## Title
Delivering the Goods: How California Can Create the Sustainable Freight System of the Future



## Authors
Lamm, Ted
Elkind, Ethan N.

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# DELIVERING THE GOODS

## How California Can Create the Sustainable Freight System of the Future

MARCH 2018

# ABOUT THIS REPORT

This report is the result of a two-day convening with regulators, advocates, experts and other stakeholders in California's freight system, jointly sponsored and organized by the California Air Resources Board and UC Berkeley School of Law's Center for Law, Energy and the Environment.

***This report and its recommendations are solely a product of the UC Berkeley School of Law and do not necessarily reflect the views of all individual convening participants, reviewers, or the California Air Resources Board.***

# ABOUT CLEE

The Center for Law, Energy and the Environment (CLEE) channels the expertise of the Berkeley Law community into pragmatic policy solutions to environmental and energy challenges in California and across the nation. CLEE works with government, business, and communities on initiatives that focus on reducing greenhouse gas emissions, advancing the transition to renewable energy, and ensuring clean water for California's future.

# AUTHORSHIP

The authors of this report are Ted Lamm, Research Fellow at CLEE, and Ethan N. Elkind, Director of the Climate Program at CLEE.

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**For more information, contact Ted Lamm at tlamm@law.berkeley.edu or Ethan Elkind at eelkind@law.berkeley.edu.**

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# Glossary of Terms

**Assembly Bill 32 (Nunez, 2006)**: California law that sets out the state's goal of reducing greenhouse gas emissions to 1990 levels by 2020.

**Assembly Bill 197 (E. Garcia, 2016)**: California law (passed in conjunction with Senate Bill 32) that requires the California Air Resources Board to consider the social cost of greenhouse gas emissions, prioritize specified emission reductions, and report to the State Legislature regarding its implementation of state climate policies.

**Assembly Bill 398 (E. Garcia, 2017)**: California law that extends the state's cap-and-trade program for greenhouse gas emissions (created by AB 32) through 2030.

**Assembly Bill 617 (C. Garcia, 2017)**: California law that provides a new community-focused action framework to improve air quality, reduce exposure to criteria air pollutants, and toxic containments. This law also further increases penalties imposed on polluters.

**Automated Vehicle Technology**: Smart technology included within a vehicle's computer system that assists a human driver.

**Autonomous Vehicle**: A vehicle capable of managing all aspects of driving without a human driver.

**California Air Resources Board**: An entity within the California Environmental Protection Agency responsible for providing and maintaining clean air, including enforcement of the state's greenhouse gas reduction laws.

**California Department of Transportation**: California's agency in charge of designing, constructing, maintaining and operating the state highway system and passenger rail system.

**California Energy Commission**: The state's primary energy policy and planning agency, with roles including supporting energy research, developing renewable energy resources, and advancing alternative and renewable transportation fuels and technologies.

**California Environmental Quality Act**: California law requiring state and local governments to identify and mitigate the environmental impacts of projects they undertake, fund or approve.

**California Public Utilities Commission**: California's agency in charge of regulating investor-owned electrical (and gas) utilities.

**California State Transportation Agency**: California's agency responsible for transportation policy and planning, with primary responsibility for administering Senate Bill 1.

**California Sustainable Freight Action Plan**: A 2016 plan issued jointly by the California Department of Transportation, the California Air Resources Board, the California Energy Commission and the Governor's Office of Business and Economic Development that seeks to coordinate policy, investment and regulatory planning across all facets of the state's freight system in order to meet a range of environmental, economic and community goals.

**Drayage**: Short-distance trucking that is typically part of a longer-distance trip, such as a move within a port or between a port and a nearby warehouse.

**Electric Vehicle**: A vehicle that runs at least partially on battery power and the battery of which can be recharged from the electrical grid.

**Executive Order B-32-15**: An executive order issued by Governor Edmund G. Brown, Jr., calling for the preparation of an interagency action plan to improve freight efficiency and competitiveness, ultimately leading to the creation of the California Sustainable Freight Action Plan.

**First Mile/Last Mile**: The portions of freight transport that occur nearest to the goods source (such as a manufacturing facility) and to the ultimate delivery point (typically a retail store or a consumer's home).

**Freight Corridor**: A railway or road route that is important to the movement of freight within a given region.

**Grade Separation**: The method of aligning surface transport lines at different heights (such as a highway overpass) so that they can cross each other without disrupting traffic flow.

**Information Sharing and Analysis Center**: An information-sharing platform created in critical infrastructure-related sectors to facilitate open, secure collaboration among industry participants and with government actors in order to identify and analyze key security and operational data.

**Intermodal Containers**: Containers of standardized dimensions that can be transported by ocean-going vessels, trucks or trains.

**Low Carbon Fuel Standard**: A state program, created pursuant to AB 32, that includes a performance-based market and mandate for transportation fuels with reduced carbon intensity.

**Mobile Source Strategy**: The California Air Resources Board's integrated plan to meet the state's targets for reductions in emissions of greenhouse gases and criteria and toxic air pollutants from mobile sources such as cars, trucks, and off-road equipment.

**On-Dock Rail**: Rail infrastructure located on a dock in a port, allowing for containers to be unloaded directly from vessels onto trains.

**Platooning**: A system of truck shipping that allows multiple trucks to drive in line at close distances via the use of automated and smart technology, potentially increasing safety and fuel efficiency.

**San Pedro Bay Ports**: The Port of Los Angeles and the Port of Long Beach, often considered together as a single unit for planning and emissions calculation purposes due to their physical proximity.

**Senate Bill 1 (Beall, 2017)**: California transportation funding legislation that provides more than $50 billion over the next 10 years, in part through increased gasoline taxes, for repairing existing roads and highways and installing new mass transit and road infrastructure.

**Senate Bill 32 (Pavley, 2016)**: California law requiring statewide greenhouse gas emissions to be reduced 40 percent below 1990 levels by 2030.

**Senate Bill 350 (de León, 2015)**: California climate and clean energy legislation that encourages electric vehicle charging station deployment in part through more investor-owned utility investment.

**South Coast Air Quality Management District:** The local air quality district for the greater Los Angeles area, one of 35 such districts in California, responsible for implementing federal Clean Air Act requirements and setting and enforcing emission standards for sources within its boundaries.

**Twin-33s**: Truck trailers measuring 33 feet in length, hauled in a pair by a single cab.

**Vehicle Miles Traveled**: The number of miles traveled by a particular vehicle in service, employed as a measure of efficiency of freight systems.

**Zero Emission Vehicle**: A vehicle that is capable of travelling a certain distance without emitting tailpipe pollutants from its onboard power sources.

# EXECUTIVE SUMMARY

California's freight system is integral to the functioning of the state, national, and global economies. It includes all forms of commercial transportation of freight to, from, and within the state and is responsible for one third of the state's economy. The vehicles, equipment, and infrastructure that constitute this system are also collectively responsible for six percent of California's greenhouse gas emissions, nearly 50 percent of statewide diesel particular matter emissions, and approximately 45 percent of statewide nitrogen oxides emissions.

*Freight accounts for approximately 6% of California's greenhouse gas emissions, 45% of nitrogen oxides emissions, and 50% of particulate matter emissions.*

In order for California to meet its ambitious climate, air quality, and public health goals (particularly in disadvantaged communities), the state will need to realize significant reductions from the freight sector. These goals lead the nation. California's air quality standards for health-harming "criteria" pollutants in all cases are equally or more stringent than corresponding national standards while SB 32 (Pavley, 2016) and AB 197 (E. Garcia, 2016) require the state to reduce its greenhouse gas emissions 40 percent below 1990 levels by 2030 and consider the social cost of greenhouse gas emissions, respectively.[1] The Climate Change Scoping Plan is the defining document for how the state will meet these mandates. Meanwhile, AB 398 (E. Garcia, 2017) clarified the role of the state's cap-and-trade program through the same year to help achieve the climate goals, while AB 617 (C. Garcia, 2017) requires the state to focus on improving air quality in vulnerable areas.

Technological developments based on the sharing of data among industry actors, pilot projects demonstrating the viability of more efficient processes or advanced technologies, and new infrastructure spending targeted at the needs of the freight system all have the potential to help achieve these needed reductions.

However, without policy support from state legislators and environmental, transportation, utility, and energy regulators, in addition to increased access to industry data to facilitate the most promising technological developments,


the system is unlikely to undergo the changes necessary to keep pace with state climate and air quality goals.

In response, the state issued the California Sustainable Freight Action Plan (the "Freight Action Plan") in 2016, which details plans to integrate investments, policies, and programs across several state agencies to help realize a collaborative vision for California's freight transport system.

The Freight Action Plan identifies key characteristics we need to see in California's future freight system to achieve the state's environmental goals while maintaining economic competitiveness and improving efficiency. As part of the implementation of the Freight Action Plan, the interagency team convened experts from government, industry, and environmental, and advocacy groups for a two-day discussion in July 2017 (all participants are listed in Section IV) to identify challenges to building the system of the future as envisioned in the Freight Action Plan, as well as potential solutions to those challenges. The Center for Law, Energy & the Environment (CLEE) at UC Berkeley School of Law facilitated the convening and prepared this report, which serves as a summary of the discussion. The first day of the discussion focused on participants' own vision and goals for achieving a sustainable freight system and the challenges they anticipated, while the second focused on a range of near- and long-term solutions to those challenges.

Participants envisioned a freight system that achieves maximum efficiency and sustainability via the following developments:

- By incorporating cutting-edge propulsion, fuel, automation, and communication technologies, and through the effective use of industry data, predictive analytics, and collaboration among parties, the system would minimize the number of times freight is moved off, on, or between vehicles, and ensure that each vehicle is filled to optimum capacity and utilizes the cleanest fuels reasonably available.
- In order to shift to this collaborative approach and adopt new technologies, industry would need regulators to set and enforce uniform standards for efficiency metrics, data security, and technologies like electric vehicle charging and vehicle automation.
- State policy makers at the California Air Resources Board, California Energy Commission, California Department of Transportation, Governor's Office of Business and Economic Development, California Public Utilities Commission and other agencies would need to integrate freight system needs into their planning processes, ranging from new transportation infrastructure dedicated to freight uses to the setting of commercial electricity rates that accommodate electric vehicle charging.

Underlying all of these developments would be a policy planning and development process that involves all relevant stakeholders—in particular local residents, labor groups, and the environmental justice community—at the earliest possible stage. Participants consistently identified the need to solicit community input, address community concerns, and earn community support for new projects and technologies as a key to moving toward their vision of California's future freight system.

## Key Challenges to Realizing the Vision of the Future Sustainable Freight System

Participants described numerous challenges faced by government, industry, and communities in identifying, communicating, and implementing necessary sustainable freight strategies. They then ranked the following top challenges:

1. Lack of community buy-in for new freight-related infrastructure, new technologies, and pilot projects.
2. Policy uncertainty regarding how the state will implement the Freight Action Plan and how responsibility for achieving efficiency gains will be allocated.
3. Lack of infrastructure supporting efficient freight operations and facilitating adoption of electric vehicles and "smart" technology.
4. Technological uncertainty regarding the economic viability of future low-carbon technologies and the operability of new freight transport processes.
5. Lack of funding for essential freight infrastructure and technology pilot projects.
6. Lack of data access for regulators seeking to set efficiency standards and for industry seeking to minimize waste while remaining competitive.

## Solutions to Overcome the Challenges

After discussing these challenges, participants were asked to propose solutions to each of them. Across multiple sessions, participants from government, industry, and advocacy and environmental groups described actions they or other stakeholders could take in furtherance of the state's goals. On the following pages is a complete list of the wide range of solutions that participants identified, including actions by all stakeholders involved in the freight system, and both near-term and long-term targets. While the list does not represent the consensus view of the participants, who debated the details of many solutions, all participants acknowledged the basic validity of the concepts on the following pages.

| Challenges | Solutions |
|---|---|
| **CHALLENGE 1:** LACK OF COMMUNITY BUY-IN | **Increased Communication with Most-Impacted Communities and Involvement of Communities in the Planning Process**<br>• Policy makers and industry leaders could ensure a meaningful seat at the table for key communities at the beginning of the planning process and identify a set of viable actions that prioritize and address the needs and concerns of communities most impacted by freight.<br>• Policy makers and private infrastructure developers could acknowledge the history of mistrust among the parties and decisions that disproportionately affect low-income communities of color; review past failures; and identify trusted third parties to facilitate communication.<br>• State leaders could increase the scope and regularity of outreach to community, labor, and environmental groups, to coordinate among multiple state transportation, energy, environmental and workforce agencies early in the process.<br>**Increased Information and Grants to Support Community Decisions and Demands with Respect to New Projects and Standards**<br>• All stakeholders could raise awareness of the successes that state and industry players have achieved and can achieve in further reducing the environmental impacts of freight in the most affected communities, and promote the interest of communities in reducing local air pollution.<br>• State leaders and industry players could provide more grants for technical assistance to help communities meaningfully engage in the decision-making process and more data and modeling to inform community processes.<br>**Increased Compensation to Reduce Project Impacts**<br>• State leaders could provide transportation mitigation funding and up-front financial compensation to avoid and minimize impacts of projects on communities.<br>**Improved Project Design and Implementation**<br>• California Department of Transportation, California Air Resources Board, and other lead agency staff could select future pilot projects that are most likely to yield near-term benefits in most-impacted communities; focus on planning areas, not discrete projects; and address traffic, pollution and safety concerns.<br>• State and industry leaders could create and fund freight education programs to enhance the current workforce, and better prepare individuals facing barriers to employment in the logistics industry.<br>• State and industry leaders could ensure training and just transitions for labor. |
| **CHALLENGE 2:** POLICY UNCERTAINTY | **Greater Integration of Industry Capabilities and Limitations into Policy Planning and Design**<br>• State leaders could clarify the role of the state in realizing greenhouse gas and criteria pollutant emission reductions from the freight sector.<br>• State leaders could prepare a detailed set of policy principles and guidelines for implementation of the Freight Action Plan and achievement of other targets and assign responsibility for implementing solutions to those parties that are best positioned.<br>• State leaders could craft flexible standards and focus on the feasibility, scalability, and interoperability of technologies.<br>• State leaders could avoid a regulatory patchwork through awareness of out-of-state policies and federal-state coordination.<br>• State leaders could solicit and be responsive to industry input and support regulatory decisions with analytics and data.<br>• The California Public Utilities Commission and the state's publicly owned electric utilities could increasingly consider the impact of electricity rates and rate design on freight efficiency and electrification opportunities and encourage further development of the grid to accommodate freight-related demand.<br>**Fast-Track Policies that Can Promote Immediate Progress**<br>• California Department of Transportation, California Highway Patrol, and state leaders could partner with shipping and trucking industry members to obtain federal regulatory approval for the safe application of twin-33s (see sidebar on page 6 for more information). |

| Challenges | Solutions |
|---|---|
| **CHALLENGE 3:** LACK OF INFRASTRUCTURE | **Maximize the Capacity of Existing Freight Infrastructure to Achieve Operational Efficiencies**<br>• State and industry leaders could facilitate and utilize more digital technologies to monitor usage and efficiency metrics.<br>• The ports could assume leadership roles in driving operational efficiency.<br>**Incorporate Sustainable Freight System Targets into All Future Infrastructure Planning**<br>• State leaders could set clear implementation deadlines and promote regular stakeholder involvement for near-term projects.<br>• State leaders could prioritize minimum-cost, maximum-return pilot projects for early deployment in order to save money for higher-cost projects later.<br>• State and industry leaders could implement end-to-end "sliver" pilots along distinct freight transport pathways.<br>• State leaders could set infrastructure standards and efficiency metrics for key areas as soon as possible.<br>**Deploy Sustainable Freight Infrastructure**<br>• State and industry leaders could identify, fund, and construct top-priority physical infrastructure to support sustainable freight practices and technologies. |
| **CHALLENGE 4:** TECHNOLOGICAL UNCERTAINTY | **Implement Targeted Pilots and Near-Term Solutions**<br>• Industry leaders could initiate more projects to demonstrate feasibility, such as drone delivery programs for rural areas, and to build markets outside California that are ready to adopt new technologies.<br>• Industry leaders could develop and implement electrification technology for medium-duty, last-mile and drayage trucks.<br>• Industry leaders could identify the goods of the future and create sustainable, smaller packaging.<br>• Industry and regulatory leaders could test new freight transport technologies against existing operations, to focus on achievement of scale. |
| **CHALLENGE 5:** LACK OF FUNDING | **Accurately Assess Funding Needs**<br>• State leaders could identify public, private, and port funding needs with specificity; make a stable, certain "ask" of industry regarding which new technologies need to be implemented; and determine what funding is needed beyond the amounts provided under SB 1 and other funding programs.<br>**Improve Access to Existing Funding and Resources and Remove Barriers to Low-cost Investment and Financing Opportunities**<br>• State energy regulators could better ensure clean transportation goals incorporate local and federal funding opportunities.<br>• State and industry actors could assist banks and investors in assessing the value of sustainability investments, and work to ensure the value of credits.<br>• Policy makers could use competitive models like the Smart City Challenge to inspire action.<br>• Large shippers could give smaller companies affordable access to used vehicles, and industry could investigate other second-life applications of equipment in general. |
| **CHALLENGE 6:** LACK OF DATA ACCESS | **Increase Policy Makers' and Industry Members' Access to Freight Industry Data**<br>• Policy makers and industry leaders could identify critical data, define the "value-add" of data sharing, and collaborate with stakeholders to encourage data sharing.<br>• Industry leaders could organize cybersecurity structures to enable third-party access to data and protect trade secrets and proprietary information. |

## First/Last Mile

These terms refer to the the "first" and "last" mile of freight transportation that brings a good from its point of extraction or manufacture to into the broader transportation network (the "first mile") and from the broader transportation network to its ultimate destination, such as a consumer's home (the "last mile"). The vehicles used for first- and last-mile transportation are typically smaller and more flexible than the large ocean vessels, highway trucks, and trains that deliver freight across long distances (for example, imagine a good that is transferred from a FedEx airplane to a FedEx heavy-duty truck and then to a FedEx van before being delivered to a retail outlet). As a result, they are often most amenable to efficiency measures such as electrification.

## Twin-33s

Twin-33s or T-33s are truck trailers measuring 33 feet in length, hauled in a pair by a single cab. Current federal legislation permits only 28-foot trailers to be hauled in tandem on national highways. Twin-33s allow for the same amount of freight to be carried by fewer trucks—generating fewer emissions and causing less congestion—but have raised safety concerns in the past due to perceived increased weight and length. However, with the rise of e-commerce and the resulting increase in direct-to-consumer shipment of relatively light packages, many carriers contend that significant efficiency gains can be realized with no weight increases, and that safety concerns can be addressed.

## Near-Term Solutions

From the aforementioned list of potential solutions for each challenge, each participant was asked to select the top three near-term solutions that he or she felt were the most readily achievable and/or essential to provide a platform from which further solutions can be implemented. Participants then "voted" independently on these top solutions, and the solutions that accumulated the most participant "votes" are listed below. As with the complete list of solutions, these top near-term solutions do not represent a consensus agreement of all participants, and participants acknowledged that in many cases further analysis is needed before a solution is implemented.

- **Identify stakeholders in industry, government, labor and communities** that are currently missing from the decision-making process, and publicize near-term successes among these stakeholders to demonstrate economic and environmental benefits and earn community trust.
- **Prepare a managed timeline with discrete action items and efficiency targets** that public and private actors can use as benchmarks for progress under the Freight Action Plan and other plans.
- **Conduct scenario analyses** of goods and technological pathways available to identify barriers to and opportunities for efficiency.
- **Implement electrification for medium-duty (Class 6 and lower) trucks** and identify solutions for heavy-duty (Class 8) trucks, beginning with first- and last-mile applications.
- **Update electrical grid planning** with a focus on medium- and heavy-duty vehicle infrastructure goals.
- **Obtain financing for biofuels offtake agreements** and educate banks and lenders on the viability of these and other sustainability investments.
- **Convene a group to determine key IT solutions for freight logistics**, drawing from ports, manufacturers, retailers and cybersecurity experts.
- **Assist shipping and trucking industry leaders by working with legislators to obtain regulatory approval for the safe application of twin-33 trucks.**
- **Partner with educational institutions** to create a skills incubator and training pipeline.
- **Generate competition** by reaching beyond California to international experts and by initiating proactive pilot programs (such as the Smart City Challenge).

