

Addressing Freight Pollution at the Source

Air Pollution, Freight Facility Clusters, and the Role of Indirect Source Rules

HIGHLIGHTS

Nationwide, over 66 million people—nearly one in five people in the United States—live near freight facilities and corridors. Growth in e-commerce has driven the construction of larger, increasingly clustered warehouses, and UCS research shows that higher concentrations of nearby warehouses are associated with greater environmental and health impacts in freight-adjacent areas. Because the US freight system largely runs on fossil fuels that pollute the air, people living around freight facilities and corridors are often exposed to elevated levels of harmful pollutants. Public health issues resulting from exposure include chronic and lethal illnesses that disproportionately affect people of color and people with lower incomes.

But indirect source rules (ISRs) for freight hubs can reduce emissions in the near term and direct investments to the people most burdened by freight pollution. This policy tool requires facilities that are pollution sources to begin to address pollution attracted by their operations.

The US freight system exposes people living and working near major ports, railyards, and warehouses to significant and disproportionate levels of air pollution. Nationwide, over 66 million people—nearly one in five people in the United States—live near freight facilities and corridors. Their communities continue to suffer despite meaningful reductions in exposure to transportation pollution in recent decades.

According to a Union of Concerned Scientists analysis, Indirect Source Rules (ISRs) offer state and local governments a promising policy tool for continuing to address the inequitable impacts of freight pollution. ISRs can also help sustain progress toward the broader pollution reductions delivered by zero-emission freight. These policies require facilities to address the “indirect” emissions associated with their operations (as opposed to “direct” or point-source emissions, such as from smokestacks).

Today, the US freight system runs largely on fossil fuels that pollute the air, harming both people and the planet. Those who live near freight facilities and corridors are often exposed to elevated levels of harmful air pollutants. The results in freight-adjacent communities, which

are disproportionately communities of color and low-income, include higher rates of cancers, cardiovascular and pulmonary diseases, and other illnesses.

Freight Hubs Are Major Indirect Polluters

The rise in e-commerce has reshaped goods consumption and fundamentally altered the freight system that underpins the movement of goods. Although these changes have introduced some systemic efficiencies, they are also driving the construction of increasingly large warehouses, increasing the clustering of freight hubs, and increasing the operation of fossil-fueled tractor trucks, cargo handling equipment, and other vehicles. Nearly 60,000 large warehouses, distribution centers, and truck terminals now support the US freight system. As waypoints for goods making their way from ports and railyards to consumers, these facilities are often highly concentrated near major metropolitan areas where their operations attract and create significant amounts of air pollution.

Both coastal and inland ports are significant drivers of local and regional air pollution from freight trains, transoceanic ships, other marine vessels, and an ever-increasing number of trucks. In 2023, nearly 40 million shipping containers moved through the top 25 US container ports. The top five ports—Los Angeles, Long Beach, New York/New Jersey, Savannah, and Houston—moved around 60 percent of containers.

States with the highest shares of freight-adjacent populations tend to be those that have large shares of urban residents and that are also home to major international container ports (Table ES1). The largest container ports are in California and New Jersey, where 27 and 31 percent of residents, respectively, live near freight hubs and corridors. Illinois, a national hub for rail freight, is the fourth largest freight mover by tonnage. Around one-quarter of all US freight trains move through the Chicago area and over 40 percent of Cook County residents live close to freight hubs and corridors.

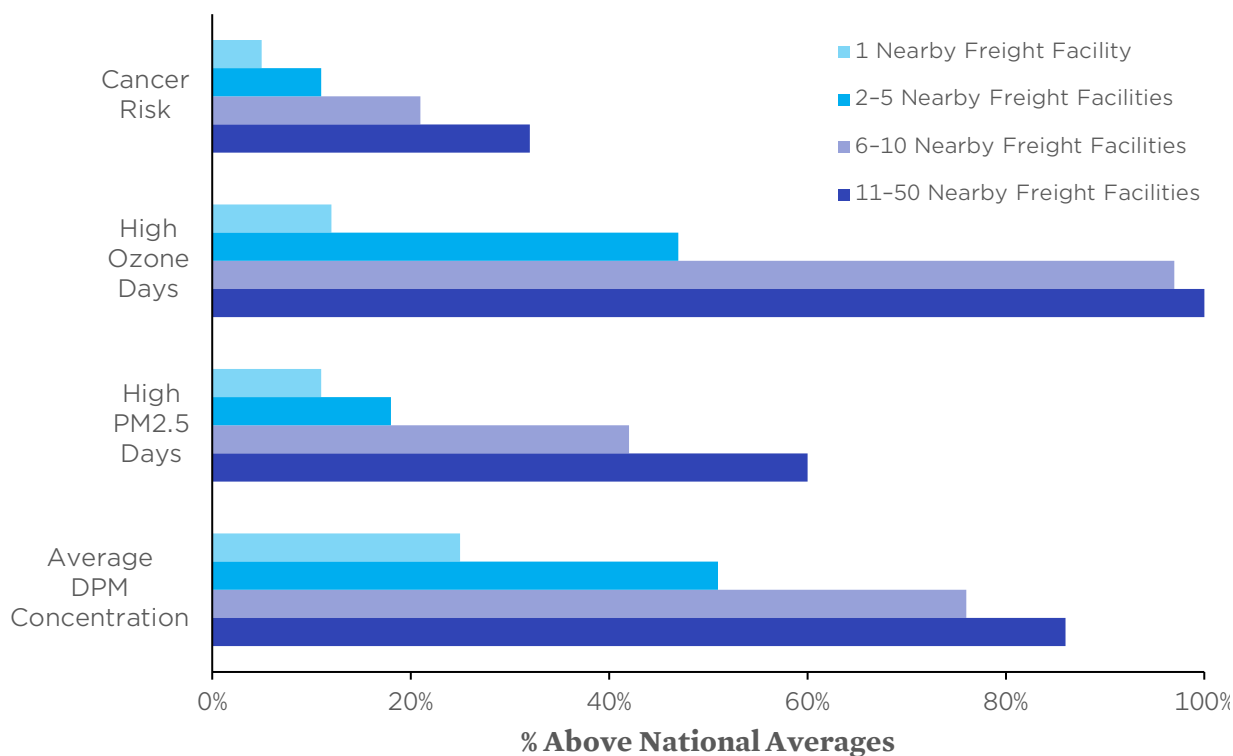
Table ES1. States with the Highest Shares of Populations Near Freight Facilities

