Freight Transport and Goods Movement - Impacts on Workers, Health, Community and the Environment

An excerpt from the forthcoming report: Global Trade Impacts: Addressing the Health, Social and Environmental Consequences of Moving International Freight through Our Communities

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Impacts on Workers, Health, Community, and the Environment

Evidence makes it clear that global trade and the freight transportation system causes substantial environmental, health, workplace and community impacts. These include local and regional air pollution from emissions of ships, trucks, locomotives, and yard equipment operating at ports, rail facilities, on highways, and at warehousing operations. Such impacts can disproportionately affect residents in communities near ports and in neighborhoods near freeways or where heavy truck traffic or locomotives are present, in addition to affecting the health of dock and warehouse workers, truck drivers, and railroad employees. Recognizing that port and rail communities disproportionately bear the costs of health impacts from international trade while the rest of the U.S. reaps benefits, Mayor Bob Foster of Long Beach CA commented in 2008:

> Quite frankly, my first job as mayor of Long Beach is to protect the health and safety of my citizens. In my city, families that live along the trade corridors have two to three times the statewide average of asthma cases. That's not an accident. I've said it many times: we are not going to allow kids in Long Beach to contract asthma so someone in Kansas can get a cheaper television set. Those days are over.[1]

Other neighborhood impacts from freight transportation operations include noise, round-the-clock bright lighting at port and rail operations, conflicts between incompatible land uses and public health, and the potential for contamination from hazardous spills. Goods movement communities also face traffic safety problems, unsafe streets for pedestrians, and hefty local tax charges to repair streets that are damaged by big-rig trucks.

Workers in the freight transportation industry face a number of issues. Some, such as unionized longshore workers, are able to secure living wages and benefits while others, such as warehouse workers, are part of the contingent workforce, working at the convenience of employers and often through a temp agency. Still others, such as port truck drivers, who are technically classified as "independent contractors," are left to carry the heavy burden of maintaining and operating their trucks while performing the work of private freight transport firms.

On a more global scale, international trade activities contribute to global warming, with significant emissions of carbon dioxide, black carbon and other pollutants. While the published and peer review literature has documented these community, workplace, health, and environmental impacts, findings have not been widely incorporated into policy decisions or into assessments of the comparative benefits and negative impacts from international trade and freight transportation. The section of the report below provides a brief summary of health research findings and helps situate the policy and organizing context for how best to address the underlying problems associated with international trade and goods movement traffic. Additional information about air pollution and health impacts can be found in a searchable U.S. EPA database of scientific citations.[2]

Impact on Workers

Health and safety of workers in the freight transportation industry

Many workers in the goods movement industry also face significant health and safety hazards on their jobs as truck drivers, warehouse workers, and railroad workers. For example:

- **Worker fatalities**. In 2009, workers in the "transportation and warehousing" industry had the second highest number of worker fatalities in the United States, with #1 being "construction." As a rate, workers in this industry had the third highest work injury fatality rate of all industries, exceeded only by the category of "agriculture, forestry, fishing, and hunting" (#1) and by "mining" (#2).[3]
- **High hazard jobs**. In California, both warehousing and truck transportation were on the "Highest Hazard Occupation" list for OSHA inspections (2009-2010).
- **Exposure to heat stress**. Workers in non-air conditioned truck and locomotive cabs and in warehouses are subject to potential heat stress. Warehouses in the Inland Valleys of Southern California, where summer temperatures are often above 100 degrees F, seldom have air-conditioning.
- **Lung cancer and heart disease deaths, accidents – truck drivers**. A study of causes of death among unionized workers in the trucking industry (compared with the general U.S. population) found an excess of lung cancer and heart disease deaths among drivers, dock workers and shop workers at trucking terminals, and higher than expected deaths from transportation-related accidents.[4] Another scientific study surveyed 31,000 union workers in the U.S. trucking industry exposed to higher levels of diesel exhaust on a regular basis as part of their jobs. It found that they were more likely to develop lung cancer with increasing years of work. [5] According to the California Air Resources Board, lung cancer rates among workers in the trucking industry are among the top five highest rates of all industries surveyed in the state.[6, 7]
- **Lung cancer deaths – railroad workers**. A study of nearly 55,000 U.S. railroad workers (who worked in the industry from 1959 – 1996 found that exposure to diesel exhaust was linked to lung cancer deaths among these workers.[8]
- **COPD – railroad workers**. U.S. railroad workers hired after the introduction of diesel locomotives had a 2.5% increase in chronic obstructive pulmonary disease (COPD) mortality risk for each additional year of work in a diesel-exposed job.[9]