# INTRODUCTION

## A. California's Freight System

California's freight sector encompasses "industries that rely heavily on the transportation of their raw materials, intermediate goods, and components, as well as their final goods and finished products."[2] It includes the transportation, warehousing, utility, trade, manufacturing, construction, agriculture, and mining industries; constituting approximately one third of California's economy.[3]

The freight system can be defined to include four modes of transit (sea vessels, trains, trucks, and airplanes) and seven types of facilities (seaports, airports, rail yards, distribution centers, warehouses, high traffic highways, and border crossings).[4] California's system consists of 12 deep-water seaports, 12 major cargo airports, three international commercial border crossings, 6,000 miles of railroad track, 5,800 miles of high-volume highways, and 19,000 miles of pipelines.[5] California is home to the top two, and three of the top 10, North American ship ports by container traffic and accounts for approximately 40 percent of container freight moved throughout the United States.[6]

The physical footprint of California's freight network—the hubs and connecting arteries described above—is the key infrastructure

*California's freight system consists of 12 deep-water ports, 12 major cargo airports, three international commercial border crossings, 6,000 miles of railroad track, 5,800 miles of high-volume highways, and 19,000 miles of pipelines.*

### Freight Transport

This term refers to the processes and activities involved in the pickup, movement and delivery of goods (agricultural, consumer, and industrial products and raw materials) from producers/points of origin to consumers/point of use or delivery.

Source: California Environmental Protection Agency.

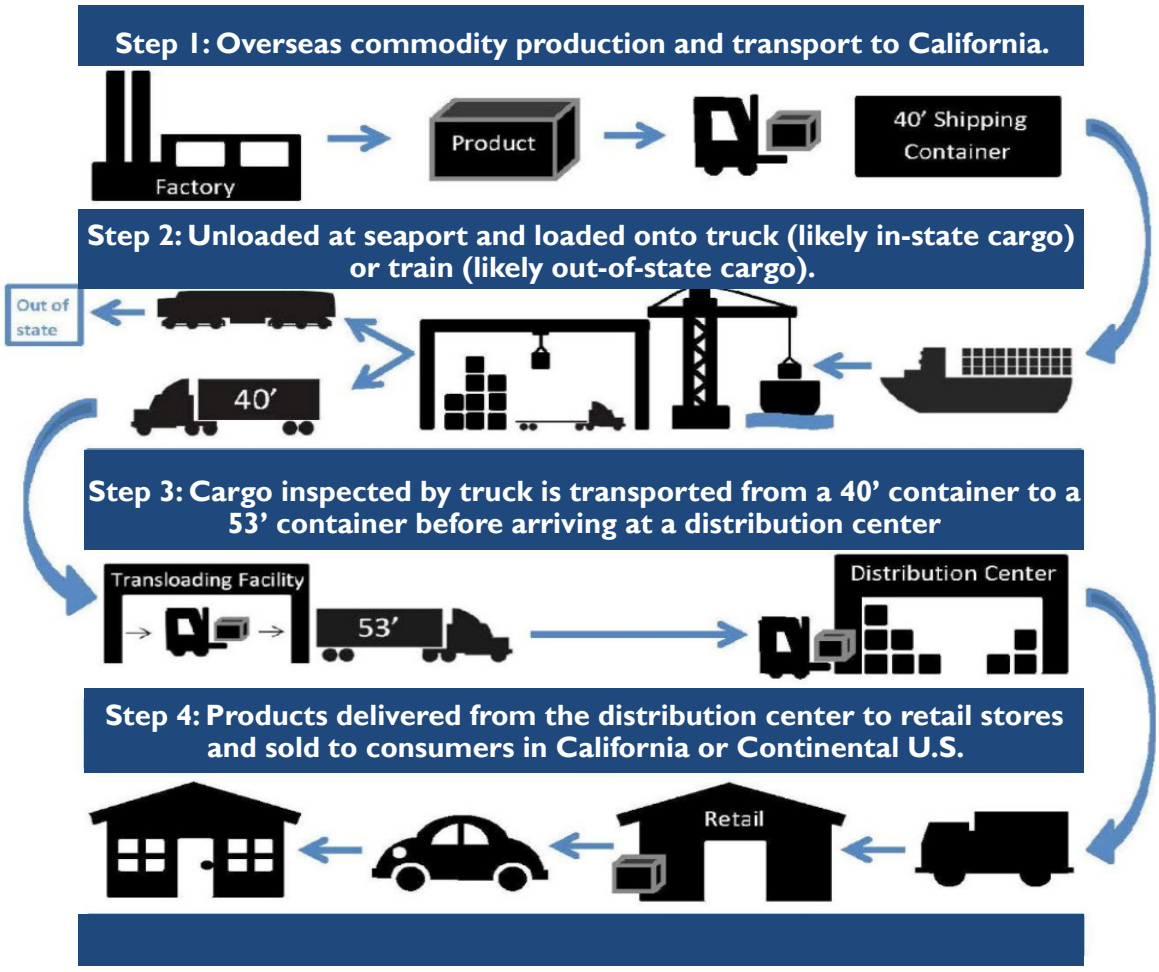



Figure 1. Freight System Processes
Source: California Air Resources Board, "Sustainable Freight: Pathways to Zero and Near-Zero Emissions" (Discussion Draft) (April 2015).

*"Freight is the economy in motion."*

**- Fran Inman, Majestic Realty Co.**

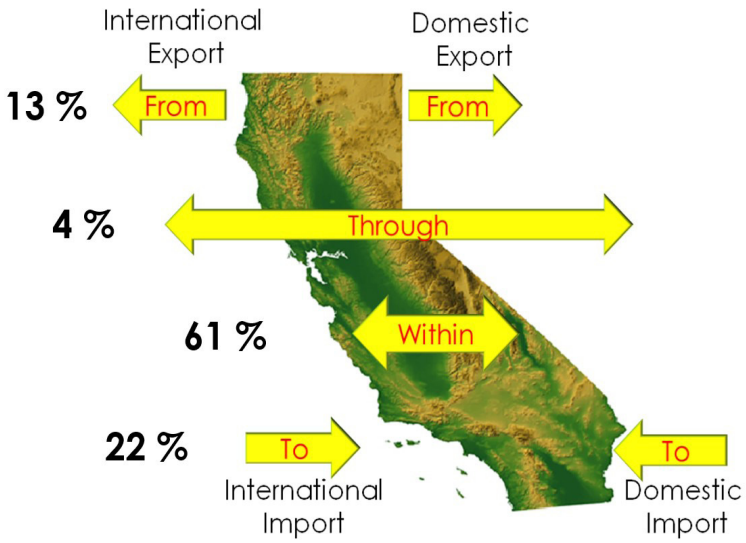


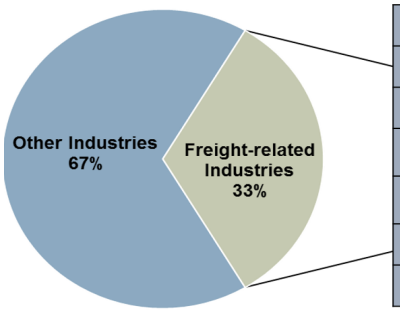

Figure 2. California Freight Destinations
Source: California Air Resources Board (Freight Analysis Framework Data provided by U.S. Department of Transportation).

that supports all freight functions. But freight transport, comprising the full range of freight operations performed on or at that infrastructure, constitutes a diverse set of movements and interactions among a range of modes of transit and industrial, commercial, and consumer entities.

California's freight system includes all freight moved in the state, regardless of origin or ultimate destination. While the state's sea and air ports are essential nodes for both the import of international freight for the entire United States and for the export of California's goods worldwide, over half of all California freight is the movement of goods entirely within the state: between California producers and California consumers.

**California Industry Employment Composition**

Total Employment (2016): 17 Million




| | |
|---|---|
| Retail Trade | 10% |
| Manufacturing | 8% |
| Wholesale Trade | 4% |
| Mining, Logging, & Construction | 5% |
| Transportation & Warehousing | 3% |
| Farm | 3% |
| Utilities | 0.4% |

Figure 3. California Industry Employment Composition
Source: California Air Resources Board (Data provided by California Employment Development Department, Labor Market Information Division).

## FREIGHT AND EMPLOYMENT

Approximately one third of all jobs in California are in freight-related industries. These jobs are shared among the trade, manufacturing, extractive, construction, farm, transportation and utility industries, each of which is directly linked to the physical movement of freight by one or more modes of transit. According to the most recent available data from the Bureau of Labor Statistics, approximately 230,000 Californians work as heavy- or light-duty truck drivers, and over 300,000 Californians are employed as freight and material movers.[7]

However, while the freight system is defined by the transportation network that spans the entire state, the employment benefits of the freight system are felt most directly in communities where major freight facilities are located. For example, the Port of Los Angeles estimates that the port directly employs nearly 1,000 people and indirectly generates another 133,000 jobs in Los Angeles, while the Port of Long Beach estimates that it is responsible for approximately one in eight jobs in Long Beach.[8] The Port of Oakland estimates that its direct and related business create over 73,000 jobs in the Oakland region.[9] The California State Transportation Agency has estimated that by 2040, the total amount of freight transported to, from and within California will increase by approximately 160 percent.[10]

*"Freight is already a sharing economy: it seeks to move the maximal amount of goods using the minimal amount of resources."*

**- Mitch Jackson, FedEx**

| PM2.5 and NOx | 2012 | 2030 | 2050 |
|---|---|---|---|
| Mortality | 2,200 | 980 | 1,100 |
| Hospitalizations | 330 | 330 | 150 |
| ER Visits | 950 | 420 | 450 |
| Valuation (billions) | $20 | $9 | $10 |

Figure 4. Statewide Health Effects and Valuation (2013 $) Associated with Freight Emissions Contributing to PM2.5—Midpoint Projections
Source: California Department of Transportation, California Sustainable Freight Action Plan (2016).

## B. Freight Emissions and the Environment

California's freight system is responsible for nearly 50 percent of statewide diesel PM2.5 emissions, approximately 45 percent of statewide NOx emissions, and approximately 6 percent of statewide greenhouse gas emissions.[11] PM2.5 and NOx emissions from freight are associated with thousands of premature deaths and billions of dollars in medical and lost-productivity costs.[12]

These health impacts are concentrated in areas closest to major freight facilities. According to the Natural Resources Defense Council, "[p]eople who live or go to school near ports, rail yards, distribution centers, and other diesel 'hot spots' face disproportionately higher exposure to diesel exhaust and associated health impacts, including increased risks of asthma and other respiratory effects, cancer, adverse birth outcomes, adverse impacts to the brain (including potentially higher risk of autism), heart disease, and premature death."[13] In California, this disproportionate impact is felt most by low-income communities of color: household incomes are 20 percent lower than average in areas neighboring the state's busiest roads, and almost 90 percent of residents in areas with the worst air quality are people of color.[14] In addition, the California Air Resources Board has estimated that people living and working in locations nearest to the San Pedro Bay Ports—communities like Long Beach, Wilmington and San Pedro—can face a much greater cancer risk than the average resident of the region, primarily due to their exposure to diesel particular matter from freight-related activities.[15]

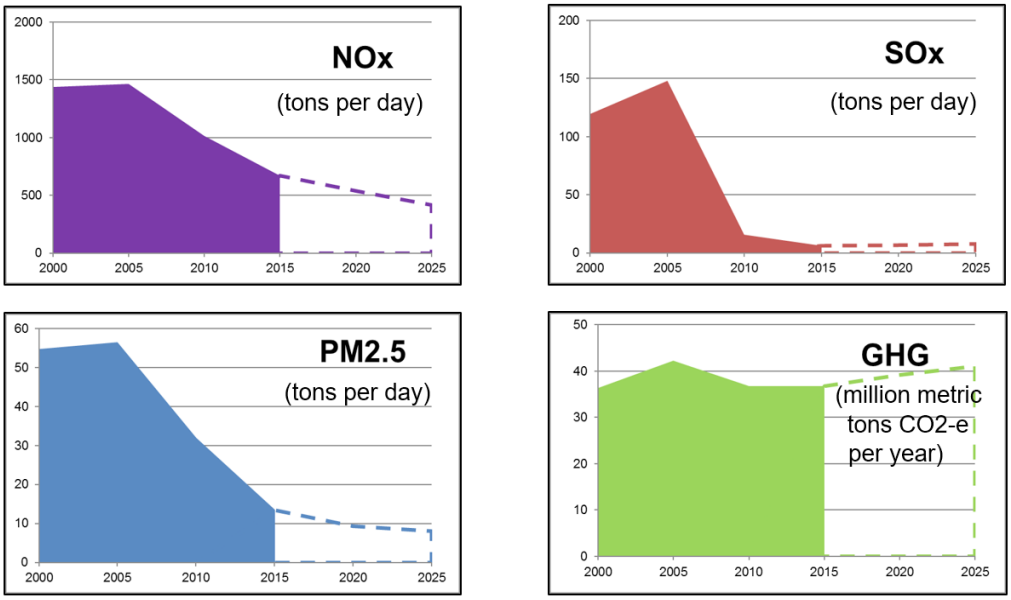



Figure 5. California Freight System Emissions: Progress and Projections
Source: California Air Resources Board, California Sustainable Freight Action Plan Public Workshop (May 2017).

Switching from diesel-powered trucks to electrically powered trucks could reduce emissions of PM2.5 and NOx (two of the most harmful and common air pollutants) and greenhouse gases by up to 90 percent. Transitioning completely to on-dock rail (*i.e.*, eliminating the use of trucks to transport cargo from ships to rail yards) could reduce emissions of PM2.5, NOx and greenhouse gases by approximately 70 percent. Switching from diesel truck transport to double-stacked rail transport could reduce greenhouse gas emissions by over 80 percent, and PM2.5 and NOx emissions by over 70 percent.[16] These changes would benefit the health of all Californians, and in particular that of the low-income communities of color that currently face the most significant impacts from the freight system.

## C. The Existing Freight Policy Landscape

Despite its significance within the California and global economies, the freight system has not historically been subject to coordinated planning by state regulators and policymakers. Rather, various core areas of state and local policy—including air quality and climate-change regulation, transportation and infrastructure funding, zoning and land use planning, labor policy, and economic policy—each affect the freight system, in diverse and often conflicting ways. The goal of the Freight Action Plan is to coordinate these policy processes in order to "integrate investments, policies and programs across several State agencies to help realize a singular vision for California's freight transport system."[17] In addition to the state agencies responsible for implementation of the plan, a number of federal, state, and local bodies house authorities and mandates that directly affect the freight system.

## 1. FEDERAL

The federal government, like the California state government, contains no single freight-related legal or regulatory authority. The U.S. Environmental Protection Agency is responsible for setting nationwide performance standards for emissions of harmful pollutants such as NOx and PM from "mobile sources." These standards cover all motor vehicle engines including passenger automobiles, light- and heavy-duty trucks, locomotives, and other non-road engines and many of the vehicles and equipment used in the freight system.[18] The National Highway Traffic Safety Administration and the U.S. Environmental Protection Agency also jointly set standards for fuel efficiency and greenhouse gas emissions from many classes of vehicles including medium- and heavy-duty trucks commonly used to haul freight containers.[19] Under the federal Clean Air Act, California may request from the U.S. Environmental Protection Agency a waiver to enact vehicle emission standards (including fuel efficiency standards) that are more stringent than those set by EPA.[20] The state has requested and received dozens of waivers, and once a waiver has been granted, other states may adopt California's standards.[21] Since the waiver process can be time- and litigation-intensive, and since federal standards are sometimes sufficiently stringent to meet California's requirements, the state only selectively applies for waivers. At the same time, due to California's size and economic power, when the state does obtain a waiver under the Clean Air Act, its more stringent standard is typically adopted by many other states. For example, 12 states have opted into California's Zero Emission Vehicle program, representing approximately one third of the US automobile market.[22]

In addition, under the 1982 Surface Transportation Assistance Act, the U.S. Department of Transportation enforces limitations on the length and width of trucks permitted on national highways, including a prohibition on twinned trailers over 28 feet long.[23] While states may permit longer trailers on state roads, the use of national highways is so integral to the state freight system that in practice the federal rule controls.

Like all states, California is heavily reliant on federal funding for the construction, repair, and maintenance of many of its roads and highways. While locally-raised funds represent approximately 50 percent of California's transportation dollars, approximately 21 percent comes from the federal government.[24] Continued receipt of these funds is premised on compliance with federal law.

Finally, under the Commerce Clause of the U.S. Constitution, states may not enact laws that "discriminate" against out-of-state commerce

by imposing lighter obligations on or otherwise favoring in-state actors.[25] Thus while state policies may negatively affect shippers or manufacturers from other states (for example, by requiring a level of fuel efficiency in trucks from other states that drive on California roads), they must apply to in-state and out-of-state parties equally.

## 2. STATE

In July 2015, Governor Brown issued Executive Order B-32-15, which called for the development of "an integrated action plan" for California's freight system with clear targets for improving efficiency, increasing competitiveness, and transitioning to zero-emission technologies.[26] In July 2016, the California Department of Transportation, the California Air Resources Board, the California Energy Commission and the Governor's Office of Business and Economic Development jointly issued the Freight Action Plan, which outlined both a long-term vision for California's freight system in 2050 and a set of targets for 2030, together with near-term actions, pilot projects, funding opportunities, and other concepts for implementation of these goals.[27]

The 2050 vision described in the plan is a system that "move[s] freight in California on a modern, safe, integrated, and resilient system that continues to support California's economy, jobs, and healthy, livable communities" while "[t]ransporting freight reliably and efficiently by zero emission equipment everywhere feasible, and near-zero emission equipment powered by clean, low-carbon renewable fuels everywhere else."[29] The plan identifies three 2030 targets—improving system efficiency by 25 percent in terms of value of goods moved relative to carbon emitted, deploying over 100,000 vehicles and equipment capable of zero-emission operation, and increasing economic growth and competitiveness—to move California toward accomplishing the 2050 vision.[29]

As the state's air quality regulator, the California Air Resources Board (in conjunction with the U.S. Environmental Protection Agency) sets efficiency and emissions standards for motor vehicle and equipment engines used in California, including highway trucks, sea vessels, port equipment, locomotives, and rail yard equipment.[30] Thus, the agency is arguably the most significant state-level authority with regard to freight sector sustainability.

