Port of Oakland

Where Regulation Meets Environmental Justice: A Model That Scales

~440 t
criteria pollutants emitted at berth annually

442K
below-median-income residents in surrounding communities

86%
reduction in diesel particulate matter since 2005

CARB
mandatory at-berth emissions controls since 2014

Sources: ICCT Port Emissions Screening (2024); Port of Oakland 2020 Seaport Air Emissions Inventory; BAAQMD West Oakland Community Action Plan; U.S. Census ACS

Port Overview

The Port of Oakland is the third-busiest container port on the U.S. West Coast and a critical gateway for Northern California commerce. The port handles approximately 2.4 million TEUs annually across 28 berths, with predominantly container ship traffic. In 2024, loaded TEU volumes increased 18.6% year-over-year, reflecting the port's growing role in trans-Pacific trade.

Oakland occupies a unique position in this portfolio: it is a **CARB-regulated port** where at-berth controls have been in effect since 2014, but it is also home to **West Oakland** — one of the most nationally recognized environmental justice communities in the United States and the first community to complete California's AB 617 emissions reduction planning process. Oakland proves that the CARB regulatory model scales down from the mega-ports of LA/Long Beach to a mid-size port — and that community-led advocacy can drive measurable health improvements.[1]

Who Is Affected

West Oakland is immediately adjacent to the port's container terminals. The community has borne the cumulative burden of port operations, rail yards, freeways, and industrial facilities for decades — a legacy of deliberate infrastructure placement in communities of color.

Community	Population	Key Health Burden
West Oakland	22,000–26,000	42% African American; diesel PM 3x Bay Area background; cancer risk 1,200 per million
East Oakland	120,000+	Elevated asthma rates; cumulative freeway and industrial exposure
Jack London District	8,000+	Adjacent to port terminals and Alameda rail corridor
Alameda	79,000+	Downwind of port operations across Oakland Estuary
Emeryville	12,000+	Northern port impact zone; industrial corridor exposure

Environmental Justice

West Oakland residents face diesel PM concentrations nearly 3 times the Bay Area background — and 6 times the statewide per-capita average. Cancer risk from port, rail, and freeway diesel emissions is estimated at 1,200 excess cancers per million. Asthma ER visits are 76% higher than the Alameda County average, and children under 4 face asthma ER visit rates nearly 3 times the county rate. The ZIP code 94607 has a pediatric asthma hospitalization rate 7 times the statewide average. Life expectancy in West Oakland is 6 years shorter than the county average — and for African American residents, 12–15 years shorter than Oakland Hills neighborhoods just miles away.[2]

Health Impact Analysis

Using the Port of Oakland's 2020 Seaport Air Emissions Inventory and the EPA's concentration-response methodology, we model the remaining health outcomes from at-berth vessel emissions under the CARB regulatory framework.

Oakland demonstrates the CARB model working at smaller scale. STAX 2, a CARB-certified barge-mounted capture system (99% PM2.5, 95% NOx removal — independently verified by Yorke Engineering LLC), operates at Oakland to serve vessels that cannot connect to shore power.

Health Outcome	2005 Baseline Burden	Current (With CARB Regulation)
PM2.5 emissions at port (tonnes/yr)	~250 t	~54 t (78% reduction)
NOx emissions at port (tonnes/yr)	~4,005 t	~2,400 t (40% reduction)
Premature deaths from port PM2.5	Estimated 15–40/year	Estimated 3–9/year (remaining)
Cardiovascular & respiratory hospitalizations	Estimated 60–160/year	Estimated 12–35/year (remaining)
Childhood asthma ED visits	Estimated 90–240/year	Estimated 18–50/year (remaining)
Monetized health benefit of regulation (EPA VSL)	**$55M+/year (baseline burden)**	**$40M+ saved annually by regulation**

Methodology Note

Baseline estimates use EPA's concentration-response function for PM2.5 (Krewski et al. 2009, ACS CPS-II) and EPA Value of Statistical Life ($11.8M, 2024-adjusted). Emissions data from the Port of Oakland 2020 Seaport Air Emissions Inventory and 2017 emissions update. DPM reductions (86%) from port's official inventory comparison. All estimates are conservative — they exclude SOx and secondary PM2.5 formation, which would increase totals. Oakland's ICCT Priority 2 classification reflects the combination of the largest below-national-median population (442,000) among Priority 2 ports with significant remaining emissions.

The West Oakland Model

West Oakland's journey from one of America's most polluted neighborhoods to a national model for community-driven environmental justice is one of the most important stories in U.S. port policy.