For those workers who live in the neighborhoods surrounding ports, the health risk is compounded. In Los Angeles, for example, 50% of port truck drivers live in low-income or poverty level neighborhoods near the ports and along the port trucking corridors,[10] where levels of localized air pollution are elevated.

Exposure to Air Pollutants

Air pollution is a mixture of gases, such as carbon monoxide and nitrogen dioxide, and particles of different sizes. The particles usually come from vehicle emissions, factories, wood or gas stoves, and/or wildfires.

Goods movement activities provide multiple sources of air pollution, much of which relate to diesel emissions. Freight transportation can add to "regional air pollution" or, in cases where freight facilities are close to homes and schools, they can create "localized pollution." Thus, ship and vehicle emissions near a port can add to the regional pollution that residents in a wide geographic breathe. But for those residents who live in close proximity to a marine terminal with ships, yard equipment and idling trucks waiting for containers, it can mean additional "local pollution." This is also true for residents living near rail yards, highways, and distribution centers. In these cases, not only are the residents exposed to regional pollution similar to all residents in their region, but they are also exposed to additional pollution because of their closeness to truck, locomotive and ship exhaust.

Diesel exhaust consists of gases and particles. Some of these particles are in the $PM_{2.5}$ range (that is they are smaller than 2.5 microns in diameter). Within that size range are extremely small particles called "ultrafine particles," tinier than 0.1 microns in diameter. Automobile exhaust also contains particles in these sizes. Both cars and diesel trucks emit "black carbon" in their exhaust, although much higher levels of black carbon (or "elemental carbon") are found when sampling air pollution levels on truck-congested highways than on highways with mostly gasoline vehicles.

Diesel particulate forms a large part of the fine particulate matter (PM) in urban air.[11] Because studies of PM seldom differentiate the source of the particulate matter (that is, whether the PM comes from gasoline vehicles, diesel vehicles, power plants, refineries, etc.), we present first the information on health effects of PM and then the specific studies addressing diesel PM. We also note that diesel exhaust contains gases as well as both fine and ultrafine particles (UFPs).

Below, we describe some of the research findings on health effects of exposure to air pollution.

Health effects of exposure to $PM_{2.5}$

Studies demonstrate that exposure to $PM_{2.5}$ (particles) increases the risk of cardiovascular disease and reduces life expectancy. That is, those exposed to higher levels of particulate matter are more likely to develop cardiovascular disease or die earlier than expected from heart disease (such as heart attacks and coronary artery disease, according to a number of studies published during the past 20 years.[12,13, 14] The American Heart Association recently published a statement on the role of air pollution in heart diseases, stating that:

Numerous epidemiological studies conducted worldwide have demonstrated consistent associations between short-term elevations in PM and increases in daily cardiovascular morbidity [illness] and mortality [death]…. Several studies have also reported adverse cardiovascular outcomes in relation to long-term PM exposure. Elderly patients, those with underlying coronary or pulmonary disease, lower socioeconomic populations, and diabetics may be at particularly increased risk… Pope has estimated an average loss of life expectancy directly related to chronic air pollution exposure from between 1.8 and

3.1 years for those living in the most polluted cities in the United States. Cardiovascular causes account for the majority (69%) of the overall excess in morbidity and mortality.[15]

Globally, concerns have also been raised about shipping emissions, because ships have diesel engines that run on bunker fuel – a low-grade fuel that is considered "dirtier" than diesel fuel. A landmark study by a University of Delaware scientist noted that those living near coastlines are at particular risk from particulate matter in shipping emissions; he and his team calculated that 60,000 persons a year die prematurely from particulate matter released by ocean-going ships involved in international trade.[16]

Diesel particulate emissions in the community: impacts on residents' health

Concerns about diesel exposure are highlighted in this report because the ships, trucks, locomotives and much of the yard equipment used along the entire goods movement supply chain are diesel-fueled and emit a significant amount of air pollutants – and they create significant risk for residents in goods movement communities.

