

Chapter 1-4: Community and Environmental Context of Goods Movement in California

According to the Federal Highway Administration (FHWA) Freight and Air Quality Handbook, May 2010, freight emissions comprise close to one-third of the United States

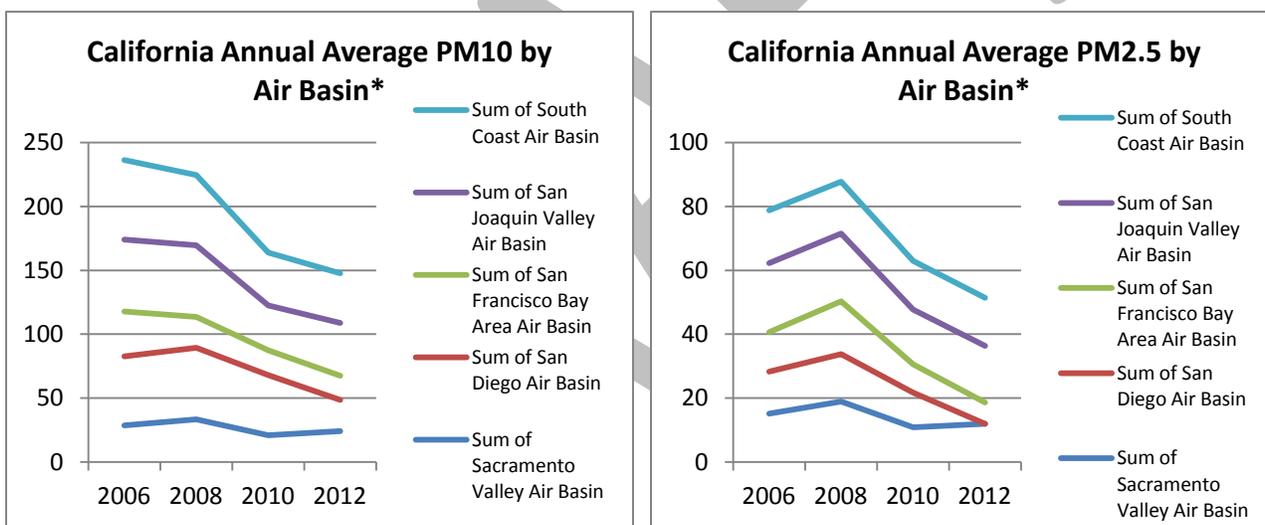


transportation Green House Gas emissions. Freight industry pollutants, particularly air pollutants, impact public and environmental health in numerous ways. Large, heavy duty vehicles such as trucks, trains, and cranes traditionally use diesel fuel and

ships use highly polluting bunker fuel on trans-oceanic voyages. In addition to the large vehicles, the industry also uses a wide variety of smaller equipment such as individual refrigeration units on truck trailers, forklifts, and on-board ship equipment that run continuously or for long periods of time on diesel fuel. The emissions generated by burning diesel fuel include diesel soot, other particulate matter (PM), nitrogen oxides (NO_x), sulfur oxides (SO_x), and other air pollutants that cause health and environmental problems.

As shown in the tables below, the PM emissions in California are declining. The freight industry has been making dramatic reductions in air pollution emissions, exemplified by the improvements to air quality in Southern California and the San Francisco Bay Area. Working in coordination with regulatory, energy, and research organizations, as well as

community and environmental groups, the freight industry has begun transitioning to using much cleaner fuels and cleaner, more efficient engine technologies. New operations practices such as slowing ship speed off-shore and switching ships to cleaner burning fuels as they approach California ports has significantly reduced maritime emissions. However, additional improvement is still needed to meet air quality mandates and as each freight project is implemented, with new projects employing the best commercially available emissions reductions technologies and practices. Further research in energy sources, energy distribution, and engine technology is needed to provide a broader range of options that will enable the freight industry to reduce, and eventually, approach zero mobile source air pollutants. This must be accomplished while maintaining and improving California’s national and global economic competitiveness.



