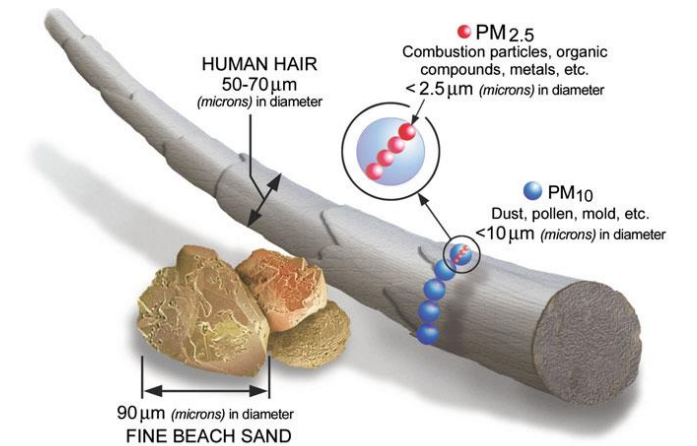
What is PM_{2.5} and Why Does it Matter?

What is PM_{2.5}?

- PM_{2.5} refers to tiny particles in the air that are **smaller than 2.5 micrometers**—about 30 times smaller than a human hair!

Where Does PM_{2.5} Come From?

- Common sources include:
 - **Truck exhaust** and other vehicle emissions.
 - **Factories** and industrial activities.
 - **Wildfires** and burning of wood or trash.
 - **Construction sites** (dust from digging, demolition, etc.).
 - **Cooking**, especially with wood stoves and deep frying



This illustration from the U.S. EPA highlights the size of PM_{2.5} particles compared to a human hair, emphasizing their tiny scale and ability to penetrate deep into the lungs.

Health Impacts

What happens when we breathe PM_{2.5}?

- These tiny particles can travel deep into the lungs and even into the bloodstream.

Short-term effects:

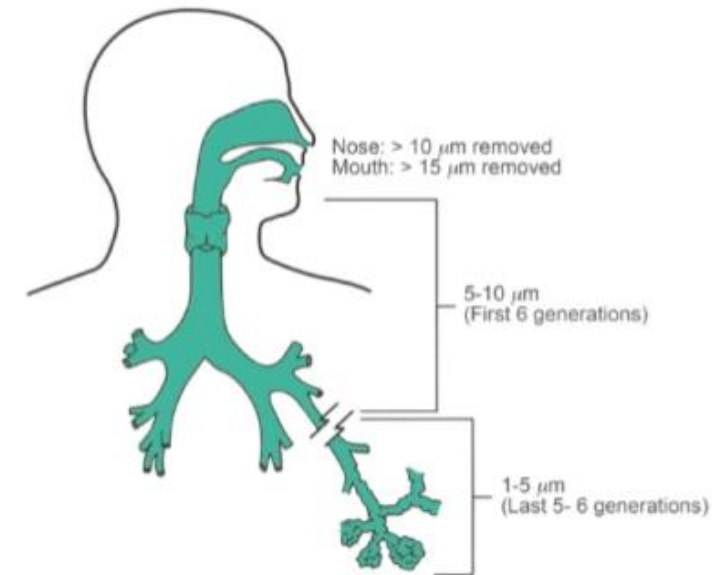
- Breathing problems like coughing, sneezing, or shortness of breath.
- Worsens asthma and bronchitis symptoms.

Long-term effects:

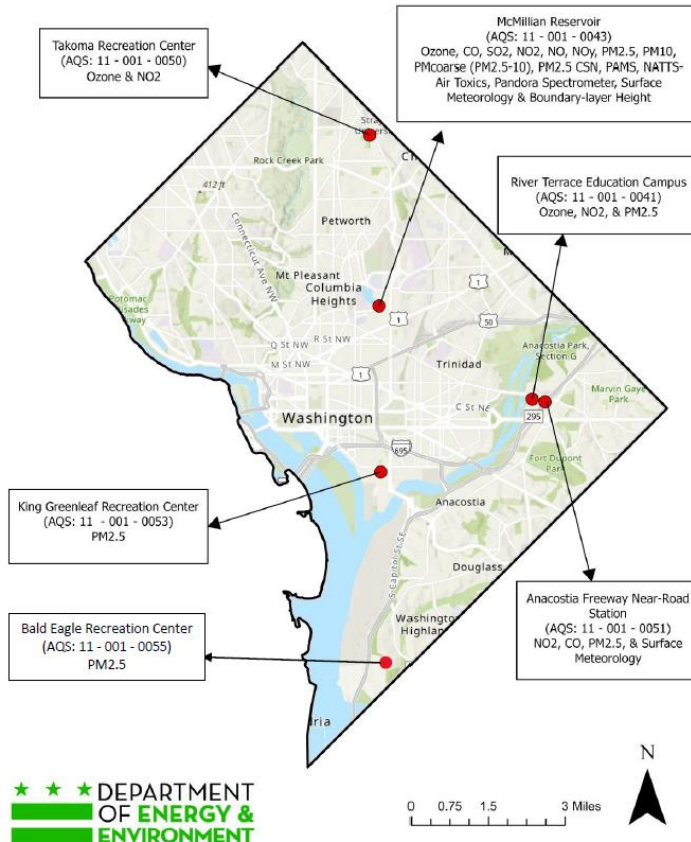
- Can lead to heart and lung diseases.
- Increases the risk of heart attacks, strokes, and some cancers.