Diesel emissions cause some of the most extensive impacts from freight transportation. The California Air Resources Board estimates, for example, that goods movement activities in that state each year cause 3,700 people to die prematurely – earlier than they would have if they had not been breathing high levels of particulate matter.[17]

To calculate the anticipated output of particulate matter (PM) and other air pollutants, a number of ports have conducted emissions inventories. One of the first such studies was conducted in Southern California and published in 2007, estimating that the Port of Los Angeles in 2005 was contributing 12.5% of the PM air pollution in the Southern California region (and that the Los Angeles and Long Beach Ports combined were contributing some 25% of the region's PM).[18] This inventory determined that ships were the largest source of diesel pollution from the ports, producing 54% of the ports' diesel emissions in 2006, with freight trucks being second.[19]

Another study of the Port of Los Angeles was a Health Risk Assessment (HRA), conducted by the California Air Resources Board. It found an elevated diesel cancer risk in those living close to the Port, but also found that even 15 miles away residents had a higher risk than others in Southern California did. The HRA calculated that emissions from the two Ports combined were estimated to cause annually 120 premature deaths and 750 asthma attacks.[20] Another study by the South Coast Air Quality Management District took air pollution samples and modeled air pollution risks. It, too, demonstrated elevated diesel cancer risks in and around the Port of Los Angeles, leading one resident – an emergency room physician – to proclaim that those in the Harbor area were "living in a diesel death zone."[21]

Emissions inventories have also been conducted at 18 major rail yards in California, as part of a series of Health Risk Assessments for those yards prepared by staff of the California Air Resources Board. The inventories were used to estimate the tons of particulate matter in diesel exhaust emissions at each yard per year. For example, a large

BNSF rail yard in Barstow, CA was estimated to emit 26 tons of diesel particulate matter per year.

Above, we described some of the known health impacts of diesel exposure on workers, including lung cancer. Exposed community members are also considered at risk of lung cancer from diesel emissions in and near their communities. Some of the other known health impacts for residents exposed to diesel include:

- **Reduced lung function in children exposed to diesel while growing up**. According to investigators at the University of Southern California, children who grow up in more polluted communities with high levels of elemental carbon or EC (indicating diesel particle pollution) are more likely to have reduced lung function.[22]
- **Effects on lung function in adults with asthma, exposed for a brief period to diesel exhaust.** A study in London demonstrated that short-term acute exposure to diesel exhaust in adults who already had asthma could impact lung function; the study compared persons with asthma who walked in a park with no diesel traffic and then several weeks later walked on a London street with high volumes of diesel taxis and buses. Reduction in lung function and an increase in markers of inflammation were seen when the group was exposed to diesel exhaust – and the changes were associated with elevated levels of elemental carbon and UFPs.[23]
- **Reduced sperm production and endocrine disruption in laboratory animals**. In a series of Japanese studies of laboratory animals, prenatal (in *utero*) exposure to diesel exhaust particles were found to reduce sperm production in adulthood.[24] The Japanese team concluded that exposure to diesel exhaust particles disrupts endocrine (testicular) function in the male mouse reproductive system.[25] In many of these studies, filtered air caused the adverse effects, suggesting that the gaseous phase of diesel exhaust appears to be the cause.