*"We are trying to deal with the negative externalities of the current system and using our public funds to manage them: congestion, air quality, community impact."*

**- Brian P. Kelly, California State Transportation Agency**

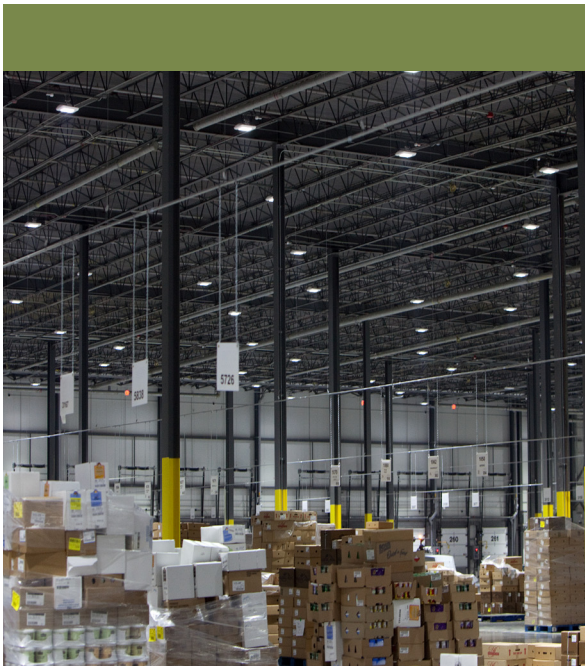
Figure 6. California Air Resources Board Mobile Source Strategy: Proposed Measures and Implementation Schedule (Freight-Related)
Source: California Air Resources Board, Mobile Source Strategy (May 2016).

| Measure | Agency | Action | Implementation Begins |
|---|---|---|---|
| **On-Road Heavy-Duty** | | | |
| Lower In-Use Emission Performance Level | ARB | 2016 | 2017 |
| Low-NOx Engine Standard – California Action | ARB | 2017-2019 | 2023 |
| Low-NOx Engine Standard – Federal Action | US EPA | 2017 – 2019 | 2024 |
| Medium and Heavy-Duty GHG Phase 2 | ARB / US EPA | 2016 – 2019 | 2018 |
| Advanced Clean Transit | ARB | 2017 | 2018 |
| Last Mile Delivery | ARB | 2018 | 2020 |
| Innovative Technology Certification Flexibility | ARB | 2016 | 2016 |
| Incentive Funding to Achieve Further Emission Reductions from On-Road Heavy-Duty Vehicles | ARB / SCAQMD | ongoing | 2016 |
| Further Deployment of Cleaner Technologies | ARB / SCAQMD / US EPA | ongoing | 2016 |
| **Off-Road Federal and International Sources** | | | |
| More Stringent National Locomotive Emission Standards | US EPA | 2016 | 2023 |
| Tier 4 Vessel Standards | ARB / IMO | 2015 – 2018 | 2025 |
| Incentivize Low-Emission Efficient Ship Visits | ARB | 2017 – 2018 | 2018 |
| At-Berth Regulation Amendments | ARB | 2017 – 2018 | 2022 |
| Further Deployment of Cleaner Technologies | ARB / SCAQMD / US EPA | ongoing | 2016 |
| **Off-Road Equipment Sources** | | | |
| Zero-Emission Off-Road Forklift Regulation Phase 1 | ARB | 2020 | 2023 |
| Zero-Emission Off-Road Emission Reduction Assessment | ARB | 2025 | -- |
| Zero-Emission Off-Road Worksite Emission Reduction Assessment | ARB | tbd | -- |
| Zero-Emission Airport Ground Support Equipment | ARB | 2018 | 2023 |
| Small Off-Road Engines | ARB | 2018 | 2022 |
| Transport Refrigeration Units Used for Cold Storage | ARB | 2017 – 2018 | 2020 |
| Low-Emission Diesel Requirement | ARB | by 2020 | 2023 |
| Further Deployment of Cleaner Technologies | ARB / SCAQMD / US EPA | ongoing | 2016 |

In addition to its foundational role in the preparation and implementation of the Freight Action Plan, the California Air Resources Board is also currently implementing the 2016 Mobile Source Strategy, which includes California Air Resources Board-specific emission reductions from a wide range of freight-related sources including medium- and heavy-duty trucks, ocean-going vessels, locomotives, forklifts, and other support equipment.[31]

| Project Category | Allocation (millions) |
|---|---|
| Advanced Technology Demonstration Projects | $34 |
| Low NOx Engine Incentives with Renewable Fuel | $23 |
| Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project | $18 |

Figure 7. Low Carbon Freight Transportation Project Allocations
Source: California Air Resources Board, Revised Fiscal Year 2016-17 Funding Plan for Low Carbon Transportation and Fuels Investments and the Air Quality Improvement Program.



In addition, the California Air Resources Board is responsible for administering some state funds raised through cap-and-trade auctions and allocated by the legislature. In Fiscal Year 2016-2017, these funds totaled over $360 million including $34 million for advanced technology demonstration projects for trucks and freight equipment, and $41 million for low- and zero-emission truck and freight equipment and incentives.[32] For Fiscal Year 2017-2018, the California Air Resources Board received $398 million from the legislature to further its investments in low carbon freight transportation.[33]

The California State Transportation Agency was created in 2013 to coordinate all California state-level transportation regulation, funding, and construction activities, including those of the California Transportation Commission (responsible for allocating highway and transportation improvement funds), the California Department of Transportation (responsible for the design, construction, maintenance, and operation of the state highway system), and the California Department of Motor Vehicles (responsible for vehicle registration and licensing). As a result, the California State Transportation Agency oversees the bulk of the roadway infrastructure that determines where and how efficiently freight trucks move freight. In the 2014 Freight Mobility Plan, California State Transportation Agency personnel identified approximately 100 then-current freight-related "Transportation Corridor Investment Fund" projects under agency purview, at an estimated cost of $7 billion.[34] Agency staff also identified an aggregate total need of $138 billion to fund a comprehensive, state-wide set of 700 freight projects.

The California State Transportation Agency is responsible for the implementation of Senate Bill 1 (Beall, 2017) which will play a significant role in shaping the future growth of the freight network. SB 1 enacted the state's first gasoline tax increase in over 20 years,

raising an anticipated $50 billion over the next decade for transportation funding focused on road and bridge repairs, mass transit improvements, and new surface transportation investments.[35] Described in more detail below at page 43, SB 1 is a key opportunity for investment in freight corridors, electric vehicle charging stations, and other efficient infrastructure necessary for the transition to a sustainable freight system.


The California Energy Commission is responsible for the state's energy policy and planning, and supports the development of low- and zero-emission fuel and vehicle technologies.[36] The California Energy Commission awards funds for activities related to alternative fuel production, fueling and charging infrastructure deployment, vehicle development and deployment, and workforce training and planning efforts.[37] These programs have been and will continue to be integral to the development and scaling of commercial near-zero and zero-emission vehicle technologies that all participants viewed as essential to the development of a sustainable freight system.

Finally, the California Public Utilities Commission is the state's regulator of privately owned electric, natural gas, and other public utilities. As such, it is heavily involved in the implementation of the state's energy-related laws such as SB 350, including rules surrounding electric utilities' support of electric vehicle charging. The California Public Utilities Commission has primary oversight over the rates charged and investments made by the state's private electric companies, and thus plays a key role in ensuring that the electrical system will support the electric vehicle functions that are anticipated to become core components of the freight transport system.

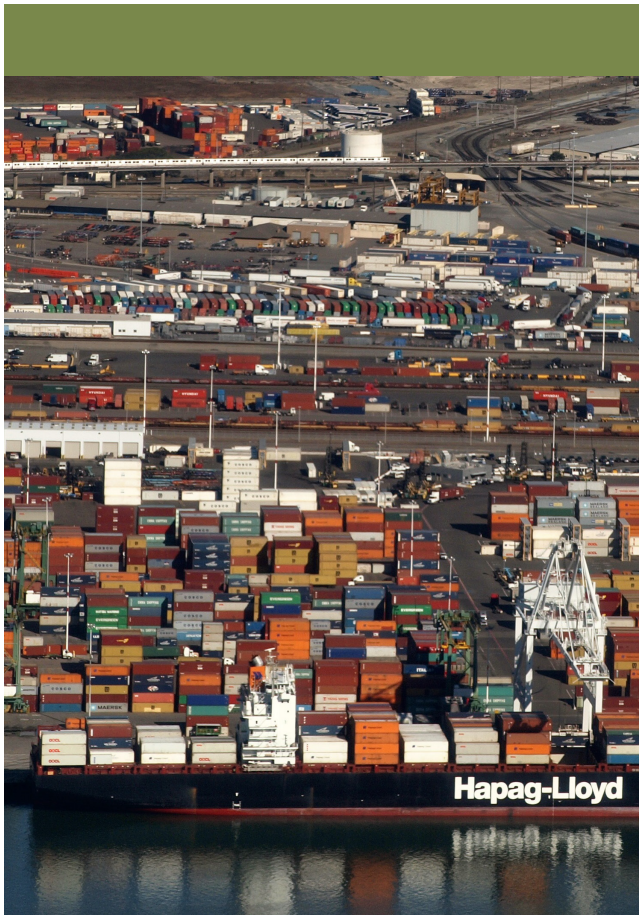
## 3. LOCAL

Local government entities and authorities play a significant role in the freight planning and decision-making process. Cities and counties maintain and enforce zoning codes, which dictate the areas within a jurisdiction that may be used for residential, commercial, agricultural, and industrial development. Local zoning boards have the authority to determine what uses are permitted in a given area, and will often prohibit location of commercial and industrial uses (such as rail yards and warehouses) in or near residential areas, which can be a significant barrier for state agencies and freight industry members seeking to construct new freight infrastructure.

In addition, under state law California is divided into 35 local air districts (known as Air Pollution Control Districts or Air Quality Management Districts) that are responsible for preparing implementation plans under

the Clean Air Act and setting and enforcing emission standards for sources within their boundaries.[38] Local air districts are integral to California's clean air programs, and they will be involved in many of the regulatory and funding actions under the Freight Action Plan.

## 4. PORTS




California is home to 12 sea ports, of which three—Long Beach, Los Angeles and Oakland—are major international container cargo ports, together handling over 25 percent of all U.S. container cargo traffic.[39] In 2006, the San Pedro Bay Ports (the two largest ports in the country by container volume, and combined equivalent to the tenth largest port in the world by container volume[40]) partnered with the California Air Resources Board, the South Coast Air Quality Management District, and the U.S. Environmental Protection Agency to adopt the San Pedro Bay Ports Clean Air Action Plan, a port-wide strategy for reducing air pollution from port operations.[41] The Clean Air Action Plan set emission reduction targets for NOx, SOx, PM and greenhouse gases at the ports and outlined measures to achieve these targets including retrofitting and phasing out older, higher-polluting trucks; introducing cleaner ocean vessel fuels and modifying in-port operations; accelerating turnover of cargo handling equipment and harbor craft; and upgrading locomotive engines.

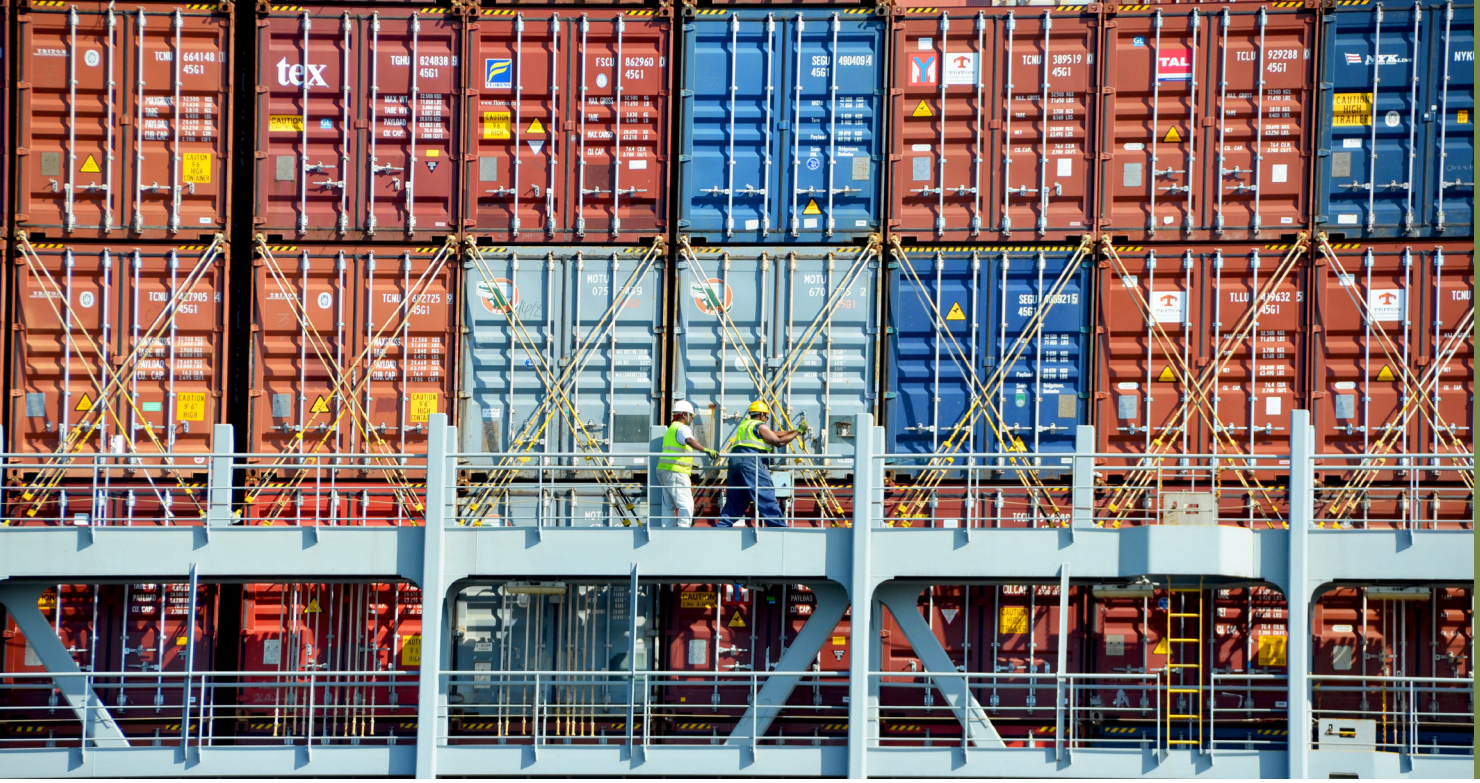
The ports updated the Clean Air Action Plan in 2017. The updated plan aims to reduce greenhouse gas emissions 40 percent below 1990 levels by 2030 (thus aligning with SB 32's target) and decrease PM, NOx and SOx by the previously-established amounts of 77 percent, 93 percent, and 59 percent below 2005 levels by 2023, respectively. In order to achieve these goals, the updated plan focuses on strategies such as expanded use of near- and on-dock rail, development of a universal truck appointment system and intelligent transportation systems, additional equipment electrification infrastructure, and transitioning to a zero-emissions drayage fleet by 2035.[42]

## D. Technological Developments

Implementation of the Freight Action Plan and the state's sustainable freight goals in general will rely on the successful development and deployment of a range of new goods movement technologies. Many of these technologies, such as low-emission fuels and biodiesels, have been substantially developed but are not yet available or economically viable at commercial scale; others, such as electric heavy-duty trucks, are still in research and development stages. While a complete survey of these technologies is not possible within the confines of this report, below is a summary of some of the key technologies upon which state regulators and industry actors will be relying in order to develop a sustainable freight system.

**Sample Freight Technological Developments**

| Technology | Description | Example |
|---|---|---|
| **Truck Electrification** | Powering of medium- and heavy-duty truck engines with electricity, rather than diesel fuel, similar to plug-in passenger vehicles such as the Chevrolet Bolt or Tesla models. | The Cummins AEOS, an electric heavy-duty (Class 7) truck cab with a range of 100 miles. [43] |
| **Truck Platooning** | A system of truck shipping that allows multiple trucks to drive in line at close distances via the use of automated and smart technology, potentially increasing safety and fuel efficiency. | Peloton, a California-based technology startup that is partnering with truck companies to test the technology. [44] |
| **Automated and Autonomous Trucks** | Digital sensor- and camera-based technology that assists human drivers with maneuvering and safety or allows for self-driving vehicles. | Tesla, Uber, Google, and many others are all developing similar versions of the technology. [45] |
| **Clean Fuels** | Internal combustion engine fuels that have a lower carbon footprint than traditional gasoline and diesel, such as natural gas (due to lower emissions when burned) and certain biofuels (due to lower lifecycle emissions). Many of these fuels can also emit less PM, NOx and other harmful pollutants than traditional fuels. | California currently operates a Low Carbon Fuel Standard, which requires fuel refiners and sellers in the state to use or blend certain minimum levels of low-emission fuels such as plant-based ethanol or natural gas. [46] |
| **Dynamic (or Smart) Truck Parking** | Truck parking lots equipped with sensor technology that detects the number of parking spaces available, which is communicated to drivers via roadway message boards to limit inefficient rest stops and searches for parking. | The Truck Parking Information Management System is conducting a pilot project in eight Midwestern states. [47] |
| **Port Automation** | The use of fully automated on-loading, off-loading and drayage technology, with minimal oversight by human operators, at containerized seaports. | TraPac operates an automated terminal at the Port of Los Angeles. The Port of Rotterdam, in the Netherlands, is largely automated. [48] |



# VISION, CHALLENGES AND SOLUTIONS

## Participants' Vision for the 2030 Freight System

As described on the previous page, the Freight Action Plan details three targets for 2030 that will enable the state to meet the 2050 vision of a sustainable freight system: a 25 percent increase in system efficiency; deployment of 100,000 zero-emission vehicles and equipment; and increased economic growth and competitiveness. Participants, in turn, identified their own vision of the sustainable freight system of 2030—the characteristics that they believed were essential to the implementation of the plan and achievement of its near-term goals. Participants envisioned a system that:

- Is more efficient (in terms of velocity and capacity) and less polluting;
- Employs enhanced system management software, and provides access to relevant real-time data;
- Benefits surrounding communities;
- Integrates globally to avoid "leakage" to other jurisdictions;
- Includes more near- and on-dock rail;
- Includes truck-only lanes and priority for freight;
- Utilizes a mix of both alternative and low-carbon fuels;
- Maximizes truck capacity utilization with efficient scheduling;

- Achieves maximum electrification that is both cost-effective and operationally viable;
- Relies on more autonomous, automated-with-driver, and connected vehicles; and
- Operates within a broader transportation network that is in good repair.

Participants then identified the challenges preventing that vision from becoming reality. After refining individual challenges and barriers into the group of six core challenges discussed below, participants proposed solutions—some broadly agreed, others heavily debated—to those challenges.

*"The community will block proposals if the breathers and the payers do not benefit as much as the thinkers and the earners."*

**- Hector De La Torre, California Air Resources Board**

*"Air pollution is only one impact that communities experience from the current freight system. It's not enough that trucks, trains, and fuels all be as clean as possible. We need to help the most impacted neighborhoods breathe healthy air and feel a sense of ownership of the solution. Otherwise they will continue to fight every new project, even those designed to move goods more efficiently and reduce emissions."*

**- Mary Nichols, California Air Resources Board**

## Challenge #1: Lack of Community Buy-In

Participants cited gaining community buy-in to new freight infrastructure projects and technological developments as the single greatest challenge facing policy makers and industry. The communities most impacted by freight infrastructure may be neighborhoods where new infrastructure is planned, adjacent areas experiencing freight-related air pollution, or port, trucking, rail, and warehouse labor groups. These are most often low-income communities and communities of color, who have suffered from a long history of disproportionate exposure to harmful emissions and other impacts.[49] But their concerns are not limited to the significant air quality- and public health-related issues described above. Communities located near freight facilities also frequently suffer from increased noise and traffic levels, visual blights, and depressed property values.[50] Development processes that do not address these concerns can lead to litigation and other processes that can slow or block proposals.

Participants cited three core components when describing the lack of community buy-in: 1) a lack of trust by communities of developers and industry; 2) a lack of public and policymaker education about the freight system; and 3) labor union resistance to new freight technologies.

Addressing this lack of community trust is critical to building the sustainable freight system of the future, as policy makers and industry will need to be able to plan and construct substantial new freight-related infrastructure, which may include new highway freight corridors, increased capacity at rail yards, expanded warehouses and distribution centers, and significantly increased electric vehicle charging infrastructure. All of this new infrastructure will need to be located within existing communities that have both access to existing freight infrastructure (such as sea ports and highway access points) and capacity to accommodate new

development. In addition, industry will need to adopt a host of new technologies, ranging from electric vehicles and vehicle automation to truck platooning and container offloading software. Without proper outreach to and input from affected communities, freight system stakeholders will not be able to design and implement new projects and standards in the manner that is most efficient and most responsive to community needs.

