Local air pollution insights for local planning decisions: Oakland, CA

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Black carbon, nitric oxide (NO), nitrogen dioxide (NO$_2$)

1Hz sample rate

Daytime, 150 days over 1 year (mid 2015 – mid 2016)

400+ unique miles of roads.
14,000+ miles driven total.

Each road/highway segment sampled 30+ times

Each road segment (30 m) has ~100 observations

$3 \times 10^6$ data points
1 regulatory air pollution monitoring site in WO
Mobile monitoring measurements every 30 meters

Levels vary by a factor of >8 times within West Oakland.

In some areas, levels vary by a factor of >5 times within a single city block.

Many places higher than levels measured at BAAQMD central site.
Confirmed multiple hotspots of elevated air pollution

A metal recycler makes up roughly seven acres of this mixed residential and industrial neighborhood. Trucks of all sizes drop off materials. Relocation is being considered as a potential part of the Army Base redevelopment plan.
High exposure near schools and childcare facilities
Elevated air pollution on truck-prohibited routes

EDF Black Carbon Map

Oakland Truck Routes and Truck Prohibited Streets
Air pollution high on prohibited truck routes

Oakland Truck Routes and Truck Prohibited Streets
Elevated air pollution in buffer and residential zones
OWNING OUR AIR
The West Oakland Community Action Plan - Volume 1: The Plan
October 2019

A project of the Bay Area Air Quality Management District and West Oakland Environmental Indicators Project

PROPOSED MAUL

TOWN HALL MEETING

WEST OAKLAND ENVIRONMENTAL INDICATORS PROJECT
AND BAY AREA AIR QUALITY MANAGEMENT DISTRICT
PRESENT

TOWN HALL MEETING
M U N I C I P A L & S T A T E O F F I C E S

Topic of Discussion

West Oakland Transportation Plan

Invited Speakers

Cristina Garcia
CA Assemblywoman

Libby Schaaf
Mayor of Oakland

... And more guests!

Revised Draft Seaport Air Quality
2020 and Beyond Plan
June 20, 2018

PORT OF OAKLAND
Policy responses

Planning and Building Codes:

- Relocate industrial facilities to outside the community and redevelop former sites for new business and light industrial uses that align with green economy. This requires the City to identify locations outside of West Oakland for these businesses, while ensuring that any relocated businesses do not cause harm at the new location.
- Enact new rules or policies to accelerate the relocation of businesses in West Oakland that do not conform with the current zoning designations. This may entail sunsetting land use permits for these facilities and/or providing incentives and subsidies to relocate businesses away from West Oakland.
- Update Performance Standards (Particulate Matter & Air Contaminants)
- Shorten termination timeframe for conditional use permits and non-conforming uses
- Increase buffer requirements between commercial/industrial and residential uses
- Require current and proposed businesses to disclose truck visits per day and air pollution permits
- Revise land use codes to prohibit new truck-attracting or truck-serving businesses in West Oakland.
- Revise zoning to allow electric truck parking under freeways

Urban Design Policies:

- Create a comprehensive, area-wide urban canopy and vegetation plan that identifies locations where trees can be added and maintained, such as parks and along Caltrans’ right-of-ways, and develop a plan to protect existing trees that reduce exposure to air pollution emissions in West Oakland.
- Develop and implement a pilot project to build a green barrier (‘biofilters’) between a freeway and a residential neighborhood.
- Explore a policy requiring solid or vegetative barriers to be incorporated into site design between buildings and sources of air pollution (for example, a freeway).

Additional Policies:

- Prohibit natural gas systems in new builds (residential and most commercials).
- The City of Oakland adopts more stringent air quality construction and operations requirements.
- As air pollution condition improves and West Oakland becomes more livable, the City of Oakland works with local community groups to address gentrification and the pricing out of long-term residents and businesses.
Average black carbon for a weekday at 9 am
3rd St and Adeline St

Hourly Average Black Carbon (on Weekdays)

Location S2
Neighborhood Average

Jul 2, 2017
Hour of Weekday
18th St between Wood and Campbell

Hourly Average Black Carbon (on Weekdays)

Predominant wind direction
Air Tracker
https://globalcleanair.org/air-tracker/map/

That air you’re breathing, where’s it been?

AirTracker makes visual connections between the air you are breathing and the locations of air pollution sources in your city. Users can view source areas, which show where air comes from at any time.

Key interactive features include:

- View real-time pollution and wind measurements across your city. Click on a blue circle, indicating an available city. Once the region has loaded, click on a circle to see these sensor measurements.

- Click anywhere in the dotted region of the city to create a source area that “looks upwind” to see where the air came from to end up at that location, at that time.
Receptor-based source apportionment: inverse dispersion modeling

Dispersion processes can be calculated in reverse to look upwind and estimate the most likely area the contributing source(s) was/were located.

We are using the Stochastic Time-Inverted Lagrangian Transport model (STILT), developed by John Lin at the University of Utah.
Real-world use: fire in Houston
Local monitors show fire hot spot
Annual average PM2.5 concentrations approaching National Ambient Air Quality Standards (NAAQS)

Annual Average PM-2.5 Concentrations

<table>
<thead>
<tr>
<th>Summary Statistics</th>
<th>For 2021 (May 3 - December 31)</th>
<th>For 2022 (January 1 - June 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Mean</td>
<td>12.7</td>
<td>11.2</td>
</tr>
<tr>
<td>Highest Daily Mean</td>
<td>31.4 (October 31)</td>
<td>33.9 (June 13)</td>
</tr>
<tr>
<td>Lowest Daily Mean</td>
<td>2.7 (October 27)</td>
<td>-0.8 (March 03)</td>
</tr>
</tbody>
</table>

12.5-month avg = 11.9µg/m³

This site began collecting PM-2.5 (Local Conditions) on May 3, 2021

Four Highest 24-Hour PM2.5 Concentrations in 2022

<table>
<thead>
<tr>
<th>Monitoring Site</th>
<th>POC</th>
<th>Highest Date</th>
<th>Value</th>
<th>Second Highest Date</th>
<th>Value</th>
<th>Third Highest Date</th>
<th>Value</th>
<th>Fourth Highest Date</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Houston North C405/C1033</td>
<td>1</td>
<td>06/13/2022</td>
<td>33.9</td>
<td>06/12/2022</td>
<td>30.9</td>
<td>06/14/2022</td>
<td>30.7</td>
<td>03/01/2022</td>
<td>27.4</td>
</tr>
</tbody>
</table>

As of June 14, 2022. Source: [https://www.tceq.texas.gov/cgi-bin/compliance/monops/24hr_annual.pl](https://www.tceq.texas.gov/cgi-bin/compliance/monops/24hr_annual.pl)

Notes: PM2.5 NAAQS: Annual mean = 12.0 µg/m³; 24-hour mean = 35 µg/m³
Questions?

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