Health impacts of exposure to ultrafine particles

New concerns have been raised in the past 10-12 years about the potential health effects of ultrafine particles (UFPs) from combustion processes. These UFPs have been studied less extensively than $PM_{2.5}$ or larger PM_{10} particles. UFPs do not weigh much because of their size, making up only 10% of the total mass of $PM_{2.5,}$ and they have a large surface area, to which harmful chemical constituents from the exhaust can adhere.[26]

Recently, fourteen European scientific experts collaborated on reviewing the scientific literature on UFPs. Most of the experts concluded that:

> The likelihood of an independent causal relationship between increased short-term UFP exposure and increased all-cause mortality, hospital admissions for cardiovascular and respiratory diseases, aggravation of asthma symptoms and lung function decrements was rated medium to high.[27]

The group stressed the importance of considering UFPs in future risk assessments and the need for further research on UFP exposure and health effects. Similar suggestions were made at a symposium in California sponsored by the South Coast Air Quality

Management District, at which several scientists who spoke concluded that that if UFPs cause health effects, an air pollution standard for UFPs is needed.[28]

Some of the studies show that:

- **More than 90% of particles in diesel exhaust are actually ultrafine particles UFPs**) – smaller than 0.1 micron in diameter, and the **tiny particles can be easily inhaled into the lung.**[29] Laboratory studies increasingly show that these UFPs are more toxic and have a greater ability to cause lung inflammation than larger sized particles.[30]
- **Ultrafine particles appear to possess the most toxic potential of various size particles**, according to Los Angeles researchers.[31]
- **Ultrafine particles translocate (migrate) to the brain**[32] **and to promote early atherosclerosis** (hardening of the arteries) in exposed laboratory animals.[33]

Exposure to traffic-related pollution: living close to busy road and highways

New studies over the past decade have examined the levels of traffic-related pollution at different distances from homes and schools, the volume of nearby traffic, and the nature of land uses in the area. These studies have shown that the levels of several traffic-related pollutants (ultrafine particles, nitrogen dioxide, and elemental carbon, a marker for diesel) are high in close proximity to roadways, especially within the first 150 meters from the road[34] and that living or going to school in close proximity to busy roads and highways with significant traffic-related pollution is linked to adverse health effects. Studies involving children exposed to traffic-related pollution have shown the following effects:

- **Reduced lung function**. Children who live near traffic-related air pollution are more likely to suffer reduced lung function as they grow up.[35]
- **Increased risk of asthma**. Children living in homes within 225 feet of a highway have an increased risk of asthma.[36] Children are more likely to develop asthma when exposed to traffic pollution at school.[37]
- **Increased wheezing, use of medication**. Asthma exacerbation such as wheezing and use of more asthma medication occurs more often among children living closer to highways.[38]

Many recent studies involve adults exposed to traffic-related pollution. The research findings have shown the following adverse effects:

- **Low-birth weight babies.** Women who live near busy highways while pregnant are more likely to have babies with low-birth weight or who are premature.[39]
- **Miscarriages**. California women who live within 50 meters of a road with daily traffic of 15,200 or more (compared to women living further away and exposed to less traffic) were more likely to suffer miscarriage. This finding was especially true among African-American and nonsmoking women.[40]

- **Pregnancy complications**. Exposure to traffic-related air pollution during pregnancy increases risk of preeclampsia and preterm birth.[41]
- **Women undergoing in-vitro fertilization** who were exposed to higher levels of traffic-related air pollutants, particularly nitrogen dioxide, had an increased chance of in-vitro fertilization failure.[42]
- **Breast cancer**. The risk of breast cancer among post-menopausal women is higher in areas where there are higher levels of NO_2. In this Canadian study, there was an increased risk of ~25% for every increase of 5 ppb in exposure to NO_2 (as a marker for traffic-related pollutants) when the levels in one area were 5 ppb higher than in another area, the risk of breast cancer went up by 25%.[43]
- **Atherosclerosis.** Adults living within 328 feet of a Los Angeles freeway have twice the average progression of atherosclerosis, the thickening of artery walls that can lead to heart disease and stroke.[44]
- **Cognitive impairment**. Women living within 50 meters of roads with at least 10,000 vehicles a day on them are more likely to develop mild cognitive impairment as they age.[45]
- **Diabetes**. In a study of German women living near busy roadways, women who were exposed to traffic-related pollution were more likely to develop new cases of diabetes than those who were not exposed.[46]
- **Heart/lung disease deaths**. Living near a major road is strongly associated with deaths from cardiopulmonary (heart/lung) disease. Adults who lived near a major road in the Netherlands were found to have twice the risk of mortality from heart/lung disease as adults in the same city living further from roads.[47]
- **COPD**. Long-term exposure to traffic-related air pollution may contribute to the development of chronic obstructive pulmonary disease (e.g., emphysema), and this may be more likely to occur in people with diabetes and asthma.[48]