Who is most at risk?

- **Children:** Developing lungs are more vulnerable.
- **Elderly:** More prone to heart and lung issues.
- **Pregnant people:** Can affect the baby's development.
- **Those with preexisting conditions:** Especially asthma, heart disease, or respiratory illnesses.



How is PM_{2.5} Measured?



This map highlights air quality monitoring stations across the District, with five locations specifically measuring PM_{2.5} levels to track air pollution and protect public health.

How do we measure PM_{2.5}?

- PM_{2.5} is measured using specialized air quality monitors that collect and analyze tiny particles in the air.
- Monitors continuously track air quality, providing accurate, real-time data.

Who manages these monitors?

- The District Department of Energy and Environment (DOEE) oversees the network.

Federal Reference Monitor, FEM for short



This is one of the air quality monitors used in the District to measure PM_{2.5} levels. It provides valuable data to assess air quality and protect public health.

Overview of PM_{2.5} Trends in DC



The District has seen a steady decline in both annual and daily PM_{2.5} levels since 2004, with air quality consistently meeting the most recent health-based standards

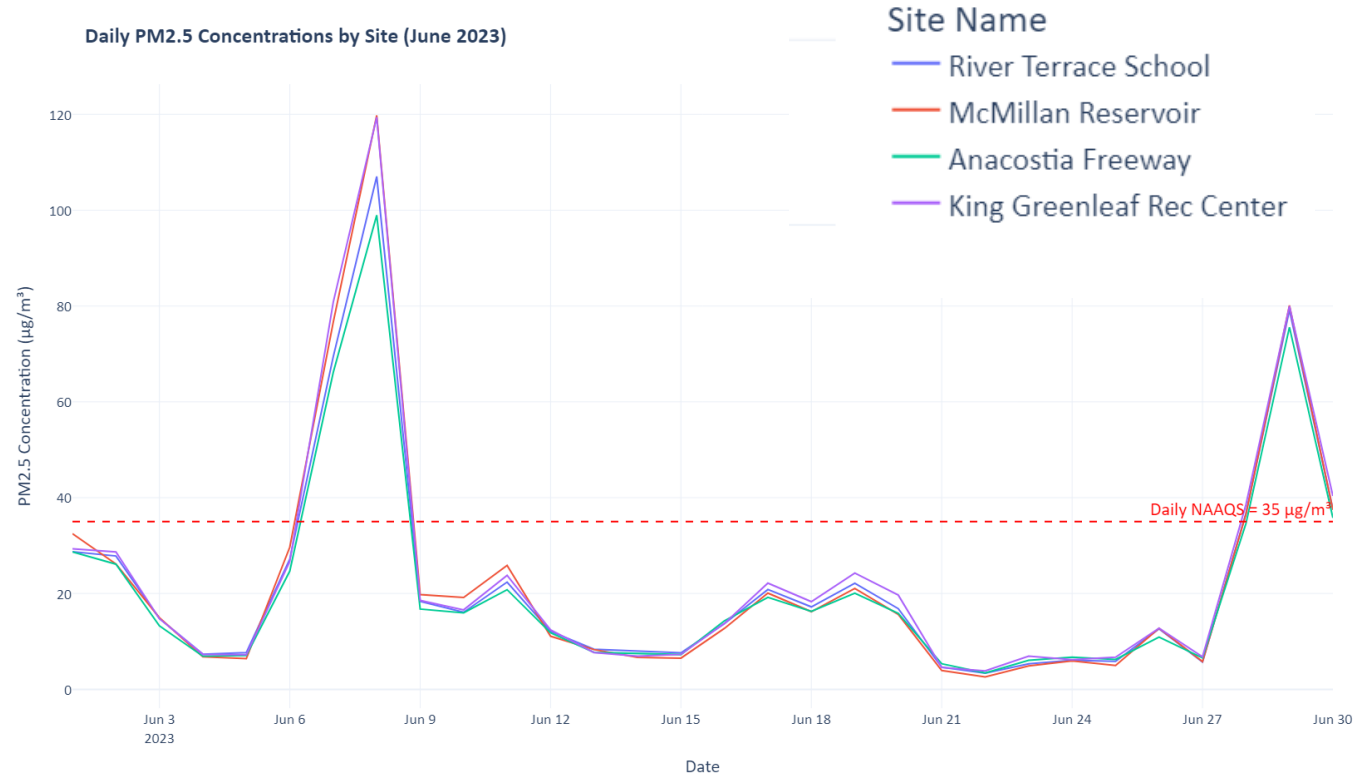
When Does PM_{2.5} Peak?

