CALTRANS FREIGHT PROGRAM ASSESSMENT

TASK ORDER 19

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Introduction

California has long held a position of preeminent power and influence that has helped it stand apart from the rest of the United States (U.S.). At 155,959 square miles, California is the third largest state in the U.S. with nearly one thousand miles of coastline, home to large metropolitan regions, and two mega regions (north and south). California also has an abundance of natural resources, such as timber and petroleum, and is the largest agricultural producer and exporter in the country. Endowments such as these have made California's economy the largest in the nation, with a Gross Domestic Product of almost $3 trillion. The State has major influence in policy development and implementation for other states and the federal government as well.

The size and complexity of California's economy make it an important player on a global scale. California, with a population of 39.56 million,[1] currently has the fifth largest economy in the world, followed by the United Kingdom, which has a population of 66.02 million.[2] Thus, trends and developments in the State may serve as models not only for other states, but also for countries and supranational bodies around the world. This is particularly true when considering the global freight transportation industry, where ports in Oakland, Los Angeles, and Long Beach serve as crucial gateways connecting markets in East Asia to the U.S. and beyond. California is home to the top two container ports in the nation in terms of annual throughput (Los Angeles and Long Beach), as well as extensive rail and highway infrastructure that connects these ports to distribution facilities and retailers across the U.S. California is also home to the nation's fourth largest air cargo facility—Los Angeles International Airport, which is also among the world's Top 20 facilities in terms of total cargo handled and total international freight[3]. Finally, the State is home to the world's busiest border crossing at San Ysidro. The southern border serves as a gateway for not only passenger traffic but also cargo.

California is critically important to the nation's economy and especially to the freight transportation sector that supports and maintains economic activity throughout the U.S. As such, it is uniquely positioned to assume a leadership role among the 50 states in tackling the complex freight transportation policy issues that the nation faces today including:

- aging highway infrastructure,
- inadequate connectivity between rural communities and freight corridors,
- increasing congestion in urban mega-regions, and
- technological innovation and disruption.

In recent years, California has distinguished itself from the rest of the country through its commitment to a sustainable freight system that is efficient yet optimized to reduce environmental costs most often borne by communities adjacent to freight facilities. This

[1] United States Census Bureau. (2018, July 1). *QuickFacts: California*. Retrieved April 24, 2019 from United States Census Bureau: https://www.census.gov/quickfacts/fact/table/ca/PST045218.

[2] The World Bank. (2017). Population, total: United Kingdom. Retrieved April 24, 2019 from The World Bank Group: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=GB.

[3] Harris, D. (2018, April 9). *Top 20 cargo aiports in 2017*. Retrieved May 11, 2018, from Cargo Facts: https://cargofacts.com/top-20-cargo-airports-in-2017/

commitment is instantiated in Governor Jerry Brown's Executive Order B-32-15.[4] That order mandates new standards for California's "complex freight transportation system" requiring multiple state agencies to collaborate on a Sustainable Freight Action Plan that identifies strategies "to improve freight efficiency, transition to zero-emission technologies, and increase the competitiveness of California's freight system." To play its part in achieving these goals, Caltrans must ensure that freight-planning teams are adequately funded, staffed, and trained to meet the complex challenges that face them now and in the future.

Caltrans freight-related activity is currently housed in the Office of Freight Planning (OFP), which resides within the Division of Transportation Planning. The Office is responsible for not only freight planning, but also freight analysis and research. It responds to planning imperatives and mandates at the state level, like the aforementioned Executive Order, as well as freight-related federal mandates like those established by the Fixing America's Surface Transportation (FAST) Act. Caltrans itself falls under the umbrella of the California State Transportation Agency (CalSTA).

The areas of responsibility are multidisciplinary in nature. In addition to developing the California State Freight Mobility Plan, OFP is engaged in freight-related data analysis, project identification and prioritization, coordination with freight planners at other levels of government (including Metropolitan Planning Organizations [MPOs]) and industry, management of consultant efforts on various studies, and advisement on the development of freight-related research programs for the agency. OFP is also required to coordinate with other units within Caltrans itself in the fulfillment of its mission.

The skill sets needed to accomplish these tasks and to respond to the changing nature of a dynamic goods movement industry are both broad and deep in nature. When drawing from a traditional pool of transportation planners and engineers, the OFP's success also depends upon some knowledge and skills in geography, economics, logistics and supply chain management, and communications.

This is a challenge not only for the individual pursuing an appropriate career pathway leading to development and advancement within Caltrans, but also to the organization itself, which has limited resources for training (not to mention strategic recruitment, retention, and succession planning). However, the need to identify and develop freight-related positions and related skill sets remains vital to the success of the Office, the Division, and the Department, as a whole.

In order to better assess Caltrans' freight program, Caltrans engaged the Center for International Trade and Transportation (CITT) at California State University, Long Beach (part of the METRANS Transportation Center) to conduct a program assessment that identified the "strengths, weaknesses, opportunities and threats of the Caltrans freight program and recommend best practices to improve Caltrans freight planning processes, programs and project delivery." To address the breadth of its contracted scope of work, the CITT team used a phased method that struck a balance between near-term and long-range assessments of resources that Caltrans could use to implement freight-related programs. After assessing those resources, the CITT team analyzed the extent to which Caltrans was implementing them. Using this mode of

[4] CA Exec. Order No. B-32-15, 3 C.F.R. (2015).

organizational analysis, the CITT team identified areas within the OFP and the Division of Transportation Planning that supported innovative approaches and strategies to "help fulfill the freight program's mission."

Understanding that targeted training and other innovative methods of knowledge transfer were critical to promoting cultures of innovation within the OFP and the Division of Transportation Planning, Caltrans leadership directed the CITT team to integrate into this freight program assessment those activities related to the development and implementation of the related Caltrans Task Order Number 21, which funded the 2018 Caltrans Freight Academies. Led by CITT under the direction of Caltrans leadership and offered since 2005, the Freight Academies provide targeted training for Caltrans leadership and staff who make decisions, projections, and assumptions about the transport sector as part of the planning process. Under Task Order 21, CITT designed and implemented two four-day training academies, one each in Ontario and Sacramento for Caltrans staff from district offices and headquarters.

As directed by Caltrans, CITT used the classes to conduct structured interviews with Caltrans staff involved in freight-related occupations and to gather additional data. The interviews, surveys, and other data-gathering exercises developed for the Caltrans Freight Academies informed the development of the freight capacity building study contained in this report. Conducting task orders 19 and 21 in parallel, the CITT team tested the effectiveness of training materials while providing an opportunity for Caltrans personnel from different parts of the State and from different units to provide input on the need for freight-related professional development. An additional charge from Caltrans for both the capacity building assessment and the freight academies was to address not only coordination with external partners, including the freight industry, but also coordination within Caltrans.

Conducting these two tasks in parallel provided substantive feedback from Caltrans staff based in district offices and headquarters that there is a lack of specialized freight training. Feedback from Freight Academy attendees and in a related peer exchange and survey relayed in this report also affirmed that there is a need for specialized freight training that simultaneously promotes cross-disciplinary thinking. Such thinking is critical given the integrated and interrelated nature of supply chain systems in an era of transformational technologies and shifting global trade policies.

To address the abovementioned challenges and priorities, the scope of work was divided into four integrated tasks:

Task 1: Assessment of resources available to perform Caltrans freight programs, involving:

- a peer exchange with counterparts in other state DOTs followed by a broader survey of Caltrans personnel to inform the development of a gap assessment, including the missing parts of Caltrans' freight program today (training, collaborative relationships, personnel retention, succession planning, etc.) as articulated by Caltrans staff, freight program leadership and partners in both industry and government;
- structured interviews with external partners, including representatives from freight units in other states;

- structured interviews with participants in Caltrans freight training programs, district level staff, and district project managers to assess performance of Caltrans with regard to its freight planning mission; and
- a survey of Caltrans personnel at the headquarters and district level regarding the need for content-specific knowledge in order to perform job duties.

Task 2: Identification of best practices in freight planning, involving:

- a review of statewide and regional freight plans to identify innovative practices and
- the development of 10 mini case studies highlighting innovative freight development functions, including planning and implementation.

Task 3: Defining roles for freight development process, involving:

- the identification of characteristics of an innovative freight development team and
- the use of a process map to capture the scope of freight and infrastructure planning, development, and post-development asset management within the State DOT, as well as the appropriate role of OFP and its internal and external partners with regard to the freight system.

Task 4: Developing implementation plan, involving:

- a review of the current strengths and weaknesses of the Caltrans freight programs and recommended steps, including milestones and performance metrics, needed to bring about a more innovative unit in the short-term and
- the preparation of a high-level, long-term policy plan that identifies steps that Caltrans should follow in order to achieve the goal of establishing the best state DOT freight program in the nation.

Each subsequent section of this report will identify ways Task Order 19 deliverables have been addressed. The report will also categorize the challenges related to each deliverable, and identify new questions that can be addressed to mitigate those challenges. Alignment with Task Order 21 provided a unique opportunity to gather data for the report and test the effectiveness of some of the materials presented herein. It also allowed the trainers and Caltrans to assess the effectiveness of the Academy structure as a training approach that responds to the needs outlined in this broader assessment.

Task 1: Assessment of Resources Available to Perform Caltrans Freight Programs

Interviews and Peer Exchange

To assess resources available for freight programs, the METRANS research team attended national and state freight-related events to conduct structured interviews with public- and private-sector leaders in supply chain and logistics and members of the California Freight Advisory Committee (CFAC) and California Sustainable Freight Action Plan Freight Efficiency Group. These interviews also engaged Caltrans leadership and staff to inform the development of a subsequent peer exchange and surveys to research and develop the freight assessment.

In September 2017, the METRANS research team attended the American Association of State Highway Transportation Officials (AASHTO) annual meeting in Phoenix, Arizona. The meeting enabled the METRANS team to conduct interviews with state officials involved in freight planning, identify participants for the state peer exchange, and better understand AASHTO's organizational structure with regard to freight and how its network can support capacity building.

The METRANS team built on the foundational research with AASHTO stakeholders by conducting similar research and engagement with members of the CFAC on November 29, 2017. During the CFAC meeting, the METRANS team distributed a fact sheet[5] summarizing Task Order 19 goals, which provided context for the interviews with the following Caltrans leadership and staff:

- Coco Briseno, Caltrans Deputy Director, Planning and Modal Programs;
- Chris Schmidt, Caltrans Division Chief, Transportation Planning;
- Rahul Srivastava, Chief, Office of Freight Planning; and
- Gilberto Chambers, Caltrans Associate Transportation Planner in the Transportation Planning Division.

The interviews conducted at the November 29, 2017 CFAC meeting enabled the METRANS research team to gain valuable feedback on priorities to improve Caltrans' freight programs. Top priorities identified during those interviews were to:

- focus on skills gaps—particularly data analytics;
- develop new mechanisms to address funding and financing challenges at the district level; and
- establish the capability to roll up district funding efforts into a coherent state plan.

During the CFAC meeting, the METRANS team also interviewed Tashia Clemons, Director, Program Development in the California division of FHWA in Sacramento. Clemons noted three freight resources that should be reviewed as part of the Caltrans freight assessment:

- FHWA's forthcoming guidebook on freight bottlenecks;

[5] A copy of the Task Order 19 Fact Sheet is enclosed in the Appendix of this document on page 83.

- FHWA's biannual assessment of states on how freight is being moved; and
- FHWA's state review of MPOs, which alternates years with the above state assessment.

During the meeting, CFAC members expressed a desire to establish significant private-sector input into future Caltrans freight initiatives. One member contended that CFAC should reach out to nontraditional partners who could address issues like blockchain and predictive analytics. That member also noted that the National Retail Federation could serve as a valuable nontraditional stakeholder, and suggested that CFAC empower a volunteer Task Force to focus on the Infrastructure for Rebuilding America (INFRA) Grant Program. Two other CFAC members spoke in favor of the state strengthening its advocacy role and its function as a clearinghouse for lessons learned from prior federal grant applications.

CFAC members also stated the importance of developing an integrated set of freight priorities for the state that break down piecemeal approaches to make way for local, state, and national strategic supply-chain initiatives to:

- mitigate risk;
- document and respond to community impacts;
- address truck parking issues;
- factor in environmental and related health impacts;
- assess externalities beyond the actual freight system when determining priorities;
- find new funding partnerships that link local, regional, state, and federal dollars;
- promote community-based engagement and research; and
- foster strategic advocacy efforts to ensure that California gets its fair share from Washington, D.C.

During the CFAC meeting, the METRANS research team also interviewed members of the consulting team leading the update of the California Freight Mobility Plan. Those conversations provided an opportunity for the METRANS team to gather input on Caltrans freight priorities and the ways that the development of the California Freight Mobility Plan could inform the development of the Caltrans Task Order 19 report.

Shortly after the CFAC meeting, the METRANS research team also conducted a phone interview with Kome Ajise, now Executive Director of the Southern California Association of Governments and former Caltrans Chief Deputy Director, to gain a richer sense of the most pressing needs facing the Caltrans freight division. Ajise noted that skills gaps and freight training are critical priorities but also emphasized the need to focus on near-term truck parking issues that are impacting California's freight capacity.

In addition to attending formal meetings and conducting structured interviews, the METRANS team has regularly engaged industry on freight capacity building issues at meetings of the freight efficiency and competitiveness working groups assembled to guide the development of the California Sustainable Freight Action Plan. These venues also provide additional input for Caltrans because it is the convener of the Freight Efficiency Group and a contributor to the competitiveness group. In early January 2018, the METRANS research team also conducted

extensive outreach during the 2018 Transportation Research Board (TRB) meeting to recruit national freight leaders to participate in its forthcoming peer exchange.

On January 24, 2018, the METRANS Transportation Center convened seven freight experts from across the U.S. via webinar to discuss the current state of practice with regard to freight programming and planning in state departments of transportation (DOTs). The participants were selected based on input from the previous interviews and the review of state freight plans undertaken for Task 2 below, which addressed challenges similar to those faced by California. The participants in the peer exchange included:

Table 1: Participants in the January 24, 2018 freight peer exchange

Name	Title	Affiliation
Thomas McQueen	Assistant Planning Administrator	Georgia DOT
Roger Millar	Secretary of Transportation	Washington State DOT
Caroline Mays	Director, Freight and International Trade Section	Texas DOT
Bill Gardner	Director, Freight Planning	Minnesota DOT
Paul Sittig	Technical and Freight Supervisor	New Mexico DOT
Holly Ostdick	Bureau Chief, Planning	Illinois DOT
Marygrace Parker	Director, Freight & Innovation in Transportation Program Manager, Freight Academy	I-95 Corridor Coalition
Tom O'Brien	Executive Director	CITT
Tyler Reeb	Director of Research	CITT

The purpose of the State DOT Policy Peer Exchange was to identify best practices across a broad sample of state DOTs related to structuring and operating freight-related activities to best serve the State's freight transportation systems needs and its stakeholders. During the peer exchange, the project team queried participants about a wide range of topics including but not limited to:

- Where is the freight division housed within your organizational chart?
- How do you engage freight-related partners?
- What are your agency's top priorities?
- What do you see as your agency's mission or role in the freight system? What do you think it should be?
- What are your approaches to articulating department missions?
- What methods does your freight division use to manage and allocate available resources?

- What approaches does your DOT use to offer consistency and value to external partners?
- What training resources do you envision to fill freight-related skills gaps?

While participants addressed a variety of issues, several recurring themes emerged from the discussion, including recognizing the need for cross-functional collaboration, upholding the DOT's role as a steward of the transportation system, offering consistency and value to external partners, addressing suboptimal asset utilization, and dedicating funding for capacity development in freight planning.

Recognizing the Need for Cross-Functional Collaboration

The varied organizational structures of state DOTs demonstrate the broad array of functions that they must perform and how these differ from state to state. Participants noted the interdisciplinary nature of a freight planning team's role within a state DOT and the need for cross-functional collaboration within the state's DOT and across regulatory jurisdictions and industry sectors to address freight issues. Caroline Mays noted that state DOTs can be hindered by pre-existing functional silos with regard to freight planning, adding that the freight planning section of the Texas DOT (TxDOT) engages in the most cross-functional collaboration. Through the implementation of a more integrative work setting that promotes cross-functional collaboration within DOTs, each department can configure its own mission and collectively contribute to the leading role of their DOT. Examples of TxDOT's collaborative and cross-functional approach are featured in the case-studies section of this report.

Upholding the DOT's Role as a Steward of the Transportation System

Given the strong need for freight planning teams to manage transportation systems that fall within the purview of a tremendous diversity of stakeholders, the question arises as to what a DOT's role precisely entails. Roger Millar of the Washington State DOT (WSDOT) noted that upholding WSDOT's role as a "steward of the transportation system" was a top priority for his organization at present and moving forward. He later explained that for WSDOT, there is no issue with project delivery, but rather project prioritization at a system-wide level. Millar's comment underscores the importance of ensuring that project priorities established during the policy and planning phase are extended in the programmatic phases of the project. Such knowledge transfer is critical to maintaining an optimal transportation system. These findings are validated by Caltrans' own System Planning 2 Programming (SP2P) effort reviewed later in this report.

Furthermore, long-term stewardship requires attention not only to today's needs but also to the anticipated needs of future users of the system. This requires a holistic perspective that considers each of the DOT's responsibilities as pieces of an integrated systems approach to transportation management, including issues like workforce development and transformational technology that may be overlooked by a traditional approach more focused on managing day-to-day operations and project delivery.

Offering Consistency and Value to External Partners

When evaluating the success of TxDOT's stakeholder engagement efforts, Mays recommended that state DOTs "offer consistency and value" to encourage stakeholders to participate in and

elicit feedback on the freight planning process. Consistency entails a structured relationship with well-defined roles and responsibilities and regular interaction. This approach ensures that state DOTs generate value for external partners (e.g. MPOs, freight advisory committee members, and local nonprofits) by incorporating their needs and recommendations into freight planning and programming. Likewise, DOTs benefit from the diverse perspectives of all stakeholders in the freight transportation community, from drayage operators at the ports to rural farmers exporting agricultural products overseas. These perspectives help DOTs prioritize investments in projects and initiatives with the greatest return for the state economy.

Participants had various strategies for conducting outreach to specific subsets of freight system stakeholders. Paul Sittig noted that in New Mexico, rural stakeholders are more engaged at the district or regional level than at a statewide level, so outreach efforts with a focus on region-specific issues within the state tend to be most successful. In addition, Marygrace Parker, Director of Freight Innovation for the I-95 Corridor Coalition, noted her organization's success in securing private-sector participation in the I-95 Freight Academy and creating a forum for interaction and learning with professionals from various DOTs and private sector industries. (The I-95 Freight Academy was created by the I-95 Corridor Coalition to "efficiently train public sector agency staff whose planning, operational, and/or management work impact goods movement decisions, investments, and interactions").[6]

While collaboration between the private sector and DOTs generates meaningful knowledge exchange, participants noted that privacy and ethics concerns limit private-sector participation and must be considered in collaborative efforts. In this regard, participants identified how the Minnesota Freight Advisory Committee (FAC) helped the Minnesota DOT define its role in addressing specific issues as they arise. Participants noted that, through giving the Minnesota FAC a greater degree of involvement across the statewide freight system as a whole, the committee was better able to coordinate between the public and private sector.

The American Transportation Research Institute (ATRI) noted that, in a report identifying best practices in state freight plans, "ideal advisory committees will possess some amount of decision-making authority." However, they found in their review of freight plans that "no FAC had any direct decision-making authority in the project selection process." Nevertheless, ATRI considers it a best practice to grant this authority and allow the FAC to, for example, veto or add projects after a series of projects have been selected. This expands the FAC's role beyond an advisory capacity and results in a more robust partnership between a DOT and its stakeholders. They further note that the Washington State Freight Mobility Strategic Investment Board comes closest to achieving this best practice of granting decision-making authority (ATRI, February 2018).

Addressing Suboptimal Asset Utilization

During the State DOT Policy Peer Exchange, Holly Ostdick stated that promoting mode shift is one of the top priorities of the Illinois DOT. In particular, the DOT is seeking ways to encourage shippers to shift from trucking (which causes costly wear-and-tear on infrastructure) to rail or barge (which have excess capacity and lower maintenance and repair costs). While mode choice

[6] Federal Highway Administration. (2018, May 11). *Education*. Retrieved May 11, 2018, from U.S. Department of Transportation: Federal Highway Administration: https://ops.fhwa.dot.gov/freight/fpd/education.asp

is a market-based decision, DOTs can advocate for legislators to develop policy that calls for the use of tools, such as user fees, to better represent the costs and benefits associated with each mode *at a system level*, thereby incentivizing market behavior in a way that optimizes asset utilization and reduces expenditures on infrastructure maintenance and repair. By optimizing transportation system performance, the DOT will inevitably improve supply chain performance for resident firms as well.