In addition, an analysis of cancer by census tracts in Los Angeles County found elevated rates of throat, mouth and tongue cancers and certain types of lung cancer in close proximity to a truck-congested I-710 freeway in Los Angeles County,[49] one of the most heavily used highways for movement of goods in the country.

Regulation of diesel emissions

Vehicle emission standards in the U.S. are promulgated by the U.S. EPA. The State of California has authority under the Clean Air Action to adopt more stringent standards, which are set by the California Air Resources Board. Other states can adopt the California standards or the national standards.

The U.S. EPA has studied the health effects of diesel exhaust and concluded that diesel is a "likely" human carcinogen, that is, a toxic likely to cause cancer in humans who are exposed over time. The agency regulates diesel exhaust as a Mobile Source Air Toxic (MSAT).

In California, diesel particulate matter is regulated more strictly than in the rest of the U.S. In 1998, diesel particulate was designated a Toxic Air Contaminant (TAC) in that state, based on more than 30 studies showing that worker exposure to diesel exhaust is linked to lung cancer and other health effects.[50] This designation, along with hundreds of scientific studies showing the health effects of particulate matter (especially $PM_{2.5}$) provides authority for California to strictly regulate diesel emissions.

Community groups have raised serious concerns about locomotive emissions, especially from idling locomotives operating at rail yards that are near homes and schools. U.S. EPA has primary regulatory authority over locomotive emissions and has issued regulations. Arguing that "Federal law preempts California from setting emission standards for new locomotives and new engines used in locomotives," CARB has instead negotiated voluntary agreements with BNSF and Union Pacific, the two major freight railroads operating in the State. The South Coast Air Quality Management District attempted to limit idling of locomotives, efforts that have ended up in litigation. These voluntary efforts have disappointed and angered environmental justice organizations that represent residents who live near rail yards and resulted in protests in both Los Angeles and Sacramento.

Exposure to Noise

Port and intermodal rail operations are noisy by virtue of the locomotives and yard equipment being used and the handling of heavy containers by cranes and other equipment. A common negative impact in freight transportation communities relates to the high volume of heavy-duty trucks – a major source of noise. Community and occupational health studies show that noise can affect health and quality of life.

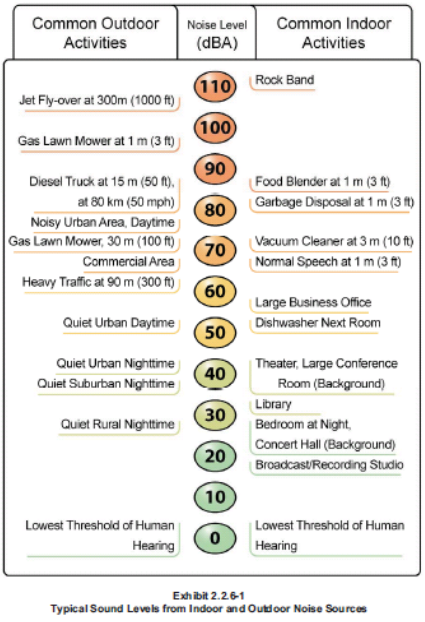
Transportation noise research, largely conducted in Europe, shows three main types of impacts from noise:

- **Psychological (e.g. annoyance).** A number of studies show significant annoyance from exposure to high levels of transportation noise above 60 decibels.[51] Children studied in The Netherlands were found to be seriously annoyed by both aircraft noise and road traffic noise at school.[52]
- **Physiological (e.g., hearing loss, increase in blood pressure).** Published studies show that workers are at risk of noise-induced hearing loss from noise at rail yards.[53] In addition, chronic noise exposure may contribute to the progression of heart disease.[54] In a recent study in the Netherlands, adults living near roadways who were exposed to noise were found to have higher rates of stroke in relationship to higher levels of noise, after accounting for air pollution.[55]
- **Mental health (e.g., anxiety).** Elevated noise levels from road traffic and airports affect children's mental health and classroom behavior.[56, 57, 58] Excessive noise from traffic can disturb restorative sleep.[59]

The figure below shows the noise levels in decibels for common outdoor and indoor noise activities. Note that quiet urban daytime noise is usually slightly above 50 dBA

and that a diesel truck 50 feet away, going 50 miles per hour, may register between 80 and 90 dBA.

Figure 6. Noise levels for common activities



Source: Final Environmental Impact Report for the Gerald Desmond Bridge, Port of Long Beach. 2010

The chart below shows estimated noise levels at certain distances from busy roads and at certain speeds, with varying levels of traffic. It helps to illustrate how much the number of trucks and the speed that the traffic is moving impacts the noise levels. The more trucks there are and the faster the traffic is moving results in higher noise levels.

Figure 7. Levels of noise at 150 feet from busy roads

TABLE 3 One-hour Equivalent Sound Level at 150 feet from Roadway

Vehicles per Hour			Speed, mph	Leq(h) dB(A)
Automobiles	Medium Trucks	Heavy Trucks		
1,500	100	200	65	67
1,500	100	200	50	64
1,500	100	0	65	63
1,500	0	0	65	62

Source: Transportation Research Board of the National Academies, TR News. Transportation noise. Sept-Oct 2005, Number 240.

According to Southern California Association of Governments, complaints about noise vary according to the decibel level[60]

Table 2. Impacts of various noise levels on sensitive uses

Source: Adapted from text, SCAG Regional Transportation Plan, Proposed EIR, 2004.[61]

As the table above shows, widespread complaints begin when noise gets into the 60 dB range, with serious annoyance between 60-70 dB.

Noise from locomotives is particularly high. A Southern California study showed that the noise impact caused by 40 freight trains per day generates approximately 75 decibels at 200 feet from the tracks and that freight trains also generate substantial amounts of ground-borne vibration near the tracks.[62] Community residents near rail yards in Los Angeles have complained about noise for decades.[63] A recent study in Teaneck, NJ by Rutgers investigators estimated that 40% of residents living near train tracks where locomotive horns sounded at night had a high probability of waking from the horn noise.[64]

Despite documentation of excessive noise levels and the presence of federal noise limits, many proposed rail yard projects claim that they will generate no significant noise impacts. For example, in 2010, McCalla, AL, residents expressed concerns about potential noise from a proposed Norfolk Southern Railroad intermodal hub,[65] but a consultant hired by the railroad dismissed the noise concerns even before finishing an environmental review.[66]

Noise level	**Where the noise is**	**Impact**
55 dB	Outdoors near homes and sensitive uses	Sporadic complaints and community annoyance start
DNL 55-60 dB	Outdoors and near sensitive uses	Upper range for intelligible speech indoors at a typical home
55-60 dB range	Homes and sensitive uses	Widespread complaints
60-70 dB	Homes and sensitive uses	Threats of legal action begin
70 dB and above	Homes and sensitive	Strong appeals to local officials to stop the noise and threats of legal action