*Data for tables collected from California Air Resource Board www.arb.ca.gov

Community Health

Community impacts from the freight industry have been long standing. Recent studies (i.e. “Paying With Our Health, The Real Cost of Freight Transport in California” and “At a Crossroads in our Region’s Health: Freight Transport and the Future of Community Health in the San Francisco Bay Area, both prepared by the Pacific Institute”) show

direct correlation between the proximity of community residents to heavy freight industry activity and increased incidence of serious resident health problems such as asthma, other respiratory ailments, cancer, cardiovascular disease, and premature death. The impacts are not limited to disease and illness; issues such as noise, traffic congestion, glare from facility lighting, and vibrations from heavy vehicles affect the quality of life in many communities and reduce residents' sense of well being.

The freight industry is widely distributed within California along and near truck and rail corridors, railyards, warehouse districts, sea and airports, intermodal transfer facilities, agricultural processing plants, and industrial and manufacturing facilities. Therefore, the impacts from the freight industry are also widely distributed. The worst effects are often borne by the communities residing near the freight corridors and facilities, while the benefits of freight movement are shared by a larger population at the regional, state, or national level that may experience little or no direct impact from the movement of freight through their communities. Housing and schools are often located near or immediately adjacent to freight facilities, with the communities surrounding the freight network typically being low income and having other Environmental Justice (EJ) attributes. Many of California's most densely populated communities also have the greatest amount of freight activity.

In order to better understand community perspectives regarding freight impacts, Caltrans conducted a series of focus groups in early 2013 with representatives from community groups that work on related issues. (See Appendix ___ for further details.) Focus groups were held in Fresno, Oakland, Los Angeles, and San Bernardino. During the sessions, it was found that most respondents agreed that negative effects of freight include impacts to health, noise, air quality, traffic, vibration, pavement damage, and disproportionate impacts to EJ communities. Participants also identified positive effects from the freight industry, particularly in relation to job creation and employment. The majority of participants believed that unmet freight related needs include efficiency, safety, green technology, collaboration with the public and EJ communities, and rail improvements. They suggested green technology to reduce impacts and address

sustainability goals, innovative funding, more rail systems, double tracking existing rail lines, and the use of rail over trucks for hauling long distances.

Air Quality and Climate Change

The California Air Resources Board (CARB) is the State agency charged with developing regulations, strategies, and programs to reduce the emission of smog-forming pollutants and toxics from mobile sources such as automobiles, trucks, construction equipment, and other vehicles. The agency is joined in its work by regional air quality management and control districts such as the South Coast Air Quality Management District, Bay Area Air Quality Management District, and San Joaquin Valley Air Pollution Control District. The regional air districts have additional responsibilities to reduce emissions and authority to regulate. To support its mandate to reduce emissions, CARB actively promotes and dispenses grant and incentive funds to assist trucking and freight operators to comply with clean air regulations. Regional air districts have similar incentive programs.

The CARB is developing the Sustainable Freight Transportation Initiative that will outline what is needed to make the freight transportation system in California more efficient and sustainable to meet air quality targets. The CFMP is consistent with and supportive of CARB's Sustainable Freight Transportation Initiative. The goals of the initiative will include¹:

- Move goods more efficiently and with zero/near-zero emissions;
- Transition to cleaner, renewable transportation energy sources;
- Provide reliable velocity and expanded system capacity;
- Integrate with national and international freight transportation system; and
- Support healthy, livable communities.

The CARB is also in the process of preparing the Vision for Clean Air: A Framework for Air Quality and Climate Planning. The document will provide strategies, incorporating technology, cleaner energy, and efficiencies, to meet California's state and federal air

quality and climate goals. Caltrans is working closely with CARB on the development of both documents and has made the CFMP as consistent as possible with the early phase of the CARB process.

