

Figure 4.17: Critical Minerals in a Broader Context (Source: GO-Biz Critical Materials and Critical Minerals in California)

4B. Freight Safety, Security and Resiliency

The freight system is a complex network that is susceptible to natural disasters and human-caused events. Whether the result of natural processes, accidents, criminal activity or terrorism, freight system disruptions can have devastating consequences. California's economy is dependent on the strength, reliability, and resiliency of its freight sector. Disruptions may impact the economic health of individual companies, communities, regions, the State and nation.

California needs to ensure that the freight transportation system prevents and minimizes negative impacts from such events and quickly recovers when they occur. California's freight system needs to be particularly adaptable so that emergency supplies can be transported and distributed when and where they are needed.

To affirm Caltrans commitment to Safety First, enhancing freight security and resiliency, the Department is incorporating a Safe Systems approach principles into all work. It works by building and reinforcing multiple layers of protection to both prevent incidents from happening in the first place and minimize the harm caused to those involved when incidents do occur. It is a holistic and comprehensive approach that provides a guiding framework to make places safer for people. This is a shift from a conventional safety approach because it focuses on both human mistakes AND human vulnerability and designs a system with many redundancies in place to protect everyone.

Safe Systems approach incorporates the following principles:

- Death and Serious Injuries are Unacceptable. A Safe System approach prioritizes the elimination of crashes that result in death and serious injuries.
- Humans Make Mistakes. People will inevitably make mistakes and decisions that can lead or contribute to crashes, but the transportation system can be designed and operated to accommodate certain types and levels of human mistakes and avoid death and serious injuries when a crash occurs.
- Humans Are Vulnerable. Human bodies have physical limits for tolerating crash forces before death or serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.
- Responsibility is Shared. All stakeholders – including government at all levels, industry, non-profit/advocacy, researchers, and the general public – are vital to preventing fatalities and serious injuries on our roadways.
- Safety is Proactive. Proactive tools should be used to identify and address safety issues in the transportation system, rather than waiting for crashes to occur and reacting afterwards.
- Redundancy is Crucial. Reducing risks requires that all parts of the transportation system be strengthened, so that if one part fails, the other parts still protect people.¹⁶³

In the 2023 State Highway System Management Plan, Caltrans updated funding strategies that address performance objectives aligned with the Climate action Plan for Transportation Infrastructure (CAPTI). This document includes the 10-Year State Highway Operation and Performance Protection Program (SHOPP) Plan and a 5-year maintenance plan that will fund system resiliency objectives. System resiliency objectives address Caltrans Strategic Plan goals in Stewardship and efficiency as well as climate action with objectives including bridge scour Mitigation, Bridge seismic restoration, Major Damage (Emergency Restoration), Major Damage (Permeant Restoration), protective Betterments and climate adaptation and resilience. Over the next 10 years Caltrans plans to spend \$21,278,000,000 in system resiliency objectives.¹⁶⁴ This funding will allow the state highway system to be more adaptive and resilient to the impacts of extreme weather and natural disasters on freight mobility.

State Highway System Management Plan Resilience Performance Targets:

- Major Damage System Resiliency Objective:
 - The Emergency Restoration objective: The Emergency Restoration includes emergency repair of assets damaged or imminently threatened by natural or human-caused events. Qualifying repairs include those needed to restore essential travel. To be considered, the work is typically tied to an identifiable natural event such as a storm, flood, fire, earthquake, tsunami, or volcanic action. Human-caused events such as vehicle collisions, Programs & Performance Objectives: Major Damage explosions, civil unrest and acts of war or terrorism are included. Repair to current design standards is allowed. The level of repairs needed varies depending on the situation. Funding needs are estimated in real-time when the event(s) occur, based on the damage experienced and cost of repair. The goal is to repair 100 percent of damaged assets as soon as possible.
 - Permanent Restoration Objective: The Permanent Restoration objective includes permanent repair and restoration of assets to pre-emergency condition and either follows or runs concurrently with the emergency restoration phase. Restoration to current design standards is allowed and may include elements of betterments. These projects go through the project development process and are mitigated in more depth than typical Emergency Restoration projects. However, they can be expedited into construction when the immediacy of an emergency arises during the design phase. The funding needs are more detailed and accurate compared to an Emergency Restoration project.
- Bridge Goods Movement Upgrades Other Assets and Objectives: The Bridge Goods Movement Upgrades objective is to identify and address geometric restrictions to permit vehicle traffic on the SHS. Bridge Goods Movement Upgrades address restrictions from reduced vertical clearance as established in the Caltrans HDM, and load capacity restrictions as identified by state guidelines. The emphasis of this objective is to address poor condition bridges impacting Interstate mainline traffic. The goal of this objective is to improve Goods movement bridges to 75% to good condition, 15% to fair condition.
- Bridge Scour Mitigation System Resiliency Objective: Ideally, the goal of the Bridge Scour Mitigation objective would be to address all identified scour critical (poor) bridges. Due to the dynamic nature of identification of scour critical bridges (major flooding or storm events) and the time required for the project delivery process, it is not realistic to assume that at the end of the 10-year cycle all scour critical bridges would be addressed. The Bridge Scour Mitigation target is to reduce scour critical bridges to 10 percent of the projected 10-year scour critical need. The performance target is to achieve 90% of bridges into good state of repair.
- Bridge Seismic Restoration System Resiliency Objective: Ideally, the goal of the Bridge Seismic Restoration objective is to address all seismically vulnerable (poor) bridges identified in the preliminary screening process. The screening process is a preliminary review of bridges that may be seismically vulnerable based on the element configuration of the structure and the surrounding soil prior to detailed seismic analyses being completed. Because bridges identified in the screening process may be found to not require seismic restoration during detailed seismic analysis, and due to the length of the time required for the project delivery process, it is not realistic to assume that at the end

of the 10-year cycle all currently identified seismically vulnerable bridges would be addressed. Therefore, the Bridge Seismic Restoration target is to reduce seismically vulnerable bridges to 30 percent of the projected 10-year seismic need.

- **Protective Betterments:** The goal of the Protective Betterment objective is to address all identified vulnerable locations in the roadway system. However, due to the dynamic nature of natural events that often expose more vulnerable locations or the discovery of new, vulnerable locations, it is not realistic to assume that at the end of the 10-year cycle all vulnerabilities would be addressed. Protective Betterment protects infrastructure at vulnerable locations to reduce risk of roadway closures during anticipated natural events (storms, floods, landslides, etc.) or human-caused events. Typical SHOPP-funded treatments or projects may include protecting rock slopes, preventing rock fall, stabilizing slopes and trenches, improving retaining walls, improving pumping stations at depressed sections, and security improvement

Emergency Support Functions

The State of California is prepared to respond quickly and effectively to large-scale safety and security events on a 24-hour basis. When an event or potential event is first detected, the California Office of Emergency Services (Cal OES) is activated to a level appropriate to the magnitude of the threat. All state agencies and volunteer organizations that comprise the State Emergency Response Team (SERT) are grouped into 18 Emergency Support Functions (ESF) to carry out coordination and completion of assigned missions¹⁶⁵. These functions represent specific response activities that are common to all disasters. Each ESF is comprised of one or more primary agencies serving as the lead and several other agencies and organizations providing support. The State-level ESF 1 activities support the coordination of transportation across various modes, including surface, maritime, railroad, aviation, and pipeline.

The ESF 1 lead agency, CalSTA, has delegated to the CHP and Caltrans, the responsibility to provide expertise primarily for surface transportation, and has identified stakeholders from primary and supporting agencies to take the coordination lead for other modes of transportation¹⁶⁶. According to the State of California Emergency Plan, ESF 1 – Transportation, “assists in the management of transportation systems and infrastructure during domestic threats or in response to incidents.” ESF 1 also provides recommendations and subject matter expertise to Cal OES including ESF 1 preparedness, mitigation, response, and recovery.