Dedicating Funding for Capacity Development in Freight Planning

As technological and socioeconomic trends translate to changing freight transportation needs in the future, continuous learning and improvement for freight planners is crucial for proactively identifying and responding to these trends. Mays stated that the need for adequate freight planning capacity must be recognized at the highest levels of DOT leadership so that funding, time, and other resources are dedicated for freight planners to pursue learning opportunities, including research conferences like the TRB Annual Meeting or seminars like the I-95 Freight Academy.

However, several participants noted that their freight planning team has no committed funding source for training purposes. As a result, they rely on free resources, like webinars offered by organizations such as the National Highway Institute (NHI) and the Federal Highway Administration (FHWA). On one hand, this reality reflects the value of free online resources such as these to the freight planning community, so continuation and expansion of these resources would have widespread benefits in DOTs across the nation. On the other hand, it also reflects an ongoing need for the awareness of freight issues to be elevated within DOTs so that problems like corridor congestion and environmental degradation are recognized as burdensome costs for communities and businesses that are nevertheless capable of being solved, given adequate resources and proper training for freight planners.

Table 2: Key takeaways from peer exchange

State DOT Policy Peer Exchange Key Takeaways	
What are your agency's top priorities?	● Exploration by DOTs of novel funding mechanisms for infrastructure projects. (Requires identifying key beneficiaries of the proposed project and working in partnership with them to secure public and/or private funding.) ● The development of strategies to address impact of disruptive/transformational technologies on transportation in general and freight in particular. ● Workforce training/Succession planning. ● Truck parking. ● Diversity, inclusion, and stewardship. ● Connectivity among modes and corridors ● Action in regard to the lack of national freight policy.
What do you see as your agency's mission or role in the freight system? What do you think it should be?	● State DOTs should take initiative to be the primary advocate for sound freight policy with their state legislatures. ● State DOTs should be less project-oriented and more programmatic in their approach to managing freight issues. ● Careful attention should be paid to project prioritization to ensure that the system as a whole serves the needs of its users with minimal disruption to their operations. ○ State DOTs are in a unique position to offer system-wide perspective.
Where is your freight division housed within your organizational chart?	● State DOTs take a variety of approaches to the organization of the freight unit. Most are embedded within modal or planning units although in some cases freight is part of the Business unit because it is deemed to be industry-facing.
How do you engage external partners?	● State DOTs have had the most success with stakeholder engagement when they offer external partners consistency and value to encourage active stakeholder participation and earn stakeholders' trust throughout all policy, planning, and programming efforts. ○ Stakeholders can provide DOTs with networks to the research community and demographers. ● Stakeholders need to be included as part of asset management and inventorying. ● The size, structure and purpose of FAC matters should be considered.
What training resources do you use to fill freight-related gaps?	● Due to funding limitations, DOTs rely solely on free webinars and other digital resources. ● However, state DOTs should recognize, at the highest level of leadership, that freight planning is a rapidly evolving field and requires dedicated training funding to allow freight planners to stay abreast of critical issues and best practices in the field. In particular they should note: ○ the benefits of regional (virtual) peer exchanges, ○ the opportunities via FAC including process improvements, and ○ the potential of pooled resource models (I-95).

	● The freight planning unit should boast an integrated and interdisciplinary skill set to address all stakeholder needs when faced with complex freight issues. Considerations on this front include: ○ life cycle costing and total-cost-of-ownership approaches and ○ communications and media avenues (e.g. WA travel advisories and the TX website).

Conclusion: Creating Collaborative DOT Work Cultures

While peer exchange participants raised a wide range of oversight, transactional, and operational challenges and priorities, all of their comments linked back to an abiding question:

> **How can DOT leaders establish organizational priorities that move beyond traditional siloes to promote work cultures focused on cross-functional awareness, collaboration, and continuous improvement?**

This question and related workforce development challenges were used to conduct a gap assessment that informed the development and deployment of the survey instrument for this report (see Survey Analysis subsection). Cross-functional innovations and implementable strategies are addressed in Task 2. The gap assessment also identified a lack of available funding for on-the-job training and professional development opportunities for DOT workforces. In this way, Caltrans has already established itself as a national leader by funding its own Caltrans Freight Academy.

During the 2018 Caltrans Freight Academies held in Ontario and Sacramento, California, members of the METRANS team engaged with a wide range of Caltrans freight professionals to further explore themes addressed in the peer exchange. This input, which was factored into the development of this report, underscores how Caltrans can use the Freight Academy in the future as a forum to better prepare its freight workforce for short- and long-term challenges. An ongoing commitment to an immersive on-the-job training program like the Freight Academy will ensure that Caltrans has the capacity in the future to address skills gaps created by transformational trends including, but not limited to: data management/security, predictive analytics, artificial intelligence, autonomous vehicles, new environmental mandates, e-commerce, resource management, and changing market conditions.

Survey Analysis

This section examines the results of two surveys that were conducted by the participants of two 2018 Caltrans Freight Academies held in Ontario and Sacramento. The surveys were sent to all participants between April and June 2018.

The first survey was distributed to all participants at both Freight Academies. Each Academy had approximately 40 attendees and, on average, about half of them submitted their responses at the end of each session. The participants were asked to rate the effectiveness of each of the sessions, as well as the effectiveness of the speaker(s) in presenting the topic at the Caltrans Freight Academies. The participants used a five-point scale to rate each session. Additionally, the participants could leave feedback about each of the sessions in the form of short comments. The analysis of the first survey includes the use of the effectiveness evaluations to assess the quality of

the training and an assessment of the received feedback in the form of comments to identify future training needs.

The Freight Academies consist of three parts. First, sessions are offered on a range of freight-related topics. Second, the participants have the opportunity to visit freight-related sites of operation. Finally, the participants engage in hands-on activities, such as a walk audit where participants used a GIS-enabled data collection tool downloaded to their mobile phones to assess the transportation systems around a study area. In coordination with the Caltrans freight planning team, the 2018 Freight Academies included content addressing coordination across units at Caltrans and on changes to the focus of the planning function as outlined in Caltrans' then recently-released SP2P report. Caltrans was also interested in an exercise that asked participants to contribute to the development of a statewide marketing piece for the state as a trade gateway with a focus on the role of Caltrans in facilitating trade flows.

The METRANS research team's analysis of the first survey identified several training needs and gaps, as well as ways to improve future training. The topics of all sessions and the results of the analysis are featured below:

1. State of the Supply Chain: The Changing Geography and Economics of Logistics and Supply Chain Management: E-commerce, Drones and Blockchain

Some participants expressed that the overview of supply chain and related freight industry definitions and terms provided in the first session were very valuable. The session received high evaluations for effectiveness with 96 percent of the 51 total respondents strongly agreeing or agreeing that the session was effective. Similarly, 98 percent admitted that the speaker(s) was (were) effective in presenting the topic. The findings suggest that it is necessary to provide an overview of freight as well as the most common terms and their definitions in the beginning of a training course. One respondent identified a need for a more in-depth discussion of the future of freight industry and topics, such as artificial intelligence (AI), robots, and drones.

2. Freight Planning Perspectives and Challenges:
    a. The National Freight Strategic Plan and State Freight Priorities (Ontario only)
    b. State Freight Priorities (Sacramento only)
    c. The National Freight Strategic Plan (Sacramento only)

In Ontario, the session received high effectiveness evaluations with 96 percent of the 26 respondents strongly agreeing or agreeing that the session was effective. Additionally, 81 percent of the respondents strongly agreed or agreed that the speaker(s) was (were) effective in presenting the topic. The high effectiveness of the session shows that the attendees enjoyed learning about the current planning efforts underway and about priorities at the state and national levels. The feedback shows that more effective speakers and more time allotted for this discussion would have improved the effectiveness of the session.

In Sacramento, during the State Freight Priorities session, 80 percent of the 25 respondents strongly agreed or agreed that the session and the speaker(s) were effective. There was a similar response for the National Freight Strategic Plan session, where 76 percent of the 25 respondents strongly agreed or agreed the session was effective, while 80 percent of the respondents strongly

agreed or agreed that the speaker(s) was (were) effective. Splitting the session in two parts, as it was done in Sacramento, appeared to have lowered the effectiveness of the sessions. Perhaps attendees found it easier to comprehend how state's projects fit into the national narrative when the discussion combined state and national freight planning efforts. Additionally, including metrics to make the presentation more informative and avoiding technical issues could have improved the evaluations of this session.

3. The Corridor Planning Process

This session focused on the rollout of the recommendations contained in the SP2P report. Some attendees commented that the corridor planning process was an intermediate or advanced topic that required prior training or background to fully understand the topic. Many attendees were not aware of Caltrans' own SP2P effort and felt unprepared to discuss how it would impact their work in freight planning. Despite the fact that the session was perceived as challenging to some of the attendees, the vast majority found the discussion of identifying gaps and opportunities in the planning to programming process as effective. Out of the 47 respondents, 81 percent strongly agreed or agreed that the session was effective and 79 strongly agreed or agreed that the speaker(s) was (were) effective in presenting the topic. In future, this type of session would benefit from a longer introduction and a more concise and structured presentation that makes it easier for attendees to understand the material.

4. Regional Demands:
    a. Logistics Services in Central California (Sacramento only)
    b. Freight-related Infrastructure in the Inland Empire (Ontario only)

The evaluations for the Sacramento session stated that 67 percent of the 21 respondents strongly agreed or agreed the session was effective and 57 percent agreed the speaker(s) was (were) effective in presenting the topic. The respondents would be open to this topic in the future, but this session would benefit from a more compelling and dynamic speaker who conveys the importance of farm-to-market supply chains moving through California's Central Valley and their relationship to broader goods movement activities in the state more efficiently.

Participants at the Ontario Caltrans Freight Academy expressed an interest in hearing about freight demand in the Inland Empire. Participants found value in studying freight systems located within the geographic location of the actual training. Those comments suggest that future freight academy curriculum should identify real-world analogs to accompany in-class theoretical supply chain concepts. The attitudes in the comments correlated to strong effectiveness evaluations of the session and speaker(s) with 96 percent of the 25 respondents strongly agreeing or agreeing that the session was effective and 100 of the respondents strongly agreeing or agreeing that the speaker(s) was (were) effective in presenting the topic. This finding suggests that training should incorporate similar topics that focus on the importance of farm-to-market supply chains in the area of the actual training.

5. Using GIS Tools to Assess the Freight System (Sacramento only)

Respondents acknowledged that geographic information systems (GIS) applications have significant potential for various applications within the freight industry and their occupations. Respondents expressed interest in publicly available GIS freight data and the potential uses of the collector app. The survey responses indicated that 52 percent of the 21 respondents strongly agreed or agreed that the session was effective while 34 percent neither agreed nor disagreed the session was effective. Additionally, 48 percent of the respondents strongly agreed or agreed that the speaker(s) was (were) effective while 24 percent of the respondents stated they neither agree nor disagree that the speaker(s) was (were) effective in presenting the topic. The criticisms were mainly aimed at the quality of the presentation, meaning that a more refined presentation would have resulted in higher evaluations because the respondents expressed a strong interest in the topic and the potential applications of the GIS tools in their occupations.

6. Freight Data and Performance Measures: Why We Should Care?

This session received one of the highest effectiveness evaluations. 98 percent of 47 survey respondents strongly agreed or agreed that the session was effective and 96 percent strongly agreed or agreed that the speaker(s) was (were) effective in presenting the topic. Furthermore, 14 participants expressed interest in learning more about publicly available freight data and the advantages and disadvantages of working with particular datasets. The evaluations and the received comments suggest that there is a need for training on topics regarding freight data, its accessibility, and performance measures. Participants acknowledge the benefits of quantitative analysis and data modeling in freight planning efforts. Overall, the feedback shows that the awareness and availability of publicly available freight data are limited, and there is a need for types of resources that summarize the data and make it accessible for transportation workers.

7. Identifying Solutions from the Caltrans Freight Planning Toolkit

Generally, participants expressed that the session was informative and saw value in learning about the innovative solutions to freight-related challenges within Caltrans. 86 percent of the 43 respondents strongly agreed or agreed that the session was effective and 82 percent of the respondents strongly agreed or agreed that the speaker(s) was (were) effective in presenting the topic. These findings suggest that there is a need for training that educates on the processes and available resources within the agency.

8. Identifying Solutions:
    a. Lessons from the Freight Capacity Building Study Peer Exchange (Lessons on Freight Planning and Organization)
    b. What Can We Learn from MPO and DOT Peers Part 2 (Lessons on Marketing and Stakeholder Engagement)

Overall, the participants benefited from learning and being aware of the efforts of similar transportation agencies and research institutions. One participant noted that they enjoyed learning about the findings of the National Cooperative Highway Research Program (NCHRP). This comment suggests that the Freight Academy's attendants are interested in the research that is available and are looking to use that knowledge to expand their understanding of the freight

industry. This session received relatively high evaluations, pointing to the fact that peer-exchanges should remain part of the training. 88 percent of the 41 total respondents strongly agreed or agreed that the session was effective and 90 percent of respondents strongly agreed or agreed that the speaker(s) was (were) effective in presenting the topic.

Furthermore, the attendees evaluated learning from MPO and DOT Peers Part 2 as highly effective, suggesting that transportation planners are interested in the processes and solutions that other states' Department of Transportation have found. 98 percent of 40 respondents strongly agreed or agreed that the session was effective and 97 percent of 39 respondents strongly agreed or agreed that the speaker(s) was (were) effective at presenting the topic.

9. Mapping Caltrans Process Flows

This session offered a presentation that was followed by a group activity that involved filling out process mapping templates to envision the multijurisdictional interactions that connect oversight, transactional, and operational aspects of the California supply chain. Some reported the presentation on Caltrans process flows as being challenging and others as important and informative. Similar to the session titled "The Corridor Planning Process," prior training or background might have helped to fully comprehend the topic. The survey responses show that 80 percent of the 44 respondents strongly agreed or agreed that the session and the speaker(s) were effective in presenting the topic.

10. Developing a Script for a Video for Marketing Freight Investment Showcasing California's Freight Story

For this session, participants engaged in an activity that tested their newly acquired knowledge of freight. Survey respondents found this exercise highly effective with 95 percent of the 40 respondents strongly agreeing or agreeing that the session was effective and the speaker(s) were effective. The major strength of this session appears to be the interactive activity that was extremely engaging and helped the attendees deepen their understanding of the material.

The Academy's sessions were supplemented by visits to freight-related sites. The participants at the Ontario course had the opportunity to visit Target's omni-channel distribution facility and the headquarters of Esri. The participants of the Sacramento course visited the Port of West Sacramento, Cold Storage warehousing and distribution facility, and the sporting and special events facility Golden 1 Center. The responses on the effectiveness of these visits and the speakers were aggregated to reflect the opinion of the entire cohort for all visits of that particular day. In Ontario, 92 percent of the 50 responses (25 respondents in each of two cohorts) recorded that the attendees strongly agreed or agreed that the site visits were effective and 96 percent of the 49 responses disclosed that the attendees strongly agreed or agreed that the speakers during the site visits were effective as well. Similarly, in Sacramento, 97 percent of the total 63 responses (21 respondents in each of three cohorts) indicated that the attendees found the site visits effective and 95 percent of the total 63 responses indicated that the speakers were effective as well. Overall, the METRANS Research team concludes that survey participants benefited from visiting sites of freight-related operations.

The final part of the Freight Academy training was a walking freight audit. This section, however, received relatively lower evaluations than the activities discussed above. Some of the criticisms for this evaluation were mentioned in the comments. For example, participants experienced technical issues with the app and commented that the session was not focused enough on freight. Nevertheless, the participants acknowledged the potential of the data-collecting app and were interested in the idea of the app replacing paper surveys. Overall, 63 percent of the 44 respondents strongly agreed or agreed and 23 percent neither agreed nor disagreed that the session was effective. There were some technical issues with the mobile application that interfered with the activity, but overall the participants saw potential value in the walk audit.

The second survey deployed was initially designed for another METRANS project titled National Transportation Career Pathways Initiative (NTCPI). The objective of the NTCPI survey was to document and analyze workforce requirements of transportation planning professionals. In addition, the survey also assesses future workforce skills needs for transportation planners. The METRANS research team revised the survey so that it was tailored to Caltrans and deployed it with all attendees of the 2018 Caltrans Freight Academies. This survey asked participants to select and identify what the necessary knowledge, skills, and abilities (KSAs) of future freight professionals will be. The survey offered a set of predetermined choices and a "comments" or "other" section for each question. While the sample size is relatively small, with 23 out of 80 participants' responses reflected, these survey results offer a general assessment of broader workforce development needs and general challenges that Caltrans professionals face.

Findings from the second survey are as follows:

- The top five occupations that were identified as "very critical" at Caltrans include: Transportation Planner, Transportation Engineer, Regional Planner with Geographic Information System (GIS) specialization, Environmental Engineer, and Contract Manager.
- Occupations said to gain prominence in the future may include: Social Media and Outreach Specialist/Analyst, Land-Use Lawyers, Community Development Specialist, Logisticians, and Right-of-Way Architects.
- Eighty percent of all respondents believed that a bachelor's degree was important to perform the job responsibilities of their position. Other recommendations from the survey group included a licensed engineer certification.

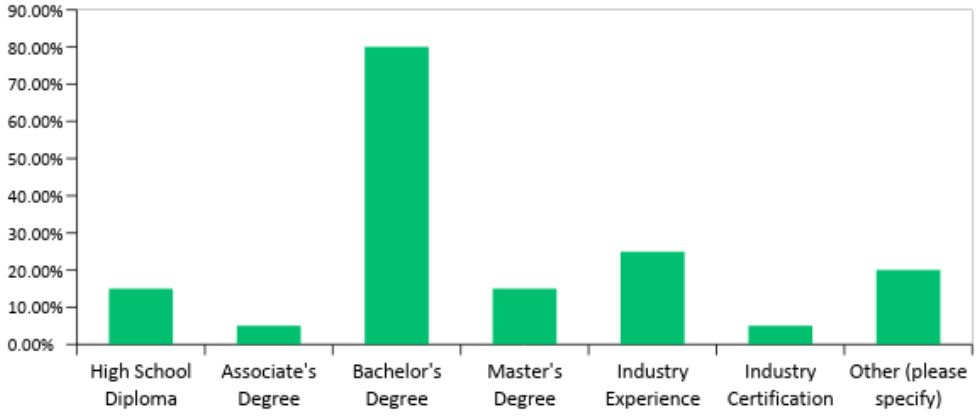

Figure 1: Responses to education requirements

- In the larger context of professional certifications, 58 percent of the respondents believed that an American Institute of Certified Planners (AICP) Advanced Specialty Certification in Transportation Planning (AICP CTP) would be useful, followed by other certifications from AICP.
- In anticipation of future changes, respondents were asked, "What education, training, experience, and/or certification SHOULD be required for your position?" Although a bachelor's degree was still a prerequisite, respondents also identified social sciences, railroad training, freight training, and management certification as other skills that would be necessary in the future. This position reiterates that "planning" as an occupation is multi-disciplinary in its execution.
- 35 percent of the respondents to the survey identified that intra-agency cooperation was challenging because there was no specific funding attributed for this purpose, and 25 percent of them believed that intra-agency collaboration was not perceived as an avenue of opportunity and not a priority for state DOTs.
- In understanding the impact of future technology on transportation, the respondents ranked technologies from most to least disruptive of Caltrans' core functional abilities. The results suggest that autonomous vehicle technology, intelligent tracking and navigation, alternative fuel vehicles, e-commerce, intelligent transportation systems (ITS), and big data would be the most disruptive to Caltrans' functionality and their ability to govern such systems.