Seasonal Trends:

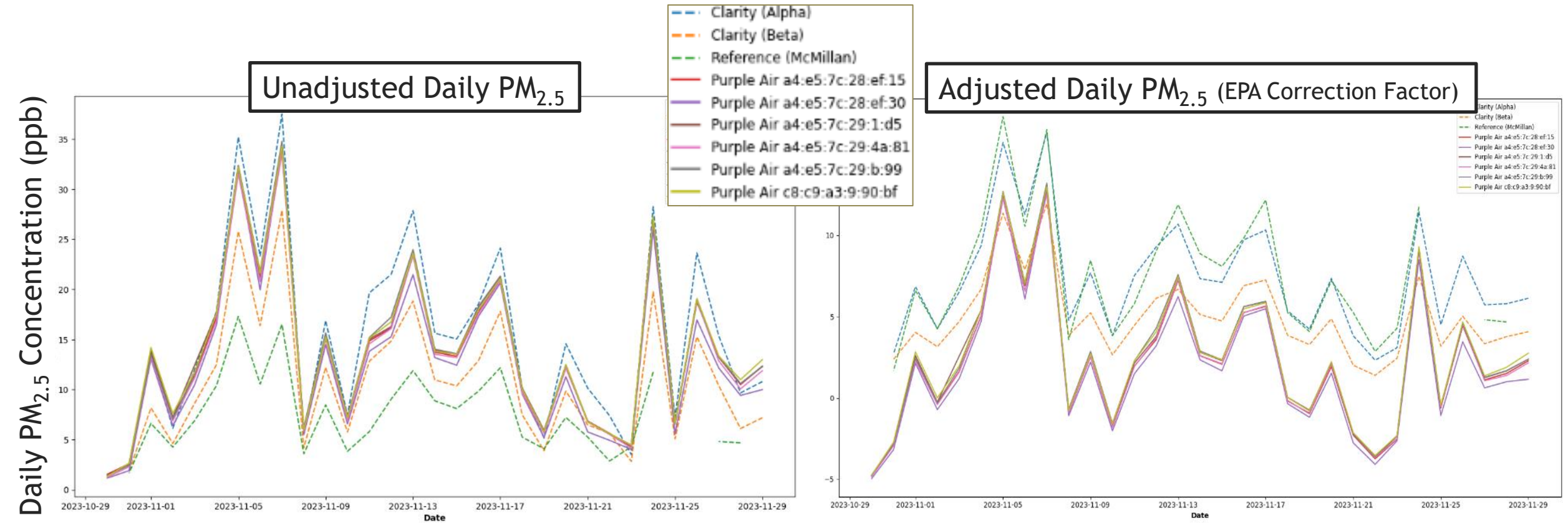
- Higher PM_{2.5} levels in winter due to heating emissions.
- Higher levels in summer from wildfires and stagnant air.

Daily Trends:

- PM_{2.5} can spike during rush hours because of traffic. So, think of your morning commute or your drive home from work.
- At night, temperature inversions can trap pollution close to the ground, leading to higher PM_{2.5} levels.



How Good are Low-Cost Sensors: Purple Air Comparison



Corrections factors are needed, especially to avoid oversampling high values.