Neighborhood Impacts – Lighting, Traffic Congestion, Truck and Rail Accidents

When faced with new or expanding freight transportation facilities, concerns of residents often focus on the proximity of neighborhood schools and homes to ports, rail yards, warehouses, and highways. While residents in these communities highlight potential health effects of traffic-related air pollution and noise, they also express deep concern about their "quality of life." Ports, rail yards, and many distribution centers operate round-the-clock operations, often employing bright lights, often referred to as "stadium lighting." New interest in the effects of bright nighttime lighting has recently emerged, with human studies looking at the effect of bright light and disturbances in sleep,

hormones, immune function, and circadian rhythm. [67] A laboratory study in mice has shown that nighttime exposure to artificial light stimulated the growth of breast tumors by suppressing the levels of a key hormone called melatonin.[68] In addition, night lighting (or "bright skies") creates serious negative consequences for animal and bird life. [69]

Occasional train derailments and frequent truck accidents are a common occurrence in goods movement communities. Nationwide, in 2008, more than 4,000 persons were killed in big-rig truck accidents, with 69% of them being occupants of passenger vehicles.[70] Also in 2008, more than 200 persons died at highway-rail grade crossings involving freight railroads.[71] Traffic congested with big-rig trucks is also a common complaint and safety hazard in communities with ports and rail yards. Big-rig trucks constitute 20-25% of the volume of vehicles on the Long Beach Freeway in Southern California, the conduit from the Ports to the major downtown rail yards.[72] The truck route already has 35,000 trucks a day on it, and there is a proposal to triple that number by widening and double-decking the freeway in some sections of its 20-mile route.[73]

Race and Place Issues

According to the U.S. EPA National Environmental Justice Advisory Council report on goods movement:

> The environmental, public health and quality-of-life impacts of goods movement on communities are more pronounced in areas with major transportation hubs and high traffic roads. Minority and low-income communities near these hubs and throughways bear disproportionate impacts because of their close proximity to multiple pollution sources.[74]

A screening analysis done for U.S. EPA determined that at least 13 million people, including a disproportionate number of low-income, African-Americans and Latinos, live in close proximity to these facilities and are exposed to higher levels of diesel particulate matter than other residents in their region.[75]

Incompatible Land Uses

As in many communities across the country, land use decisions have resulted in homes, schools, and even parks being located near ports, highways, rail yards, and warehouses. Despite the growing amount of scientific research that shows the direct correlation of health risk with proximity to freeways, rail yards, and diesel emission sources, health considerations typically are not integrated into land use decision-making. In Southern California for example, 65 schools are located within one mile of the I-710 Freeway,[76] a major highway connector from the Ports of Los Angeles and Long Beach for which government officials have proposed an expansion. More than 600,000 residents, including 212,000 under age 18, live within 1,500 meters of the freeway.[77]

Another example of incompatible land uses concerns rail yards in Southern California. In the Los Angeles area, BNSF is proposing to develop a new intermodal rail facility four miles from the ports,[78] and Union Pacific has proposed expansion of its adjacent UP Intermodal Container Transfer Facility (ICTF).[79] Many neighboring residents oppose

both projects because they are located in close proximity to schools and established residential communities.[80] Draft environment impact reviews for the two projects are expected in 2011.

At the urging of community and environmental justice groups in California, the California Air Resources Board adopted guidelines for the siting of schools near sources of pollution, such as rail yards, ports, warehouses, and busy highways.[81] In addition, the U.S. EPA recently published draft guidelines on school siting, which suggest buffer zones to protect students from the pollution of highways, rail yards, and ports.[82] These proposed guidelines do not have legal authority, however, and few local governments responsible for land use planning have actively pursued implementation of such approaches. See land use and health section below.

Health Impacts in Asia from Manufacturing Products for Export

The dramatic increase in international trade, especially between developing countries in Asia and the U.S., has also resulted in major impacts for the exporting countries as well, where the system of trade is inextricably linked to manufacturing processes that compound negative impacts to worker, health, and communities.