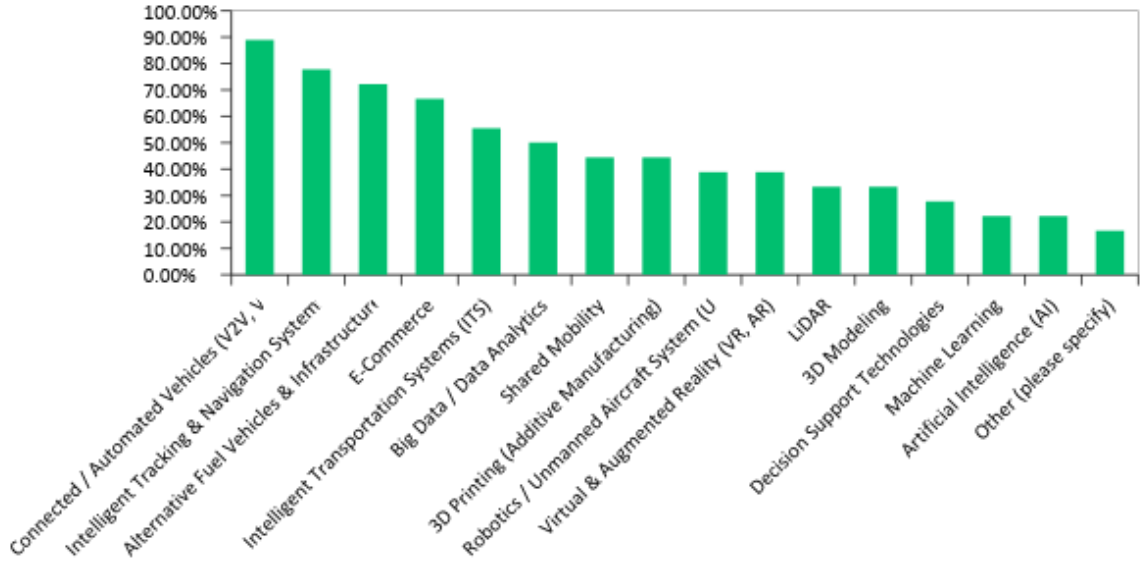

Figure 2: Future disruptive technologies

- In terms of freight-related issues at specific Caltrans districts, the top five areas of concern included:
    - Truck access (i.e., "last-mile" issues),
    - Air quality, health and environmental impacts of freight uses,
    - Congestion on freight corridors,
    - Conflicts between freight and non-freight serving uses, and
    - General state of infrastructure.

- Respondents were asked to list names of projects that would enhance freight flow at their respective districts. Some of the project suggestions included: grade separations, improvements on Interstate (I)-80 corridor, upgrades on I-5 corridor, capacity enhancement on State Route (SR) 99 north of Fresno and south of Tulare County, freight parking, and driver behavior modification/education.
- Respondents were also asked the reasons that prevented completion of projects, which enhanced freight flow. The overwhelming response was lack of project funding followed by regulatory conflicts.

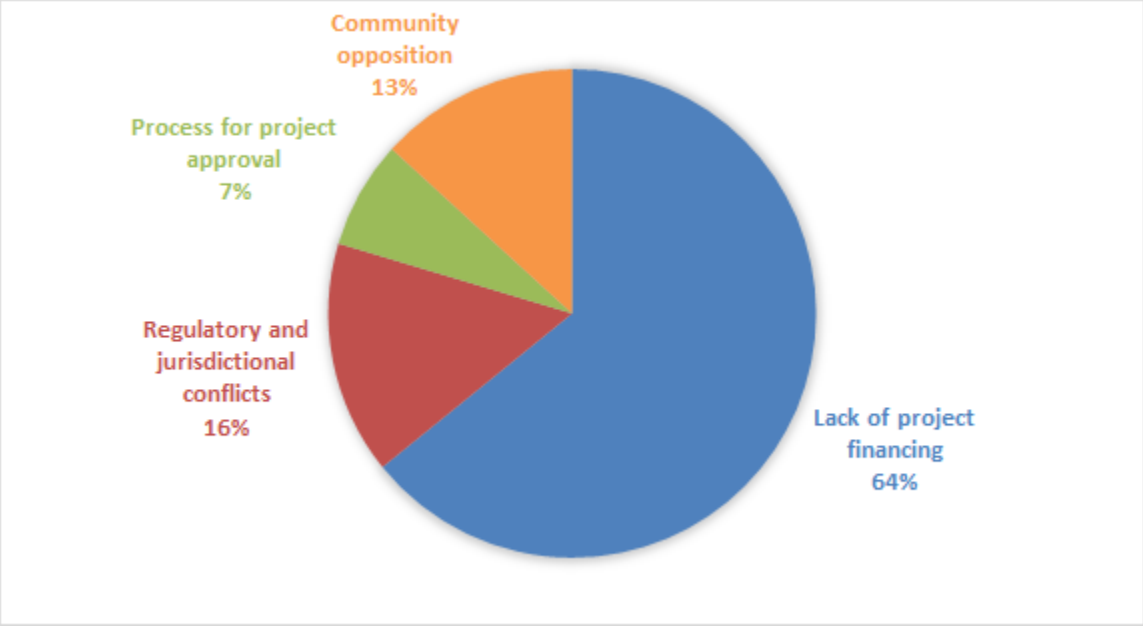

Figure 3: Responses to delayed project completion

The survey represents opinions from Caltrans' freight professionals about the direction and the changes adopted within the freight sector. Trends like workforce needs, technology disruptions and key freight occupations have and will play a critical role in determining the future quality of the organization's workforce. The survey highlights these potential changes from the lens of Caltrans' ability to manage the changes in freight patterns.

The survey findings also align with an earlier study titled "The Freight Mobility Scoping Study," conducted in 2013 by the METRANS Transportation Center. The overarching goal of the Freight Mobility Scoping Study was to improve goods movement and expand economic development within the State of California. A survey instrument sent to 200 stakeholders generated about 60 responses that were used to garner information on freight-related issues.

The Freight Mobility Scoping survey findings identified a lack of funding as the largest challenge in project completion, along with institutional factors such as environmental regulations, community opposition, and land availability. In another question, the Freight Mobility Scoping survey also asked participants, "What prevented successful regional coordination to execute a project?" Most of the respondents concurred that regional prioritization and differences in operational execution of projects were the primary reasons for poor or delayed execution. Other issues included:

- Inconsistency in district leadership, stakeholder outreach, and interaction with MPO/Regional Transportation Planning Agency/private-sector stakeholders;
- A need for consistent policy support for districts to better manage and execute their policy directives; and
- The need for Caltrans to provide consistent directions and develop district freight plans.

Those results corroborate findings in the Task Order 19 Peer Exchange that call for more meaningful collaboration between and among freight divisions at Caltrans and relationships with external stakeholders.

One of the key findings of the results of both surveys implemented for this project showed that Caltrans Freight professionals are interested in learning more about the larger systems of logistics that are in place. It is helpful for Caltrans professionals to know about new technological advancements like CAVs or data-enriching software like Esri, but the specifics of these tools and their implementation are nothing without an informed global perspective. This is true for both incumbent employees and new Caltrans professionals. These survey results show that freight professionals are open and eager to receive education and training on a more global and wider perspective of freight in light of the larger supply chain.

The data gathered as part of Task 1 indicate that some of that knowledge can come from other DOTs which have undertaken similar planning exercises and confronted similar issues. In the next section, we identify some of those Best Practices from around the country.

Task 2: Knowledge of Current Best Practices

Changing transportation conditions and the emergence of innovative technologies and innovative decision-making tools has led to the enhancement of freight planning, infrastructure development, and operations. Considering the changing dynamics of freight planning, statewide, regional, and local agencies must adapt their current practices to best fit current freight needs. As noted in the aforementioned ATRI report, current best practices in freight planning at the state level will allow state DOTs to effectively address the critical components of freight planning. To ensure efficient analysis of best practices in freight planning, this report identifies top priorities for maintaining and implementing best practices in freight planning and related organizational and programmatic development.

By underlining major topics that are relevant to the current best practices of freight planning units, statewide and local agencies can analyze and articulate their mission and goals, identify potential shortcomings in specific operations, and prepare for external influences more efficiently. Expanding on the issues addressed in the peer exchange in Task 1, this report draws from exemplary approaches utilized by state DOTs across the U.S. This section also identifies case studies from specific DOTs that underline major components and issues of their freight plans and how those agencies address those issues.

Methodology for Selecting Best Practices

To validate the criteria for selecting freight planning and programming case studies and best practices, METRANS selected state freight plans for analysis based on recommendations from industry experts and relevance to California's freight system characteristics and needs. This includes information revealed in Task 1 interviews. For example, an industry stakeholder identified the Iowa State Freight Plan as a source of innovative ideas and approaches to freight planning. Similarly, the Texas, Washington, and Georgia plans were selected because of our in-depth engagement with representatives from our State DOT Peer Exchange outlined in Task 1 of this report. The Florida and Maryland plans were selected because they are part of the I-95 Corridor Coalition, which was also represented in the State DOT Peer Exchange. It is also worth noting that as the world of state freight planning is still relatively small and a relatively small number of consultants have been engaged to assist states with their efforts, we found consensus developing around the states and experts who produce the most effective plans.

Each state has certain characteristics—political climate, geography, budgetary constraints, infrastructure assets, and socioeconomic conditions, for example—that constrain its ability to build and maintain an optimized freight transportation network. There is naturally a broad diversity of responses to these constraints from each of the 50 states, and freight strategies in one state may not be directly transferable to another. However, California can also find many useful lessons in the ways that other states have responded to freight issues. With this in mind, METRANS identified several state freight plans for analysis based on the applicability of their insights to California's freight transportation system. Plans that addressed issues relevant to California were prioritized for analysis. Examples of these issues identified by METRANS include:

- cross-border freight movement with Mexico,

- seaports and maritime trade flows,
- farm-to-market access for agricultural producers, and
- environmental impacts of freight activities.

Overall, METRANS sought a representative sample of freight plans that reflect the most critical issues facing California's freight transportation network, as well as some issues that tend to receive less attention, like ensuring corridor access for key rural freight generators. While California is an outsized contributor to the freight sector in the U.S., the state has much to learn from smaller states that are developing innovative approaches and leveraging the latest technologies to solve long-standing issues in freight transportation. In fact, such learning can lead to deeper partnerships and collaborations among state DOTs, as they recognize their similarities and the value that can be gained from learning from and working with one another.

For the purpose of this report, the METRANS team reviewed freight plans from the following states:

- Alabama,
- Iowa,
- Florida,
- Georgia,
- Texas,
- Washington,
- Maryland, and
- Mississippi.

In addition, the team also reviewed MPO-level plans that were identified through the Task 1 interview and peer exchange efforts. These include the outcomes of a partnership between the Capital Area MPO, the Durham-Chapel Hill-Carrboro MPO, and the North Carolina DOT designed to undertake collaborative efforts in developing freight-specific plans at the regional level. It also includes a plan developed by the Greater Memphis Regional MPO due to its emphasis on intermodalism.

In addition to reviewing the plans with an eye toward innovative practices, we also indicated whether or not the plan included capacity building as a need and if it identified specific strategies for meeting the education and training needs of the DOT or the broader workforce. After reviewing the eight state freight plans and two MPO freight plans, the METRANS research team reviewed the Caltrans freight plan and conducted comparative analysis.

Freight Plan Summaries and Analysis

Table 3: Alabama Department of Transportation (ALDOT); plan completed 03/2016

Criteria	Items listed in the plan
Workforce Development	• Plan suggests workforce training and job placement • Development of internal education programs at ALDOT on logistics taught by private sector
Stakeholder Outreach	• Stakeholders gathered through the Freight Advisory Committee (FAC) • FAC advices on freight issues, priorities and funding • 3 total meetings conducted
Funding	• NHFP: $22 million on freight
Investment Priorities	• Existing ALDOT projects • Intermodal projects • Rail crossings • Truck parking • Applicable ITS
Performance Metrics	• Statewide Traffic Model • Pavement Management Program • Comprehensive project management system • Bridge Program • Critical analysis and environmental reporting
Key Freight Issues	• Congestion and mobility preservations • Infrastructure conditions • Economic competitiveness • Safety • Innovative operational improvements • Environmental sustainability & justice
Freight Goals and Strategies	• Improve reliability and reduce congestion • Good repair on freight corridors • Support investment in public and private sector in freight network • Safety & security of freight infrastructure • Promote ITS • Promote human and natural environment while balancing freight priority

Table 4: Florida Department of Transportation (FDOT); plan completed 06/2013

Criteria	Items listed in the plan
Workforce Development	• Future workforce needs are addressed beginning from page 3-12; however, little is discussed regarding strategies for proactive workforce development
Stakeholder Outreach	• Regional listening forums • Florida freight leadership forum • Scenario planning • Plan development • Public commentary
External Collaboration	• Chamber of commerce • Economic development organization to maintain an inventory of private facilities that are large truck-trip generators
Funding	• The state legislature has committed funding for Intermodal Logistics Centers (ILCs) Chapter 6 of the document lists all of the funding programs
Investment Priorities	• Florida considers connections (e.g., distribution hubs, ILCs) to be priorities for investment
Performance Metrics	• Highway, seaway, aviation and rail performance metrics are provided beginning from page 5-4 • Total of 12 performance measures for the four categories
Key Freight Issues	• Freight flow imbalances • Workforce education and availability • Congestion • Funding availability
Freight System Assets	• FDOT considers spaceports as freight transportation assets
Freight Goals and Strategies	• Invest in transportation systems which support a globally competitive economy • Transportation decisions which make livable communities • Responsible environmental stewardship • Safe and secure transportation • Proactive use of transportation system • Improve mobility and connectivity for people and freight

Table 5: Georgia Department of Transportation (GDOT); plan completed 2012

Criteria	Items listed in the plan
Stakeholder Outreach	• Georgia freight infrastructure was developed through several decades of outsized investment by both the public and private sectors
External Collaboration	• Georgia Department of Economic Development • Governor's Office • Private sector stakeholder advisory committee
Funding	• In 2010, the Georgia State Assembly approved the Georgia DOT Statewide Strategic Transportation Plan (SSTP), which concluded that an investment of $15 billion is needed over the next 20 years • Freight rail is funded and operated by the private sector
Investment Priorities	• The deepening of the Savannah Harbor is the top freight priority for Georgia
Key Freight Issues	• Several portions of the shortline railroad infrastructure need infrastructure improvement • The interstate interchange on I-20 at I-285 west of Atlanta also has been noted by freight stakeholders as a significant safety issue for trucks and is recommended for improvements
Freight System Assets	• Port of Savannah • Air cargo facilities at Hartsfield-Jackson Atlanta International Airport • Major rail yards, warehouses, and distribution centers in the Savannah and Atlanta regions
Freight Goals and Strategies	• Marine port strategy • Rail strategy • Highway strategy • Air cargo strategy

Table 6: Iowa Department of Transportation; plan completed 2016

Criteria	Items listed in the plan
Workforce Development	• Develop skill sets of youth through University of Iowa • Training programs to include lifestyle skills and soft skills • Outreach programs to develop good quality truck drivers
Stakeholder Outreach	• Freight Advisory Council • Face-to-face meetings and exercises • Email correspondence and online surveys • Issue-based workshop • High leverage stakeholder committee • Rail Advisory Committee
External Collaboration	• Midwest state webinar • Moving Iowa Forward Conference • Mid America Association of State Transportation Officials (MAASTO) • Mid-America Freight Coalition (MAFC) • ITS Heartland Corridor Coalition • Seven other Midwest industry bodies • Associated with Iowa State University
Funding	• Linking Iowa's Freight Transportation System (LIFT) Program: $2.6 million for freight • Railroad Revolving Loan and Grant Program • Highway-Railroad Crossing Surface Repair Program • Other programs to address air quality, bridge repair, and urban engineering programs No dollar values for all of the above is mentioned in the report
Investment Priorities	• Target investment to address mobility issues that impact freight movements • Target investment on the interstate system • Advance a 21st century farm-to-market system
Performance Metrics	• Improvements, policies, and operational innovations • Safety, security, efficiency, and resiliency • State of good repair • Innovation and advanced technology • Economic efficiency and productivity • Reliability • Short and long distance movement • Flexibility of states • Environmental Impacts
Key Freight Issues	• Funding to finance infrastructure maintenance • Multimodal system deterioration • Labor, driver shortages, and hours of service requirement

Criteria	Items listed in the plan
	• Operational challenges: equipment maintenance, cleaner trucks, and transload facilities • Fuel supply and price
Freight System Assets	• Airways • Roadways • Railways • Pipeline • Waterways • Intermodal facilities • Transload facilities
Freight Goals and Strategies	• Safety • Efficiency • Quality of life • Align with national freight goals

Table 7: Maryland Department of Transportation (MDOT); plan completed 02/2017

Criteria	Items listed in the plan
Workforce Development	• Increased availability and enrollment of freight services degree and continuing education • Partner with community colleges and industry leaders through the Maryland Higher Education Commission • Continuing education programs in freight and logistics
Stakeholder Outreach	• "Maryland Freight Finder" geographic database to identify where freight facilities and clusters are located and how they contribute to economic activity across the state
External Collaboration	• State transportation agencies • Regional and local government • Economic development • Private sector (water transport, industrial, chamber of commerce, railway, Johns Hopkins University) • Education and advocacy
Funding	• MDOT should monitor economic, trade and logistics, environment, technology, energy, and land use trends and assess implications, especially for MDOT capital investment programs
Investment Priorities	• State-owned shortline rail infrastructure and assets • Reliable and safe transport on state-owned shortline rail system • Emissions reductions, safety improvements, or improved system performance • Reduced traffic congestion • Passenger and freight rail

Criteria	Items listed in the plan
Performance Metrics	• Economic competitiveness • Quality service • Transportation system performance • Safety and security • Environmental stewardship • Community vitality
Key Freight Issues	• The true cost of loads and their benefit to economic activity is not clear • Truck size and weight should be studied to assess the impacts of inconsistent regulations across states and the need for clear, formal policy guidance
Freight System Assets	• Highway infrastructure • Railroad infrastructure • Port and waterway infrastructure • Air cargo infrastructure
Freight Goals and Strategies	• Maryland recognizes the need to provide clear, proactive guidance on truck routing to prevent misrouting and safety hazards

Table 8: Mississippi Department of Transportation (MSDOT); plan completed 10/2017

Criteria	Items listed in the plan
Workforce Development	• No emphasis on training and development • Economic data on job growth sectors only

Stakeholder Outreach	• Mainly through the Freight Advisory Committee (FAC); FAC included stakeholders from:
	  • Freight carriers
	  • Freight forwarders
	  • Freight industry bodies
	  • Shippers and receivers
	  • Government (policy/regulation)

External Collaboration	• Academia and university centers
Funding	• Multimodal Transportation Improvement Fund • Mississippi Major Economic Impact Authority • Intermodal Connector Improvement Program
Investment Priorities	• Safety improvements • Operational efficiency enhancement • Investment (infrastructure) preservation • Reliability enhancement

Criteria	Items listed in the plan
Performance Metrics	• Economic development • Accessibility and mobility • Safety • Maintenance and preservation • Environmental stewardship
Freight System Assets	• Highway capacity and bottlenecks • Pavement conditions • Bridge conditions • Accommodating changing international shipping patterns • Improving the “last mile” access to port facilities for trucks and railroads
Freight Goals and Strategies	• Environmental stewardship • Maintenance and preservation • Awareness, education, and cooperative processes • Funding and finance • Safety • Accessibility and mobility • Economic development

Table 9: Texas Department of Transportation (TxDOT); plan completed 11/2017

Criteria	Items listed in the plan
Workforce Development	• Texas Workforce Development Board provides customized training to logistics and warehouse operators • Texas alone will need 40,000-50,000 more truckers
Stakeholder Outreach	• 23 stakeholder workshops held across the state from February to July, 2017 • Inputs from these workshops were translated into plans and targets
Funding	• National Highway Freight Program (NHFP): $55.1 million on freight • Biennium funding sources totaled more than $23 billion in 2016-17

Investment Priorities	• 11 projects identified as top priorities which support:
	  • Reduced freight travel time
	  • Increased reliability
	  • Safety

Criteria	Items listed in the plan
Performance Metrics	• Safety: 7 measures • Asset preservation and utilization: 4 measures • Multimodal connectivity: 4 measures • Mobility and reliability: 6 measures • Customer service: 4 measures • Stewardship: 2 measures • Sustainable funding: 5 measures • Economic competitiveness: 3 measures • Technology: 3 measures
Freight System Assets	• Roads • Pavements • Bridges • Public truck parking • Railroad and related assets • Port and waterways • Airports and equipment for cargo handling • Pipelines: international cross-border pipeline freight
Key Freight Issues	• System capacity • System operations • Safety • Multimodal connectivity. • Rural connectivity • NAFTA and border crossings • Freight asset preservation and operations • Education/public awareness • Funding/financing • Energy/environmental
Freight Goals and Strategies	• Safety • Economic competitiveness • Asset preservation and utilization • Mobility and reliability • Multimodal connectivity • Stewardship • Customer service • Sustainable funding

Table 10: Washington Department of Transportation (WSDOT); plan completed 12/2017