## SOLUTION: INCREASED COMMUNICATION WITH MOST-IMPACTED COMMUNITIES AND INVOLVEMENT OF COMMUNITIES IN THE PLANNING PROCESS

- ***Policy makers and industry leaders could ensure a meaningful seat at the table for key communities at the beginning of the planning process and identify a set of viable actions that prioritize and address the needs and concerns of communities most impacted by freight.***

As an initial step in the planning process for new freight vehicles, equipment, infrastructure, and technology, planners need to identify those communities that are at greatest risk of increased traffic, congestion, and pollution as a result of existing and proposed freight projects, as well as those communities that might benefit most from new projects and increased efficiency. These communities should be involved in the project selection process at the earliest possible stage, to identify best-case scenarios and concerns raised by other proposals. After identifying these risks and opportunities, planners can work with community leaders to determine the level of benefit or harm reduction that those communities will need in order to support a given project, and incorporate these outcomes into their initial proposals.

Participants cited the Southern California International Gateway project and the successful community-led challenge as an example of a freight infrastructure project that offered significant and identifiable net gains, but faced significant opposition due to a failure to properly identify community needs at the outset. Had the Port of Los Angeles and Burlington Northern Santa Fe Railway included affected community groups in the planning process earlier, it might have been possible to demonstrate why they believed other alternatives were not feasible solutions, or to find cost-effective ways to incorporate protective measures such as a buffer zone or zero-emission technologies. As policy makers and industry seek ever more complex solutions to

### Case Study in Community Relations: The Southern California International Gateway Project

In 2013, Burlington Northern Santa Fe Railway and the Port of Los Angeles submitted a proposal for the Southern California International Gateway project, a plan to construct a new 150-acre intermodal rail yard and container storage facility to serve the San Pedro Bay Ports with increased access to near-dock rail in order to meet anticipated container cargo growth. In the Environmental Impact Review prepared in connection with the project under the California Environmental Quality Act, the Port found that the Gateway project would significantly reduce truck trips on highways within Los Angeles, provide thousands of construction and long-term jobs, and help achieve the state's freight transport goals.[51] The Port also identified significant, unavoidable negative impacts to air quality (including increased NOx and PM emissions) and noise levels in the local community that would likely result from the construction and operation of the project, but determined that the anticipated benefits of the project would outweigh these environmental effects.[52] The Los Angeles Board of Harbor Commissioners and the City Council approved the project.

A coalition of community, environmental, and trucking groups challenged the Gateway project under the Environmental Quality Act, arguing that the Port had understated the likely environmental impacts, and in 2016 the trial court vacated the approvals.[53] While the court's opinion focused on technical questions, the challengers made clear that they were objecting broadly to the construction of the new facility in a low-income, minority neighborhood and near multiple public schools when alternative plans or zero-emitting technologies could avoid negative health impacts.[54]

*"What communities want is a seat at the table in the planning process and prioritization of the needs of our most impacted communities. That needs to happen on freight. A lot of what they're asking for is not hard."*

**- Joel Espino, Greenlining Institute**

*"No utilitarian arguments are going to satisfy the community buy-in aspect of the discussion. Do we have the institutions to give the community a seat at the table and earn their buy-in?"*

**- Gene Seroka, Port of Los Angeles**

infrastructure needs and as new technologies develop to mitigate environmental impacts, such prioritization of communities will be essential to the success of proposed projects.

- ***Policy makers and private infrastructure developers could acknowledge the history of mistrust among the parties and decisions that disproportionately affect low-income communities of color; review past failures; and identify trusted third parties to facilitate communication.***

One challenge in building trust is the history of negative impacts and controversial projects that have contributed to the gap in trust between communities and environmental groups, on one hand, and policy makers and planners on the other. While early convening opportunities and solicitation of input will help to close this gap, the community members that come to the table may be hesitant to rely on developers' assessments at all, even if they are based on good faith efforts. For example, while finding the Gateway project's environmental assessment legally deficient, the court stated that it was "clear that a great deal of careful thought has been given to the environmental impacts of the project" and expressly "infer[red] that petitioners must share that notion."[55] The petitioners, meanwhile, argued publicly that the project "typifie[d] environmental racism."[56]

In order to bridge this gap, policy makers and industry leaders could consider not just the current concerns and needs of local communities, but also review where past policies and projects have failed or harmed those communities. Participants noted the potential value of neutral third parties from outside the relevant government agencies—for example, elected officials or even trained mediators—in facilitating this process and helping the parties to find common ground. By involving a third party to lead interactions, an agency representative or developer can signal to the community that he or she is approaching the development process as an equal partner.

- ***State leaders could increase the scope and regularity of outreach to community, labor, and environmental groups, to coordinate among multiple state transportation, energy, environmental and workforce agencies early in the process.***

Participants emphasized the importance of not only soliciting community input at an early stage, but also designing forums that foster continued community involvement and allow agencies, industry, and communities to share information and concerns throughout the planning process. Regular check-ins with community groups, identification of community leaders to coordinate the communication of suggestions and responses, and inviting community members to freight facilities to gain a better understanding of their operations and demands are all key components of this strategy.

Participants cited the California Air Resources Board's standing, monthly update meetings with environmental and public health leaders as a model for how state agencies involved in freight planning could address community buy-in by giving advocates a regular opportunity to ask questions and make suggestions about projects in development. Industry members also described the success of convening community groups for warehouse and retail store visits as a method to initiate dialogue about the freight system. Groups like the California Cleaner Freight Coalition[57]—a nonprofit coalition of environmental, environmental justice, and public health groups—could spearhead such interactions in order to provide communities with context for considering proposed projects, and to ensure that planners are fully apprised of community needs.

State agency representatives stressed the value of encouraging inter-agency cooperation during all phases of project development, noting that while government agency mandates and authorities are often limited to distinct "silos," community concerns are not. Thus, crafting an acceptable solution for an affected community may require input from and actions by two or more state entities. For example, the California Air Resources Board and an Air Quality Management District may determine that a particular level of vehicle electrification is required in order for a new port facility to meet community air quality needs, only to learn that current utility rates will not allow the cost-effective use of charging infrastructure. If the California Public Utilities Commission were involved in the planning process at the outset, it could use knowledge of


*"Communities aren't siloed, though government is. If we can volunteer a solution for a community by having energy at the same table as freight, it might make that community happier with what we're trying to work on."*

**- Carla Peterman, California Public Utilities Commission**

community and industry needs with regard to electric vehicle charging infrastructure to inform long-term decisions about electric utility rates, and thus increase the chances of satisfying those needs. Regulators could form inter-agency freight task forces to tackle the goals of the Freight Action Plan, and use these task forces as platforms to interact with industry and community groups in order to identify needs and concerns at the earliest possible juncture.

## SOLUTION: INCREASED INFORMATION AND GRANTS TO SUPPORT COMMUNITY DECISIONS AND DEMANDS WITH RESPECT TO NEW PROJECTS AND STANDARDS

- ***All stakeholders could raise awareness of the successes that state and industry players have achieved and can achieve in further reducing the environmental impacts of freight in the most affected communities, and promote the interest of communities in reducing local air pollution.***

Participants consistently remarked that stakeholders on all sides were not adequately communicating the benefits of and desire for emission reduction. Meanwhile, industry and state leaders may have insufficiently described the positive health and community impacts associated with completed and new projects or inadequately acknowledged the public's desire for further emission reductions.

As discussed above in connection with the Gateway project, the simple presentation of net social benefits of a proposed regulation or infrastructure development, however accurate, is often not enough to garner the support of affected communities: local area and neighborhood benefits must be clear and tangible. At the same time, policy makers and planners often may not be aware of specific community desires until after a proposal has begun to move forward: following mandates to generate statewide environmental and economic improvements, they may rush to commit to a project without a complete understanding of local concerns and potential opposition. Earlier, more complete information sharing among stakeholders and the creation of regular working groups have the potential to ensure that all parties effectively communicate their interests and goals regarding emission reductions at the first possible stage.

- ***State leaders and industry players could provide more grants for technical assistance to help communities meaningfully engage in the decision-making process and more data and modeling to inform community processes.***

In addition to complete information and data, communities in many instances also require technical assistance in order to interpret proposals, identify concerns and opportunities, and develop potential solutions.

Assembly Bill 617 (C. Garcia, 2017)[58] could help address the technical assistance need. The law aims to reduce harmful criteria pollutants and toxic air emissions from industrial facilities in the state's most vulnerable areas. AB 617 requires the California Air Resources Board and local air districts to develop and implement stringent, community-specific emission reductions targets and deploy community air monitoring systems in these areas, and to engage with community stakeholders in the process of identifying them. In order to support this community participation, the California Air Resources Board is obligated to provide technical assistance grants to community organizations. Participants identified AB 617 as a key opportunity both for communities to obtain needed technical assistance funds, and for state leaders to help achieve community buy-in by demonstrating the level of support and collaboration that is possible through well-designed grants.

### Technical Assistance Grants

Technical assistance grants are government funds provided to communities to assist in decision-making and policy process participation. Grants typically are used by qualifying community to retain their own technical advisors to review government and industry reports, proposals and decisions and explain their implications and impacts to non-expert community members.

## SOLUTION: INCREASED COMPENSATION TO REDUCE PROJECT IMPACTS

- ***State leaders could provide transportation mitigation funding and up-front financial compensation to avoid and minimize impacts of projects on communities.***

The freight system, like all other commercial and industrial operations, can exact a financial toll on communities in the form of congestion, property value, and most importantly, health related impacts. According to the Freight Action Plan, while premature deaths related to PM2.5 and NOx emissions from the freight sector are anticipated to fall by over 50 percent, nearly 1000 individuals are still expected to die prematurely due to these emissions in 2030. The combined economic impact of these health effects would be nearly $10 billion,[59] and, as noted above, this impact will likely be concentrated in low-income communities of color. Developing and publicizing the means to help communities avoid or reduce the impacts they may face from freight projects would help to address the disproportionate impacts these communities already

experience, and could motivate greater community interest in the achievement of statewide freight development targets.

Under the state's Environmental Enhancement and Mitigation Grant Program, local and non-profit entities may apply for state funding for projects that contribute to mitigation of the environmental effects of transportation facilities.[60] The program's fund is limited to $7 million per year, but the program could serve as a model for future state funding to mitigate the impacts of new freight infrastructure projects that, even as they help to reduce statewide environmental impacts in furtherance of the Freight Action Plan's sustainability goals, may redirect disproportionate impacts to vulnerable communities that suffer as a result. SB 1's Advance Mitigation program, which includes $120 million over four years to fund mitigation projects related to SB 1 construction, focuses primarily on land conservation but provides another model for the type of commitment that could be made in the freight context.[61]

A well-funded freight mitigation program would give medical and environmental nonprofits easier access to funds necessary in order to preserve and improve human and environmental health when freight infrastructure projects may lead to negative impacts. Any such funding should be provided in concert with increased technical assistance and process involvement, so that communities are able to fully evaluate and weigh in on the impacts of proposed projects before they are finalized; as well as ensure strict enforcement of regulatory requirements once projects are under construction and after they are completed, in order to verify that projects operate as planned and permitted. Mitigation funding can thus serve as an essential component of a holistic approach to the better integration and protection of communities in the freight planning process, providing needed funds to supplement increased information, participation and prioritization for communities.

## SOLUTION: IMPROVED PROJECT DESIGN AND IMPLEMENTATION

- ***California Department of Transportation, California Air Resources Board, and other lead agency staff could select future pilot projects that are most likely to yield near-term benefits; focus on planning areas, not discrete projects; and address traffic, pollution and safety concerns.***

In order to earn community and industry buy-in, participants agreed that the state needs to ensure that early funds generate immediate efficiency and emission reduction gains (especially in the most-impacted communities) and demonstrate the potential benefits of further projects to all stakeholders. To that end, state leaders could continue to focus on pilot projects that are most likely to yield a diverse set of near-term benefits, in order to gain momentum and build trust among the parties. The state agencies responsible for implementing the Freight Action Plan have selected three initial pilot projects that can provide early, identifiable benefits to labor, community and industry groups, thus ensuring project buy-in and future success. The design and selection of these projects can serve as a model for effective next-stage pilots.

*"We often approach planning project by project, but that is a mistake. Any project can be delayed and every project has opponents. We need to look at a planning area, at the net benefits and costs for the area, as a whole."*

**- Ken Alex, Governor's Office of Planning and Research**

### **Case Study in Project Design:** Freight Action Plan Pilot Projects

Three initial pilot projects have been selected to fund (1) the construction of new biomethane production plants, pipelines and fueling stations and the upgrade of selected truck fleets to use these fuels; (2) the deployment of zero-emitting technologies, hydrogen and electric fueling stations and dynamic truck parking at select southern California trucking corridors; and (3) the installation of advanced information, lane management and other technologies at select border crossings.[62] One of these projects includes the deployment of 500 zero-emitting and near-zero-emitting trucks and the construction of 10 electric charging stations and five hydrogen refueling stations along the I-710 corridor connecting the Port of Long Beach to Los Angeles, each beginning in 2018.[63] Another includes the construction of biomethane generation plants beginning in 2017-2018 and a new fueling station by 2018-2020.[64]

While the pilots include construction and deployment timelines extending through 2023 to 2035, and projects are always subject to potential revision and delay, the inclusion of near-term implementation dates for these pilots will ensure that the implementing agencies can quickly assess some of the benefits they generate, and share these results with a range of stakeholders. In addition, they can provide a range of benefits, including reduced traffic congestion and road accidents, decreases in harmful PM and NOx emissions, optimized driver schedules, and new jobs in locations where fuel production facilities are constructed.[65]

The truck corridor pilot is designed to implement a range of freight solutions across the entire 23-mile I-710 corridor: vehicle-based technologies including low- and zero-emission engines and connected vehicle technology; roadway-based technologies including camera-based data collection and traffic management and optimization; and new infrastructure such as charging and refueling stations and dynamic truck parking at rest areas.[66] By approaching the entire corridor as a single planning area, rather than separately proposing and designing each the California Department of Transportation has ensured that the benefits of the pilot are assessed accurately and holistically, and that the interconnectedness of the freight system is adequately reflected in project design.


*"The fact that we don't have a top-ranked university supply chain program in California is a missed opportunity for the freight system. Our academic centers should be focusing more on the field."*

**- Fran Inman, Majestic Realty Co.**

*"We need to avoid having the longshoremen being in the same boat as coal miners are today. Retraining to be factory workers in a place with no factories doesn't do displaced workers any good."*

**- Conference Participant**

- ***State and industry leaders could create and fund freight education programs to enhance the current workforce and better prepare individuals facing barriers to employment in the logistics industry.***

Industry participants remarked on the lack of a premiere freight systems- or freight transport-related program within the University of California or California State University system, and the lack of emphasis on freight-related training programs in state high schools and colleges. Specifically, participants commented that the freight system's transition to newer, more efficient technologies will require both increased technical training among policy makers and new training programs for laborers who will utilize the technologies. While the state's colleges do offer a range of degree and certificate programs in logistics and supply chain management, the California State Transportation Agency has acknowledged that due to the retirement of the baby boomer generation "the freight sector has a great need for proactive workforce development, succession training, and workforce retention programs" and "[t]he creation of a comprehensive workforce development strategy across all would be beneficial in this regard."[67] Participants emphasized that such workforce development not only would aid the freight sector by increasing the supply of qualified workers, but also would facilitate community buy-in by creating greater linkages between the sector and communities through employment.

California state leaders could look to institutions like Michigan State University and the Massachusetts Institute of Technology, which are home to top-ranked supply chain management and logistics programs,[68] for guidance on how to design freight-related higher education programs. In addition, state leaders could increase funding and promotion of programs like the supply chain management certificate programs available at UC Irvine, UCLA, UC Riverside and other major state universities. To the extent industry members see the lack of freight-specific education as harmful to their bottom lines, they could also consider providing financial assistance to high school- or college-level training programs. These programs could help ensure that new freight projects are connected to new freight jobs in the communities where they are located.

- ***State and industry leaders could ensure training and just transitions for labor.***

Increasing use of port technologies such as computerized cargo offloading and trucking technologies such as truck automation and platooning, widely recognized as essential to the efficiency gains that will be necessary for a sustainable freight system, is anticipated to displace significant numbers of workers throughout the state.[69] Some estimates place future job displacement in the trucking industry, for example, at up to 80 percent or more—which could easily translate into hundreds of thousands of jobs in California.[70] Participants uniformly agreed that the transition to the future freight system must include job retraining and other mechanisms to ensure a just transition for current workers.

State leaders could work to ensure that funding for retraining and transitioning programs remains a priority and does not fall behind in favor of funding for high-publicity technology and infrastructure proposals. Industry leaders can also provide financing to support these initiatives, or engage in proprietary programs to retrain their own workers for the technologies that they expect to implement in the future. As training programs progress and become more robust, both government and industry will need to seek community and labor input to ensure that workers' and families' needs are actually being met. Furthermore, program designers and administrators who focus on maximizing equity benefits by targeting job training opportunities to low-income and diverse groups can build additional community trust and buy-in. Such programs will serve not only the workers who participate, but also the broader communities that rely on their income and the state and industry entities that benefit from their skills.

## Challenge #2: Policy Uncertainty

Participants, particularly those representing industry, identified a lack of certainty regarding future freight-related policies as a second key barrier to the achievement of their vision of the sustainable freight system. In particular, participants cited three distinct factors—a lack of clearly established standards for electrification, autonomy, and other new technologies; a lack of trust between industry and regulators; and potential California Environmental Quality Act litigation—as the basis for an environment that is not optimally conducive to forward-looking, sustainable freight investments.

At the same time, industry participants cautioned that regulations and standards that fail to align with industry's technical or economic capacities can lead to even more delay in achievement of efficiency goals. To that end, government and industry participants discussed the value of engagement with industry in the policy making and infrastructure planning process, as a way to ensure that state leaders commit to new regulations, standards, and projects based on the most current possible information.

### Freight Action Plan Workforce Development Initiatives

The Freight Action Plan includes three different workforce-related actions, each to be implemented by the Governor's Office of Business and Economic Development and the California Workforce Development Board: coordinating workforce investment initiatives by establishing a skills pipeline in critical occupations and creating regional training partnerships; developing more freight-specific training models; and supporting community workforce agreements.[71] Each has a long-term implementation timeline beginning in 2017. The pursuit of an expansion of these and similar initiatives is a core element of participants' vision of the future freight system.

### The California Environmental Quality Act

The California Environmental Quality Act (CEQA) is a state law that requires state and local governments to identify and mitigate the environmental impacts of projects they undertake, fund or approve. When a public agency or private developer proposes a new freight (or other) infrastructure project, it must prepare an environmental impact review of the project, a legally and technically complex process that can take many years and often leads to litigation.

## SOLUTION: GREATER INTEGRATION OF INDUSTRY CAPABILITIES AND LIMITATIONS INTO POLICY PLANNING AND DESIGN

- ***State leaders could clarify the role of the state in realizing greenhouse gas and criteria pollutant emission reductions from the freight sector.***

Industry participants stated that while the state has been consistently clear about its overall greenhouse gas emission reduction goals, from the initial enactment of AB 32 in 2006 through the recent targets set by Governor Brown's executive orders and the passage of SB 32 in 2016, it has been less clear about the role of the state in realizing these goals within the freight sector. While the Freight Action Plan provides a planning framework, industry leaders may need further direct instruction from state regulators on the extent to which they expect industry to achieve the planned reductions via business-as-usual technological process and innovation, and the extent to which they anticipate incentives and regulatory requirements will force changes.

Participants from across industry, government, and advocacy groups emphasized the value of clear timelines in accomplishing this desired clarity. In particular, participants indicated a need for the state to design and promote a timeline for the achievement of the Freight Action Plan's policy goals, based on discrete action items for a range of parties. While the Freight Action Plan includes a thorough list of proposed actions with development and implementation dates, participants expressed a desire for a more widely disseminated, easily referenced timeline that could be used by all parties as a benchmark for progress.