The California Global Warming Solutions Act of 2006 (AB 32) requires that California reduce its Greenhouse Gas (GHG) emissions to 1990 levels by 2020. For the long term, California has a goal to emit 80 percent fewer emissions than 1990 levels by 2050. The CARB estimates that passenger vehicles account for approximately 38 percent of the State's GHG emissions; however, goods movement related transportation is also a significant contributor. Of all transportation sources on a national scale, heavy-duty vehicles generate 19 percent of GHG emissions. In California, heavy-duty vehicles are responsible for 20 percent of the global warming pollution from transportation sources.

Maritime

The 11 publicly owned California deepwater seaports are committed to reducing the environmental impacts associated with the maritime industry and have implemented strategies including clean air programs, shore side power options, ship speed reduction, and other environmental initiatives to reduce emissions. California's only privately owned cargo port at Benicia is also taking actions to reduce impacts.

In 2006, in an effort to reduce emissions and improve air quality, the Ports of Los Angeles and Long Beach (San Pedro Bay Ports) established the Clean Air Action Plan (CAAP). The plan includes milestones, goals, and recommendations for air quality improvements through programs such as the Clean Truck Program, the Technology Advancement Program, and Vehicle Speed Reduction Plan for Ocean Going Vessels (OGV). In addition, the plan committed the ports to reduce emissions by 45 percent over a five year period, ending in 2011. Largely due to the Clean Truck Programs adopted by the ports and the Vessel Fuel Regulations for cargo ships established by CARB, the ports exceeded the 45 percent goal. The CAAP was updated in 2010 to include new goals and strategies to further reduce port related health risks and emissions based on clean air targets set by state and federal regulatory agencies.

The Port of Los Angeles Clean Truck Program involves the banning of all trucks that do not meet 2007 Federal Clean Truck Emissions Standards from the port. The Port of Los Angeles states that within the first year of the program, in 2008, port truck emissions were reduced by an estimated 70 percent. In 2012, when the program was fully implemented, port truck emissions were reduced by more than 80 percent². The Port of Long Beach reports reducing more than 90 percent of the air pollution from harbor trucks in a little over three years³.

The goal of the Technology Advancement Program is to identify emission reduction technologies such as improved waste heat recovery, exhaust gas recirculation, alternative fuels, and optimization of pump and cooling water systems for the port industry. Successful technologies are implemented to achieve the goals of the CAAP.

The Port of Los Angeles has implemented the OGV Speed Reduction Program. This program encourages ship speed reduction, fuel improvements for main engines, technology improvements, and shore power Alternative Marine Power (AMP). Reducing speed reduces the amount of fuel used and pollutants emitted.

Alternative Marine Power enables ships to plug into shore side electrical power rather than idling on diesel fuel to power on-board equipment while the ship is docked. The Port of Los Angeles was the first in the world to use alternative marine power for in-service container ships. The Port of Long Beach also has shore power at four berths and has the world's only shore power capable tanker facility. In January 2014, the Shore Power Regulation, a new law administered by CARB, went into effect. The law requires operators to shut down auxiliary engines and plug into the electrical grid while at berth. The law requires both landside infrastructure and shipside power modifications. CARB recognizes a fleet's good faith effort to comply with the requirements during a transition period in which a vessel equipped to receive shore power but power is not available at the berth or there is a delay in making retrofits to the vessel.

Similar to the Port of LA, the Port of Long Beach offers the Green Flag Vessel Speed Reduction Program. Vessels that voluntarily reduce their speed to 12-knots within 20 or

40 nautical miles of the port pay reduced dockage fees as compared with ships that do not reduce speed. The Port reports that, in 2011, 96 percent of the vessels reduced their speed within 20 nautical miles and 80 percent within 40 nautical miles. As a result, diesel particulate matter emissions were reduced by more than 40 tons, NOx emissions by more than 950 tons, and SOx emissions by 330 tons. Additionally, green house gasses were reduced by more than 45,000³ tons.