The West Oakland Environmental Indicators Project (WOEIP), co-founded by Margaret Gordon and Brian Beveridge in the 1990s, pioneered **resident-led air quality monitoring** before it became standard practice. Their work — including the seminal Pacific Institute report "Neighborhood Knowledge for Change" (2002) — established the data foundation that led to regulatory action.

In 2019, West Oakland became the **first community in California** to complete an AB 617 Community Action Plan, developed collaboratively with the Bay Area Air Quality Management District. The West Oakland Community Action Plan (WOCAP) set enforceable targets for emissions reductions from port trucks, rail, and marine sources.

The five-year results speak for themselves: diesel PM in West Oakland is down 31% from the 2017 inventory, DPM exposure is down 56%, and cancer-risk-weighted emissions are down 28%. These are not projections — they are measured outcomes from a community that refused to accept pollution as inevitable.[3]

In 2013, WOEIP was featured on the White House blog for citizen engagement in air quality measurement. Their partnership with the Environmental Defense Fund, Google Maps, and Aclima produced hyperlocal pollution mapping published in *Environmental Science & Technology* — data that continues to inform regulatory decisions.

The Regulatory Gap — What Oakland Proves

Oakland operates under the same CARB At-Berth Regulation as LA/Long Beach. Container and refrigerated cargo vessels have been subject to at-berth requirements since January 2023. Ro-Ro vessels at Oakland became regulated in January 2025, and tankers will be covered when Northern California ports enter the regulation in January 2027.

STAX 2 operates at Oakland to provide emissions capture for vessels that cannot connect to shore power infrastructure at Everport, OICT, or TraPac terminals. This dual approach — shore power plus barge-mounted capture — ensures comprehensive at-berth coverage regardless of vessel type or terminal configuration.

Oakland proves that the CARB model works at mid-size ports, not just mega-complexes. The health benefits scale with the regulation — and the community-led accountability mechanisms developed in West Oakland provide a template for every port community in the country.

What Oakland Demonstrates

Oakland's experience offers critical lessons for every non-California port:

- **The model scales down**: CARB regulation delivers measurable health benefits at a 2.4M TEU port, not just 10M+ TEU mega-ports
- **Community advocacy works**: West Oakland's AB 617 process produced enforceable emissions reduction targets — and met them
- **Barge-mounted capture fills gaps**: STAX 2 serves vessels that cannot use shore power, ensuring no vessel class is exempt
- **Data drives accountability**: Resident-led monitoring created the evidence base for regulatory action
- **Progress is measurable**: 86% DPM reduction, 31% diesel PM reduction in West Oakland in 5 years

What Comes Next

Oakland's remaining challenge is NOx — where reductions have reached only 40% versus 86% for DPM. NOx is a precursor to secondary PM2.5 formation and ozone, meaning its health impacts extend far beyond the immediate port area. Expanded barge-mounted capture (95% NOx removal) and the CARB regulation's 2027 tanker phase will address this gap.

Port Health Watch is developing frameworks to extend the Oakland model nationally:

- **Air Quality Health Units (AQHUs)**: The first tradable health benefit asset class for port pollution reduction, under development for submission to Verra's SD VISta program. Learn more →
- **Carbon credit methodology**: A Verra VCS methodology for at-berth maritime carbon capture, targeting July 2026 submission. Learn more →

The Model

Oakland proves that at-berth emissions regulation works at every scale — and that community-led advocacy creates the accountability that makes regulation effective. With diesel particulate matter down 86% from 2005, cancer-risk-weighted emissions down 28% in West Oakland, and STAX barge-mounted capture filling the shore power gaps, Oakland is the blueprint for mid-size ports nationwide. The question is not whether this model works. It's whether other states will adopt it.

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1. Port of Oakland, "2020 Seaport Air Emissions Inventory" (2024); ICCT, "Nationwide port emissions screening for berthed vessels" (September 2024); Port of Oakland, "86% Reduction in Diesel Emissions" press release. ↩
2. CARB, "West Oakland Diesel PM Health Risk Assessment"; BAAQMD, "West Oakland Community Action Plan" (2019); Alameda County Public Health Department; U.S. Census ACS 5-year estimates. ↩
3. WOEIP, "West Oakland Community Action Plan 5-Year Progress Report" (2024); BAAQMD AB 617 Community Air Protection Program; Pacific Institute, "Neighborhood Knowledge for Change" (2002). ↩

This assessment was produced by Port Health Watch, a research initiative of Civil Ledger Lab, operated by EcoAsset Lab LLC. For site-specific assessments with higher-resolution modeling, contact research@porthealthwatch.org.