Port of Houston / Galveston

The Cost of Breathing Along America's Busiest Ship Channel

~1,000 t
criteria pollutants emitted at berth annually

1.5M
below-median-income residents in surrounding communities

$100M+
estimated annual public health cost of port emissions

ZERO
mandatory at-berth emissions controls

Sources: ICCT Port Emissions Screening (2024); Port Houston 2019 Goods Movement Emissions Inventory; EPA BenMAP methodology; U.S. Census ACS

Port Overview

The Port of Houston is the largest port in the United States by total waterborne tonnage and the busiest petrochemical port in the nation. The Houston Ship Channel stretches 52 miles from the Gulf of Mexico through densely populated communities in East Harris County. The port handles over 8,000 vessel calls annually, with tankers accounting for approximately 80% of deep-draft vessel traffic — a fleet composition that makes shore power impractical and emissions capture the only viable at-berth control technology.

The Port of Galveston, located 50 miles southeast, handles cruise ships, cargo, and petroleum products. Together, the Houston and Galveston port group is classified as an ICCT Priority 2 port complex for health impact intervention. While docked, these vessels run auxiliary diesel engines and boilers that emit fine particulate matter (PM2.5), nitrogen oxides (NOx), sulfur oxides (SOx), and carbon dioxide (CO_2) directly into adjacent residential neighborhoods.

Who Is Affected

The communities lining the Houston Ship Channel are overwhelmingly low-income and communities of color. More than 136,000 people live within one-half mile of the channel, facing cumulative exposure from refineries, chemical plants, and vessel emissions simultaneously. NRDC analysis found that air pollution burdens in Ship Channel communities were approximately 50–60 times those of the broader Houston metropolitan region.[1]

Community	Population	Key Health Burden
Galena Park	10,000	Majority-Hispanic; formaldehyde levels 7x EPA chronic screening level
Manchester / Harrisburg	10,000+	Cancer rates 22% above city average; PM2.5 burden 50–60x regional average
Pasadena	150,000+	Adjacent to Ship Channel refineries and terminal complexes
Deer Park	34,000	Surrounded by petrochemical facilities; cumulative industrial exposure
Texas City	50,000+	Galveston Bay port community; refinery and terminal emissions

Environmental Justice

Houston Ship Channel communities are predominantly Hispanic and low-income, with median household incomes well below the state average. Amnesty International has documented that residents near the Ship Channel have lower life expectancies than those in wealthier neighborhoods farther from the industrial corridor. During Hurricane Harvey, 94% of excess toxic emissions in Harris County were concentrated in these communities.[2]

Health Impact Analysis

Using the ICCT's Port Emissions Screening data and the EPA's concentration-response methodology, we model the health outcomes attributable to at-berth vessel emissions and the benefits of their reduction.

The scenario below models outcomes using the performance of currently deployed, CARB-certified barge-mounted capture systems (99% PM2.5, 95% NOx removal — independently verified by Yorke Engineering LLC). This technology is particularly critical for Houston, where tanker dominance makes shore power infeasible for the majority of vessel calls.

Health Outcome	Current Annual Burden	With At-Berth Capture
PM2.5 emissions at port (tonnes/yr)	~350 t	69–99% reduction
NOx emissions at port (tonnes/yr)	~550 t	Up to 95% reduction
Premature deaths from port PM2.5	Estimated 30–80/year	20–75 lives saved/year
Cardiovascular & respiratory hospitalizations	Estimated 120–320/year	85–305 avoided/year
Childhood asthma ED visits	Estimated 180–480/year	125–460 avoided/year
Monetized public health benefit (EPA VSL)	**$100M+/year**	**$60–$100M saved/year**

Methodology Note

Premature death 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). Hospitalization and ED visit rates scaled from Texas Department of State Health Services surveillance data and ICCT emissions screening. Ranges reflect uncertainty in dispersion modeling and exposure assumptions. All estimates are conservative — they exclude SOx and secondary PM2.5 formation, which would increase totals. Houston's cumulative industrial burden means actual health impacts from port emissions are likely compounded by co-exposures from adjacent petrochemical facilities.