Criteria	Items listed in the plan
Workforce Development	• Port of Seattle undertakes training for maritime industry—150 paid internships in 2017 • Warehousing & transportation sectors provide in-house training • Maritime Administration (MARAD) provides grants to upskill and enhance worker productivity
Stakeholder Outreach	• Extensive stakeholder outreach led to truck parking issue discovery
External Collaboration	• Regional and interstate collaboration • Great Northern Corridor Coalition, ASHTO, etc.
Funding	• NHFP: $89 million from 2016-2020 • State passed legislation, "Connecting Washington": $1.2 billion for 16 years for highway improvement
Investment Priorities	• Improve port competitiveness • Protecting freight-dependent sites • Improving intermodal connections
Performance Metrics	• Safety: 5 measures • Pavement: 4 measures • Bridge: 2 measures • National highway system: 1 measure • Freight movement: 1 measure • Congestion & air quality: 3 measures • Highway, rail, marine and air cargo performance
Key Freight Issues	• Truck parking • Traffic, congestion, and bottlenecks • Marine congestion
Freight Goals and Strategies	• WSDOT has a Target Zero Plan • Freight Action Strategy for Seattle and Tacoma (FAST) has a statewide comprehensive plan

Table 11: Capital Area MPO, Durham-Chapel Hill-Carrboro MPO, North Carolina DOT; combined plan completed 11/2017

Criteria	Items listed in the plan
Stakeholder Outreach	• Establishment of Regional Freight Stakeholder Advisory Council • Technical and brainstorming workshops with public sector officials, economic development officials, and the project's multi-

	agency steering committee online survey, several phone and on-site interviews • Supply chain industry outlook survey • Presentation at the joint MPO Board meeting
External Collaboration	• Site visits at local freight distribution terminals • Discussion with vehicle fleet supervisors on truck route recurrent bottlenecks
Investment Priorities	• Access to market • Good transportation network • Labor and workforce • Total cost environment • Access to facilities • Utilities • Regulation • Taxes • Climate and natural hazards
Performance Metrics	• System reliability: 9 metrics • Improve infrastructure condition: 5 metrics • Promote multimodal and affordable choices: 2 metrics • Promote safety and health: 6 metrics • Protect environment and minimize climate change: 2 metrics • Stimulate economic vitality: 1 metric • Ensure equity: 2 metrics
Key Freight Issues	• Traffic congestion • Failing infrastructure • Long-term transportation funding solution
Freight Goals and Strategies	• Manage congestion and system reliability • Improve infrastructure condition • Promote multimodal and affordable choices • Promote safety and health • Protect environment and minimize climate change • Stimulate economic vitality • Ensure equity

Table 12: Greater Memphis Regional Freight Plan; plan completed 10/2017

Criteria	Items listed in the plan
Stakeholder Outreach	• Online survey • Truckers survey
External Collaboration	• Policy Board Manager (Tri-State) • Vice Chair, Freight Advisory Committee

Key Freight Issues	• Freight movement issues • Workforce development issues • Economic development • Ports of entry (sea and air)
Freight Goals and Strategies	• Freight movement and infrastructure • Land use and transportation • Strategic freight corridors and location • Stakeholder engagement

The plans reviewed for this report identify critical freight goals and issues within other DOTs across the country. While varying greatly in scope and focus, the plans reflect the common challenges and concerns confronting the movers of freight and the public agencies that develop and maintain much of the infrastructure on which the freight moves—issues that clearly stand out from the comparison and which may prove useful to Caltrans as it establishes its priorities. Such priorities include those tied to the role of the state in the freight system, the rapid change of freight systems at the last mile and the need for data to monitor these changes, the threat to efficient goods movement flows from the trucking sector, and the role played by advisory bodies. Capacity building, where identified, is often focused on industry segments.

Project Identification at Freight Nodes

Currently, state DOTs have jurisdiction primarily over publicly funded roads and highways. However, true system stewardship necessitates a greater role for state DOTs in identifying and facilitating infrastructure projects that historically are developed and financed through market-based mechanisms and regulated at the municipal level. The Iowa DOT exemplifies this approach through its freight strategies, which offer business cases for new cross-docking, rail intermodal, warehousing, and other facilities throughout the state. The DOT conducted quantitative analysis to determine optimal locations and estimated cost savings at a systems level for these facilities, which is particularly unique given that these facilities tend to be developed by private-sector actors that lack system-wide considerations.

In other states whose plans were reviewed, the presence of a predominant trade node provided focus for the state plan. This includes Georgia, where the port of Savannah and the Atlanta airport are investment priorities even for projects such as channel improvements, which are not normally considered to be part of a state DOT's area of responsibility.

The Rise of E-commerce

While e-commerce has engendered a revolution in consumer behavior and distribution patterns, it also presents added challenges to the freight network. The rise in e-commerce has resulted in greater freight vehicle miles traveled, as merchandise that was once consolidated and shipped to central retail locations is now more often deconsolidated into parcel shipments for delivery to individual residences and businesses. Thus, more trucks are required to service a given amount of economic activity, adding to road congestion and air pollution. This issue is compounded in dense urban areas, where many residences and businesses tend to cluster and congestion already exists. The resulting conflict between freight and other transportation

functions can lead to a higher likelihood of collisions and fatalities, as well as greater socio-economic burdens due to the costs of congestion and poor air quality.

In the plans reviewed, the impacts of e-commerce on the freight system often translate into data needs. At the last mile, much of the impact is experienced by local jurisdictions where land use strategies become the mechanism for addressing shared use of space by freight, passenger vehicles, pedestrians and bicyclists as well as transit. At the MPO level, Memphis, for example, conducted its own truck survey to better understand the routes used by truckers through the metropolitan area. The balance of the other plans indicate the rise of e-commerce as a challenge to states while recognizing the limited jurisdictional authority of the state (vs. the municipality) to respond to those challenges. Instead, the state provides value through the statewide data collection process (such as the Maryland freight finder) in a way that supports efforts at more local levels of government.

The Challenges of Trucking

Trucking is a common theme of the plans reviewed. It is apparent that the lack of well-developed and commonly accepted truck routes poses a frustration for both the state DOTs as well as the truckers themselves. This is the case in both rural states like Iowa, where farm-to-market issues predominate, as well as states with large mega regions. In terms of DOT program needs, the truck routing problem is emblematic of the challenges facing freight planning units. It is a data gathering need that translates into a resource allocation problem, which requires collaboration across various levels of government in order to solve.

The Use of Advisory Bodies

In terms of capacity building, all of the State DOTs and MPOs whose plans were reviewed involved the input of key stakeholders. The size and composition of the advisory bodies differ greatly, however, along with the frequency with which they meet. In states such as Texas, the advisory body is largely industry-driven and more narrowly focused on infrastructure development and facilitating freight flows.

While capacity building appears in a number of plans, it is most often in terms of the industry's workforce and usually with regard to the need to fill the demand for truck drivers. Iowa references university partners for both training and outreach, Alabama recognizes the role that the private sector plays in building the capacity of the freight workforce, and others recognize the role of workforce development agencies. Internal capacity building within the DOT is not the focus.

Compilation of Case Studies

While a review of state freight plans is a useful exercise in identifying state freight priorities, and thus the role of the freight-planning unit within the DOT, it is also useful to look at individual project implementation to understand at a more granular level the role of the state DOT in facilitating freight flows and working across institutional boundaries. Drawing from findings in the peer exchange and freight plan analysis in this report, the METRANS team identified ten relevant state DOT and regional MPO case studies to compile organizational and operational best practices that Caltrans leadership can apply to its freight planning and programming efforts. The

table below illustrates specific freight problems that were assessed as a part of this case study approach. The resulting solutions and discoveries of each case study can be adapted to meet Caltrans' needs. The case studies represented in this report draw from the many issues addressed during the peer exchange and the gaps addressed within freight plans.

Table 13: Summary of case studies

State	Topic
Iowa	Inflexibility of Oversized (OS) and Overweight (OW) Trucks
Washington	Statewide Truck Parking Issues
Boston Region MPO	Municipal Truck Parking Issues
Texas	Rising Congestion Costs
New York	Disruptions Caused by Transformational Technologies
Texas	Inefficient Stakeholder Engagement
Illinois	Issues Arising from Shifting Road to Rail
Texas	Lack of Cooperation Between Private- and Public- Sectors
Iowa	The Cost of Transloading
Texas	Insufficient Planning Partnership Between U.S./Mexico

Case Study 1: Inflexibility of Oversized (OS) and Overweight (OW) Trucks

Problem:

Iowa experiences multiple challenges related to transporting oversize and overweight (OS/OW) freight. Lowering transportation costs continues to be a top priority for freight movement within the state. The intent is to decrease the number of trips taken by trucks to make transportation more efficient for businesses. OS and OW freight create inflexibility in terms of added costs of trucking and lost economic competitiveness, which necessitates re-routing. Such cargo is often not incorporated in the freight mobility plans of many states. In Iowa, heavy equipment such as mining and windmill components are often oversize in nature and require specific strategies for management.

Challenges Identified:

- The size and dimensions of OS/OW loads, such as windmill components and mining/drilling equipment, continue to grow.
- Movements of OS/OW lead to accelerated damage of roadways and bridge structures.
- The routing of OS/OW trucks on a system that was designed without the ability to predict the future complexities of load sizes and dimensions limits the number of available primary highway routes for these movements.
- Drivers of these loads are often challenged by inconsistent rules and regulations across states.

Solutions:

- As potential solutions to regulatory bottlenecks that impact the trucking industry for movement of OS/OW loads, the Iowa Department of Transportation identified harmonizing regulations across the Midwestern States,
- incorporating highway designs compatible with OS/OW freight movements, and
- planning the movement of OS/OW from the port of entry to the destination.

Case Study 2: Statewide Truck Parking Issues

Problem:

The Washington Department of Transportation (WSDOT) in its 2017 Freight System Plan recognized that nearly 64.3 percent of all goods in the state of Washington moved via truck. This observation created an imperative to make truck movement safe and efficient. The WSDOT plan explicitly highlights the need to have an integrative truck parking system. Nearly 31 percent of truck accidents can be attributed to truck driver fatigue. This concern has motivated DOTs to identify the root cause of this issue. One possible cause, voiced by many stakeholders, is the lack of available truck parking spots on freight-heavy corridors.

Challenges Identified:

- WSDOT identified 14 high-volume truck freight economic corridors. Each corridor carried four million or more tons of weight annually.
- WSDOT recognized that changing business patterns such as just-in-time, e-commerce, and logistics models affect truck parking demand at differing times of the day.
- 46 percent of WSDOT surveys identified driver fatigue due to insufficient parking.
- Support infrastructure associated with truck parking is not clearly laid out (example: coordination of available parking spots).
- Safety rest areas have a limit of 8 hours, while truck drivers must park for 10 hours to abide by hours-of-service requirement.

Solutions:

- WSDOT plans to display real-time parking availability through smartphone apps,
- integrate the use of existing mobile apps as a stop gap arrangement to include rest areas and parking availability until the real time app is functional,
- increase capacity by adding additional truck parking to existing rest stops,
- ensure that newer weigh stations include truck specific parking, and
- encourage private sector participation by increasing truck parking stops at gas stations.

Case Study 3: Municipal Truck Parking Issues

Problem:

Boston Region Metropolitan Planning Organization (BRMPO), like many other MPOs, faces challenges in the execution of truck parking facilities within its region. In a memorandum, the BRMPO identified common problems that led to the parking facility supply gap. The BRMPO memorandum also discussed problems within the parking infrastructure. [7]

Challenges Identified:

- Hours of service regulations demand that drivers not exceed a cumulative 11 hours of driving in a day and must take a 10-hour rest break.
- If the driver has reached their driving limit, they need to stop driving. Usually if a driver cannot find parking, they may pull up on city streets and/or on off-ramps.
- There are a variety of issues that arise from insufficient truck parking. Personal safety is a major one that drivers must consider. (As per Moving Ahead for Progress-21 (MAP-21) requirements, one of the mandates for Jason's Law calls for an assessment of truck parking conditions in all states).
- For truck drivers to be able to access heating/cooling and other refrigeration facilities, engines need to be turned on, which results in idling. If the truck driver is forced to pull onto an off-ramp due to the lack of designated parking, this situation will increase the levels of emissions in a residential area.

Solutions:

- A consensus on hours-of-service has not yet been reached, because regulations vary across states. However, there have been efforts to mitigate some of the problems. For example:
    - The National Truck Stop Directory publishes a comprehensive list of commercial truck stops on or near an interstate and other major highways. The online version of the directory also publishes truck parking spaces available via zip code.
    - For hybrid trucks, truck stop electrification (TSE) is an approach to negate excessive idling. In TSE's simplest implementation, 120-volt household current is available at designated parking spaces at a truck stop.

[7] Technical Memorandum, Boston Regional Metropolitan Planning Organization

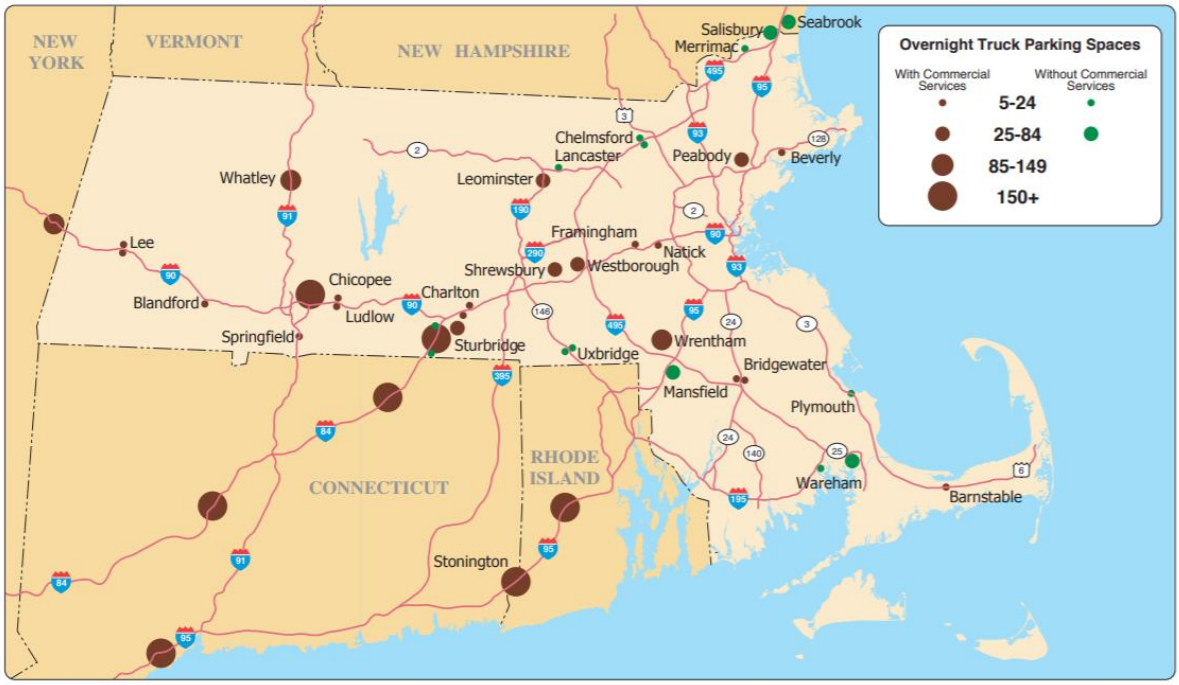

Figure 4: The BRMPO's Freight Planning Support references this map for identifying available truck parking locations in Massachusetts and neighboring states

Case Study 4: Rising Congestion Costs

Problem:

Texas is experiencing peak congestion on all modes of transportation. One cause for this issue is population growth. As population increases, there is a correlated need for goods and services as well. Hence, freight-heavy corridors cause an acute problem in Texas's transportation system. Texas is home to two major mega-regions: the Texas Triangle (Houston, Dallas-Fort Worth, San Antonio, and Austin) and the Gulf Coast (Houston, Corpus Christi, Texas City, Beaumont, and Port Arthur). Both the mega-regions intersect at Houston, resulting in peak congestion. Texas incurred a total of $5.1 billion in congestion costs in 2016.

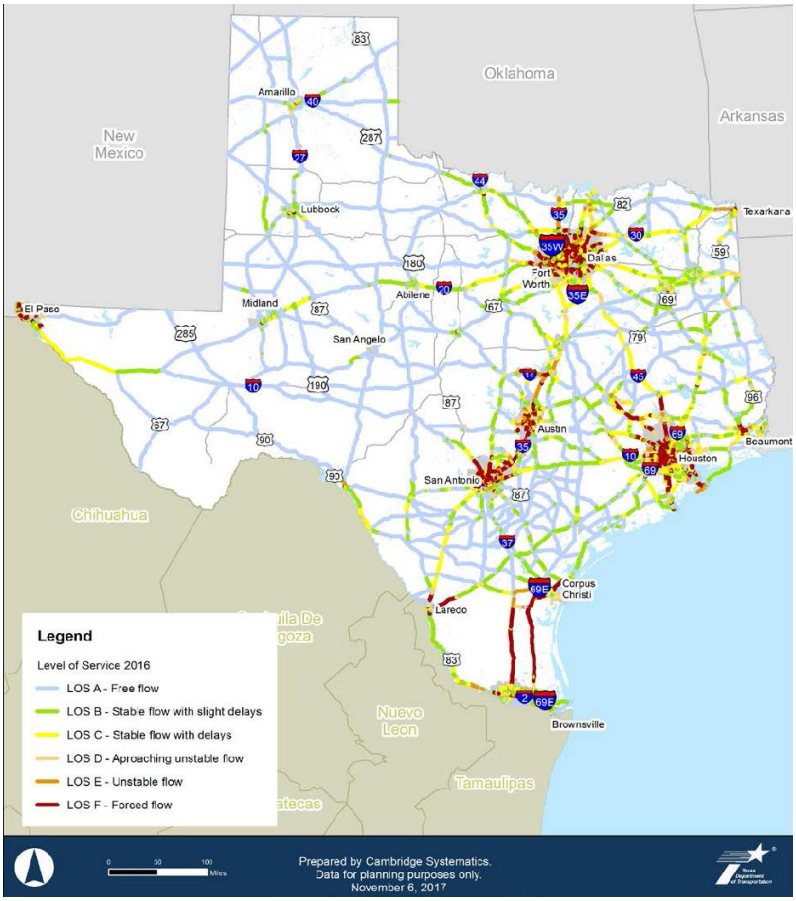

Figure 5: The congested Texas Triangle

Challenges Identified:

- Texas anticipates rising congestion costs: in 2013, Texas had more than $1 billion in congestion costs, which increased to over $5 billion by 2015.
- Major highway corridor sections predicted to have significant congestion by 2045 are: I-10 from Houston to San Antonio, I-45 from Dallas-Fort Worth to Galveston, and US 59 (future I-69) from I-20 to Houston.

Figure 6: Three-pronged methodology

Solutions:

- Figure 9 shows the methodology that Texas used to identify solutions for freight-related problems.
- Texas plans to:
  - create a Texas Global Gateway concept of a one-stop, unified, coordinated, and comprehensive information portal for all transportation modes;
  - identify asset-related constraints that lead to increased congestion, longer trip times, and higher costs for businesses, all of which impact industry productivity and competitiveness;
  - develop public and private partnerships to effectively identify freight transportation challenges; and
  - create a robust mechanism of project prioritization.

Exhibit 10-12: Summary of High-Level Highway Project Screening

Types of Projects on Texas Highway Freight Network	Economic Competitiveness	Mobility and Reliability	Safety	Asset Preservation	Multimodal Connectivity
Bridge Replacements	◒	◒	◒	●	◔
Additional Lanes	◒	●	◒	◔	◔
New Right-of -Way	●	●	◒	◔	◔
Bypasses	●	●	◒	◔	◔
Maintenance and Rehabilitation	◔	◔	◒	●	◔
Design Modernization	◔	◒	●	●	◔
Interchange Reconstruction	◔	●	●	◒	◔
ITS Implementation	◔	◒	◔	◔	◔
Intermodal Connector Improvements	◒	◒	◒	◔	●
Real-Time Data Access	◔	◒	◔	◔	◔

◔ *Low* ◒ *Medium* ● *High*

Figure 7: Summary of high-level project screening

Case Study 5: Disruptions Caused by Transformational Technologies

Problem:

The New York State Department of Transportation (NYSDOT) released a white paper in 2018 that analyzed emerging trends in freight technology. NYSDOT identified various emerging practices across other DOTs, which could be used as potential solutions at Caltrans. Technology increasingly holds the promise of solving challenges within the transportation sector. Choosing the most appropriate technology for enabling better mobility, safety, supply chain efficiency, and environmental stewardship is the cornerstone effort for DOTs across the country.

Challenges Identified:

- Producing effective, real-time data is difficult due to the lack of "smart" mobility systems.
- There is a need to develop curriculum that prepares future professionals to design, develop, operate, and maintain these new technologies while also deploying on-the-job-training programs to upskill incumbent workers.