One example of such a "benchmark" timeline might be the state's Zero Emission Vehicle Action Plan, which lists dozens of specific goals, including lead and supporting parties and achievement timeframes, under the broad categories of achieving mainstream acceptance, increasing affordability, ensuring charging access, maximizing economic and job opportunities, bolstering the out-of-state market, and integrating zero emission vehicles into state operations.[72] While these goals are necessarily somewhat narrower than the state's goals for the sustainable freight system, they nonetheless share the same technological, infrastructural, and economic concerns. The Action Plan states that its "intent is to clearly communicate what state government will do to advance zero emission vehicles and serve as a 'to-do' list for the Governor's Office and state agencies to enhance interagency coordination."[73] Such a "to-do" list can serve as a model for the state in preparing a timeline or other similar document that will allow stakeholders to track progress.

- ***State leaders could prepare a detailed set of policy principles and guidelines for implementation of the Freight Action Plan and achievement of other targets, and assign responsibility for implementing solutions to those parties that are best positioned.***

Government and industry participants hailed the vision and scale of the plan but emphasized that given its breadth and implementation timeframe, California Air Resources Board, California State Transportation Agency, California Energy Commission, California Department of Transportation, Governor's Office of Business and Economic Development and other lead agency staff could prepare a set of detailed policy guidelines to shape that implementation. Specifically, state leaders could build on the "guiding principles" outlined in the Freight Action Plan[74] by identifying the key metrics by which achievement of those principles will be measured (for example, the number of freight-related deaths, injuries and security threats to be avoided) and the key players who will participate in that achievement. All stakeholders acknowledged that uncertainty regarding policy specifics is unavoidable in any long-term planning process involving such a diverse range of interested parties. As a result, clear policy principles—creating a common definition of success, facilitating inter-jurisdictional consistency, determining which parties could be responsible for which developments—are especially important in order to ensure successful investment and deployment.

- ***State leaders could craft flexible standards and focus on the feasibility, scalability, and interoperability of technologies.***

Industry participants emphasized that in order to facilitate compliance and progress on emission reductions, state regulators could work to ensure that regulations implementing new emission reduction policies and other efficiency targets are centered on commercial feasibility. In particular, industry representatives stated that a few key concepts could direct policy makers: whether new technologies could be produced and implemented at commercial scale; requiring compliance to the maximum extent possible, rather than setting inflexible standards; the return on investment that industry can generate; and technological reliability, both short- and long-term.

## Case Study in Flexible Standards: The Clean Air Act

The Clean Air Act contains examples of different types of standard-setting that may be informative in considering feasibility. Under the law's hazardous air pollutant provisions, which limit emissions of the most immediately health-harmful substances, state regulators require facilities to implement "maximum achievable control technology": at least the level of emission reduction that the best-controlled similar facility achieves.[75] Thus for the most toxic pollutants, facilities are essentially required to use industry-leading technology to control emissions. By contrast, under the Act's provisions dealing with ambient air quality for areas of the country that have already achieved national baseline quality levels, state regulators require facilities to implement "best available control technology": a case-by-case determination of the emissions limitation achievable at each individual source taking into account energy, environmental and economic impacts.[76] While technology-forcing requirements are naturally more appropriate for the most harmful pollutants, industry, perhaps unsurprisingly, tends to prefer more flexible, case-by-case standards that account for economic costs. As state agencies design and enact new regulations on freight vehicle and facility emissions and other efficiency requirements, embracing the "best available control technology" model where possible may foster greater industry buy-in.

- ***State leaders could avoid a regulatory patchwork through awareness of out-of-state policies and federal-state coordination.***


*"Whatever policies we put in place in California, we need to make sure they work nationally. We don't want to build a 49-state truck."*

**- Susan Alt, Volvo**

In addition, regulators are and could remain aware that since California often takes a leadership role on air quality and environmental regulation—setting standards that exceed federal baseline requirements—manufacturers must be able to produce, and sellers and shippers must be able to purchase, vehicles and equipment that satisfy all applicable regulatory requirements. In practice (and by design), California's more stringent rules often become de-facto national standards, due to the economic inefficiency of producing multiple models of the same equipment.[77] Thus, while the California Air Resources Board and other state regulators will continue to lead the way on emission reductions, the industry members that will be required to achieve those reductions may be considering transitions to new technologies or operations on a nationwide basis. Coordination with federal and out-of-state regulators, to the extent it does not limit California's ability to achieve environmental quality targets, could be considered a priority to ensure optimal implementation.

One instance of such coordination occurred in 2009, when the U.S. Environmental Protection Agency and National Highway Traffic Safety Administration first set automobile greenhouse gas emissions standards in a joint rulemaking. In order to avoid inconsistent rulemakings on fuel efficiency and tailpipe emissions (two related but previously distinct policy areas), the two agencies decided to coordinate and set a single national standard. The California Air Resources Board, which had previously set greenhouse gas emissions standards that the automobile industry challenged in federal court, agreed to treat compliance with this federal standard as equivalent to compliance with its own program, effectively foregoing its waiver authority under the Clean Air Act, in order to support a streamlined, progressive national program. In exchange, the automobile companies agreed not to challenge the program in court.[78] While the context of the joint rulemaking may not be replicable—the automobile industry was also working to receive bailout funds from the Obama administration, which in turn was sympathetic to the California Air Resources Board's waiver applications—the decision to align state policy with federal policies led to a unified program that industry supported, and which could serve as a model for freight-related regulations.

- ***State leaders could solicit and be responsive to industry input and support regulatory decisions with analytics and data.***

Both government and industry representatives stated a desire for more industry input in the policy making process, in order to ensure that the decisions ultimately made by state regulators align sufficiently with industry capabilities and projections. One example of the value of such input is the recent controversy over indirect source rules, which require developers of projects to account for all emissions from mobile sources associated with the projects, such as the emissions from new traffic attracted to a development.[79] In early 2017, the South Coast Air Quality Management District approved a 15-year air quality plan that included potential imposition of indirect source rules at the San Pedro Bay Ports.[80] While many local representatives and environmental groups hailed the rules, freight industry members argued that they are commercially impractical and can lead to inefficient siting of freight facilities, more total miles driven and greater congestion. Industry participants felt that the inclusion of indirect source rules in the final plan could ultimately prove counterproductive by alienating freight and shipping industry entities that might, in a different environment, be more likely to cooperate with future voluntary emission reduction measures. The District will likely need to engage in additional outreach to select a policy that ultimately satisfies community and environmental demands while also accommodating industry's concerns.


- ***The California Public Utilities Commission and the state's publicly owned electric utilities could increasingly consider the impact of electricity rates and rate design on freight efficiency and electrification opportunities, and encourage further development of the grid to accommodate freight-related demand.***

Industry and government representatives were equally concerned that electric utility regulation and planning may not support the efficiency measures, such as vehicle and equipment electrification, that will be expected of industry in the future. For example, port representatives indicated that, even ignoring the costs of proposed electrification, local utilities simply may not be able to meet the increased demand for electricity. Similarly, shipping industry members discussed the need for flexible electricity rates that can accommodate the introduction of a new class of vehicle charging.

The California Public Utilities Commission (as the state's regulator of privately owned electric utilities) and the state's publicly owned utilities have the power to incentivize expansion of (or more efficient use of existing) capacity to meet new charging and facility electrification needs, and to permit the use of dynamic rates and charging speeds to assist industry's transition away from fossil fuel-powered vehicles while ensuring grid stability. The California Public Utilities Commission and the publicly owned utilities will need continued input from industry early and often to identify where growth and flexibility are most needed as implementation of the Freight Action Plan gets underway.

## SOLUTION: FAST-TRACK POLICIES THAT CAN PROMOTE IMMEDIATE PROGRESS

- ***California Department of Transportation, California Highway Patrol and state leaders could partner with shipping and trucking industry members to obtain federal regulatory approval for the safe application of twin-33s.***

Industry representatives emphasized that twin-33 trailers have the potential to reduce emissions and congestion by shipping the same freight weight in fewer vehicles. Historically, opposition has centered on the increased weight of longer twinned vehicles; but the growth of e-commerce, and the direct-to-household shipping of smaller consumer items practiced by companies such as Amazon, may reduce freight weight-to-volume ratios such that longer trucks do not necessarily hold unsafe weights. Industry participants noted that since no technological development or breakthrough is required to deploy twin-33 trailers, and since they are not seeking an increase in weight limits, only regulatory hurdles—centered on the resolution of these safety concerns—remain. California is free to permit any length trailers on its state roads and highways, but since essentially all freight-carrying trucks must be able to travel on federal interstate highways, current federal law limiting twinned trailers to 28 feet effectively restricts the use of twin-33 trailers.[81] California Department of Transportation and California Highway Patrol staff and state leaders could assist industry leaders by partnering with them to provide relevant data to federal lawmakers to explore and support this potentially high-efficiency, low-cost measure.

## Challenge #3: Lack of Infrastructure

Participants cited a lack of adequate infrastructure as a key impediment to the creation of a sustainable freight system. For example, truck platooning technology, which is already in the demonstration phase,[82] may ultimately require dedicated truck-only lanes on highways in order to achieve maximum efficiency. Few, if any, such dedicated lanes exist. Similarly, participants noted that ports currently lack sufficient near- and

on-dock rail and support rail infrastructure to facilitate efficient on- and off-loading technologies.

Often, the need for new freight infrastructure runs into conflict with local zoning and land-use laws and challenges under the California Environmental Quality Act. As with their emphasis on community outreach and community buy-in for new projects, participants felt that working with local governments and residents to promote new infrastructure projects could prevent these obstacles from being raised and speed the approval and deployment process.

## SOLUTION: MAXIMIZE THE CAPACITY OF EXISTING FREIGHT INFRASTRUCTURE TO ACHIEVE OPERATIONAL EFFICIENCIES

- ***State and industry leaders could facilitate and utilize more digital technologies to monitor usage and efficiency metrics.***

Dedicated truck lanes, near- and on-dock rail lines, electric vehicle charging stations, and new highway on-ramps are examples of major new infrastructure installations that will be necessary to increase freight system efficiency in the long term. They are also examples of projects that require dedicated funding, multiple state and local approvals, and long construction timelines. However, policy makers may want to focus on bolstering existing infrastructure that can be upgraded feasibly and quickly, as well as new installations that may be relatively quick to build in the near term, in order to facilitate the development and adoption of efficient technologies.

**Advanced Traffic Management Strategies**

The Freight Action Plan's truck corridor pilot project incorporates a series of efficiency strategies that are based on existing infrastructure and thus can be implemented rapidly.

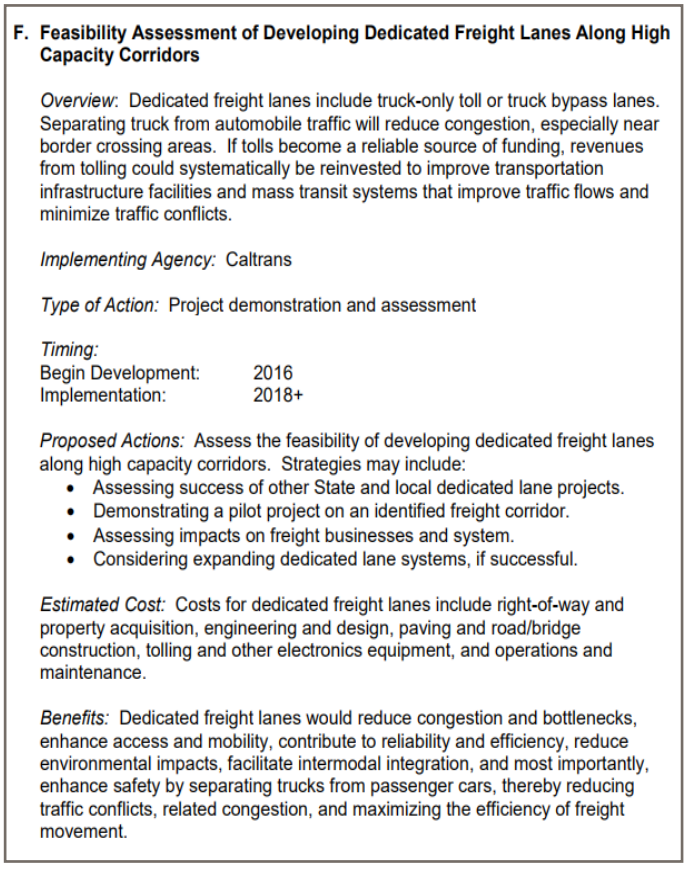
| Dynamic Lane Management | Variable Speed Limits and Speed Harmonization |
|---|---|
| This strategy involves the opening and closing of lanes on a highway in response to real-time conditions. Traffic incidents may warrant the closure of certain lanes, whereas congested conditions may result in the opening of additional lanes (such as reversible or shoulder lanes) to traffic. When closures occur, dynamic lane management also provides a means of warning drivers in advance of the closure so that they may anticipate the merge ahead. Overhead or side-mounted electronic signage within the corridor communicate lane status and other information to drivers. | The objective of speed harmonization is to avoid sudden changes in speed due to congestion or roadway conditions (*e.g.*, fog, work zones), thereby improving safety and enhancing throughput. Also called Variable Speed Limits, this strategy gradually slows traffic down ahead of a congested area using overhead changeable speed limit signs to reduce the occurrence of traffic collisions, and attempts to set speed limits appropriately in the congested regions so that traffic continues to flow smoothly rather than deteriorating to less efficient stop-and-go conditions. |
| **Queue Warning System** | **Dynamic Corridor Adaptive Ramp Metering** |
| Differences in speed tend to cause vehicle conflicts and can lead to abrupt stopping and slowing leading to increased congestion and the potential for collisions. The basic principle of Queue Warning Systems is to inform travelers of the presence of downstream stop-and-go traffic (based on real-time traffic detection) using warning signs and flashing lights. Drivers can anticipate an upcoming situation of emergency braking and slow down, avoid erratic behavior, seek alternative routes, and reduce queuing-related collisions. | Platoons of merging vehicles can disrupt the smooth flow of traffic on a freeway. Ramp metering seeks to break up such entering platoons so that vehicles can merge onto the highway efficiently and safely. With dynamic ramp metering, an additional consideration is given regarding the current conditions on the highway, either in the immediate vicinity of the entrance or on a broader, system-wide scale. Depending on current performance and the remaining available capacity of the corridor, metering rates can be adjusted up or down accordingly. |

**Figure 8. Advanced Traffic Management Strategies**

Source: California Department of Transportation, Sustainable Freight Action Plan Pilot Project Work Plan: Advanced Technology for Truck Corridors (Jul. 28, 2017) at pp. 6-7.

## Case Study in Improving Existing Infrastructure: Connected Corridors Program

The Connected Corridors program, a collaboration between the California Department of Transportation and UC Berkeley, is an example of an integrated approach to deploying existing technologies to reduce congestion, improve mobility, and increase overall transportation system efficiency, starting with a pilot program on I-210 in Los Angeles.[83] These strategies, considered part of the "Integrated Corridor Management" system, include real-time travel demand monitoring, smart parking, dynamic route guidance, and signal synchronization.[84] While this suite of solutions is tailored to the goal of whole transportation corridor management, the holistic approach represents a model for how freight system management might be improved in the near-term using existing infrastructure.



**F. Feasibility Assessment of Developing Dedicated Freight Lanes Along High Capacity Corridors**

*Overview*: Dedicated freight lanes include truck-only toll or truck bypass lanes. Separating truck from automobile traffic will reduce congestion, especially near border crossing areas. If tolls become a reliable source of funding, revenues from tolling could systematically be reinvested to improve transportation infrastructure facilities and mass transit systems that improve traffic flows and minimize traffic conflicts.

*Implementing Agency:* Caltrans

*Type of Action:* Project demonstration and assessment

*Timing:*
Begin Development: 2016
Implementation: 2018+

*Proposed Actions:* Assess the feasibility of developing dedicated freight lanes along high capacity corridors. Strategies may include:

- Assessing success of other State and local dedicated lane projects.
- Demonstrating a pilot project on an identified freight corridor.
- Assessing impacts on freight businesses and system.
- Considering expanding dedicated lane systems, if successful.

*Estimated Cost:* Costs for dedicated freight lanes include right-of-way and property acquisition, engineering and design, paving and road/bridge construction, tolling and other electronics equipment, and operations and maintenance.

*Benefits:* Dedicated freight lanes would reduce congestion and bottlenecks, enhance access and mobility, contribute to reliability and efficiency, reduce environmental impacts, facilitate intermodal integration, and most importantly, enhance safety by separating trucks from passenger cars, thereby reducing traffic conflicts, related congestion, and maximizing the efficiency of freight movement.

Figure 9. Sample: "Action Item" from Freight Action Plan
Source: California Department of Transportation, California Sustainable Freight Action Plan (July 2016).

Participants also discussed the importance of increasing the use of IT sensor technology to measure the use of existing infrastructure, which is essential to the identification of critical freight corridors and heavily trafficked areas; and the use of digital monitoring technology to assess electric vehicle charging demand and, eventually, avoid demand spikes.

- ***The ports could assume leadership roles in driving operational efficiency.***

Traditionally, the ports have functioned as "landlords" for shipping companies, providing docking and storage space in exchange for rents.[85] However, ports also possess the unique capacity to collate information about all cargo and manage shipments across all parties to identify and pursue the most time-, cost- and emissions-efficient process possible. The San Pedro Bay Ports Clean Air Action Plan is an explicit acknowledgment of that capacity and of the ports' necessary role in reducing air emissions and health impacts while facilitating economic growth.[86] As state officials begin their implementation of the Freight Action Plan, they will rely on the ports to continue to develop this leadership role.

## SOLUTION: INCORPORATE SUSTAINABLE FREIGHT SYSTEM TARGETS INTO ALL FUTURE INFRASTRUCTURE PLANNING

- ***State leaders could set clear implementation deadlines and promote regular stakeholder involvement for near-term projects.***

As discussed above, industry participants emphasized the need for clear timelines in order to properly align their investments in new technologies. For example, to the extent truck platooning technology relies on the existence of dedicated truck lanes in order to be viable at commercial scale, trucking companies will be able to properly develop the technology only

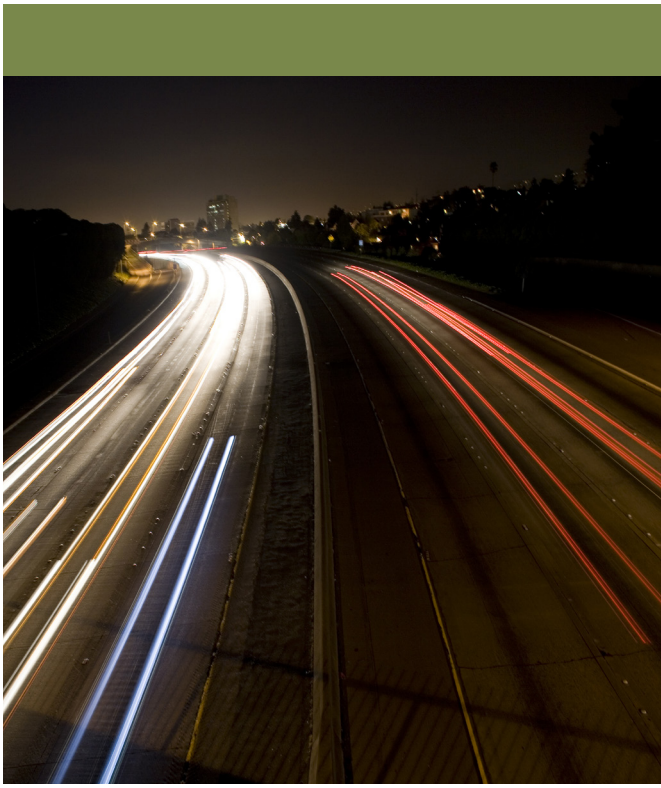
if they know when and where lanes will be created. The Freight Action Plan contains a robust list of state agency implementation actions across all areas of the freight system, ranging from identifying locations for electric truck charging infrastructure to petitioning the U.S. Environmental Protection Agency for more stringent national locomotive emission standards.[87]

The Freight Action Plan's preliminary list of action items is thorough, and identifies the implementing agency and basic timing for each. As agency staff move from planning to implementation of these actions, they will need to work with community and industry stakeholders to develop more detailed timelines and identify interested parties. At the same time, by working with stakeholders early in the process, state agencies can have access to better information on demand for particular technologies and fuels, which in turn will inform planning timelines and investment levels.