Incentive programs like the Port of Los Angeles Voluntary Environmental Ship Index (ESI) were developed to reward vessel operators for reducing emissions from their OGV. Each vessel is given points based on clean technology and practices to reduce emissions beyond regulatory requirements. Operators must register with the international ESI and the Los Angeles Harbor Department. Incentives are paid per call, based on the points earned, and are paid out to the operator on a quarterly basis.

The Port of Oakland has committed to reducing seaport related diesel health risks by 85 percent by 2020 from a 2005 baseline⁴.

Additionally, in 2009, the port approved the Maritime Air Quality Improvement Plan (MAQIP). The Port of Oakland has a Comprehensive Truck Management Program (CTMP) that requires the Port's drayage trucks to



meet the specified emission requirements established by CARB in effect January of each year. In 2012, the port had achieved a 70 percent reduction in diesel particulate emissions despite increasing cargo handling by three percent. The Port of Oakland has also implemented shore power, habitat restoration projects, and a Clean Water

Program.

The smaller, dynamic ports in the state, have also established short and long term strategic air quality and water improvement plans. These plans identify projects and programs that will keep the Ports in compliance with environmental regulatory commitments and also identify projects and programs that encourage pollution prevention and natural resource protection. As part of the air quality implementation plans, the Ports will identify and measure the effectiveness of emission reduction measures such as vessel speed reduction, shore power, and energy conservation programs. For detailed information regarding each port, please refer to the Port Fact Sheets (Appendix ____).

Rail

Freight rail provides a higher level of efficiency and reduced emissions compared to trucking for long distance trips/ hauls⁵. The CARB 2010 emissions inventory estimates that diesel locomotives represent 4.6 percent of all mobile source NOx emissions in the state. The CARB estimates emissions will increase to 8.2 percent of all mobile source NOx emission in the state by 2020 (CARB “Emission Projections by Summary Category, Base Year 2008: 2008”, April 2013.) In 1998 the United States Environmental Protection Agency (EPA) created tier standards based on emissions for locomotive engines. These standards were subsequently amended in 2008 and 2010.

Railroads are constantly working to improve fuel efficiency and cut GHG emissions including investing in greener locomotives and training engineers how to maximize fuel-efficiency. Given that America’s railroads account for 40 percent of interstate freight volume, more than any other mode of transportation, rail’s fuel efficiency is a major bonus for the economy and the environment.

The two Class 1 railroads serving California, Union Pacific Rail Road (UP) and BNSF, have an agreement with CARB that requires the railroads to significantly reduce diesel emissions by implementing a statewide idling reduction program, performing health risk

assessments at all major rail yards, and coordinating with communities. In order to further reduce emissions, the railroads are also implementing low emission technologies. These include cleaner burning locomotive engines, multiple smaller engines (GenSets) within a locomotive, and increasing the use of natural gas and electrification rather than using diesel fuel. GenSet switch locomotives are powered by three, relatively low-horsepower engines that only operate when needed instead of one large engine operating at all times.

Electrification has the potential to dramatically reduce emissions by using cleaner burning fuel at power plants which may also use pollution control mechanisms that are cleaner than those used for locomotives. However, there are difficulties in deploying the new locomotives and electric power distribution networks such as high upfront costs, impacts on existing operations, long term energy costs, availability of electricity on the grid, the challenges of building new electric generation powerplants, and the national extent of the railroad industry that currently requires line-haul locomotives to move across the country, not remain in California. Therefore, the California specific measures are applied to equipment in railyards and intermodal facilities where the equipment stays in California. Natural gas also has the potential to reduce emissions and is relatively low in cost and more widely available than electricity. The BNSF and UP railroads are working with manufacturers to develop hybrid technology for line-haul locomotives. This type of rail would capture energy generated from braking and reuse it as available for propulsion thus reducing the use of diesel.