Solutions:

- Several DOTs use drones for aerial accident surveillance.
- NYSDOT uses an Adaptive Control Decision Support System (ACDSS). This system is an advanced, real-time, signal optimization system that integrates online simulation with actual field traffic controllers and detectors. NYSDOT deployed ACDSS successfully in a 110-square-block area in Midtown Manhattan, resulting in a 10 percent improvement in speed.
- Practices adopted from Chicago and Kansas of using smartphone apps to disseminate information to truckers on real time traffic congestion, road conditions, and road closures resulted in efficient ICM.
- Miami used a signal prioritization system to provide earlier access to freight carrying perishable goods; this move improved efficiency and reduced emissions.
- NYSDOT used technology platforms such as Waze and HERE to identify real-time congestion-related information to help manage pricing and demand models for third-party logistics (3PL) and load dispatching companies.
- Eight Midwestern states brought forward an integrative solution by establishing a Regional Truck Parking Information and Management System.

Case Study 6: Stakeholder Engagement

Problem:

DOTs need to uphold consistent stakeholder engagement in order to keep key participants informed about planning efforts. In Texas, one of the 2016 freight recommendations resulted in an extensive stakeholder engagement process. The engagement process consisted of inputs from the Texas Freight Advisory Committee, two rounds of stakeholder workshops in 12 cities, meetings with TxDOT and MPO bodies, and public comments on MoveTexasFreight website.

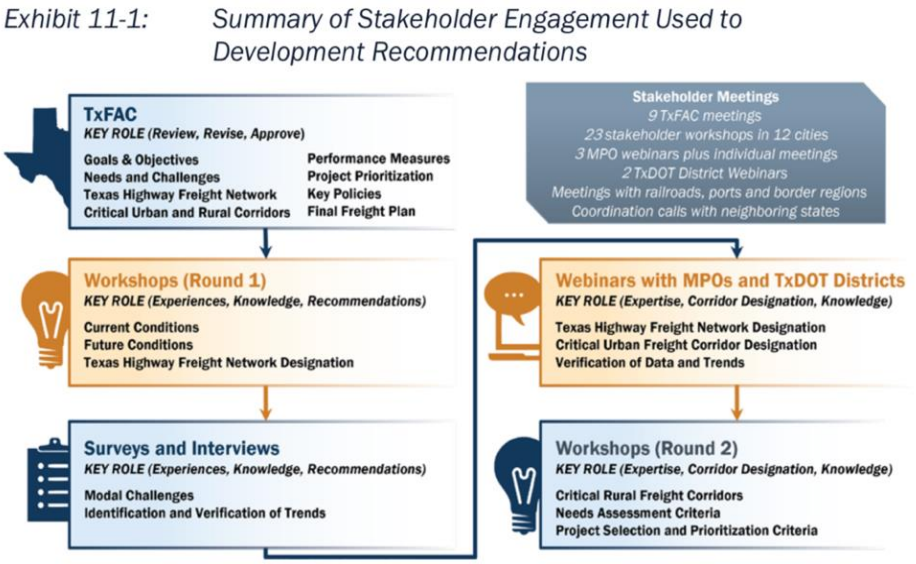

Figure 8: Stakeholder engagement practice by TxDOT

Challenges Identified:

- There is a lack of communication between stakeholders and MPOs.
- There is a lack of sustained stakeholder engagement.

Solutions: Figure 11 shows outreach efforts like webinars, workshops, surveys, and interviews used to gather stakeholder input on key needs and issues. The needs identified range from general regional and statewide economic trends to specific projects.

- Figure 12 reflects how stakeholders evaluate project prioritization based on the potential impact of a project.
- Project impacts are also presented in commodity-specific summaries on the MoveTexasFreight website. The presentation of freight flows at the level of individual commodities important to the state's economic development helps to connect goods movement to Texas residents and businesses and untangle the complex nature of freight activity by making it more understandable. At the same time, by establishing a freight-specific website, the DOT takes what is usually a topic embedded in other sections of the DOT website and gives it prominence.

Exhibit 12-1: Stakeholder Input on Project Identification and Prioritization

Outreach Method	Fact-Finding and Issue Identification	State and National System Designation	Prioritization of Needs and Projects
TxFAC	Diverse perspectives from public- and private-sector representatives on key freight issues and trends	Input on and approval of the Texas Multimodal Freight Network and Critical Rural/Urban Freight Corridors	Input on needs assessment methods and criteria and project selection criteria
Workshops: Round 1	Input to identify regional and statewide trends in freight movement	Input on significant regional freight corridors and criteria used to designate the Texas Highway Freight Network	Input on general needs and concerns as well as emerging trends
Workshops: Round 2	Input on regional and statewide opportunities and needs	Review of and edits to draft Multimodal Freight Network	Input on preliminary needs assessment results and project selection criteria
TxDOT Freight Planning Partners	Includes TxDOT Modal Divisions, Districts and Metropolitan Planning Organizations Continuous input, needs identification and plan implementation through internal collaboration within TxDOT		

Figure 9: Stakeholder input and project prioritization techniques

Case Study 7: Issues Arising from Shifting Road to Rail

Problem:

The Illinois State Department of Transportation (IDOT) has determined that freight movement via rail can be more cost-effective and optimally-used. The IDOT freight-planning document stated that rail carried nearly 44 percent of the value of goods, compared to 36 percent via truck. This distribution created a unique opportunity to identify intermodal efficiencies. Illinois' rail system is comprised of 45 railroads and is the third largest intermodal system in the world.[8]

Challenges Identified:

- Domestic intermodal growth outstrips international movement of goods. More carriers are placing goods on railways than on roads to move domestic shipment.

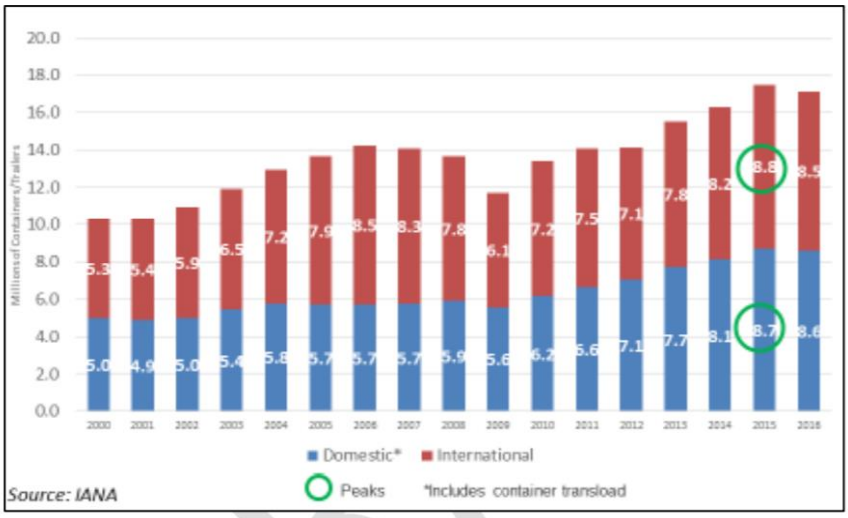

Figure 10: Domestic intermodal growth outstrips international

- Short haul intermodal routes have multiplied exponentially, and the state has not been able to cater to this rapid growth.

Solutions:

- Intermodal facilities could transfer load only on a point-to-point basis. A system of wide-span cranes that cross multiple tracks has improved the transfer of containers between railcars in a rapid and largely automated process.

[8] WSP. (2017). *Illinois Department of Transportation Freight Plan.* Herndon, VA: WSP.

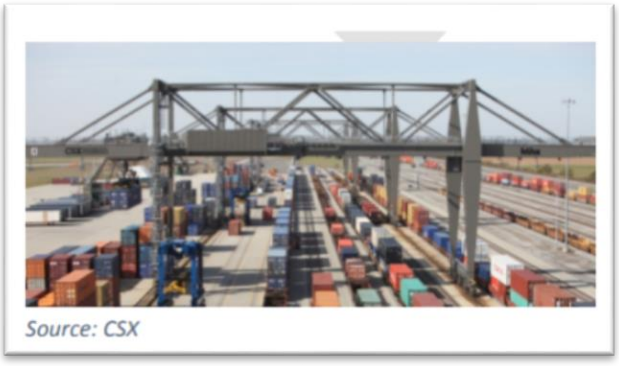

Figure 11: Wide span cranes

- Changing food consumption trends have led to containerization of food products. Food no longer travels as cheap bulk. Instead, produce has been categorized as a valuable container commodity. Hence, the state needs to plan for the transport of produce via both truck and rail.
- In the future, the idea is to move larger freight traffic onto rail and relieve traffic on streets. The state views highway-to-rail diversion as a good opportunity to repurpose high traffic zones.

Case Study 8: Lack of Cooperation between Private- and Public- Sectors

Problem:

Coordination among various agencies and cross-border nations on trade is an integral part of any freight plan. Such inter-agency linkages are essential for the swift movement of goods between states and countries. Large amounts of time, effort, and manpower are spent to ensure that freight moves safely and quickly between borders. The Texas Department of Transportation (TxDOT) is responsible for ensuring the safe passage of goods between states and with Mexico. The TxDOT has established the Texas Multimodal Freight Network, encompassing: Texas Highway Freight Network, Texas Rail Freight Network, Gulf Intracoastal Waterway (GIWW), major seaports, major cargo airports, and commercial border crossings. These stakeholders were marked as critical in developing a freight plan and recommending policies on multijurisdictional approach.

Challenges Identified:

- There is a lack of stakeholder engagement between other DOTs.
- There is a lack of communication between private sector and public institutional bodies.

Solutions:

- TxDOT initiated:
    - the development of a multimodal freight network with a focus on the freight plan, freight transportation investment, and strategic facilities;
    - discussions on trade agreements such as the North American Free Trade Agreement (NAFTA) with stakeholder organizations such as: Alliance for I-69 Texas, Ports-to-Plains Alliance, and Texas Border Trade Advisory Committee;
    - input on project planning from TxDOT districts involved in joint multistate corridor projects with neighboring states (for example, attendance of New Mexico and Arkansas officials at stakeholder workshops in El Paso and Texarkana, respectively); and
    - support and advice on international activities at the Texas-Mexico border through the TxDOT Freight and International Trade (FIT) Office. Tasks for FIT generally include:
        - liaising,
        - researching freight movement improvements, and
        - playing hosts for international transportation officials to exchange technical information and share common practices.

Case Study 9: The Cost of Transloading

Problem:
Rising drayage costs within Iowa State have posed a significant problem to moving freight in the most efficient and least expensive manner. The State of Iowa identified that movement of goods was becoming costly due to closure of intermodal facilities within the state. These costs resulted in problems with connecting manufacturers and producers for long-haul shipments. In addition, this situation increased the cost of export goods, impairing Iowa's position in foreign and domestic markets.

Challenges Identified:

- Development of larger intermodal facilities in Chicago and other Midwest states outside of Iowa shifted focus from state-specific intermodal requirements.
- Closure of other smaller intermodal facilities within Iowa added to the burden of rising costs.
- Iowa ships more products in containers than it receives. This has created a container imbalance (it is estimated the container imbalance is anywhere between a 3:1 and 8:1 ratio).

Solutions:

- The Iowa DOT:
    - developed strategies for more local rail connections, cross-dock facilities and transload facilities;
    - developed Iowa-specific intermodal corridors, thereby reducing the need to haul shipments to identify a transload center;
    - evaluated ways to develop cost-effective rail transfer facilities; and
    - investigated container imbalance and identified if Iowa can collaborate with neighboring states to negate the imbalance.

Case Study 10: Insufficient Planning Partnership between U.S./Mexico

Problem:

Border states like Texas often face challenges in maintaining diplomatic and economic relations with next-door neighbors—in this case, Mexico. In addition, safety and projects around the border need cooperation and constant monitoring. The state of Texas, under the TxDOT, has established a comprehensive Border Master Plan (BMP) for understanding the infrastructure inventory available at the port of entry (POE) for trade. Texas has also set a system of prioritization of projects around the POE.

Challenges Identified:

- There is a need for a stakeholder-inclusive approach in developing BMPs.
- There is also a need for creating a dynamic planning tool to address any major changes/projects launched around the POE.

Solutions:

- Stakeholder inclusiveness was developed using two key committees: the Policy Advisory Committee and a Technical Working Group. The Technical Working Group committee selected most of the technical parameters used to prioritize projects.
- BMPs are recognized as benefits to both the U.S. and Mexico; this bi-stakeholder relationship has resulted in informed decision-making process by both countries and ensured continued co-operation for supporting transportation infrastructure across the border.

Conclusion: Learning Outcomes and Lessons for Caltrans

The findings from the peer exchange and a review of the case studies indicate that shifting freight trends are inevitable due to new business models and technology disruptions. In the future, public sector services will have to align their priorities with these "new normal" approaches. Many of the challenges and opportunities will come with better use of technology. There is widespread application of Global Positioning Systems data that can offer real-time, location-specific information on network utilization. For example, 13 states currently use data from the Waze mobile application to assist with vehicle routing and real-time data collection. The Florida DOT (FDOT) has gone even further and secured a data-sharing agreement with Waze, whereby both entities benefit from an additional data source. In turn, real-time data gathering facilitates Integrated Corridor Management (ICM) for transportation agencies in places like Chicago and Kansas, where smartphone applications (apps) disseminate real-time road and weather information to truckers. These programs have led to reduced fuel consumption, emissions, and deadhead mileage.[9]

But technological solutions depend upon effective data management, including data sharing where appropriate. Freight data is often organized around jurisdictional and institutional boundaries that freight does not recognize. Coordinated planning and data sharing have proven effective in the Midwest where neighboring states have taken a multi-state regional approach to the lack of truck

[9] New York State Department of Transportation, February 2018

parking along major trade corridors, the problems caused by OS/OW trucks, and container imbalances affecting statewide, regional, and national trade.

Caltrans itself should be viewed as a best practice. It was among the first states to undertake statewide and regional freight planning. The Goods Movement Action Plan and Southern California's Multi-county Goods Movement Action Plan predated many of the federal mandates to develop state freight plans. California's leadership in environmental planning has also influenced the way in which the state and the private sector coordinate on sustainable freight planning.

Table 14: Caltrans; plan completed 12/2014

Criteria	Items listed in the plan
Workforce Development	• Two-pronged approach—retention and succession planning • Create new work opportunities for the workforce that is retiring by offering flexibility with working hours & other strategies • Conduct training programs to update skills, particularly technology skills
Stakeholder Outreach	• A mix of state, public, and private freight stakeholders • ARB has met with over 220 companies, associations, organizations, and agencies to seek their input
External Collaboration	• Collaborative process that incorporated feedback from many freight stakeholders, including those represented on the CFAC, and community and environmental justice organizations
Funding	• Federal planning grant funds provided by Caltrans • Under MAP-21, freight projects must be included in a state adopted freight plan in order to be eligible for certain federal funding benefits
Investment Priorities	• Maintain and enhance existing assets • Apply new technologies and system operations practices • Address negative impacts of freight movement • Strategically add new capacity • Strengthen the collaborative approach • Create dedicated, reliable, long-term freight funding programs
Performance Metrics	Metrics were defined by facility type: freight infrastructure, congestion, and safety. Mode specific metrics include: • Highway metrics • Rail metrics • Seaport metrics
Key Freight Issues	• Congestion and mobility preservations • Infrastructure conditions • Economic competitiveness • Safety • Innovative operational improvements

Criteria	Items listed in the plan
	• Environmental sustainability & justice
Freight System Assets	• Twelve deep water seaports (11 private and 1 public) • Twelve airports with major cargo operations • Two Class I railroads and twenty-six short-line railroads operating over approximately 6,000 miles of railroad track • Approximately 5,800 centerline miles of high-traffic-volume interstate and state highways • Three existing and one future commercial land border ports of entry (POE) with Mexico • Intermodal transfer facilities • 19,370 miles of pipelines
Freight Goals and Strategies	• Economic competitiveness • Safety and security • Freight system infrastructure preservation • Environmental stewardship • Congestion relief • Innovative technology and practices

The size of California, the size and scope of its freight-related activity and its willingness to take a leadership role may ultimately pose additional challenges for freight planning within Caltrans. The diversity of freight plans involving not only the DOT but also the Air Resources Board creates some confusion on the part of the users of the freight system and also requires sometimes statutorily-defined inter-agency coordination. The same factors may also contribute to an environment in which the state views itself as being too distinct to benefit from regional coordination such as that exhibited in the Midwest. However, there are potential lessons for Caltrans from the review of state plans and case studies.

What are the potential learning outcomes for Caltrans in enhancing their freight capacity?

- *Leveraging technology:* Technology, although disruptive, is a possible solution for issues of truck parking and traffic congestion. Real-time data obtained on truck parking and traffic congestion could enable Caltrans to focus its efforts on certain freight corridors, thereby converting problems to solutions in a timely manner. This kind of advancement would save Caltrans millions of dollars in opportunity costs.
- *Multi-stakeholder approach:* Approaches for strategic stakeholder engagement and project prioritization process, along with enhanced real-time data, could potentially reduce bureaucratic time and ensure safe and accurate project identification for Caltrans. As a border state, Caltrans and MPOs already engage stakeholders on the Mexican side of the border, but in this area in particular there may be potential for DOT-driven multi-state collaborations that address common issues.

- *Asset utilization:* States such as Iowa and Illinois are making efforts in utilizing rail for short-haul movements. Iowa is also using the state freight planning process to address issues of regional imbalance in container availability. A similar approach could enable Caltrans to relieve freight-heavy highway corridors.

Overall, these case studies suggest that innovation through process changes and technology merits considerable focus. The next section of this report will discuss a systems approach to organizational management with the goal of creating a workforce culture that promotes the kind of innovation and systematic thinking capable of integrating the best practices and priorities into the organization's planning processes.

Task 3: Defining Roles for Freight Planning Innovation

Innovative Approaches to Improving Caltrans Freight Capacity and Efficiency

A key component of developing a world-class freight planning organization is to understand the core vision and mission that supports a cohesive and collaborative functional unit. For Caltrans this means a state DOT that is taking steps to ensure that its own internal professional development, stakeholder outreach, freight goals and strategies, among other considerations, are in accordance with the department's core mission.

In 2015, Caltrans updated its mission, vision, and goals to reflect a shift "from automobile-centric operations and capital expansion to multi-modal system management, operations, and sustainability."[10] This shift in organizational focus is a key strength for Caltrans for two primary reasons:

- first, it reflects the integrative systems approach to supply chain management that is becoming more prevalent for sophisticated freight system users in the private sector; and
- second, it implies the need for long-term system stewardship to balance and prioritize the diverse concerns of stakeholders, ensuring that investments simultaneously meet the critical needs of the State's economy and provide an optimal return for the public at large.

Emerging Emphasis on Multimodal System Management

Traditionally, supply chain models have emphasized a unidirectional flow of goods from origin to destination, while only peripherally acknowledging other flows, like those of information, finances, and other phenomena of value to supply chain participants. Other supply chain models emphasize the institutional dynamics that speak to the diversity of stakeholders involved in the transportation system. Figure 5 shows a supply chain model that maps stakeholders in the California environment according to their relative power and influence within the system. The maritime sector and its largest customers tend to exhibit the greatest influence on the California supply chain largely because of concentration within the industry and the role played by the

[10] Caltrans. (2017). *System Planning to Programming.* Caltrans.

stakeholders who dictate trade flows. Large multinational shippers and labor unions, in turn, have political and economic leverage over ocean liners in the U.S. Rail, too, is a critical link in the system, yet its viability is limited by the capital intensity of improving intermodal connectivity with ports located in expensive and congested cities. Third-party logistics providers, trucking, and small shippers exert weak or negligible influences since their industries are more fragmented and competitive in nature.