- ***State leaders could prioritize minimum-cost, maximum-return pilot projects for early deployment in order to save money for higher-cost projects later.***

The sustainability goals set in the Freight Action Plan, and in practically every other statewide and local emission reduction or efficiency-related plan, are ambitious—as are many of the operational and technological developments that will be needed in order to achieve those goals. As a result, many of the pilot projects associated with those developments are ambitious, involving high costs and long time horizons. For example, the proposed program for developing regulations to incentivize zero-emission last-mile delivery vehicles, a core component of most participants' vision of the sustainable freight system, has an implementation schedule that runs through 2050.[88]

Participants consistently emphasized the importance of identifying, funding, and implementing pilot projects that can generate immediate results at the lowest cost—both as a means to build community and industry buy-in, and as a means to preserve funds for later commitment to longer-term, more technologically intensive projects. The Freight Action Plan's truck corridor pilot, which has a construction implementation phase beginning in 2018, may serve as an example of a pilot with potential for near-term returns. Other projects focusing targeted use of proven technologies, such as the Advanced Traffic Management strategies discussed above, could as well.



*"There will be limited amounts of money available. The question is, what projects can give us the greatest value and how do we distribute that money pursuant to the Freight Action Plan and the timelines we have established? We need to locate areas where the minimum amount of money can generate the maximum amount of return."*

**- Conference Participant**

- ***State and industry leaders could implement end-to-end "sliver" pilots along distinct freight transport pathways.***

Participants discussed the concept of pilots based on end-to-end "slivers" of the freight industry: projects that map cause-and-effect relationships and their evolution in real-time for one type of product, traveling from one factory to shelves in one store or homes in one neighborhood. While most pilot projects are targeted at deployment of a particular technology or identifying the efficiencies available in a geographic space, a "sliver" pilot

*"California freight often sits in the middle of complex global supply chains. Without end-to-end visibility and coordination across those supply chains, we end up with higher emissions and higher costs. Rather than trying to coordinate all players and integrate all systems, we could identify one sliver of the supply chain. We could choose one product from an overseas factory and add real-time tracking and coordination on its journey through California to a store or home in another state. We could compare products inside and outside of the sliver to see where and how we can reduce emissions and improve efficiency."*

**- Julian Loren, Smartest Systems**

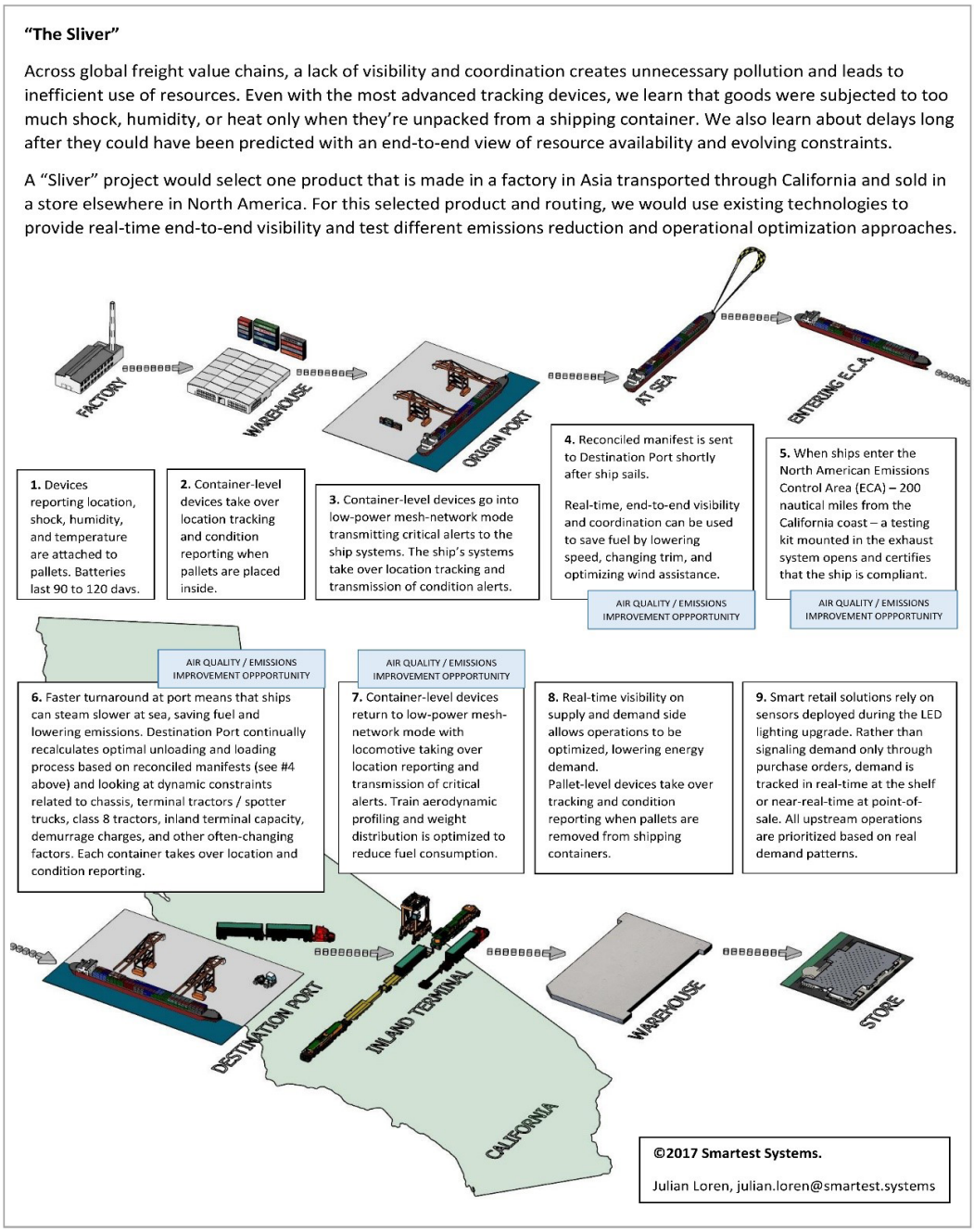



Figure 10. Silver Pilot
Source: Smartest Systems.

would study the entire length of the supply chain, thus allowing planners and industry to identify not only where efficiency can be gained, but also which efficiency gains can be achieved most affordably.

- ***State leaders could set infrastructure standards and efficiency metrics for key areas as soon as possible.***

Industry participants stressed the need for government standard-setting—in consultation with industry—in a handful of areas critical to the promotion of efficient technologies: electric vehicle and equipment plug sizes; electric vehicle and equipment charging speeds; and smart and autonomous vehicle communication protocols.

Vehicle and equipment electrification and autonomous vehicle technologies topped nearly every participant's list of necessary technological developments, as well as industry participants' lists of developments already underway. Each of these technologies will necessarily interact with centralized infrastructure or otherwise require cross-industry compatibility in order to be fully functional.

For example, electrified trucks will be produced by dozens of manufacturers, but will need to be able to charge at shared stations along public highways. But charging station technology is also being developed by multiple companies that may use different physical plug formats (think of the different household wall outlet shapes in the U.S. and Europe), and different charging speeds (such as the Level 1, Level 2 and DC fast charging formats currently available for passenger electric vehicles) that may not be compatible with every vehicle. While market forces could eventually determine one dominant technology to which all manufacturers adapt, such as the now-ubiquitous USB port present in all personal computers,[89] it would save both time and money if state leaders, together with industry representatives, could select formats around which all manufacturers could focus their development efforts.

*"We need to set standards for charging infrastructure such as connectors and voltage. Standards will speed innovation as well as ensure interoperability for freight trucks that visit a variety of facilities."*

**- Elizabeth Fretheim, Walmart**

## Case Study in Standardization: Electric Vehicle Charging

Currently, three main options exist for passenger electric vehicle charging. Level 1 charging uses 120-volt outlets found in most homes and can add about five miles of range per hour. Level 2 charging involves 240-volt current that can add about 25 miles of range per hour but usually requires new wiring within a home. DC fast-charging can charge a vehicle up to 90 miles of range in 30 minutes and requires installation of dedicated charging infrastructure. Since each technology has its own charging protocols and outlet designs, some vehicle models can only charge where the right charging stations are located. While electric trucks will likely rely on their own, separate charging infrastructure, a similar situation would severely limit their range and economic viability.

*"Any time infrastructure is put in place—new roads, new grade separations, new traffic lights—we need to include smart infrastructure components to be ready when digital transportation technologies are ready to install."*

**- Conference Participant**

*"Battery storage on heavy-duty electric trucks limits moves to within facilities or to near-dock rail yards. Electrical infrastructure built near docks can facilitate development and deployment of these technologies."*

**- John Lovenburg, BNSF Railway**

*"More than just dedicated freight lanes, we need end-to-end dedicated freight corridors."*

**- Fran Inman, Majestic Realty Co**

## SOLUTION: DEPLOY SUSTAINABLE FREIGHT INFRASTRUCTURE

- ***State and industry leaders could identify, fund, and construct top-priority physical infrastructure to support sustainable freight practices and technologies.***

Participants identified a group of infrastructure developments that were most essential to the achievement of freight system sustainability:

| Infrastructure | Description |
|---|---|
| **Dedicated Freight Lanes and Corridors** | Dedicated freight lanes are lanes on public highways with access restricted to commercial trucks, so no passenger cars or other vehicles are permitted. When multiple linked roads along an established port- or source- to- destination pathway contain dedicated freight lanes, a dedicated freight corridor may exist. By segregating commercial trucks from other traffic, dedicated lanes promote efficient transportation practices, including truck platooning. |
| **Grade Separations** | Grade separations are surface transport junctions at which one road or rail line is elevated over another, permitting traffic across both arteries without disruption of flow. |
| **On-Dock Rail and Support Track** | On-dock rail consists of rail lines that extend from mainland railyards and routes onto the on-loading and off-loading portions of docks, allowing ocean vessels to load directly to and from trains and bypass drayage vehicles. Support track is excess track at a port facility or railyard that allows for efficient train car reorganization and coupling. |
| **Truck Stops** | Efficient truck stop infrastructure includes electric vehicle charging stations to facilitate recharging during driver rest periods, and dynamic truck parking systems that inform drivers of available parking spots to decrease idling time. |
| **Intermodal Facility Electrification** | Unlike highways, intermodal facilities like docks and rail yards offer physically isolated, controlled-flow and low-mileage environments in which electric vehicle charging and stationary equipment electrification can be tested with readily assessed performance metrics. |
| **Digital Connected Infrastructure** | Future efficient technologies, such as connected and autonomous vehicles, will rely on infrastructure that is embedded with interacting components, like charging infrastructure, communications systems, cameras, and intelligent sensors. When new physical infrastructure is installed, it can be "future-proofed" to include the basic electrical and other components that will be needed when these technologies are ready to be installed. |

## Challenge #4: Technological Uncertainty

Industry participants stated that, even as they spearhead the development and deployment of efficient freight technologies, substantial uncertainty regarding how and when those technologies will develop and become commercially viable represents a significant roadblock to achieving more rapid progress. In particular, they cited the current high cost of low-carbon technologies, challenges in developing low-carbon fuels and biofuels, and unintended disincentives to new propulsion technologies as key barriers.

### SOLUTION: IMPLEMENT TARGETED PILOTS AND NEAR-TERM SOLUTIONS

- ***Industry leaders could initiate more projects to demonstrate feasibility, such as drone delivery programs for rural areas, and to build markets outside California that are ready to adopt new technologies.***

As discussed above, well-targeted pilot programs will be essential to the development of sustainable freight practices and technologies, and program funds could be directed toward projects that can yield near-term benefits and results. However, industry participants also stressed the importance of demonstration projects for early-stage technologies, such as drone delivery. This type of delivery in particular has the potential to reduce traffic congestion and may afford emission reductions (although any reductions must be offset against potential consumption increases, with their attendant emissions footprint).[90] While the technology is far from ready for large-scale commercial deployment, drone delivery could prove economical in certain rural and developing areas, where road and rail infrastructure penetration is insufficient.[91] State and industry leaders could collaborate to identify other markets that may afford similar demonstrations and full-scale deployment proving grounds for technologies that are not likely to be commercially viable in California markets in the near term.

Similarly, as the state continues to drive technological development and serve as an incubator for some of the most promising sustainable freight technologies, such as electric and hydrogen-powered engines, state and industry leaders should ensure that markets outside California are ready to adopt these same technologies when they reach commercial viability. In particular, they will need to advertise the economic and environmental successes of California's leading climate policies to other willing states—these policies are key to the viability of efficient technologies within California, and may be key to viability in other markets as well.

- ***Industry leaders could develop and implement electrification technology for medium-duty, last-mile and drayage trucks.***

While the eventual transition to an electric trucking fleet—beginning with the Freight Action Plan's goal of deploying 100,000 zero-emission freight vehicles and equipment by 2030—is a key target for the sustainable freight system, development of fully electric heavy-duty vehicles such as Class 8 trucks at cost-effective, commercial scale may be a long way off, due to both travel distances and vehicle weight and horsepower requirements.[92] However, first- and last-mile vehicles are often smaller, medium-duty trucks and vans, and drayage vehicles only travel short distances within the confines of self-contained freight facilities such as rail yards and ports. With their reduced power requirements, these vehicles represent an opportunity for near-term electrification, which can achieve immediate emission reductions and provide proof-of-concept for the transition to electric heavy-duty trucks, which present the greatest overall opportunity for emission reduction.

- ***Industry leaders could identify the goods of the future and create sustainable, smaller packaging.***

As noted above in the discussion of twin-33s, the advent of e-commerce has led to an increase in the shipment of goods directly to consumers in individual packages. While e-commerce has resulted in increased consumer convenience and lighter shipping loads, these lighter loads come with a cost: inefficient quantities of packaging and an overall increase in vehicle miles traveled.[93] Shipping and retail industry participants acknowledged this effect, and their role in developing solutions to marry consumer convenience with sustainability. Dimensional pricing, which charges retailers by the size of their parcels rather than by weight, is one strategy that shippers such as UPS and FedEx have been employing to respond to the new reality of e-commerce. More centrally, by anticipating the goods that they will be producing and shipping in the future, and working together with waste management and environmental experts, industry leaders can continue to develop innovations such as lighter, form-fitting package fillers that promote maximum packaging efficiency and help reduce overall emissions.[94]

- ***Industry and regulatory leaders could test new freight transport technologies against existing operations, to focus on achievement of scale.***

Industry participants emphasized the importance of ensuring that new freight transport technologies and innovations, and the pilot projects that pioneer them, are not developed in an operational vacuum—rather, if they are to be adopted on a significant scale, they must consistently be tested in the context of actual freight operations, with pre-pilot workshops to account for key issues and advance and real-time distribution of results to interested parties. For example, truck platooning technology will ultimately be most useful in long-haul scenarios. Short-distance or non-road pilot programs are essential for initial proving of technological viability. But commercial viability will rely on testing of platooning over a long-haul route. The sooner industry and state leaders are able to conduct such operational testing, the sooner they will be able to achieve gains in efficiency.

## Challenge #5: Lack of Funding

Underlying nearly all of the challenges raised by participants is the issue of a lack of sufficient funds to support the infrastructure and technology developments necessary in order to improve freight system efficiency. Industry participants described a lack of available funding to adopt zero- and near-zero-emitting technologies, and the inability of smaller businesses (which constitute a relatively large portion of trucking fleets, for example) to finance turnover from older, less-efficient technologies. Government participants noted that funding and financing, even when available, are often misaligned with the needs of both public and private actors.

SB 1, the recently adopted law to increase the gas tax and vehicle registration fees, will provide $5 billion of transportation funding each year over the next decade. Of this, nearly $3.5 billion per year will be spent on state highway, bridge, and local road repair and maintenance, while $250 million will be spent on congestion reduction and another $12 million will go to research and workforce training.[95] In addition, $300 million per year will be devoted to trade corridor-specific projects such as high-priority grade separations, construction of a new crossing at the border with Mexico, and key highway improvements including along I-710 in Southern California (the focus of the Freight Action Plan's truck corridor pilot program).[96] This represents a significant opportunity to address critical freight infrastructure needs, but is a long way from the level of funding required for the investments that are necessary to create a sustainable freight system.

*"With SB 1, the relevant word is opportunity. This is the largest transportation funding package ever passed by the California legislature. The history of transportation funding in the state is a lot of project-specific commitments, but those days appear to be over. Two-thirds of SB 1 is fix-it-first work, not expanded capacity."*

**- Brian P. Kelly, California State Transportation Agency**


*"Industry will fund it if it knows what will be required. But until policies are totally clear, especially dealing with emerging technologies, you are not going to see industry step in and fund."*

**- Conference Participant**

## SOLUTION: ACCURATELY ASSESS FUNDING NEEDS

- ***State leaders could identify public, private, and port funding needs with specificity; make a stable, certain "ask" of industry regarding which new technologies need to be implemented; and determine what funding is needed beyond the amounts provided under SB 1 and other funding programs.***

The state has the authority to raise and expend public funds on freight infrastructure and technology demonstrations and to incentivize or mandate the use of particular emission-reduction and other technologies. However, state authorities do not exercise these powers in a vacuum. They communicate with industry parties to better determine what technologies are feasible and how much they will cost to implement and with communities to determine where health impacts are felt most severely and what economies are most vulnerable. In addition, while SB 1 funds are substantial and will be able to address certain specific freight needs (such as the I-710 corridor project), industry and local governments will need to be vocal about where and to what extent those funds need to be supplemented.

At the same time, industry must finance its own technological developments, but can only do so when it is sufficiently confident that future policies will support or permit those developments. Participants were emphatic that in order for government to properly meet its obligation to target funding and incentives efficiently, and for industry to set the right levels of investment in efficiency, each must solicit and be responsive to the needs and plans of the other.

## SOLUTION: IMPROVE ACCESS TO EXISTING FUNDING AND RESOURCES, AND REMOVE BARRIERS TO LOW-COST INVESTMENT AND FINANCING OPPORTUNITIES

- ***State energy regulators could better ensure clean transportation goals incorporate local and federal funding opportunities.***

While the California Air Resources Board, California Public Utilities Commission, California Energy Commission and other state agencies have primary responsibility for achieving the air quality and emission

reduction goals set by the state legislature, those agencies are often not involved key decisions related to obtaining or spending necessary funds. For example, the California Public Utilities Commission and other agencies frequently do not participate in federal grant processes for local transportation electrification projects.[97] Similarly, state regulators are rarely involved in the expenditure of the up to $4 billion of California's annual transportation spending that is raised via county sales taxes.[98] As a result, funds may be generated and spent in ways that are not optimal to achieving the state's targets. As they begin to implement the Freight Action Plan, state leaders could establish working groups and information-sharing opportunities to ensure that its goals are incorporated to the greatest extent possible when federal and local funds are being obtained and used.