As China's economy has changed to focus on manufacturing and on international trade, occupational hazards have become a major concern. Lead poisoning (and more recently cadmium poisoning) among workers, for example, has been a ubiquitous problem in – and near – metal smelters in China. Children in Chinese provinces have also suffered. For example, children living near factories that produce car batteries (which contain recycled lead) have suffered from elevated levels of lead in their blood.[83] Protests have broken out in a number of Chinese cities when children have been found with lead poisoning or when authorities have suggested siting new chemical plants there.[84]

Growing awareness and concern focuses on air pollution. A finance organization called 24/7 Wall St. recently performed an analysis to determine the 10 cities with the world's worst air. They reviewed studies on air quality, government data, and information about sulfur dioxide, nitrogen dioxide, and particulate matter. Among the top 10 were the following four cities in China: Beijing (tied with New Delhi, India), Chongqing, Guangzhou and Hong Kong.[85]

A 2006 scientific study investigated high levels of air pollution in the Pearl River Delta region of China, home to hundreds of manufacturing operations and found that the region "produces more than $100 billion of goods annually for export to North America, Europe, and other parts of Asia [and that] 10-40% of emissions of primary SO_2 [sulfur dioxide], NOx [nitrogen oxides], RSP [respirable suspended particulates], and VOC [volatile organic chemicals] in the region are caused by export-related activities."[86] This funding has spurred environmental and public interest groups such as Civic Exchange, who advocate for reduction of sulfur content in fuels burned by ships.[87]

Climate Change/Global Warming/Natural Resource Impacts

Beyond the enormous and multi-dimensional health impacts, international shipping and freight transportation have begun to be identified as major contributors to greenhouse gas emissions and climate change. In fact, a recent study by NASA's Goddard Institute for Space Studies identifies the transportation sector, including trucks, ships, and rail that rely on diesel fuel, as "the greatest contributor to atmospheric warming now and in the near term."[88] Trucking and rail freight in the U.S. alone accounts for 1.5% of global emissions,[89] and shipping alone accounts for approximately 3-3.5% of total global emissions and 13% of global emissions from transportation.[90] According to the International Maritime Organization (IMO), the shipping industry releases more greenhouse gases than the global aviation industry.[91] On its own, a single container ship is said to emit more greenhouse gases than two thousand diesel trucks[92] and its emissions may contribute to pollution hundreds of kilometers inland.[93]

Shipping releases more carbon dioxide (CO_2) than all but six of the world's nations – more, for example, than is released by Germany.[94] Due to the anticipated growth in world trade, CO_2 emissions from global shipping are expected to rise by 126-218% by 2050 if a business-as-usual approach is followed.[95]

Much of these greenhouse gases come from the shipping industry's use of bunker fuel, a "bottom of the barrel" high sulfur petroleum product. Ships burn bunker fuel in diesel engines and the engines are among the world's highest polluting combustion sources per ton of fuel consumed.[96] Not only is bunker fuel dirty, but much of it is actually imported by China from Venezuela making the transport of the dirty fuel even more polluting in the process of transporting it. California officials are worried about increased concentrations of nitrogen oxides from burning bunker fuel, stating that they are "causing a rise in the acidification of the ocean, since the oceans are the "sink" into which about one-third of all NOx emissions are eventually deposited.[97] Burning bunker fuel in ships also produces harmful black carbon, a carbonaceous (carbon rich) aerosol considered by many to be responsible for climate change, second only to CO_2.[98] A December 2009 study in the scientific journal *Lancet* pointed to the importance of black carbon, which, in combination with ozone, "could together exert nearly half as much global warming as carbon dioxide."[99]

In yet another piece of the fuel supply chain, exports of low-sulfur coal from Montana to China are raising concerns and protests among residents in Oregon, not far from a coal export terminal in Longview, Washington, from which the coal would be shipped to Asia. Residents point out the irony that they are trying to close their own coal-burning generating plants and meanwhile may become the export location for millions of tons of coal each year to China.[100]

[1] VerdeExchange blog. Greenxchange: Long Beach mayor Bob Foster answers: 'what public policies incent renewable energy?' Vol. 01: No. 10: Feb 2008 (Accessed March 11, 2011, at http://www.verdexchange.org/node/150)

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