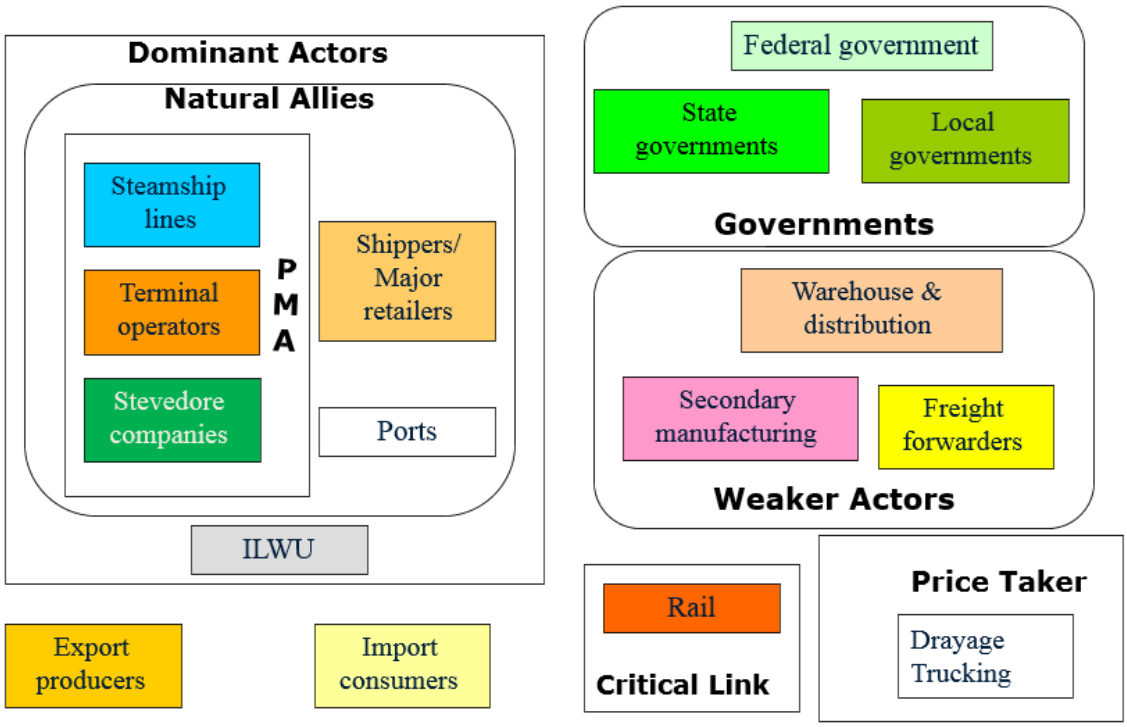

Figure 12: A modified supply chain model, with a focus on California[11]

It is also important to note the linkages and relationships among supply chain stakeholders relative to the functions they perform as part of the transportation system.

The RAND Corporation has also proposed a modified approach to thinking about supply chain interactions, including those involving the public sector.[12] This model involves revealing the linkages and relationships among supply chain stakeholders, relative to the functions they perform, as part of the whole transportation system. In Figure 6, a traditional supply chain is represented by the "logistics layer," but expanded to include a "transaction layer" and an "oversight layer" that recognize the role of external firms and regulators in a functional supply chain. This layered approach allows for analysis of simultaneous interactions occurring at any

[11] Modified from: Giuliano, G. & O'Brien, T. (2004). Evaluation of the Terminal Gate Appointment Systems at the Los Angeles/Long Beach Ports. METRANS Transportation Center.

[12] Gonzalez, G., Singh, R., Karam, R., & Ortiz, D. (2014). How Education and Training Can Successfully Adapt to Changing Labor-Market Needs. In Energy-Sector Workforce Development in Southwestern Pennsylvania: Aligning Education and Training with Innovation and Needed Skills (pp. 27-32). RAND Corporation.

given step in the supply chain, as well as analysis of the stakeholders involved and their relative importance to each step. Furthermore, three types of relationships exist between any two actors in this model: regulatory, contractual, and physical. This approach is particularly useful in identifying incentives for actors throughout the supply chain and potentially modeling and predicting participant behavior. A glossary of the organizations included in the model is contained in the Appendix.

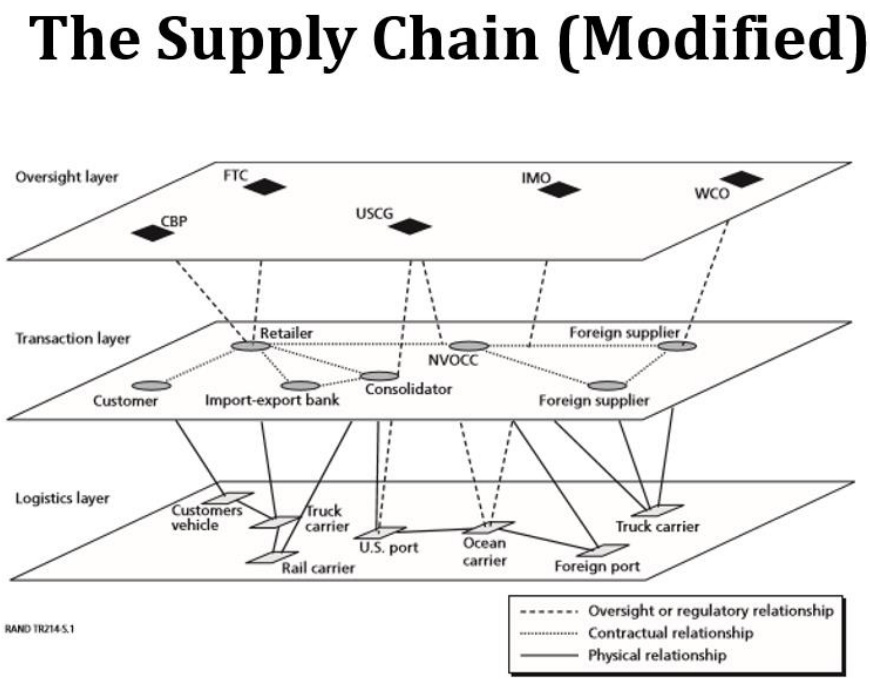

Figure 13: A layered, cross-functional supply chain model

Building upon the findings in Task 1 and Task 2 of this report, the METRANS research team conducted a literature review of innovative approaches to freight planning and programming efforts that allow for planning units within public organizations to better identify the role that they play, where they are able to exert influence and where they are merely reacting to decisions made by the private sector. This review revealed that, while there is little research to date on innovation in freight planning and programming efforts, best practices can be applied from related fields of study and internal Caltrans research.

This review draws upon private and public organizations and their innovations that may inform the Caltrans approach to organizational leadership, cross-functional collaboration, systems thinking, career opportunities, and workforce development initiatives aimed at improving Caltrans' freight capacity and efficiency. These approaches facilitate the development of a cross-functionally aware work culture.

Innovation Teams in Public Organizations

The following provides examples of the defining characteristics and the organizational structure of innovation teams within public-sector agencies. By considering the initiatives and efforts of

these innovation teams, Caltrans' various divisions will benefit from observing and considering how these agencies are implementing innovative ideas for sustainable mobility systems of the future.

One reason for identifying the state's role as a goods movement stakeholder is that there is in fact competition between different organizations, each supporting its own approach.[13] To promote urban mobility and multilevel policy support, it is crucial for a network of innovators to be established. A public-sector agency like Caltrans needs to be a part of facilitating the conversations and working partnerships that facilitate the movement of goods throughout the state.

This includes the "triple helix" of university, industry, and government cooperation "to guarantee successful implementation of innovative urban freight transportation concepts."[14] New technological advancements and innovative research require the support, vision, and consultation of public-sector organizations in order to become realities in transportation planning and policy-making. Caltrans should be keenly aware of the various stakeholders involved in fostering innovative freight planning strategies. Each part of the "triple helix" should be working in conjunction with one another, with each part recognizing the role the others have to play.

It is important to note that there is already innovation occurring within Caltrans. The Division of Research Innovation and System Information's (DRISI) involvement in the One California project is an example of innovative freight planning that foregrounds connected vehicle research to leverage the transformative capabilities of wireless technology to make surface transportation safer, smarter, and greener. Caltrans is already taking the necessary steps to pilot the initial implementations of connected vehicle technology deployed in real world settings with the aim of delivering near-term safety, mobility, and environmental benefits to the public. Pilot deployments offer an opportunity for stakeholders and partners to develop operational systems that exist well beyond the life of the program.

Other agencies within California and across the nation are also considering how and when to innovate. These include LA Metro. In 2015, The Los Angeles County Metropolitan Transportation (LA Metro) agency established its Office of Extraordinary Innovation (OEI) "to be the most innovative transportation agency in the country . . . and to improve mobility in LA County."[15] Through partnerships with private-sector organizations and the use of latest technology, the OEI is responsible for "identifying, evaluating, developing, and implementing" ideas to reach its objectives. The OEI has three clear objectives:

- **Unsolicited proposals:** the OEI assesses private-sector companies to directly present their new ideas on transportation innovation to LA Metro for review and evaluation, jump-starting the traditional public procurement process. The most

[13] Marletto, G. Who will drive the transition to self-driving? A socio-technical analysis of the future impact of automated vehicles. *Technological Forecasting and Social Change,* 139, 221-234.
[14] Verlinde, S, Macharis, C. Innovation in Urban Freight Transport: The Triple Helix Model. *Transportation Research Procedia,* 14(2016), 1250-1259.
[15] Office of Extraordinary Innovation (n.d.). Metro. Retrieved from https://www.metro.net/projects/oei/

exciting proposals could lead to a demonstration, pilot project, or, in the most successful cases, full deployment across LA Metro's systems.

- **Metro Vision 2028:** the OEI has a big picture plan to improve mobility in Los Angeles County over the next ten years. This objective shows what the public can expect of LA Metro in coming years, and it intends to stir the creativity, resources, and political will to shape LA County's mobility future and unleash unparalleled economic and social promise. Metro Vision 2028 is a result of more than 17 months of research, discussion, and outreach by the OEI.

- **Internal Consulting:** the OEI flexibly and strategically can engage in Metro initiatives where increased capacity and support or innovative and collaborative approaches are needed to develop and implement ideas of importance to Metro and the region.

Bloomberg Philanthropies has established the Innovation Teams (i-teams) program in cities across the globe. The program helps City Halls drive bold innovation, change culture, and tackle big problems to deliver better results for residents.[16] Multi-year grants are awarded to help cities create better results for a range of pressing problems pertaining to public health, environment, education, government innovation, and arts & culture. Now in the third round of funding, the Innovation Teams program allows mayors to fund in-house i-teams to investigate local challenges, design solutions with clear goals, and rigorously measure progress to improve citizens' lives. For example, New York City has joined the program and is now employing cost-effective measure to respond to aging infrastructure. To date, the i-team cities have secured $70 million in additional public- and private- matching funds to advance their work.

Systems Thinking

The emphasis on multimodal system management and innovation within the public sector can pose challenges for an organizational structure like a state DOT that is highly siloed or in an industry like freight which is highly fragmented. The freight system in California and globally is complex with interrelated systems and stakeholders involved in every phase of the supply chain—from origin to destination. Supply chain stakeholders work independently of each other, which creates challenges in keeping freight-related data flowing seamlessly and efficiently.

Various processes and conventional logistics activities are crucial for supply chain management. Long-term strategies include coordination and integration mechanisms to support these processes and achieve supply chain efficiency along with competitive advantage. The dependable, efficient, safe, and resilient global transportation schema plays a key role in future national, commercial and individual prosperity. The success of the global transportation schema must take into consideration the local communities that compose larger metropolitan areas and national transportation systems.

Hence the application of "systems theory" becomes crucial for the current supply chain models. Systems theory looks at a system as a whole including its various sub-systems and recurring

[16] About Us (n.d.). Bloomberg. Retrieved from https://www.bloomberg.org/about/

patterns in the relationships between them. One of the major tools of systems theory is systems thinking.

Systems thinking includes seeing overall structures, patterns and cycles in systems, rather than considering specific events in isolation. This helps in identifying the origin of issues that arise. A solution can then be developed using system planning, which is the process of strategizing and designing proposals to accomplish a long-term vision or goal for a system.[17]

Using Systems Thinking to Promote Cross-Functional Collaboration within Caltrans

Systems planning works to gain a comprehensive understanding of the operations between Caltrans Planning and Operations at HQ and the districts. Since it is heavily dependent on traffic operations expertise, operational strategies are involved in planning and they serve as the final observers of project delivery processes.

Caltrans has started implementing systems planning through its "System Planning to Programming (SP2P)" document, which evaluates and issues recommendations to improve the integration of the planning to program process and promotes cross-functional collaboration. It also strengthens the thought process of moving away from hard systems (product- and technology-centric) to soft systems (people- and process-centric) and looks at the system as a whole. This approach would ensure an efficient and integrated process for reaching decisions and implementing transportation solutions.

The Caltrans "System Planning to Programming" (SP2P) study[18], published in May 2017, evaluates and issues recommendations for better integrating the planning to programming process, with the ultimate goal of ensuring an efficient and integrated process for reaching decisions and implementing transportation solutions. The 21-month study is the result of 70 interviews with internal and external partners, who identified crucial gaps in the system planning process and motivated the study's final recommendations.

The study recommends that "cross-resourcing internally within Caltrans and cost sharing with external partners for staffing should be explored, including the co-location of staff for corridor monitoring and evaluation purposes."[19] While it may be challenging to implement resource sharing in practice, this strategy reflects an approach to collaboration that is built on trust and focused on sustainable solutions for the long term. This includes those involving freight.

For example, inter-agency corridor management will require collaboration across not only agencies but also job functions and transportation modes to generate consensus for a unified vision of a transportation corridor. This approach certainly is not limited to corridor management but can be applied to other planning and programming efforts that span multiple jurisdictions, like border master planning or regional transportation planning.

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[17] McNamara, C. (2006). Field guide to consulting and organizational development: A collaborative and systems approach to performance, change and learning. https://managementhelp.org/misc/defn-systemsthinking.pdf

[18] Caltrans. (2017). *System Planning to Programming.* Caltrans.

[19] SP2P System Planning to Programming (Rep.). (n.d.). doi:http://www.dot.ca.gov/hq/tpp/offices/omsp/system_planning/documents/SP2P/SP2P_Final_Report_051517.pdf

System thinking also facilitates Caltrans' collaboration with partner agencies required under Gov. Jerry Brown's Executive Order B-32-15. Strategic collective system building advances "processes and activities that innovative actors spread throughout the network."[20] Those processes provide a framework in which employees can "strategically engage … to build a favorable environment for innovative sustainability technology." Part of this systems-driven approach requires acknowledgement that individuals do not have the resources, power, and influence to produce purpose-driven organizational change. Individuals need to become "nodes in value chain networks" and compete as a network with other networks.[21] Building a supportive system around their new technology and collectively striving for change toward a new technological regime are essential elements of collective system building.[22] Such approaches will help Caltrans empower its workforce to address near-term priorities while also creating an adaptive organizational structure that is nimble and adaptive to political changes and market conditions.

For work culture innovation, a change in the macro environment beyond Caltrans jurisdiction is needed as well. Collaboration in networks or industry clusters can help build a favorable macro environment. System building in technological innovation requires a change in the organization as a whole and not just the technology. System building is defined as "the deliberate creation or modification of broader institutional or organizational structures in a technological innovation system carried out by innovative actors. It includes the creation or reconfiguration of value chains as well as the creation of a supportive environment for an emerging technology in a more general way."[23]

Process Mapping for Stakeholder Alignment and Change Management

One usual place to start in recognizing an organization's capacity for system-wide thinking and problem solving is with a map of its existing processes. While various methodologies exist to map processes, the exercise generally allows for a deeper understanding of business processes that can create value for public and private entities in a variety of ways. It has enabled drastic cycle time reduction for private firms like Motorola,[24] socialization and organizational learning,[25] and other tangible benefits. Furthermore, there is also the "inherent dynamism, multifaceted nature, and transformational capacity" of process maps, which complements the dynamism and complexity of freight transportation networks. Process maps are "boundary objects" that can "convey

[20] Musiolik, J., Markard, J., Hekkert, M.P., 2012. Networks and network resources in technological innovation systems: towards a conceptual framework for system building. Technol. Forecast. Soc. Change 79, 1032 - 1048

[21] A.H. Van de Ven Running in packs to develop knowledge intensive technologies MIS Q., 29 (2005), pp. 365-378

[22] Strategic collective system building to commercialize sustainability Innovations, Journal of Cleaner Production Volume 112, Part 4, 20 January 2016

[23] Musiolik, J., Markard, J., Hekkert, M.P., 2012. Networks and network resources in technological innovation systems: towards a conceptual framework for system building. Technol. Forecast. Soc. Change 79, 1032 - 1048

[24] "Faster Product/Process Development through Cross-Functional Process Mapping," C. Loew and H. Hurley, *Production;* Dec. 1995; 107:12.

[25] "Knowledge Acquisition through Process Mapping," G. White and S. Cicmil, *International Journal of Productivity and Performance Management*; Mar. 2016; 65:3.

information between groups and mobilize action," thereby facilitating change management throughout the organization.[26]

In particular, cross-functional process mapping is a useful tool for creating an inventory of stakeholders involved in a particular process and mapping their relationships with one another in a graphical form that is simple to understand. This helps give decision makers a broad, holistic perspective on project management that accounts for all stakeholders and their varied and, at times, conflicting interests. Caltrans has already acknowledged the benefits of cross-functional collaboration in the previously referenced SP2P study. Process mapping helps stakeholders visualize and comprehend these cross-functional linkages and their importance to the maintenance of the entire transportation system.

As a demonstration of possible value of the approach, METRANS has applied the RAND modified supply chain model to the Gerald Desmond Bridge Replacement project, a $1.3 billion infrastructure project that is critical to freight movement in and out of the San Pedro Bay Port Complex. The Gerald Desmond Bridge is a major access point to the Port of Long Beach, connecting critical freight corridors like I-710 to marine terminals located throughout the San Pedro Bay port complex. One of the replacement bridge's most important features is a vertical clearance, roughly 50 feet higher than the original bridge, allowing enough clearance for the world's largest container ships to pass below and reach the container terminals. Because of this project's importance for maintaining port competitiveness, the Port of Long Beach was its primary sponsor but the complexity of the project dictated multiple funding streams with multiple layers of approval required.

As such, it is a useful example of challenges to and opportunities for multimodal, system-wide approaches to planning within Caltrans. The bridge project became a component of the 2018 Caltrans Freight Academies. In a group exercise, participants were asked to build out the three layers, identifying critical stakeholders in project planning, design, implementation and ultimately maintenance. The objective was to inventory key units within Caltrans that served the role of "oversight" or "transaction" and identify the ways in which those units engaged with each other and external partners. A sample is provided below.

Of course, each stakeholder will likely create a different process map reflecting their individual priorities and interests. However, even these differences highlight misunderstandings and gaps in stakeholder relations that, if left unchecked, can result in costly errors or damaged relationships. Also, process mapping often occurs in two stages: one map captures the "as-is" or "current state" of a process, after which another is drafted to capture the "to-be" or "future state" as envisioned by leadership. In the context of freight planning, process mapping can thus be considered an iterative exercise, whereby Caltrans planners facilitate interaction and engage in ongoing discussions with stakeholders to accurately capture the current state and map out a vision for the future.

[26] Fenton, E. (2007). Visualizing Strategic Change: The Role and Impact of Process Maps as Boundary Objects in Reorganization. *European Management Journal*. 25(2), 104-117.

The two-stage approach to process mapping is critical because innovative entities must respond to issues proactively and focus on continuous improvement. Achieving stakeholder alignment regarding current processes is merely a stepping stone for improving those processes moving forward. Hence, the recognition that process maps "generate and diffuse knowledge between key stakeholders in the strategic change process" is important for an agency like Caltrans, which not only manages complex infrastructure projects but is also evaluating and improving upon the processes by which these projects are delivered.[27]

The table below reflects the input of those at the Academies who identified the key stakeholders in project implementation and their role. The exercise, while partly experimental, and the discussion, while only preliminary, did serve the purpose of allowing class participants to consider what role Caltrans plays in project delivery. The exercise facilitated a dialogue about the differences between the Department's purpose as the driver and overseer of a project (oversight) and one where it is meant to largely facilitate aspects of a project driven by others (transactional). The discussion included, by extension, questions of the different roles played by Caltrans Headquarters and District offices and whether employees in each had different needs with regard to professional formation, particularly in the area of collaboration.