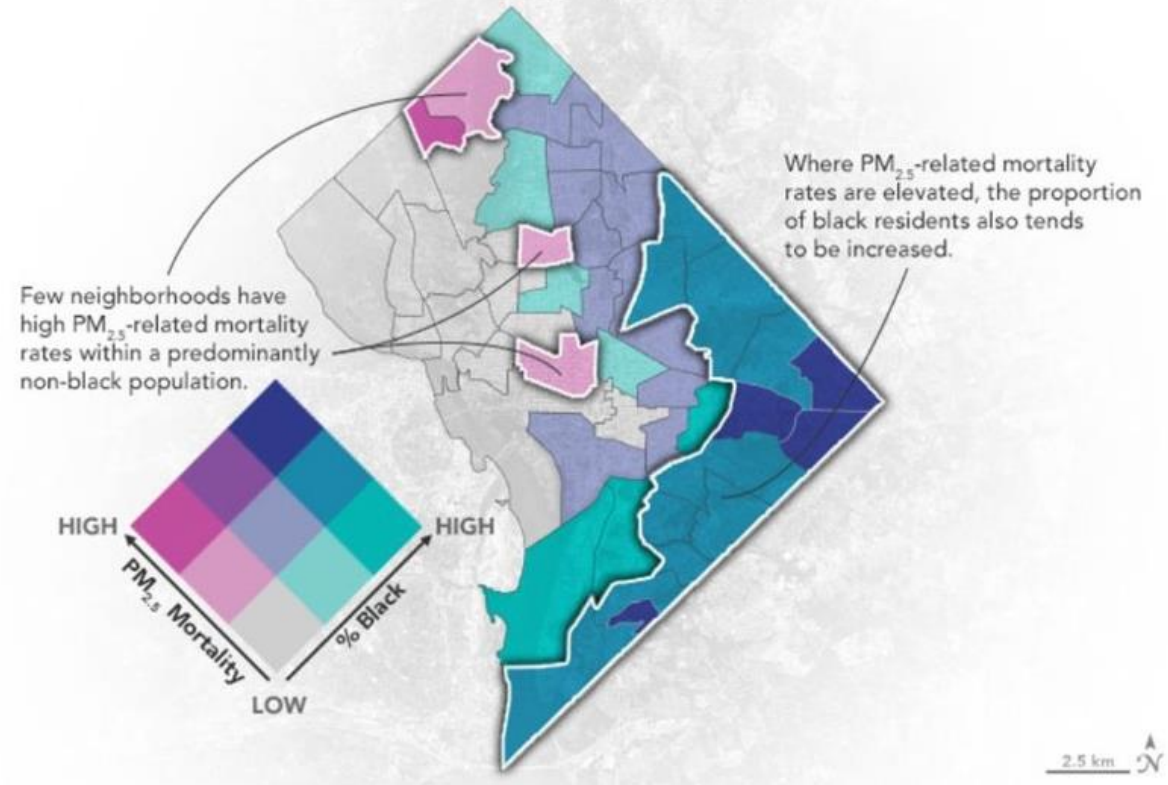
Who is Most Affected?

Disparities in PM_{2.5} Exposure:

- Wards 4, 5, 6, 7, and 8 have higher PM_{2.5} levels.
- Contributing factors include:
 - Proximity to highways and industrial areas.
 - Fewer trees and green spaces.

Impact on Health:

- Increased risk of asthma, respiratory issues, and heart disease.
- Vulnerable groups, like children and the elderly, are especially affected.
- Long-term exposure leads to chronic health problems.



How the PurpleAir Loan Program Works

Who can participate

- Eligibility requirements (e.g., District residents, businesses, community organizations, schools)

How to apply

- Visit our online application located here: [The PurpleAir Monitoring Project | doee](#)

What participants receive

- A PurpleAir sensor, training on installation, and access to data dashboards.

Expectations

- Users are expected to install, maintain the device as instructed, and return them when needed by DOEE.

Programmatic Placement Factors

These are additional factors that DOEE will consider if demand for sensors outweigh supply.

1. **Proximity:**

To minimize overlaps/gaps in coverage, DOEE will ensure that sensors are spread out across communities. If a sensor is already hosted in your community or a permanent monitor is nearby, you may be ineligible to host.

2. **Overburdened Community:**

Census tracts that experience burdens in or near the 90th percentile of the eight categories of the CEJST tool are being prioritized. For example, communities within the 75-90th percentile for “**Diesel particulate matter exposure,**” will be given priority over other areas with relatively low pollution exposure.

3. **Environmental Factors:**

E.g., large trees or nearby exhaust vents can interfere with the sensor's ability to collect data accurately.

4. **Areas of Interest:**

We will focus on locations with high pollution levels near populations of sensitive groups, such as elementary school children. This will help us understand how pollution affects vulnerable groups.

5. **Potential for Future Research:**

If data is useful for particular studies being conducted by DOEE or in conjunction with our partners.

What We Ask of Participants

- 1. Power Connection:** Ensuring that the sensor is continuously connected to a reliable power source.
- 2. Wi-Fi Connection:** Ensuring that the sensor always has a stable Wi-Fi connection, as many devices rely on internet connectivity for data transmission and processing.
- 3. Regular Checks:** Periodically checking the sensor to confirm it is functioning properly, such as verifying indicator lights or status notifications.
- 4. DOE's Loan Agreement:** Participants will be required to sign DOE's loan agreement and follow its terms and conditions.

Why Community Participation Matters

Enhanced Data Coverage

- Your participation helps us collect more comprehensive and accurate data that reflects the community's true air quality.

Local Insights

- Your knowledge of the neighborhood is invaluable in identifying pollution sources and areas that need attention.

Empowerment

- By getting involved, you can raise awareness and empower your community to take action for cleaner air.

Personal Protection

- Understanding local air quality can also empower residents to better protect themselves.

Questions?