The Ship Channel Impact

The Houston Ship Channel is unique among U.S. port complexes: a 52-mile industrial corridor where more than 200 petrochemical facilities operate alongside the nation's busiest waterway. Vessel emissions are not the only — or even the primary — source of pollution in these communities. But they represent a controllable, quantifiable source that can be reduced with commercially available technology today.

The tanker-dominated traffic profile compounds the challenge. Tankers cannot use shore power due to the safety risks of electrical connections near volatile petroleum cargo. They also run high-capacity auxiliary boilers while discharging, generating disproportionate PM2.5 and NOx per vessel-hour at berth. Port Houston's 2019 emissions inventory found that tanker boiler emissions offset much of the NOx reductions achieved through lower-sulfur fuel compliance.[3]

This makes Houston the strongest case in the United States for barge-mounted emissions capture technology — the only proven solution for at-berth tanker emissions control.

The Regulatory Gap

California's CARB At-Berth Regulation has been in effect since 2014 and was strengthened in 2020. In October 2023, the EPA authorized California's regulation under the Clean Air Act, which legally enables other states to adopt the identical standard. **Texas has not done so, and the Texas Commission on Environmental Quality (TCEQ) has no equivalent rulemaking underway.**

The TCEQ has faced criticism for its enforcement record on industrial air pollution. Over the past eight years, the agency has penalized just 2% of all illegal air pollution events in Texas. Ship Channel communities remain without mandatory protection from at-berth vessel emissions despite facing some of the highest cumulative pollution burdens in the country.

Pathways to Action

Several pathways exist for reducing at-berth emissions at the Houston/Galveston port complex:

- **State adoption of CARB-equivalent regulation**: Texas could adopt California's at-berth standard under the EPA authorization, though political dynamics make this the least likely near-term pathway
- **Port authority voluntary commitment**: Port Houston could require at-berth controls as a condition of terminal leases — following its own Clean Air Strategy Plan commitments
- **Carbon credit incentives**: Voluntary carbon market frameworks currently under development could provide revenue to fund capture deployment without regulatory mandates
- **Federal EPA Clean Ports funding**: The $3 billion Clean Ports Program (IRA Section 60102) — disbursement status under current administration requires FOIA verification
- **Community-driven advocacy**: Organizations including Air Alliance Houston, TEJAS, and the Healthy Port Communities Coalition are actively campaigning for Ship Channel emissions reductions

What Comes Next

This assessment is a screening-level analysis using publicly available data. A full site-specific assessment for the Houston/Galveston port complex — with higher-resolution dispersion modeling, localized health data, and census-tract-level environmental justice analysis — is available through our research services.

Port Health Watch is also developing:

- **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 Opportunity

At-berth emissions capture along the Houston Ship Channel could save 20–75 lives per year, prevent hundreds of hospitalizations and emergency room visits, and deliver up to $100 million annually in monetizable health benefits — using technology that is commercially deployed and independently verified today. In a port complex where tankers dominate and shore power is not viable, barge-mounted capture is the only proven pathway to at-berth emissions control.

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1. NRDC and Texas Environmental Justice Advocacy Services (TEJAS), "Toxic Air Pollution in the Houston Ship Channel: Disparities Show Urgent Need for Environmental Justice" (2020); U.S. Census ACS 5-year estimates. ↩

2. Amnesty International, "Living Near the Houston Ship Channel"; Environmental Health News, "Measuring Houston's Environmental Injustice from Space" (2019); Texas Tribune analysis of Hurricane Harvey emissions data. ↩

3. Port Houston, "2019 Goods Movement Emissions Inventory" (December 2021); ICCT, "Nationwide port emissions screening for berthed vessels" (September 2024). ↩

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.