- ***The California Air Resources Board, California Energy Commission and California Public Utilities Commission could remove any remaining barriers to installation of on-site renewable energy and other efficiency assets to help relieve any distribution grid constraints from increased on-site electricity fueling.***

The California Air Resources Board, the California Energy Commission and the California Public Utilities Commission have long been supportive of residential and commercial consumer-scale renewable energy and other efficiency-related installations, through programs such as the California Solar Initiative[99]; the California Air Resources Board's Clean Vehicle Rebate Program, which every month provides thousands of vehicle purchase rebates[100]; and implementation of the state's Renewables Portfolio Standard.[101] However, many financing barriers still remain. Facilitating more of these investments could help address increased on-site electricity usage from freight transport-related electric vehicle charging.

- ***State and industry actors could assist banks and investors in assessing the value of sustainability investments, and work to ensure the value of credits.***

Industry participants described difficulty in obtaining financing for projects involving new technologies, including even some technologies that have proven commercially viable, due to a lack of finance industry certainty or awareness about the viability of potential investments. For example, many biofuels suppliers have been unable to obtain financing to construct refineries, even though they have entered into multiyear offtake agreements (i.e., commitments by buyers to purchase all the fuel produced) of up to seven years, meaning they have in place a guaranteed income stream. By working together to better educate investors about the progress of sustainable technologies, government

## Cap-and-Trade Auction Proceeds

Senate Bill 862 (2014) established continuous appropriations of 60 percent of the statewide cap-and-trade auction proceeds for certain transportation and sustainable communities programs. In addition, annual appropriations support a variety of projects, such as $47.3 million in 2014-2015 funds directed toward zero-emission drayage trucks and multi-source freight facility projects. These funds facilitate significant technological and sustainability gains, and yet they represent only a small portion of the total funding necessary. Private sources of financing will also be needed to further develop and prove these technologies.[103]


and industry can ensure that sufficient financing is available for commercially viable projects.

Similarly, participants highlighted the importance of designing programs that generate tradeable allowances or credits—such as the statewide cap-and-trade program—with a focus on the ability of investors to rely on the value of those credits when funding projects and entities that generate credits by employing sustainable technologies. California's current cap-and-trade program includes two main methods for ensuring allowance value: a price floor, which guarantees a minimum price for any credits sold; and the ability to "bank" credits, subject to certain limitations, which guarantees that credits hold their value in future years.[102] Including these and similar components in any future programs or extensions of the cap-and-trade program will assist banks and other financing entities in assessing the actual value of investments in sustainable, credit-generating businesses.

- ***Policy makers could use competitive models like the Smart City Challenge to inspire action.***

In December 2015, the U.S. Department of Transportation launched the Smart City Challenge, which solicited applications from cities across the country to compete for transportation and freight transport technology grant funding.[104] Freight solutions such as freight signal prioritization, truck platooning and dynamic parking were among the proposals received, and the winning bid from Columbus Ohio—which received $50 million in funding efficiency project implementation—featured all three.[105] Participants highlighted the value of this competitive framework as a method to encourage development of sustainable and efficient freight infrastructure that is both forward-looking and shaped to community needs.

- ***Large shippers could give smaller companies affordable access to used vehicles and industry could investigate other second-life applications of equipment in general.***

Trucking and shipping industry participants noted that even as large fleet operators struggle to adopt the most recently developed low- and zero-emitting engine technologies, small fleets face significant capital constraints that prevent them from replacing older vehicles any more rapidly than is required by law or for operational reasons. Since fleets owned by small businesses make up a substantial number of the total number of trucks on the road (in fact, up to 40 percent of trucks that load and unload at the Port of Los Angeles are owned by small fleets), this lack

of capital can have a significant impact on the overall emissions of the trucking sector.

One potential solution is for large fleet operators that are able to engage in more frequent vehicle turnover to make their retired vehicles available to small fleet operators that cannot afford to do so. Large fleets typically sell their used vehicles to overseas buyers, but keeping them in domestic hands would assist with industry-wide emissions standard compliance and help smaller companies avoid penalties. While these retired vehicles necessarily will not contain the most efficient emission-reduction technologies, in many cases they will still represent an upgrade over the technologies that these fleets would otherwise employ, as well as a more rapid transition to newer vehicles than they could otherwise afford. And since the larger fleets would be retiring these vehicles in any event, they may be able to realize savings through resale to smaller operators.

Industry participants also emphasized the importance of researching and investing more broadly in second-life uses of vehicles and equipment, both as a means for smaller players to achieve emissions reductions and increased efficiency, and as a means to reduce life-cycle emissions overall. Increased information-sharing and coordination among industry players (see discussion of Information Sharing and Analysis Centers below) could be a mechanism to encourage discussion of second-life uses as pioneering technologies continue to develop.

## Challenge #6: Lack of Data Access

Many of the solutions described above, in particular the implementation of new infrastructure and technologies to promote efficient freight practices, rely heavily on broad access to industry data regarding the freight to be shipped via those practices. For example, if a destination port operator is seeking to minimize the total number of crane lifts of cargo containers, he or she must be able to properly coordinate the arrival of trucks and on-dock trains for offloading so that as many containers as possible can be moved directly to transit and avoid storage at the port. The source port must then load the containers onto the vessel in an order that promotes the efficient offloading. In order to achieve this efficiency, the two port operators must have equal and coordinated access to information on the weight, size, scheduling, and destination of all cargo at the earliest possible time.

*"A lack of harnessing, sharing and using data is the basis for all other challenges."*

**- Rich McArdle, UPS**

However, participants consistently identified a lack of access to such data as a key barrier to pursuing the technological and other solutions that are essential to achieving a sustainable freight system. This lack of access extends not only to system participants, as in

the example above, but also to policymakers, who will increasingly rely on the same data in order to properly set regulations on the use of new technologies and the design and location of new infrastructure.

## SOLUTION: INCREASE POLICY MAKERS' AND INDUSTRY MEMBERS' ACCESS TO FREIGHT INDUSTRY DATA.

- ***Policy makers and industry leaders could identify critical data, define the "value-add" of data sharing, and collaborate with stakeholders to encourage data sharing.***

Industry and government participants emphasized that the current lack of data sharing among industry members and between industry and government stems not from a general resistance to sharing data, but rather from a lack of clarity regarding which data would be of use, and how such data would be used by its recipients. Lacking standards for the systematic sharing or pooling of information, industry participants indicated that their default position was to continue to base decisions solely on their own internal information. To a large extent, government is often left in the dark. All participants agreed that, to the extent commercially feasible, shipping data must be freely shared among the entities involved in the freight system in order to promote its efficiency.

A potentially helpful model for standardized, secure information among private entities and between the private and public sectors is the Information Sharing and Analysis Center. The centers were created by presidential directive in 1998 to assess and reduce the vulnerability of critical infrastructure by fostering public-private partnerships based on information sharing and coordination.[106]

The centers exist for a range of critical infrastructure-related sectors, including aviation, maritime security, supply chain, and surface transportation. The Aviation ISAC, which participants discussed as a potential model for freight sector information sharing, offers members the opportunity to share data internally (and anonymously, if necessary) in order to conduct research and investigations, and provides data to government bodies only with the approval of the submitting member.[108] By providing a platform that is open internally but exclusive with regard to non-members, the centers encourage members to share available data in order to determine what is critical.

Such a member-controlled organization could provide industry with exactly the sort of guidance and certainty around data sharing that might facilitate the success of future technologies and infrastructure. While freight system efficiency and environmental sustainability is necessarily a different goal from the security- and terrorism-oriented purpose of the

### Information Sharing and Analysis Centers

"Operational entities formed by critical infrastructure owners and operators to gather, analyze, appropriately sanitize, and disseminate intelligence and information related to critical infrastructure. ISACs provide 24/7 threat warning and incident reporting capabilities and have the ability to reach and share information within their sectors, between sectors, and among government and private sector stakeholders." [107]

centers, the organizing principles of the centers—mutual access to data, analysis by member entities and by proprietary staff, trusted confidentiality—are precisely those that would be most supportive of enhanced coordination in the freight industry and policy landscape.

- ***Industry leaders could organize cybersecurity structures to enable third-party access to data and protect trade secrets and proprietary information.***

In addition to a clearer understanding across industry and government of what data is useful and/or critical for the implementation of new infrastructure and technologies, industry participants in particular emphasized the need for assurance that any data shared would be protected against external access through stringent cybersecurity measures. The Information Sharing and Analysis Centers again offer a helpful model, as their core purpose, protecting critical infrastructure against attack or interference, relies heavily on both the promotion and the use of advanced cybersecurity measures. In addition, since the organizations are member-controlled, industry would be able to bring its own cybersecurity best practices and experience to the table in setting shared standards.

On data security, as with critical data identification and stakeholder buy-in, both industry and government participants stated that they were willing to participate in the sharing process, and only a lack of certainty and standard practices stood as a barrier to more coordination. By identifying a model that allows all parties to collaboratively set commonly acceptable standards and create a secure platform, all players in freight transport and freight transport policy can facilitate a movement toward more a sustainable freight system.


# CONCLUSION: DRIVING THE FUTURE OF SUSTAINABLE FREIGHT

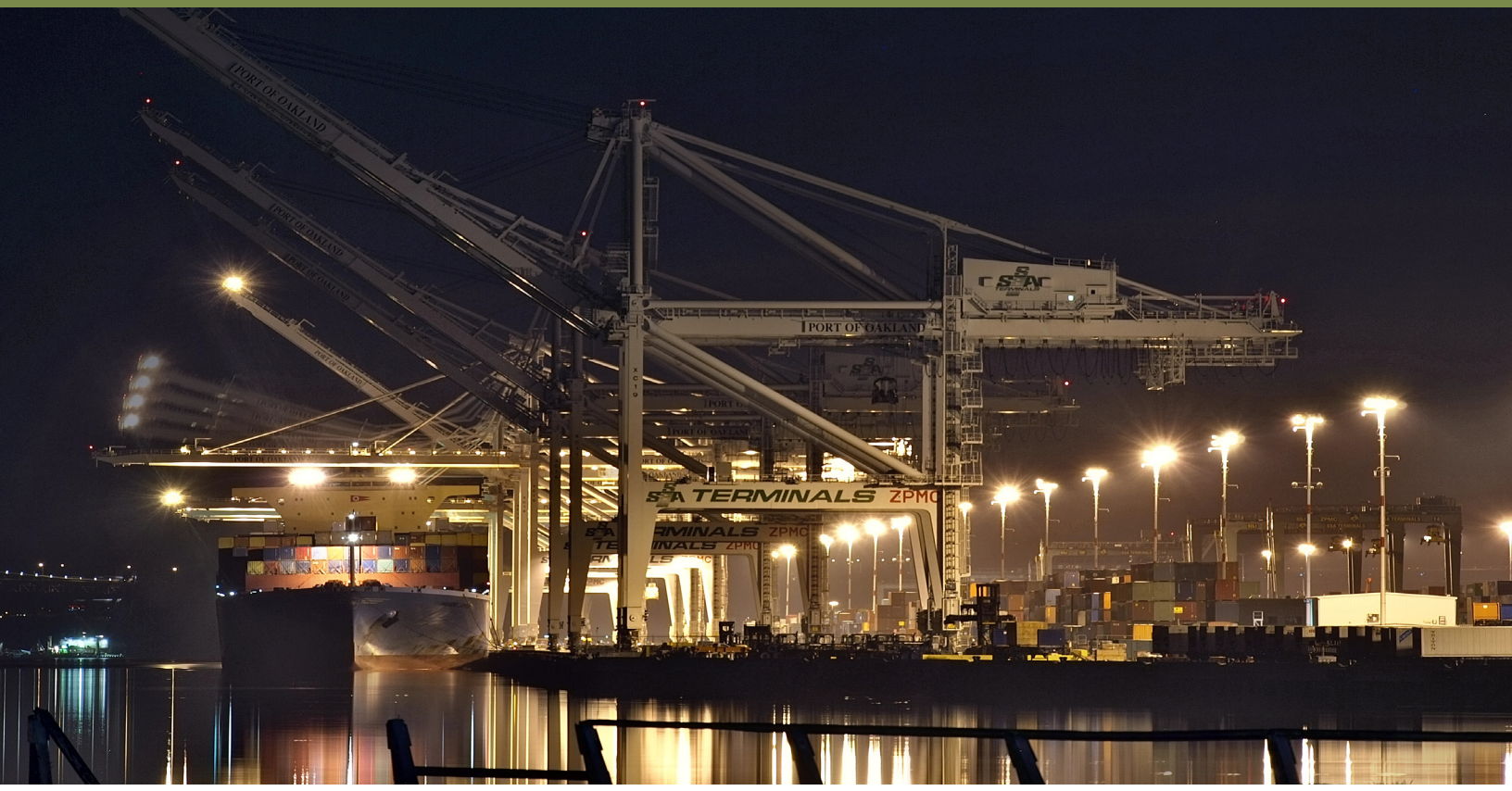
On data security, as with critical data identification and stakeholder buy-in, both industry and government participants stated that they were willing to participate in the sharing process, and only a lack of certainty and standard practices stood as a barrier to more coordination. By identifying a model that allows all parties to collaboratively set commonly acceptable standards and create a secure platform, all players in freight transport and freight transport policy can facilitate a movement toward more a sustainable freight system.

California's freight system is an engine of the state, national and international economies, as well as a major source of both greenhouse gas emissions and local air pollution in the state. While California has long been a national and international leader in sustainability and climate change policies, state and industry leaders have only begun to define the sustainable freight system that will be necessary to achieve the state's ambitious climate, air quality and economic goals. At the same time, new innovations in technology, infrastructure and policy have the potential to achieve improved efficiencies and reduce pollution. Near-term follow-up steps for policy, environmental, community, and freight industry groups could include:

- **Identify stakeholders in industry, government, labor and communities** that are currently missing from the decision-making process, and publicize near-term successes among these stakeholders to demonstrate economic and environmental benefits and earn community trust.
- **Prepare a managed timeline with discrete action items and efficiency targets** that public and private actors can use as benchmarks for progress under the Freight Action Plan and other plans.
- **Conduct scenario analyses** of freight transport and technological pathways available to identify barriers to and opportunities for efficiency.

- **Implement electrification for medium-duty (Class 6 and lower) trucks** and identify solutions for heavy-duty (Class 8) trucks, beginning with first- and last-mile applications.
- **Update electrical grid planning** with a focus on medium- and heavy-duty vehicle infrastructure goals.
- **Obtain financing for biofuels offtake agreements** and educate banks and lenders on the viability of these and other sustainability investments.
- **Convene a group to determine key IT solutions for freight logistics**, drawing from ports, manufacturers, retailers and cybersecurity experts.
- **Work with legislators to obtain regulatory approval for the safe application of twin-33 trucks.**
- **Partner with educational institutions** to create a skills incubator and training pipeline.
- **Generate competition** by reaching beyond California to international experts, and initiating proactive pilot programs (such as the Smart City Challenge).

These and other near-term solutions represent some of the best opportunities for stakeholders to begin the process of transforming California's freight system. All affected communities—including local residents, labor, and environmental and health advocates—will be needed at the table to implement them. With this coalition working together, California will be better positioned to secure the most benefits for the most people, while continuing its role as an engine of global sustainable policy and technological innovation.



# Participant Biographies

### Ken Alex – Governor's Office of Planning and Research

Ken Alex is a Senior Policy Advisor to Governor Jerry Brown, the Director of the Governor's Office of Planning and Research, and the Chair of the Strategic Growth Council, focusing on energy, environment, and land use issues. Before joining the Governor's Office, Ken was the Senior Assistant Attorney General heading the environment section of the California Attorney General's Office, and the co-head of the Office's global warming unit. From 2000 to 2006, Ken led the California Attorney General's energy task force, investigating price and supply issues related to California's energy crisis. Ken is a graduate of Harvard Law School and holds a B.A. in political theory from the University of California at Santa Cruz.

### Susan Alt – Volvo Group North America

Susan Alt is the Senior Vice President, Public Affairs for Volvo Group North America. In this role she helps to educate legislators, regulators and NGOs on the impacts new technologies may have for commercial vehicle manufacturers. She has been with the Volvo Group companies residing in the US and Europe for the last 30 years. Prior to her current role, she held senior roles for Volvo and Mack Trucks in Marketing, Strategy and Business Development. She was also the President of Volvo Logistics of the Americas, which managed the production supply chain for the Volvo Group and as such, the first woman to manage a division for Volvo Group in North America. Susan holds a BS in Mechanical Engineering from Virginia Tech and a MBA from Wake Forest University.

### Blair Anderson – Amazon

Blair Anderson is Amazon's Director of Transportation Public Policy, where he is responsible for government relations related to Amazon's growing logistics network. Prior to joining Amazon, he was confirmed by the United States Senate in July 2016 to the position of Under Secretary of Transportation for Policy, the U.S. Department of Transportation's third highest ranking official. In this position, Mr. Anderson provided leadership in the development of policies for the department, including on legislative, regulatory and safety initiatives. Prior to serving as Under Secretary, Blair Anderson was the Deputy Administrator of the National Highway Traffic Safety Administration (NHTSA) since August 2015. In addition, Blair served as the Acting Chief Financial Officer and Assistant Secretary for Budget and Programs at the U.S. Department of Transportation. Prior to joining the Department in April 2013, Mr. Anderson spent eight years as an advisor for Congressman John W. Olver. Mr. Anderson obtained his bachelor's degree in Ecology and Evolutionary Biology from Princeton University.

### Mario Cordero – Port of Long Beach

Mario Cordero is Executive Director of the Port of Long Beach, California, named to the post by the Long Beach Board of Harbor Commissioners, effective May 15, 2017. Beginning in 2003, Mr. Cordero served as a member, vice president and president of the Long Beach Board of Harbor Commissioners for eight years, before resigning to accept President Barack Obama's appointment to the Federal Maritime Commission (FMC) in 2011. He served on the FMC until May 2017 and was FMC Chairman from April 2013 to January 2017. As Executive Director, Mr. Cordero reports to the Board and leads the Port's Harbor Department staff in excess of 500 with an annual budget of $775 million. He is the Port's Representative to the Alameda Corridor Transportation Authority Governing Board and the Governing Board of the Intermodal Container Transfer Facility-Joint Powers Authority and, previously, served as an Executive Board member on the American Association of Port Authorities' Latin American delegation. Mr. Cordero holds a law degree from the University of Santa Clara and a Bachelor of Science degree in political science from California State University, Long Beach.

### Elena Craft – Environmental Defense Fund

Dr. Elena Craft is a Senior Health Scientist at Environmental Defense Fund in the Office of Chief Scientist. For a decade, she has strategized to identify, monitor, and mitigate risk from environmental pollution within the transportation sector, most specifically around port areas and freight corridors. In addition, she has facilitated development of demonstration projects for new technologies. Dr. Craft is a member of the Mobile Source Technical Review Subcommittee (MSTRS) under the Clean Air Act Advisory Committee at the U.S. Environmental Protection Agency as well as a member of the Board of Scientific Counselors. Dr. Craft's scientific research focuses on health disparities associated with living in pollution hotspots. She holds a B.S. degree in biology from UNC Chapel Hill, a M.S. degree in toxicology from NC State University, and a Ph.D. from Duke University. She also holds an adjunct assistant professorship at the University of Texas Health Sciences Center.

### Hector De La Torre – California Air Resources Board

Hector De La Torre was appointed to the California Air Resources Board by Governor Jerry Brown in 2011. De La Torre served in the California State Assembly from 2004 to 2010, representing the largely Latino 50th District in Southeast Los Angeles County. He chaired the Budget Subcommittee on Health and Human Services, the Rules Committee and helped create and chaired the Accountability and Administrative Review Committee during his tenure. De La Torre is currently the Executive Director of the Transamerica Center for Health Studies. Prior to his service in the Assembly, he served as Mayor and as a member of the South Gate City Council, Judicial Administrator in the Los Angeles Superior Court, chief of staff to the Deputy Secretary of Labor in the Clinton Administration, and a teacher at Edison Junior High in South Los Angeles. De La Torre graduated with a bachelor's degree in Diplomacy and World Affairs from Occidental College and attended the Elliot School of International Affairs at The George Washington University.