The BNSF and UP railway companies have implemented the use of electric wide-span cranes at intermodal transfer facilities. These cranes produce zero on-site emissions and generate power each time they lower a load. Due to the design of the cranes, each eliminates as many as six diesel trucks normally required for moving containers within the intermodal facility, thus further reducing emissions and improving efficiencies. Other technology, like the automated gate system that BNSF is using in San Bernardino, can identify truck drivers and reduce truck idle time when waiting to enter intermodal

facilities.

The California Cleaner Freight Coalition (Appendix ___) identifies on-dock rail as a strategy that could eliminate traditional cargo handling and local haul trucking where containers are headed for “near dock” and inland rail yards, significantly reducing emissions at the terminals. When containers are loaded from ship to rail within the port complex, emissions can be reduced by approximately 70 percent or more due to the reduction in truck trips. The typical practice of unloading containers from ships and transporting them to off-site intermodal terminals and then loading them onto railcars is inefficient, creates traffic congestion, and generates additional air pollution.

The California Cleaner Freight Coalition analysis shows that transporting double-stacked containers by rail can reduce GHG’s by 84 percent compared to trucking the same containers.

Trucking

(Placeholder for table to show cost comparison of low emissions trucks to traditional new trucks)

Trucking is the most frequently utilized freight mode in California, moving approximately 82 percent of all goods (by weight)⁶ with more than 80 percent of all communities depending solely on trucks for delivery of goods and commodities⁷. The CARB estimates approximately 100,000 drayage trucks operate statewide with nearly 20,000 frequently servicing ports and rail yards.

The trucking industry continues to improve energy and environmental efficiency even while increasing the number of miles driven. Through advancements in engine technology and fuel refinements, new diesel truck engines produce 98 percent less particulate matter (PM) and nitrogen oxides (NOx) emissions than a similar engine manufactured prior to 1990. Sulfur emissions from diesel engines have also been reduced by 97 percent since 1999. Through the U.S. Environmental Protection

Agency's (EPA) SmartWay Transport Partnership, the trucking industry is working with government and businesses to quantify greenhouse gas emissions and take steps to reduce them even further.

California has the most strict in-use emission standards in the United States, implementing multiple regulations that apply to on-road diesel trucks including the Periodic Smoke Inspection Program (PSIP), Emission Control Label (ECL), Commercial Vehicle Idling (CVI), Drayage Truck Rule, and the Tractor-Trailer, Greenhouse Gas Reduction Measure. These regulations are in place to ensure exhaust is tested, idling time is limited, and emission standards are met. Based on current targets, it is anticipated that truck emission reductions will outpace other freight modes in the South Coast Air Basin in reducing emissions. State, regional, and local criteria pollutants from trucking will be greatly reduced as a result of current regulations, especially in the South Coast and San Joaquin Air Basins, the only two areas in the country designated as extreme nonattainment for the federal ozone standard.

In order to help offset some of the economic impacts from the regulations to the trucking industry, there are incentive programs to encourage the use of more efficient vehicles. These programs include vouchers to put toward the purchase of approved electric and partial hybrid electric vehicles and price reductions for Class 7 or 8 natural gas trucks, and funds for modernizing existing fleets.

The document *Delivering Sustainable Freight: Infrastructure, Economy, and the Environment*, prepared by the California Trucking Association, identify some of the pros and cons of alternative fuels such as biodiesel, natural gas, and hydrogen fuel cells⁸. The document also provides insight to the use of electric/ hybrid, hydraulic/ hybrid, and renewable diesel. Hydraulic hybrids are being developed by the EPA with partners including the United Postal Service (UPS) and FedEx. Hydraulic hybrids use pressurized hydraulic fluid tanks and hydraulic drive pumps/motors. The EPA estimates hydraulic hybrids can increase fuel efficiency 60 to 100 percent.