	Freight-Adjacent Population	State Population	Freight-Adjacent Population Share
New Jersey	2,905,319	9,298,402	31.25%
New York	5,611,949	19,713,025	28.47%
Illinois	3,526,201	12,609,577	27.96%
California	10,632,085	39,125,347	27.17%
Massachusetts	1,770,939	7,025,465	25.21%

California and New York have the highest shares of residents living near warehouses, ports, railyards, and freight corridors.

As clusters of freight facilities grow, so does pollution exposure and cancer risk in nearby neighborhoods. Areas near more than 10 freight facilities experience average concentrations of diesel particulate matter (DPM) 85 percent higher than the national average, over twice as many high ozone days, and nearly 60 percent more days of elevated fine particulate pollution (PM_{2.5}) (Figure ES2). In census tracts close to more than 10 freight facilities, residents are 32 percent more likely to develop cancer from air toxics than the average nationally.

Figure ES1. Pollution Concentrations and Cancer Risk in Freight-Adjacent Areas, by the Number of Nearby Freight Facilities



Pollution indicators increase as the concentration of nearby freight facilities grows. Cancer risk increases as the concentration of nearby freight facilities grows.

Across the contiguous United States, over 27 million people live close to two or more freight facilities; over 1.8 million people live near more than 10 facilities. Communities of color make up nearly 80 percent of people living near the highest concentrations of freight facilities despite representing about 40 percent of the population nationwide.

ISRs Can Help Address Air Pollution Disparities

ISRs establish both facility-specific targets for reducing emissions *and* flexible sets of compliance options that covered facilities can use to meet those targets. The options may include, for example, installing infrastructure for charging electric vehicles or increasing visits by zero-emission trucks and delivery vans.

ISRs are well-suited to addressing the freight sector’s air pollution. Such policies require facilities to mitigate the pollution they attract from trucks, ships, locomotives, on-site cargo handling equipment, and other sources. The goal is to improve air quality in nearby communities, particularly those around clusters of such facilities.

A pioneer example is the Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program, the ISR of California's South Coast Air Quality Management District. Between 2021 and 2024, the use of zero-emission yard trucks at covered facilities increased by over 900 percent; visits of zero-emission Class 8 trucks increased nearly six-fold. During the same timeframe, the use of electric truck chargers at covered facilities increased from 0.87 GWh to 22.96 GWh, roughly the power that would drive battery-electric tractor trucks about 12 million miles. In 2024 alone, facilities subject to WAIRE generated over 106 GWh of solar energy, theoretically the amount of energy needed to power around 14 percent of the 2024 miles driven by Ports of Los Angeles and Long Beach drayage trucks.

By encouraging the adoption of less-polluting vehicles and equipment, ISRs can help increase demand for and supplies of clean technologies. And by making zero-emission fueling stations more available in and around freight hubs, the policies can improve the business case for companies to develop regional zero-emission fueling stations. This, in turn, accelerates the wider adoption of zero-emission trucks.

Best Practices for ISR Policy Designs

A well-designed, freight-focused ISR would meaningfully reduce air pollution around major freight hubs by offering flexible compliance pathways tailored to local economic and operational conditions. It would encourage cleaner vehicle visits, promote the use of cleaner equipment, and support infrastructure investments. Thus, it would directly reduce harmful emissions even as it accelerates the transition to a zero-emission freight system.

Several best practices for freight-focused ISR policy designs have emerged as California has implemented regional ISR programs and similar programs have been proposed in other states. At the highest level, a freight ISR would measurably and lastingly reduce air pollution in and around hubs *and* influence wider electrification throughout the economy.

Achieving these ambitious goals depends on policy designs that are feasible, flexible, and cost-effective over the long term. Best practices include:

- Robust baseline data and impact measurements to establish clear targets and evaluate policy and program performance over time;
- Feasible and flexible compliance options that deliver measurable and sustainable local pollution reductions;
- Permitting and zoning provisions that address operational and cumulative impacts on nearby communities; and
- Adaptive implementation through local air quality monitoring and modeling to ensure programs evolve with changing freight activity and technology availability.

In addition, strong public participation is essential. Inclusive and accessible processes that center local needs and communities facing cumulative pollution burdens can help ISR programs balance public health benefits with costs to covered facilities.

Finally, freight-focused ISRs must prioritize actions that produce real, net reductions in pollution near freight facilities. Compliance pathways should focus on technically feasible

measures that directly reduce emissions rather than enable expanded operations or shift benefits outside freight-adjacent communities.

Addressing Pollution While Advancing Freight Electrification

In an uncertain political environment, ISRs offer a critical pathway for continued state and local actions that achieve measurable public health benefits. While they are unlikely to fully compensate for stalled or reversed progress at the federal level, they offer a practical, durable mechanism for reducing emissions in the near term and directing investments to communities most burdened by freight activity. And when paired with complementary clean freight policies and investments in zero-emission vehicles, equipment, and infrastructure, ISRs can help protect freight-impacted communities today while reinforcing momentum toward a modern, sustainable freight system.