Table 15: Legend for Figure 14

Layer	Potential Stakeholders
Oversight Layer	• Caltrans HQ • US DOT • POLB • LA Metro • City of Long Beach • Civic Organizations
Transaction Layer	• Caltrans District Offices • Caltrans HQ • POLB • LA Metro • Federal Funders
Logistics Layer	• POLB • Consultants • SFI (Joint Venture) • ARUP North America • Biggs Cordesa • Long Beach Department of Public Works

[27] *Ibid.*

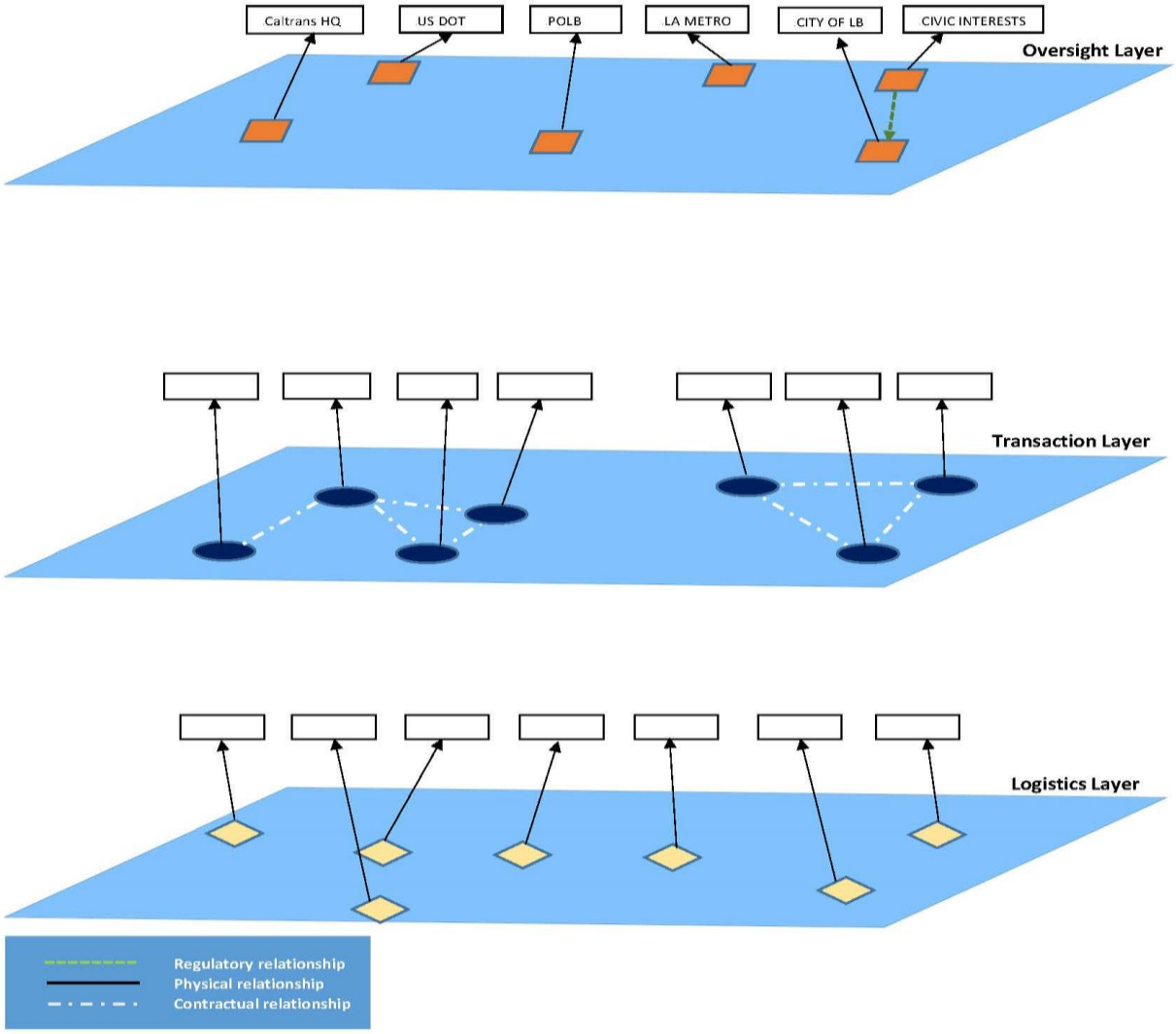

Figure 14: Systems mapping approach for the Gerald Desmond Bridge project

Developing skills for Collaborative Approaches

System-wide approaches to problem solving, performed in multi-functional teams, like the development of a layered process map, reflect broader societal changes in the types of skills needed in the workplace. The Great Recession spanning 2007 to 2009 triggered major shifts in the U.S. labor market, resulting in the loss of almost 9 million jobs in the U.S. As the economy recovered, higher-skill and higher-paying jobs replaced those that were lost during the recession; however, those jobs also tend to have higher educational requirements.[28] Hence, workforce development strategies that use a targeted approach to deliver training and educational opportunities have had demonstrated success in the past decade. The Caltrans approach to developing capacity for freight planning, already unique among DOTs, will be even

[28] Holzer, Harry J. "Better Skills for Better Jobs." Issues in Science and Technology 28, no. 2 (Winter 2012)

more effective if it marries internal needs with longer term strategic planning for professional development that consider:

- the training needs of the employee;
- the possible methods for delivery of education and training materials including
    - the availability of online tools and free or low-cost programs offered
    - by educational institutions including community colleges; and
- the expectations of partners inside Caltrans and outside the agency regarding
    - knowledge about freight systems

A paper published by the RAND Corporation[29] analyzing changing trends in workforce needs provides important considerations for Caltrans as it develops its approach to professional freight capacity building within the organizations.

- **Anticipating occupational demands:** There is a need for employers, policymakers, educational institutions and non-governmental bodies to engage in curriculum development by understanding changing labor market needs. Sustained engagement with employers through dialogue and surveys to assess regional skills enables local educational institutions to develop vocational programs for such needs. In turn, those programs become another source of professional development for the organization.
- **Adopting quality curricula:** Training systems that incorporate transferable skills along with occupation-specific skills often result in increased employee retention and adaptability to evolving job roles. Employees are able to manage transitions more easily and advance in career growth. Training systems that focus on functional ("soft") skills such as effective communication, dealing with clients, and teamwork have had better quality outputs.
- **Implement a blended instructional approach that includes workplace learning:** Combining in-class training with on-the-job-training (OJT) was shown to be the most effective system of workforce development. Technology could be understood as theoretical concepts in a classroom setting, but employees that use technology in their daily job duties are able to better learn and understand the use of such technology. Since the development of technology rapidly outpaces that of theory, employees can build their skills most effectively through the OJT process.
- **Hire and retain quality instructors:** Quality of teaching professionals also plays a vital role in delivering an effective learning process. Instructors constantly need to update their pedagogical skills along with work experience to showcase the right skills needed for their students. Efforts are also made to incorporate industry professionals into teaching,
- **Engage in meaningful, continuous quality-assurance processes:** Quality assurance of students through national/industry regulated certification is one technique. Another technique is to accredit the university/institution by performing internal and external evaluations to meet standards.

[29] Gonzalez, G., Singh, R., Karam, R., & Ortiz, D. (2014). How Education and Training Can Successfully Adapt to Changing Labor-Market Needs. In Energy-Sector Workforce Development in Southwestern Pennsylvania: Aligning Education and Training with Innovation and Needed Skills (pp. 27-32). RAND Corporation.

Thus, implementing a targeted, results-based model of collaboration between institutions and employers has been the cornerstone of many successful capacity building approaches. For Caltrans, this means, in the short term, identifying training priorities focused on:

- Increasing knowledge of freight systems for incumbent workers and new hires, both in the freight unit and outside of it;
- Allowing for expertise to develop within certain sub-units (such as rail planning or GIS);
- Providing opportunities for cross-unit collaboration; and
- Increasing collaboration with external freight stakeholders as well as peers engaged in freight planning (inside and outside California).

In the longer term, it means identifying the role it can play in building the capacity of the future workforce by contributing to the development of curricular priorities in planning and engineering programs and working with educational institutions to develop experiential learning opportunities that prepare the future workforce for the kinds of freight-related projects undertaken by Caltrans.

Existing Training Programs

Caltrans has demonstrated leadership in the development on in-service training. Funding of the Freight Academies remains a rare regular commitment to employee professional development among state DOTs. In addition to this freight-focused exercise, the Department also offers a Transportation Planning Academy, an Environmental Planning Academy and a Traffic Operations Academy along with more specialized training in areas such as airport planning.

As in most cases, the desire of the individual drives in part personal and professional development. Many Caltrans employees are hired with degrees from traditional (undergraduate and graduate level) programs in transportation and there are hybrid versions of training through online classes and certificate courses. Most of the California State University and University of California campuses offer classes and courses in urban planning with specialized electives in transportation. A list of programs offered at community colleges and universities from across the state is provided in the appendix.

The Eno Center for Transportation also conducts courses aimed at public sector transportation professionals and agencies; and the National Highway Institute (NHI) has over 20 courses on freight and ITS. The courses are available online. The FHWA also runs programs on freight financing that provide information on tools for freight financing.

METRANS includes a Metro Freight Urban Freight Curriculum Database on the METRANS website. It is a regularly updated database of knowledge, research and training materials on urban freight management. This includes YouTube videos and self-paced training options that help individuals or training coordinators identify existing resources for freight-related education.

Many of these options can be included in formal training programs like the Freight Academy; and Caltrans will provide a service to its employees by helping to raise awareness of them. How these options (and others) might be a part of a more strategic approach to freight-related capacity building is the subject of the next section.

Task 4: Developing an Implementation Plan

The following plan recommends actionable steps that Caltrans can implement to improve the State of California's freight capacity. These recommended steps are informed by findings identified in previous sections of this report that shed light on the current state of freight practices at state departments of transportation across the U.S. Research for this report includes a national freight peer exchange, survey development, literature reviews, state freight plan analysis, labor market analysis, and stakeholder engagement with business, government, and educational leaders.

A recurring conclusion throughout these related research efforts is that supply chains across the state, nation, and globe are increasingly data driven, frenetically collaborative, and continually disrupted by new technologies and market forces. These realities spotlight the role that supply chain professionals in business, government, and education must play to empower the people who will address those challenges.

Empowering the Caltrans supply chain workforce to leverage technology, manage and share data, work with governmental and business stakeholders, and strategically manage assets to meet goods movement challenges in the future is a major undertaking. Addressing those many challenges will also require new levels of collaboration with outside governmental and business stakeholders with mandates and priorities that do not always align with those of Caltrans.

Strengths and Weaknesses of the Existing Approach

As stated throughout this report, Caltrans' commitment of resources and personnel to professional development programs is unique among (and an envy of) other state DOTs. Developing a culture of professional development is not the challenge; extending its reach is. The decision to carve out a niche for freight training since 2005 means that more than 400 employees have received specialized training in freight-related topics. Many employees have taken part in multiple trainings; but as the content and approach change from session to session, the impact is greater than the number of unique individuals taking the class.

While the classes have been developed in conjunction with the Caltrans Workforce Development Branch and the Office of Freight Planning, more recently the trainings have been coordinated with the Division of Research, Innovation and System Information (DRISI). This has helped to integrate the professional development and research efforts of both Caltrans and the University Transportation Center program, of which METRANS is a part. As a result, participants in the Freight Academies have also been able to take advantage of freight-specific conferences like the International Urban Freight Conference (INUF) which extend learning beyond the classroom. There is room to expand this approach as well with other industry and university-sponsored offerings.

The willingness of Caltrans to bring training to different parts of the State and to include freight-specific locations through field visits and academies is another hallmark of its approach. It has

resulted in productive engagement with industry, many of whom have taken part on advisory bodies like the CFAC and the Freight Efficiency Working Group.

There are challenges however to not only continuing to keep capacity building a priority but in also making it more strategic. Not surprising, the first is financial-related. Budgets for training and professional development have not been consistent since the establishment of the Freight Academies in 2005; and the two most recent classes have relied upon combined resources from Workforce Development and DRISI. The ability to use Caltrans' committed match funding for its University Transportation Centers for the purposes of training is an advantage but not in and of itself a sustainable model.

The broad based input into the design of the classes reflects a diversity of opinions from HQ to the district level and from the perspective of training, freight, and research units. That should also be viewed as a plus. However, turnover in personnel within divisions at Caltrans means that the training priorities are often more a reflection of the priorities of divisional leadership and not part of a broader vision of office, division, or department goals and strategies. Furthermore, alignment of these goals assumes a level of coordination that can often be problematic in a large and distributed organization.

Another challenge to the current approach is political in nature. The priorities of the federal and state governments drive the activities of the Department, the Division and the Office. Over the course of the nearly 15 years of freight specific training offered by Caltrans, one pair of classes was cancelled at the last minute because of a ban on travel for certain state personnel. Changes in federal freight planning requirements have also meant that the trainings have sometimes by necessity focused on skills needed for compliance (such as the development of performance metrics). While appropriate for the focus of a training exercise, the approach remains more reactive than strategic and driven by external priorities.

Caltrans then has a difficult task in balancing these challenges with its own Department-wide needs. Recommendations for short-term and long-term approaches to building capacity within the freight program are contained in the following section.

Identifying Short and Long-Term Priorities for the Freight Program

To address the wide range of departmental goals and external stakeholder needs identified in this report in an integrated and sustainable manner, Caltrans needs to develop a community of practice devoted to freight systems innovation. This community of practice should consider a systems approach to organizational management to create a workforce culture that promotes innovation and systematic thinking to integrate the best practices and priorities addressed in the preceding tasks of this report. Conducting tasks 1, 2, and 3 in this report makes clear that Caltrans should maintain its best practices associated with product and technology-centric "hard systems" while also implementing new "soft systems" that are people and process driven. The broad range of infrastructure, technological, workforce development, policy, planning, and regulatory issues identified in this report (Figure 18) would all be addressed within a larger collaborative community

that continually shares data to remain cross-functionally aware, adaptive, and responsive to changing technology, regulations, and market forces.

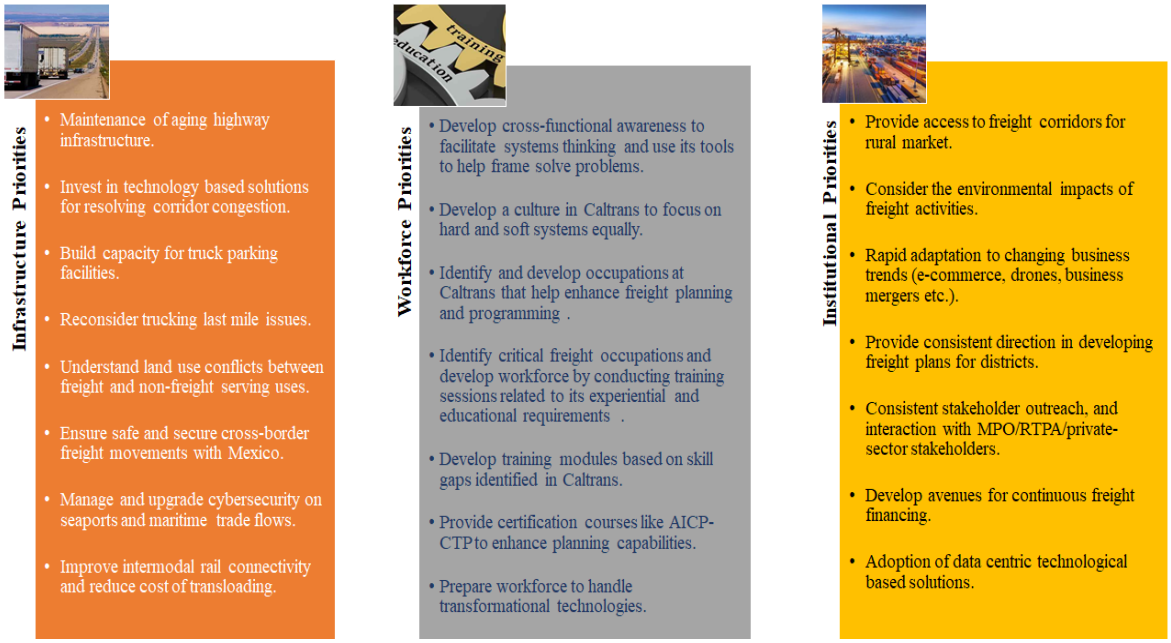

Figure 15: Caltrans priorities

Establishing a community of practice would enable Caltrans to position itself as not only a steward of California's hard systems but also the soft systems—the oversight, transactional, and operational occupations that operate systems along the supply chain. Establishing a community of practice will require agreements between leaders in industry, government, and education to commit the time and resources of their staffs to work together to meet shared workforce development goals.

Through actively cultivating a community of practice in concert with leaders in industry and education, Caltrans would work together to achieve common goals while maintaining separate resources and responsibilities. The community of practice would not be statutorily driven and would not be housed within state government. Caltrans would engage the community of practice to facilitate the sharing of advice, resources, information, and contacts to help with goal attainment in a spirit of cooperation with industry and educational leaders. Stakeholders within the community of practice would agree on common and clearly articulated goals while also defining how collaborative actions would relate to the advancement of the California freight sector. In this way, the freight sector community of practice should be viewed as a flexible interagency group that enables Caltrans to work with sister agencies, industry, and educational partners to address a range of operational and workforce development priorities on an ad-hoc basis. A community of practice

would also give Caltrans a broad base of support to elevate freight priorities in important policy arenas such as Governor Gavin Newsom's Commission on the Future of Work and, on the federal level, a more comprehensive role for freight jobs associated with organized labor and new industry recognized apprentice programs sponsored by the U.S. Department of Labor.

Cultivating a community of practice devoted to innovation and excellence in the freight sector will ensure:

- Formalizing Collaboration with External Partners;
- Expanding System Planning with other Caltrans functions;
- Aligning planning products with programming processes and timelines; and
- Addressing differences in goals and metrics with those of partner agencies.
- The CFMP planning process should provide a framework in which the California Freight Advisory Committee (CFAC) as well as key partner agencies and stakeholders can more effectively develop (or update) the State's vision, mission, values, and goals for freight mobility in compliance with federal mandates and other recent state legislation (e.g.: AB 14 and SB 473).

The CFAC currently lacks a committee structure that could facilitate not only the strategic development process but also project identification and prioritization. These should be considered as a tool to help move forward the planning process while keeping in mind the need to comply with open meeting laws.

With Caltrans' broader priorities in mind, and in order to address the priorities identified in tasks 1, 2, and 3 and establish a community of practice devoted to continuous improvement in the California supply chain, the METRANS Team recommends the following implementation steps. Some are short term, the low hanging fruit that helps build capacity in a more opportunistic fashion and with minimal cost. The longer-term strategies are those that are more strategic and require more resources but have the potential to foster institutional change. In combination, they help to build the capacity of personnel within the Office of Freight Planning, which becomes a model for the Department as a whole.

<u>Short-term Steps</u>

1. The numerous training opportunities offered by Caltrans throughout the year provide opportunities to expand the number of classes where freight can become a component (and in the process more students are reached). Caltrans should consider opportunities to use training materials and exercises developed for the Freight Academy in other curricula. The required coordination across units helps to create the intra-departmental community of practice.
2. This report also identifies the need to incorporate foundational or soft skills into training exercises. The integration of topics like "Communicating Caltrans Plans to Diverse Communities" or "Story Maps for Planners" into existing Academy curricula builds the skill sets needed in addition to discipline or modal-specific job functions.

3. This report also reveals the need for training in specific freight-related topics that are not touched upon in the Freight Academy format. The surveys and evaluations have already identified some of these topics of interest to past participants: data analytics, freight data sources, funding and financing of freight projects, developing truck routes, and GIS for freight. This allows for the development of discrete technical skills that build upon the basic skills taught in the Academy. As Caltrans outlines priorities for the Academy, it should consider balancing the general freight academy with skill-specific classes.
4. The Office of Freight Planning has had regularly scheduled distance-based workshops designed to allow personnel with freight-related job functions to share ideas and get updates on freight from industry. The reconstitution of these would provide opportunities for cross-unit, cross-district, and interdisciplinary discussions surrounding a variety of freight related issues. In the past, Caltrans-funded UTCs have also sponsored a webinar series where Department-funded research is presented to personnel on a quarterly basis. This research aspect could also be incorporated into the distance-based workshops but specifically with a freight focus.
5. While the cost of conference travel remains an obstacle to sustained long term participation for Caltrans with freight-related groups, the OFP can support Caltrans engagement with organizations that bring together private industry leaders, practitioners, and researchers. Such organizations include TRB, AASHTO, ITS America, IANA, among others. Institutional memberships and no-cost engagements (such as becoming a friend of a TRB freight committee) would begin to develop two-way channels bringing resources and knowledge back to the Department.