The California Cleaner Freight Coalition notes that several electric and fuel cell

technologies would have zero tailpipe emissions and even when considering emissions from power generation providing the electricity, the technology would still reduce emissions by roughly 90 percent. It is also stated that fuel cell trucks using hydrogen produced primarily from natural gas generate only slightly lower net PM emission compared to new diesel trucks. Additionally, natural gas trucks meeting the latest heavy-duty engine standards can reduce the net PM emissions but do not significantly reduce NOx emission levels⁹.

Some of the regional agencies are also implementing clean air programs. The Southern California Association of Government's (SCAG)'s 2012 Regional Transportation Plan (RTP) includes a "Regional Clean Freight Corridor System" as a regional highway strategy. This Clean Freight Corridor is a proposed system of dedicated truck facilities extending from the San Pedro Bay Ports to downtown Los Angeles along I-710, connecting to an east-west segment, and finally reaching I-15 in San Bernardino County. Concepts and operational details for this system have been evolving over the last decade, and the initial operating segment (I-710) is now in the environmental review stage. Current plans for this system will provide a platform for the introduction and adoption of zero- and/or near-zero emission technologies – including electrified trucks. The (East West Freight Corridor) EWFC concept proposed by SCAG is committed to building a clean freight system to the maximum extent possible. As such, the 2012 RTP/SCS includes a "Regional Clean Freight Corridor System" as a regional highway strategy. The region's understanding of a portion of this system, the "East West Freight Corridor (EWFC) was enhanced through work completed during SCAG's Comprehensive Regional Goods Movement Plan and Implementation Study. Specifically, the work included:

- Developing a better understanding of the markets served by an EWFC, including quantification of the economic benefits of regional goods movement industries;
- The identification of non-freeway alignments for the EWFC, which allowed for fewer impacts to SCAG's communities;

- Contributed to a better understanding of truck movements on the region’s system, and quantified potential benefits of an EWFC in terms of delay reduction, safety benefits, emissions reduction, and decreased impacts to communities; and
- Defined potential zero emission technology technologies and quantified the potential emissions benefits from 100% adoption of zero-emission technology on the EWFC.

The SCAG 2012 RTP/SCS suggests phasing in a zero-emission technology between 2012 – 2035, allowing for the gradual development of technology, pilot projects, the identification of funding sources, and the gradual commercialization of the technology. Currently, the SCAG region is advancing the zero-emission concept with initiatives at the Ports of Los Angeles and Long Beach through their Technology Advancement Program (TAP) and recent initiatives for our regional zero emission collaborative and potential demonstration projects.

Air Cargo

The air cargo industry is implementing a number of emission reduction measures including lighter weight aircraft, more efficient external fan engines, and operational changes or flight paths that consume less fuel. The EPA has implemented the Federal Aviation Administration Continuous Lower Energy, Emissions, and Noise (CLEEN) program to achieve NOx emission reductions from new aircraft. This program includes three levels of emission reductions in NOx and greenhouse gas in an increasing percentage of new aircraft engines between 2015 and 2035.

Additionally, California airports have implemented initiatives to reduce greenhouse gas emissions. Many of the airports have installed electric charging stations and are utilizing low emission electric vehicles and support equipment. Some have installed ground power at terminal gates, allowing aircraft to “plug in” to electrical power when parked at the gates for cargo loading and unloading.

¹California Air Resource Board website <http://www.arb.ca.gov>

²Port of Los Angeles website <http://www.portoflosangeles.org/>

³Port of Long Beach website <http://www.polb.com/>

⁴Port of Oakland website <http://www.portofoakland.com/>

⁵2013 California State Rail Plan

⁶2007 BTS/US Census Commodity Flow Survey: Shipment Characteristics by Mode of Transportation for State of Origin

⁷American Trucking Association website <http://www.trucking.org>

⁸Delivering Sustainable Freight: Infrastructure, Economy and the Environment a Special Report Prepared by the California Trucking Association, Fall 2013

⁹Moving California Forward, Zero and Low-Emissions Freight Pathways by California Cleaner Freight Coalition