### Joel Espino – The Greenlining Institute

Joel Espino is Legal Counsel for the Environmental Equity team at the Greenlining Institute, a racial and economic justice non-profit based in Oakland. He works to reduce poverty and pollution in communities of color by advocating for accessible and affordable clean transportation choices and a diverse clean energy economy.

He leads Greenlining's transportation equity work advocating to increase racial equity in transportation planning and investments; implementing the Charge Ahead California Initiative–a law that works to make electric vehicles (EV) accessible to low- and moderate-income Californians; and advocating for equitable EV charging infrastructure investments at the California Public Utilities Commission, the California Energy Commission, and within the Volkswagen Diesel Settlement. He is author of "Electric Vehicles for All: An Equity Toolkit;" lead author of "Electric Carsharing in Underserved Communities: Considerations for Program Success;" and co-author of "Delivering Opportunity: How Electric Buses and Trucks Can Create Jobs and Improve Public Health in California." Prior to joining Greenlining, Joel attended law school where he worked on consumer protection issues for the Federal Trade Commission and on civil rights cases for the Office of Staff Attorneys at the U.S. Court of Appeals for the Ninth Circuit. He earned his J.D. from UC Hastings, College of the Law, and his B.A. in Philosophy from Arizona State University.

### Elizabeth Fretheim – Walmart

Elizabeth Fretheim develops and manages the sustainability strategy for the U.S. Logistics Division of Walmart. This includes the evaluation, implementation and communication of a broad scope of diverse sustainability initiatives for over 170 distribution centers and the fourth largest private trucking fleet in the United States (over 6,000 vehicles, 7,000 drivers and 61,000 trailers). Elizabeth led Walmart's achievement of doubling their fleet efficiency from 2005-2015 for which they won Green Fleet of the Year in 2017. She is involved in a diversity of projects and initiatives including energy and operational efficiency, renewable energy, advanced vehicle technologies including autonomous vehicles, building design and technologies, packaging, water, waste and recycling, and supplier engagement. She is engaged in several industry working groups focused on lessening the environmental impact of supply chains including BSR's Future of Fuels and the Sustainable Freight Advisory Committee in California. Elizabeth has a Bachelor of Commerce from the University of Calgary. In 2016, she was one of Fleet Owner magazine's Dozen Outstanding Women in Trucking and one of three finalists for the 2nd Annual Distinguished Women in Logistics award. She won the 2013 Green Biz Verge 25 award winner for her work in creating smarter supply chains, and is a 2008 alumnus of the Governor General Canadian Leadership Conference.

### Fran Inman – Majestic Realty Co.

Fran Inman directs government relations and community affairs activities for Majestic Realty Co., one of the nation's largest privately held real estate development companies. With a real estate portfolio totaling approximately 80 million square feet of commercial properties, Majestic Realty Co. has offices in Los Angeles, Atlanta, Bethlehem, Dallas, Fort Worth, Denver and Las Vegas. Fran is a past chair of the board of the Los Angeles Area Chamber of Commerce and San Gabriel Valley Economic Partnership. Fran also serves as the vice chair for the California Business Properties Association and the California Business Roundtable. Fran is also a founding board member of FuturePorts and a member of Inland Action and is on the Advisory Board of Mobility 21. She is also a long-time member of the Coalition of America's Gateway Trade Corridors and Southern California Council of Governments.

### Mitch Jackson – FedEx Corporation

As Vice President of Environmental Affairs and Chief Sustainability Officer for FedEx Corporation, Mitch Jackson leads the strategic direction and provides vision for all aspects of the company's sustainability initiatives and environmental innovations and technologies. Jackson joined FedEx in 1985, and has experience in Operations, Engineering and Legal. Ethisphere Institute named him one of the 100 Most Influential People in Business Ethics in 2009. He was named one of the Top 100 Thought Leaders in business by Trust Across America for four consecutive years. In 2014 Green Fleet named Jackson a Sustainability All Star for his contributions to environmental sustainability and fleet efficiencies. Jackson is currently a board member of the Shelby Farms Park Conservancy and serves on the American Trucking Association's board of directors. He has served as environmental juror for the Heinz Awards and is a past chairman of the Global Environmental Management Initiative.

### Brian P. Kelly – California State Transportation Agency

On July 1, 2013, Brian P. Kelly was sworn in as the first secretary of the new California State Transportation Agency (CalSTA), which has replaced the Business, Transportation and Housing Agency (BT&H) with a new agency focused solely on transportation. Kelly had previously been running BT&H since March 2012 when Governor Edmund G. Brown Jr. appointed him to lead that agency. As Acting Secretary, he oversaw 12 departments and several economic development programs and commissions consisting of more than 45,000 employees and a budget of $18 billion -- a budget larger than most states in the nation. Kelly has been at the center of most of the major transportation policy decisions in the state of California for the past decade and a half, having served as chief transportation policy consultant for four successive Senate President pro Tempores. Kelly was executive staff director for Senate President pro Tempore Darrell Steinberg since 2008. He was executive principal consultant for Senate President pro Tempore Don Perata from 2004 to 2008, principal consultant for Senate President pro Tempore John Burton from 1998 to 2004, and assistant consultant for Senate President pro Tempore Bill Lockyer from 1995 to 1998.

### Julian Loren – Smartest Systems

Julian Loren is a Partner at Smartest Systems, a company that designs and develops intelligent solutions across the lifecycle of goods – from Smart Farming and Smart Manufacturing through Smart Freight, Smart Logistics, Smart Ports, and Smart Warehouses and all of the way to Smart Retail and e-Commerce. Julian has led the design and development of advanced decision support and AI solutions for over 20 years. Recently, he led ecosystem strategy and partner solutions at GE Digital and Smart Logistics solutions for eBay. A serial entrepreneur and intrapreneur, Julian has co-founded 6 startups, led 3 turn-arounds, and managed 77 solution deliveries. Julian is the Co-Founder of the Innovation Management Institute where he designs and facilitates Gameferences—face-to-face games that drive break-through problem solving. Julian also runs collaborative design games at Stanford University and

the University of California, Berkeley and speaks and writes about intelligent systems, innovation ecosystems and disruptive innovation.

### John Lovenburg – BNSF Railway

John Lovenburg joined BNSF Railway in September 2011 as vice president, Environmental. In this role, he leads a team of employees responsible for environmental strategy and communication, sustainability, permitting, compliance, remediation, hazardous materials, environmental litigation, and industrial wastewater. Mr. Lovenburg has more than 20 years of experience in environmental consulting with CH2M where he was vice president, Global Site Remediation and Revitalization. Mr. Lovenburg is engaged in conservation giving and projects at BNSF, including projects with the National Fish and Wildlife Foundation. Mr. Lovenburg is a Board Member of the Montana Outdoor Legacy Foundation. Mr. Lovenburg has a Bachelor's degree in geology from the University of California, Santa Barbara and a Master of Science degree in hydrogeology from California State University, San Diego.

### Rich McArdle – UPS Freight

Rich McArdle began his UPS career in 1982 as an early-morning package sorter and truck loader in Kentucky. Within three short years, he was named to the team that initiated UPS International Air Service between the United States and Europe. He was promoted to Industrial Engineering (I.E.) Manager in 1987 and developed operating plans for expansions to Canada, Japan, Southeast Asia, and Central America. He held additional manager positions in I.E. and Air Hub Operations and served on several special assignments before being promoted to Louisville International Hub Division Manager in 1990. Rich relocated to the Rocky Mountain District to become Air Manager in 1997 and later became a package division manager. He was promoted to Southeast California District Operations Manager in 2002. Rich was promoted to South Carolina District Manager in 2007. He moved to Washington D.C. in 2010 to serve with Corporate Public Affairs, overseeing UPS's global operations policy including customs and cargo security matters. He became Mid-Atlantic District Manager early in 2015 and continued in that role until being named Jack Holmes' successor as UPS Freight President in February, 2016. Rich earned a Bachelor of Finance degree from the University of Louisville and a Master of Business Administration degree from Webster University.

### Judy Mitchell – South Coast Air Quality Management District

Ms. Mitchell serves as the Mayor of Rolling Hills Estates and has been a member of the City Council since 1999 and a principal at Judith M. Mitchell Attorney at Law since 2001. She serves on the governing board for the South Coast Air Quality Management District and the regional council of the Southern California Association of Governments. Ms. Mitchell was appointed to the California Air Resources Board by Governor Jerry Brown in May of 2013. Previously, Ms. Mitchell was partner and senior litigation associate at Huang P.C., Lawyers from 1985 to 2001 and associate at the Law Offices of Russell Iungerich from 1979 to 1983. She served as president of the League of California Cities in 2009 and is past chair of the South Bay Cities Council of Governments. Ms. Mitchell earned a juris doctor degree from Loyola Law School and a master of arts degree in German literature from the University of California, Los Angeles.

### Mary Nichols – California Air Resources Board

Mary D. Nichols, J.D., was reappointed Chairman of the California Air Resources Board by Governor Jerry Brown in January 2011, a post she previously held under Governor Arnold Schwarzenegger from 2007 to 2010 and under Governor Brown (during his first tenure) from 1979 to 1983. At ARB she is responsible for implementing California's landmark greenhouse gas emissions legislation as well as setting air pollution standards for motor vehicles, fuels and consumer products. After graduating from Cornell University and Yale Law School, Ms. Nichols practiced environmental law in Los Angeles, bringing cases on behalf of environmental and public health organizations to enforce state and federal clean air legislation. President Clinton appointed her to head the Office of Air and Radiation at U.S. EPA, where she was responsible for, among many other regulatory breakthroughs, the acid rain trading program and setting the first air quality standard for fine particles. She also served as California's Secretary for Natural Resources from 1999 to 2003. Prior to her return to the ARB, Ms. Nichols was Professor of Law and Director of the Institute of the Environment at UCLA.

### Neil Pedersen – Transportation Research Board

Neil Pedersen is Executive Director of the Transportation Research Board (TRB). In that role he provides executive direction and leadership to TRB's technical activities, including its annual meeting of over 12,000 transportation professionals, its more than 200 technical committees, its conferences, and its publications; its peer reviewed policy consensus studies; its multimodal cooperative research programs; and operation of the Strategic Highway Research Program (SHRP 2) naturalistic driving study safety database. From 2012 to 2015 Neil was Deputy Director for Implementation and Communication for SHRP 2. Neil spent 29 years at the Maryland State Highway Administration, where he served the last eight years as Administrator and Governor's Highway Safety Representative. Prior to that, he was both Deputy Administrator and Director of the Office of Planning and Preliminary Engineering.

### Carla J. Peterman – California Public Utilities Commission

Carla J. Peterman was appointed to the California Public Utilities Commission by Governor Edmund G. Brown Jr. in December 2012. Commissioner Peterman is the California Public Utilities Commission's assigned Commissioner for a number of proceedings including energy efficiency, alternative transportation, energy storage, and several rate cases. Commissioner Peterman serves on many boards including the NARUC Board of Directors and the California Broadband Council. She served as the Chair of the Plug in Electric Vehicle Collaborative for 2012- 2013. She was previously appointed by Governor Brown, in 2011, to the California Energy Commission where she was lead Commissioner for renewables, transportation, and natural gas. Commissioner Peterman has conducted research at the University of California Energy Institute and the Lawrence Berkeley National Laboratory and was an investment banker focused on energy financing at Lehman Brothers. Commissioner Peterman holds a Doctor of Philosophy in Energy

and Resources from The University of California Berkeley. She also earned a Master of Science degree and a Master of Business Administration degree from Oxford University, where she was a Rhodes Scholar. Commissioner Peterman holds a Bachelor of Arts in History from Howard University.

### Peter Peyton – Port of Los Angeles Sustainable Freight Advisory Committee

Peter Peyton is a leading voice in the national goods movement conversation having spent the greater part of his career in and around the largest ports in the United States. Beginning as a dock worker in 1984 Peter rose through the ranks to become a respected International Executive Board member of the International Longshore and Warehouse Union, holding various offices and eventually becoming President of the Marine Clerks Association within that union which represents workers in the ports of Los Angeles and Long Beach. Peter also served as Co-Chair of the Education Committee for the Marine Transportation Systems National Advisory Council. Since retiring from union business in 2012 Peter has worked with the ports of Long Beach and Los Angeles on new methods of supply chain optimization and most recently is seated on Los Angeles Mayor Eric Garcetti's Port of Los Angeles Sustainable Freight Advisory Committee.

### Alice Reynolds – Office of the Governor

Alice Reynolds was appointed senior advisor to the Governor for climate, the environment and energy in the Office of Governor Edmund G. Brown Jr. on February, 10, 2017. She served as Deputy Secretary for Law Enforcement and Counsel at the California Environmental Protection Agency since 2011 and as a deputy attorney general at the California Department of Justice, Office of the Attorney General from 2002 to 2011. She was an attorney at Sonnenschein, Nath and Rosenthal LLP from 1998 to 2001 and at Furth, Fahrner and Mason from 1995 to 1998. Ms. Reynolds served as a research attorney at the Santa Clara County Superior Court from 1993 to 1995. She earned a Juris Doctor degree from Santa Clara University School of Law in 1993.

### R. Bruce Reiser – Schnitzer Steel Industries

R. Bruce Rieser is currently the Regional Director, West South Region for Schnitzer Steel Industries, Inc. Mr. Rieser joined Schnitzer in 2010 and currently oversees its Auto and Metals Recycling Business (AMR) operations, including P&L responsibilities, in California, Nevada, Utah, and Hawaii. Mr. Rieser has a 30-year career in construction material management. During his tenure in construction management he handled projects related to cement, concrete, aggregate, hot mix asphalt, and heavy highway construction. He retired as CEO & President before joining Schnitzer. Rieser completed his undergraduate studies at CalPoly Pomona and did graduate work at Stanford University.

### Matthew Rodriguez – California Environmental Protection Agency

Matthew Rodriguez was appointed California Secretary for Environmental Protection by Governor Edmund G. Brown Jr. in July 2011. As Secretary, Matt oversees the activities of the six boards, departments and offices within the Agency, including the California Air Resources Board and the State Water Resources Control Board. Matt comes to the California Environmental Protection Agency with over 24 years of environmental experience with the California Department of Justice. Matt formerly served as a Deputy Attorney General, specializing in land use and environmental law. Attorney General Brown promoted Matt to the position of Chief Assistant Attorney General for the Public Rights Division in 2009, where he supervised the environmental, civil rights and consumer law sections of the Office. Prior to his selection as Secretary, he served as Acting Chief Deputy Attorney General for Attorney General Kamala D. Harris. Matt graduated from UC Berkeley with a degree in History, and received his JD from UC Hastings College of the Law in 1980.

### Janea A. Scott – California Energy Commission

Janea A. Scott is one of five Commissioners on the California Energy Commission. Ms. Scott was appointed by Governor Edmund G. Brown Jr. in February 2013 and reappointed in January 2016 to serve as the Commission's public member. She is the lead Commissioner on transportation and western regional planning, and in 2014 Ms. Scott led the 2014 Integrated Energy Policy Report Update. Ms. Scott serves as the chair of the California Plug-In Electric Vehicle Collaborative, a public/private organization focused on accelerating the adoption of PEVs to meet California's economic, energy and environmental goals. She is also a member of the California Fuel Cell Partnership and the U.S. Department of Energy's Hydrogen and Fuel Cell Technical Advisory Committee. Prior to joining the California Energy Commission, Ms. Scott worked at the U.S. Department of the Interior in the Office of the Secretary as the Deputy Counselor for Renewable Energy and at Environmental Defense Fund in both the New York and Los Angeles offices as a senior attorney in the climate and air program. Ms. Scott was also an AmeriCorps member working at the San Francisco Urban Service Project from 1996-1997. Ms. Scott earned her J.D. from the University of Colorado Boulder Law School and her M.S. and B.S. in Earth Systems from Stanford University.

### Gene Seroka – Port of Los Angeles

Gene Seroka is the Executive Director of the Port of Los Angeles, the busiest container port in North America. He was nominated by Los Angeles Mayor Eric Garcetti on May 27, 2014, and confirmed by the Los Angeles City Council on June 11, 2014. As Executive Director, Seroka is responsible for managing a more than $1 billion budget, advancing major capital projects, growing trade volumes and promoting innovative, sustainable practices that strengthen the region's economy. His duties involve interacting with a wide range of stakeholders, including Port customers around the globe, industry partners, elected and appointed officials at all levels, harbor area residents and business leaders. He has been appointed to the following national committees at the federal level to enhance the speed and efficiency of cargo movement and supply chain optimization: U.S. Department of Commerce Advisory Committee on Supply Chain Competitiveness; U.S. Department of Transportation Bureau of Transportation Port Performance Freight Statistics Working Group; U.S. Maritime Administration Marine Transportation System National Advisory Committee; and Federal Maritime Commission Supply Chain Innovation Team. Seroka brings more than 28 years of experience in shipping, global logistics and executive management.

### Daniel Sperling – University of California, Davis

Daniel Sperling is Distinguished Professor of Civil Engineering and Environmental Science and Policy, and founding Director of the Institute of Transportation Studies at the University of California, Davis (ITS-Davis). Dr. Sperling was appointed to the California Air Resources Board by Governor Arnold Schwarzenegger in February of 2007. Dr. Sperling is recognized as a leading international expert on transportation technology assessment, energy and environmental aspects of transportation, and transportation policy. He was chair of the U.S. Transportation Research Board (National Academies) in 2015-16 and the Davos World Economic Forum's Council on "Future of Mobility". He earned his Ph.D. in Transportation Engineering from the University of California, Berkeley (with minors in Economics and Energy & Resources) and his B.S. in Environmental Engineering and Urban Planning from Cornell University.

### John Wall – Cummins, Inc.

Dr. John C. Wall has more than 35 years of industry experience in internal combustion engine technology, fuels and emissions, and in global engineering organization development. Most recently, John served as Chief Technical Officer of Cummins Inc., the world's largest independent manufacturer of diesel engines and related technologies, retiring in 2015. As he progressed from research and product engineering into engineering leadership, John remained directly involved in the most critical technology programs for low emissions, powertrain efficiency and alternative fuels. He also led the growth of Cummins technical organization from 1000 engineers, mostly centered in the U.S., to more than 6000 engineers globally, establishing new technical centers in India and China. Prior to joining Cummins in 1986, John led Diesel and Aviation Fuels Research for Chevron, where his team was first to discover the important contribution of fuel sulfur to diesel particulate emissions. John studied mechanical engineering at the Massachusetts Institute of Technology, where he received his SB and SM degrees in 1975 and ScD in 1978.

### Catherine Witherspoon – ClimateWorks Foundation

Catherine Witherspoon advises ClimateWorks on the linkages between air quality management, short lived climate pollutants, and climate mitigation. Previously, she served as the program director for ClimateWorks' non-CO2 fast action campaign. She has 26 years of regulatory, legislative, and management experience in the air quality field. Ms. Witherspoon started as a student assistant at the California Air Resources Board in 1981, and eventually rose to Executive Officer (2003-2007). In that role, she managed a staff of 1,100 and an annual budget of $350 million. Ms. Witherspoon was directly involved in the drafting of the California Clean Air Act and California's landmark Greenhouse Gas Solutions Act. In the mid-1990s, she left state government and served briefly as an Expert Consultant to the U.S. Environmental Protection Agency (Region 9), Legislative Director for the South Coast Air Quality Management District, and sole proprietor of her own consulting firm, before returning to the California Air Resources Board in 1999 as Senior Policy Advisor to the then-Chairman Dr. Alan Lloyd. Ms. Witherspoon has a BA in Politics from the University of California at Santa Cruz.

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For more information, contact Ted Lamm at tlamm@law.berkeley.edu
or Ethan Elkind at eelkind@law.berkeley.edu.

www.clee.berkeley.edu
@berkeleylawCLEE