<u>Long-Term Steps</u>

1. Develop a new strategic vision and mission statement that elevates innovation in freight planning and programming as a top priority across all Caltrans districts and divisions. These innovation-driven statements would be disseminated by Caltrans executive leadership with an end goal of developing a community of practice to cultivate a freight workforce prepared to adapt to changing leadership directives and shifting market conditions.
2. Convey the strategic missions called for in Step 1 to the CFAC.
    a. Implement relationship-mapping methods into CFAC oversight and communications efforts.
    b. Use CFAC meetings as forum for the abovementioned freight community of practice to facilitate public input and continuity in scheduled meetings.
3. Convey the strategic missions called for in Step 1 to Caltrans district and division leadership across the state.
    a. Implement relationship-mapping methods into the oversight and communications to Caltrans division and district leadership.
4. Caltrans leadership across all districts and operational units disseminate strategic vision and mission to rank and file Caltrans employees.
    a. conduct a communications audit

   b. deploy survey in this report to gather a baseline understanding of critical occupations and skills
   c. Compile results of 4a, 4b in a summary workforce implementation report
5. Using the info gathered above, develop organizational priorities to implement a community of practice through the formation of career pathways that address critical freight planning and programming occupations within Caltrans (see Figure 19 below for example of Career Pathway Template for internal Caltrans occupations). Identify freight team members to assist colleges and universities with competencies that should be incorporated into existing pathway models and help to develop experiential learning opportunities that prepare graduates of these programs for employment at Caltrans. This could include Masters level urban labs that involve the development of a freight master plan.
6. Create a new leadership framework for CFAC members to provide industry briefings on the current and future state of the California freight system during meetings. This approach would make it possible for CFAC meetings to serve as source for the dissemination of valuable information on freight in the state.
7. Establish new funding mechanisms to pool funding of freight training among state DOTs Institutionalize a regional peer exchange to identify key topics where coordinated training should occur.
8. Institutionalize the peer exchange model of engagement used for this freight assessment to provide an ongoing forum for exchange among freight planners within state DOTs.
9. Develop a mentor program that links Caltrans employees to leaders in industry to facilitate knowledge transfer between formal education and training opportunities.
10. Explore the development of resource database/clearinghouse for freight training options for staff.
11. Consider the model of the Transportation Management certificates offered through the Mineta Transportation Institute at San Jose State University as an opportunity to work with college and university partners statewide in the development of a Caltrans-centric certificate program in Freight Planning
12. In fulfillment of the goals of the SP2P document, identify a pilot co-location opportunity for a freight team member to be embedded within another Caltrans unit for the purposes of effective program delivery
13. Identify what an i-team for freight would look like both within Caltrans and with external partners.

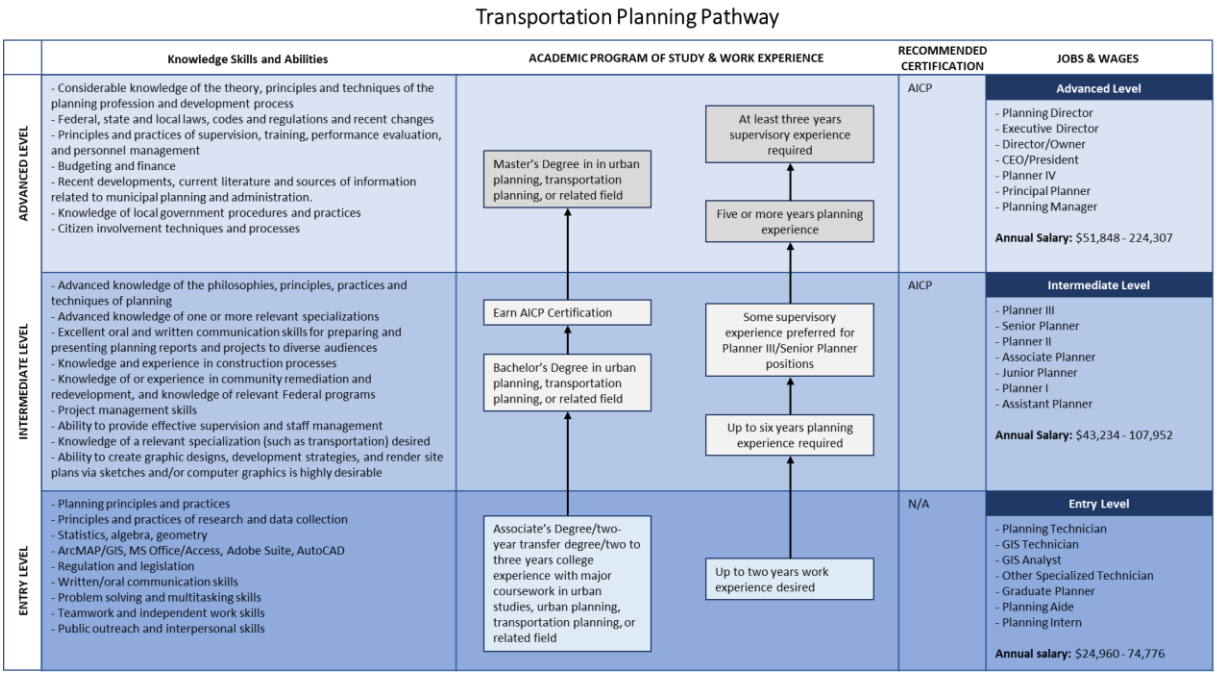

Figure 16: Transportation Planning Career Pathway

Conclusion

Cultivating a community of practice would develop strategic relationships within and beyond Caltrans to better share data and best practices to improve California's freight capacity, efficiency, and address the Governor's environmental executive orders. Said another way, a community of practice would ensure that freight is part of the conversation between leaders in industry, education, and government. By elevating the importance of freight in policy discussions among such a broad base of decision makers, Caltrans would empower stakeholders within and beyond state government to work together in new and innovative ways to strengthen critical links in the California supply chain.

APPENDIX

Programs offered at Community Colleges and Universities

Community College	Degree/ Certificate	Contact Information
Barstow Community College	· Associate of Science, Supply Chain Management (Technical) – · Certificate of Achievement, Supply Chain Management	Sandi Thomas Dean of Instruction – CTE/Workforce & Economic Development sthomas@barstow.edu 760-252-7283 x7283 www.barstow.edu Barstow Community College 2700 Barstow Road Barstow, California 92311
Cerritos College	· International Business Associate of Arts · International Business Certificate of Achievement	Rachel G. Mason, Instructional Dean, Business Education Division 562-860-2451 x 2700 rmason@cerritos.edu www.cerritos.edu
Coastline Community College	· Logistics/Supply Chain Management - Associate of Arts Degree or Certificate of Achievement · Entrepreneurship and Small Business Management - Associate of Arts Degree or Certificate of Achievement · Management - Associate of Arts Degree or Certificate of Achievement · Retail Management - Associate of Arts Degree	College Center 11460 Warner Avenue Fountain Valley, CA 92708 (714) 241-6176 CCCAdmissionsOffice@coastline.edu

Community College	Degree/ Certificate	Contact Information
	or Certificate of Achievement · Project Management - Certificate of Accomplishment	
College of Alameda	· Transportation, Distribution and Logistics –Certificate of Achievement · Transportation-Logistics Operations – Certificate of Proficiency · Warehouse and Forklift Operations – Certificate of Proficiency	Rochelle Olive Department Chair, Business rolive@peralta.edu 510-748-2322 alameda.peralta.edu College of Alameda 555 Atlantic Ave. Alameda, CA 94501
East Los Angeles College	· Technology & Logistics Associate of Science Degree · Technology & Logistics Skills Certificate (Level 1 & 2) · Logistics Material Handling Certification · Leadership in Global Logistics Certification · Certificate of Achievement in Technology & Logistics · Skills Certificate – Global Trade & Logistics – International Trade & Transportation ·Skills Certificate - Import & Export	Ann Mahrenholz, Chair of Computer Applications & Office Technologies Dept. 323-265-8928 mahrenam@elac.edu John Grimmer, Chair of Anthropology, Geography, & Geology Dept. 323-265-8843 grimmejc@elac.edu www.elac.edu
Glendale Community College	· International Business Associate of Science Degree · International Business Certificate of Achievement	Michael Scott, Chair of Business Dept. 818-240-1000 x5746 mscott@glendale.edu www.glendale.edu

Community College	Degree/ Certificate	Contact Information
Long Beach City College	· Associate of Arts Business-International Business Concentration · Certificate of Achievement, International Business · Certificate of Accomplishment, Logistics Port of Long Beach Maritime Center of Excellence · Associate of Arts Business-International Business Concentration · Certificate of Achievement, International Business · Certificate of Accomplishment, Logistics · Port of Long Beach Maritime Center of Excellence	Myke McMullen, Head of International Business Dept. 562-938-4941 mmcmullen@lbcc.edu www.lbcc.edu Workforce Development (562) 938-3248 wfdev@lbcc.edu Veronica Rodriguez Coordinator - Maritime Center of Excellence vrodriguez@lbcc.edu
Long Beach State University	· Global Logistics Specialist (GLS)	Angeli Logan Director of Trade and Transportation Programs 562-985-2874 Angeli.logan@csulb.edu
Los Angeles Pierce College	· Certificate of Achievement - International Business ·Skills Certificate – International Business	Martin Karamian, Chairman of Business Administration 818-710-2226 karamim@piercecollege.edu www.piercecollege.edu
Los Angeles Southwest College	· Associate of Arts Degree in Global Trade and Logistics	Allison Moore, Chair of Business Dept. 323-241-5386 mooreap@lasc.edu

Community College	Degree/ Certificate	Contact Information
	· Certificate of Achievement in Global Trade & Logistics · Certificate of Achievement in Global in Supply Chain Management · Certificate of Achievement in Global Entrepreneurship · Certificate of Achievement in Import/Export · Skill Certificate in Supply-Chain Management · Skill Certificate in Global Trade & Logistics	Rick Hodge, Dean of Career & Technical Education 323-241-5388 hodgerl@lasc.edu www.lasc.edu
Mt. San Antonio College	· International Business Associate of Science Degree · International Business Certificate of Achievement Levels 1, 2 & 3	Jennifer Galbraith, Dean of Business Division 909-274-4649 jgalbraith@mtsac.edu www.mtsac.edu
Norco College	· Business Administration: Logistics Management – Associate Degree	Rex Beck Professor, Business Logistics Management rex.beck@norcocollege.edu (951) 372-7068 www.norcocollege.edu/cte
Pasadena City College	· Certificate of Achievement - International Business/Trade	Argiro Kiotas, Dean of Business, Engineering, and Technology Division 626-585-7498 ajkiotas@pasadena.edu

Community College	Degree/ Certificate	Contact Information
Rio Hondo College	· International Business Associate of Science Degree · International Business Certificate of Achievement · Logistics Management Associate of Science Degree · Logistics Management Certificate of Achievement	Gita Runkle, Dean of Business 562-463-7359 grunkle@riohondo.edu www.riohondo.edu
San Joaquin Delta College	· Logistics & Transportation, Associate in Science · Logistics & Transportation Supervisor, Certificate · Traffic Shipping & Receiving Technician, Certificate	Danell Hepworth Dean, Applied Science, Business & Technology Division dhepworth@deltacollege.edu 209-954-5151 x5230 www.deltacollege.edu San Joaquin Delta College 5151 Pacific Ave Stockton, CA 95207
Santa Monica College	· Logistics/Supply-Chain Management Associate of Science Degree · Logistics/Supply-Chain Management Certificate of Achievement · International Business Certificate of Achievement · Logistics/Supply Chain Management Certificate of Accomplishment · International Business Department Certificate ·Logistics and Supply Chain Management Department Certificate · Global Studies Associate of Arts Degree	Sal Veas, Chair of Business Dept. 310-434-4617 Veas_sal@smc.edu www.smc.edu Brenda Antrim, Curriculum Chair 310-434-3561 x3538 antrim_brenda@smc.edu www.smc.edu

Community College	Degree/ Certificate	Contact Information
	· Global Studies Certificate of Achievement	
Skyline College	· Business Management – AS-60 units · Business: International Business – CERT · Business: Warehousing and Logistics, CERT-17 Units · Business: Entry-Level Warehousing, CERT - 4 Units · Business: Entrepreneurship and Small Business Management, CERT – 24 Units · Business: Entrepreneurship, CERT - 12 Units	Christine Roumbanis Dean, Business, Education & Professional Programs Division Roumbanis@smccd.edu 650-738-4362 www.skylinecollege.edu Skyline College 3300 College Drive San Bruno, CA 94066 650-738-4100
Southwestern College	· Logistics & Transportation - A.S. Degree · International Business – A.S. Degree	Mink Stavenga, Dean, School of Business & Technology mstavenga@swccd.edu Phone: 619-482-6582 www.swccd.edu Southwestern College 900 Otay Lakes Road Chula Vista, CA 91910-7299
University of California, Berkeley	· Institute of Transportation Studies	its@its.berkely.edu
University of California, Davis	· Institute of Transportation Studies	Leilani Greene llgreene@ucdavis.edu 530-752-6548

Community College	Degree/ Certificate	Contact Information
West Los Angeles College	· Associate of Arts Degree in International Area Studies · Associate of Arts Degree in international Global Studies · Certificate of Achievement –Africa, Asia, Latin America, or Middle East · Certificate of Achievement, Global Studies	Mark Pracher, Dean of Academic Affairs and Development 310-287-4467 prachem@wlac.edu www.wlac.edu

Online degrees, certificates, and training in Supply Chain Management

Online Degrees and Certificates	
Arizona State University	Thunderbird School of Global Management Certificate in Supply Chain Management
California State University, Dominguez Hills	Supply Chain Management Certificate Online
Indiana University	Global Supply Chain Management, MS
Michigan State University	Supply Chain Management Programs
Southern New Hampshire University	Online Graduate Certificate in Operation & Supply Chain Management
University of California, Irvine	Certificate in Supply Chain Management
University of California, Los Angeles	Extension Certificate in Supply Chain Management
Online Training	
American Production and Inventory Control Society	Preparation for Certified in Logistics, Transportation, and Distribution (CLTD) Exam
Council of Supply Chain Management Professionals	Supply Chain Quick Courses
	Supply Chain Management Essential Course
	SCPro Certification
East Central College	Purchasing Supply Chain Management + Freight Broker/Agent Training

Ed2go	Distribution and Logistics Management
Georgia Institute of Technology	Supply Chain & Logistics Institute
LogisticsTrainingCenter.com	LogisticsTrainingCenter.com
Open Courseware	
Coursera	Supply Chain Management Specialization
edX	Supply Chain Management Courses
Massachusetts Institute of Technology	Open Courseware Logistics Courses

Figure 5 Glossary

Acronym	Name	Description
PMA	Pacific Maritime Association	The principal business of the PMA is to negotiate and administer maritime labor agreements with the International Longshore and Warehouse Union (ILWU).[30]
ILWU	International Longshore and Warehouse Union	The ILWU was founded in 1937 and was designed to organize longshore workers. Throughout the organization's history, their mission has been to protect the interests of their members, including bargaining for fair wages, time off and safer work environments.[31]

Figure 6 Glossary

Acronym	Name	Description
CBP	United States Customs and Border Protection	U.S. Customs and Border Protection (CBP) is the law enforcement agency that regulates all goods shipped to the United States. The CBP

[30] Pacific Maritime Association. (n.d.). *What we do.* Retrieved May 6, 2019 from Pacific Maritime Association: http://www.pmanet.org/overview

[31] Ballotpedia. (n.d.). *International Longshore and Warehouse Union.* Retrieved May 6, 2019 from Ballotpedia: https://ballotpedia.org/International_Longshore_and_Warehouse_Union#cite_note-2

		facilitates lawful trade by inspecting cargo and collecting import duties when necessary.[32]
FTC	Federal Trade Commission	The Federal Trade Commission is an independent agency that aims to protect consumers and ensure a strong competitive market by enforcing consumer protection and antitrust laws. The FTC also deals with complaints of unfair business practices such as scams and deceptive advertising[33]
USCG	United States Coast Guard	The Coast Guard is a unique branch of the military responsible for an array of maritime duties, from ensuring safe and lawful commerce to performing rescue missions in severe conditions. Nearly 42,000 men and women are actively serving in the Coast Guard to defend America's borders and protect the maritime environment.[34]
IMO	International Maritime Organization	The International Maritime Organization is the United National (UN) specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. IMO's work supports the UN Sustainable Development Goals (SDGs).[35]
WCO	World Customs Organization	The World Customs Organization (WCO), established in 1952 as the Customs Co-operation Council (CCC) is an independent intergovernmental body whose mission is to enhance the effectiveness and efficiency of Customs administrations. Today, the WCO represents 183 Customs administrations across the globe that collectively process approximately 98% of world trade. As the global centre of Customs expertise, the WCO is the only international organization with competence in Customs

[32] Tradeos. (n.d.). *What is the US Customs and Border Protection (CBP)?.* Retrieved May 6, 2019 from Freightos: https://www.freightos.com/freight-resources/what-is-us-customs-and-border-protection-cbp/
[33] Kenton, W. (2019, April 04). *Federal Trade Commission (FTC).* Retrieved May 6, 2019 from Investopedia: https://www.investopedia.com/terms/f/ftc.asp
[34] GoCoastGuard.com. (n.d.). *USCG: A Multi-Mission Force.* Retrieved May 6, 2019 from United States Coast Guard: https://www.gocoastguard.com/about-the-coast-guard/discover-our-roles-missions
[35] International Maritime Organization. (n.d.). *Introduction to IMO.* Retrieved May 6, 2019 from International Maritime Organization: http://www.imo.org/en/About/Pages/Default.aspx

		matters and can rightly call itself the voice of the international Customs community.[36]
NVOCC	Non-Vessel Owning Common Carrier	A non-vessel owning common carrier (NVOCC) is an American individual or company that arranges shipments but does not own or operate any freight vessels. The term is used interchangeably with freight forwarder in the United States. [37]

[36] World Custom Organization. (n.d.). *WCO in brief.* Retrieved May 6, 2019 from World Customs Organization: http://www.wcoomd.org/en/about-us/what-is-the-wco.aspx

[37] Tradeos. (n.d.). *What is a Non-Vessel Owning Common Carrier (NVOCC)?.* Retrieved May 6, 2019 from Freightos: https://www.freightos.com/freight-resources/what-is-a-non-vessel-owning-common-carrier-nvocc/

Task Order 19 Fact Sheet

Caltrans Freight Program Assessment Initiative

The Caltrans Freight Program Assessment Initiative is intended to identify strengths, weaknesses, opportunities and challenges related to the Caltrans freight program and recommend best practices to improve Caltrans freight planning processes, programs and project delivery. This assessment will help to better understand the dynamics in play, and provide the basis for transformation. It will also help meet the expectations laid out in the Caltrans Strategic Management Plan for freight, as well as efficiency targets mentioned in California Sustainable Freight Action Plan.

The scope of work for the initiative is divided into four tasks:

1. **Assessment of resources available to perform Caltrans freight programs.** This task will focus on how the department articulates its mission, the resources available to achieve that mission and the management of those resources. It also includes qualifications of staff.

Key deliverables: A policy peer exchange that convenes a group of freight division heads from Caltrans and other state DOTs. The peer exchange will be held via Zoom teleconference and participants will help articulate both short-term (3-year) and long-term (10-year) goals. The policy peer exchange will inform the development of the subsequent survey instrument and implementation of a survey with Caltrans management at headquarters, key divisions, districts, and with staff.

Expected results: Documentation of what agency personnel know about freight and what additional knowledge is needed to be able to fulfill the Caltrans mission. This includes awareness of resources and best practices external to the agency.

2. **Knowledge of current best practices.** This task will identify innovative approaches to freight planning, infrastructure, operations, markets, and implementation of plans, programs, and processes of internal and external coordination. This includes strategic partnerships with stakeholders and other transportation agencies nationally and internationally. This scan will include an update of a similar summary of statewide freight plans and select MPO-level plans conducted by the research teams as part of the Caltrans Freight Mobility Plan Scoping Study.

Key Deliverable: Summary table with the status of statewide and MPO-level freight plans (update of existing table); development of methodology to select Best Practices; and preparation of 10 mini case studies highlighting innovative freight planning and implementation.

Expected results: Identification of groundbreaking approaches to freight planning, implementation, and strategic partnership formation from other statewide agencies, regional/local level agencies and cross-border environments.

3. **Defining roles for freight planning innovation.** This task will define the roles and assets needed to transform freight programs within Caltrans with a focus on Caltrans' vision of itself as well as on innovation. This involves a discussion of the relationship between innovation within the freight planning unit and other divisions within the agency (Planning and Modal Programs, Project Delivery, Maintenance and Operations, Information Technology and Districts) as well as key partner agencies such as CARB and the CEC.

Key Deliverable: A process map will be developed for a relevant corridor-wide project that has a central role in freight transportation regionally, statewide and nationally. The process map will be developed in coordination with Caltrans senior management, the freight team, the California Freight Advisory Committee, and other participants as appropriate. The process map will shed light on the people involved and the requirements needed for the positions they hold. This in turn will inform the gap assessment described in Task 1. A report will also be provided on the defining characteristics of an innovative freight planning team including organizational structure. This will include a brief literature review of the development of innovation teams within public sector agencies.

Expected results: Establishing a menu of programmatic, organizational and resource allocation models that will result in freight having a central focus within the agency.

4. **Developing Implementation Plan.** This task will synthesize the previous tasks and outline a series of implementation steps to be taken to redefine and restructure the Caltrans freight program. This implementation plan will establish a high-level policy direction and goal for this initiative.

Key Deliverable: A report identifying the current strengths, weaknesses, opportunities and challenges related to Caltrans freight programs and recommended steps, including milestones and performance metrics, needed to bring about a more innovative unit.

Expected results: The organizational changes recommended will be systemic and designed to transcend and survive changes in leadership (governor, political appointees) and in career/civil service staff.

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