West Oakland Air Pollution Studies
AB617 Steering Committee Kick-Off
Oakland City Hall
July 27, 2018
Contents

Study 1  100x100 black carbon sensors network
Study 2  Air pollution mapping with GSV cars
Study 3  Air pollution & health risk analysis
100×100 Study: A West Oakland Community Air Quality Study

Chelsea Preble
Julien Caubel
Troy Cados
Thomas Kirchstetter
Study Team

UCB/LBNL
- Thomas Kirchstetter
- Julien Caubel
- Troy Cados
- Chelsea Preble
- Carter Keeling
- Shannon Chang
- Annie Rosen
- Jonathan Slack
- Kelly Archer

WOEIP
- Margaret Gordon, Brian Beveridge

EDF
- Ramon Alvarez, Millie Chu Baird
- Fern Uennatornwaranggoon
- Cassandra Ely, Maria Harris

UT Austin, Josh Apte

Port of Oakland
- Tim Leong, Troy Hosmer

BAAQMD, Steve Randall, Phil Martien
Black Carbon: Sources & Impacts

Trucks play a vital role in moving freight, but black carbon (BC) soot emitted from diesel engines is of concern

- Emitted close to people, associated with adverse health outcomes, including cancer, cardiovascular and respiratory disease
- Short-lived climate pollutant, contributes to global warming
UCB/LBNL Low-Cost BC Sensor

We developed a low-cost BC sensor with similar measurement principle as commercial instruments.
Assembly of the 100×100 network at homes and businesses across West Oakland
Current monitoring
Black carbon concentrations vary with location: some up to 75% higher and some lower than central monitoring site.
STUDY 2: HIGH RESOLUTION AIR POLLUTION MAPPING WITH GOOGLE STREET VIEW CARS

www.edf.org/airqualitymaps
Mobile Monitoring with GSV

www.edf.org/airqualitymaps

DATA COLLECTION

Black carbon, nitric oxide (NO), nitrogen dioxide (NO₂)

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

3×10^6 data points
Air pollution is unevenly distributed

West Oakland – Black Carbon  www.edf.org/airqualitymaps

The most polluted areas >8 times higher BC levels than the lowest areas.

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

Many places see higher concentrations than levels measured at BAAQMD central site.

<table>
<thead>
<tr>
<th>Median BC levels comparison</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Google study</td>
<td>0.51 µ/m³</td>
</tr>
<tr>
<td>BAAQMD monitor</td>
<td>0.50 µ/m³</td>
</tr>
</tbody>
</table>
We found multiple hotspots/areas of high pollution

Example: Metal recycler on Peralta/Poplar and 28th st. Black carbon levels here are almost 4x the median for WO.

Newly built children’s playground across the street from the recycler.

Street View and aerial imagery of metal recycling cluster show frequent visits by heavy duty trucks at the facilities.

www.edf.org/airqualitymaps
Air pollution high on some prohibited truck routes

EDF Black Carbon Map

Oakland Truck Routes and Truck Prohibited Streets

www.edf.org/airqualitymaps
STUDY 3: AIR POLLUTION AND HEALTH RISK

Do people living in areas of Oakland with higher pollution have higher cardiovascular health risks?

**Data**: 3 million air pollution measurements using fast response sensors on Google Street View cars over 1 year. Mapped at 30m resolution.

**Data**: Electronic medical records of 41K people insured by Kaiser Permanente health care, linked with air pollution at residential address.

www.edf.org/airqualitymaps/how-pollution-impacts-human-health
Results

Elderly residents (age 65+) living in areas with higher NO\(_2\) and BC had an increased risk of heart attack, heart disease-related surgery, or death due to heart disease.

- A 3.8 ppb higher NO\(_2\) concentration outside the homes of the elderly living in Oakland study area is associated with
  - 20% increased risk of having a heart attack
  - 12% increased risk of having either a cardiovascular event or dying from a heart attack

- A 0.17 μg/ m\(^3\) higher BC concentration outside the homes of the elderly living in east west or downtown Oakland is associated with
  - 15% increased risk of having a heart attack or having a heart attack and dying

Based on results of this study, an elderly person living at the corner of 7th and Wood would have ~30% higher risk of heart attack, heart disease surgery or death than an elderly person living at the corner of 11th and Campbell, due to elevated concentrations of NO₂.

www.edf.org/airqualitymaps/how-pollution-impacts-human-health
Thank you

www.edf.org/airqualitymaps

Fern Uennatornwaranggoon
T 415 293 6162
fernu@edf.org

Environmental Defense Fund
123 Mission Street, 28th Floor
San Francisco, CA 94105
www.edf.org
Community Air Protection Program (AB617)

Goal: Reduce Emissions and Exposure in Over Burdened Communities

Implications: Lower Health Risk and Improved Health Effects

MAQIP 2030
- Reduce emissions from existing technologies
- Adopt cleaner technologies; invest in zero emission equipment & infrastructure

Truck Plan
- More enforcement officers; proper training
- Truck signage; truck driver education
- Improved truck routes

City Planning, Land Use, Zoning, Ordinances
- Conditional Use Permits: sunset industrial uses near residential areas
- Provide alternative locations and incentives/financial support for businesses to move out of residential areas