Caltrans specific responsibilities directly related to ESF 1 activities:

- As the owner operator of the state highway system (SHS), has administrative orders to repair, maintain and operate the SHS during and following emergencies and disasters;
- Provide assessments of transportation infrastructure and traffic conditions;
- Assess damage to highway system and establish route priorities during recovery efforts;
- Operate as the liaison to the U.S. DOT and FHWA regarding the status of the SHS;
- Provide transportation policies and guidance as needed;
- Coordinate state agency plans, procedures and preparations for route recovery, traffic regulation and air transportation; and

- Develop routing and directions for the movement of incident victims out of an impacted area and for the delivery of necessary personnel and medical supplies to local medical facilities and shelters.

CHP specific surface transportation responsibilities:

- Act as the Director of the State Motor Transport Division during times of emergency;
- Perform tasks assigned in the California Emergency Resources Management Plans for transportation during times of a war emergency;
- Continue emergency traffic regulation and control procedures as required;
- Assist Caltrans with traffic route restoration;
- Provide police escorts on closed routes;
- Activate appropriate CHP Emergency Resource Centers to coordinate resources and ensure the timely dissemination of intelligence information;
- Secure routes, regulate traffic flow, and enforce safety standards for evacuation and re-entry into evacuated areas;
- Coordinate interstate highway movement on regulated routes with adjoining states;
- Establish highway safety regulations consistent with location, type and extent of emergency conditions; and
- Support Caltrans with traffic route re-establishment and continued emergency traffic regulation and control procedures as required.

Hazardous Materials Transport

Industrial hazardous materials that are flammable, corrosive, toxic, explosive, or infectious play a vital role in the U.S. economy. They are used by industries from farming and mining to manufacturing and pharmaceuticals, and come in the form of raw materials, fertilizers, fuels, constituent parts, and other essential inputs. Of all hazardous materials, Toxic Inhalation Hazard (TIH) chemicals are among the most dangerous¹⁶⁷. Chlorine gas and anhydrous ammonia are the most common TIH chemicals; others include sulfur dioxide, ethylene oxide, hydrogen fluoride, and a variety of other products that are important manufacturing inputs. The potential consequences of a TIH release depend on the severity of the accident or event.

One widely discussed risk-mitigation proposal involves re-routing trains containing TIH tank car loads, for example, by choosing a route with less population exposure. TIH tank cars passing through major population centers were recognized as potential chemical weapons. Proponents of mandatory re-routing of TIH products argued that diverting trains around cities would place fewer people at risk of a terrorist attack and/ or collisions.

Many hazardous chemicals transported over long distances by rail, and for shorter distances by truck, may be particularly vulnerable to sabotage and disruption. At the federal level, the U.S. DOT and Transportation Security Administration (TSA) have sought to reduce the risk of terrorist attacks on freight. TSA worked with railroad carriers to implement a security program, the TIH Risk Reduction Program. TSA assumes that the risk of hazardous materials transport is directly proportional to the dwell time (the length of time that a rail car sits at a particular location), volume, and type of materials transported through densely populated areas. First implemented in New Jersey and New York, the program seeks to establish secure storage areas for TIH materials and to expedite their movement through the system.

Rail Freight

California has increased state-level oversight of rail freight and strengthened the regulation of railroad security. In addition to its role enforcing federal rail safety regulations, the California Public Utilities Commission (CPUC) is developing the capacity to improve rail security. The CPUC was charged with enforcing the provisions of AB 3023 requiring railroad operators to conduct risk assessments of their facilities and to develop and implement infrastructure protection programs. CPUC has more than 40 federally certified inspectors who are authorized to issue security enforcement recommendations under the auspices of federal law. Additionally, California actively seeks to bring State-level knowledge regarding rail safety and security to short line rail carriers that may not have the resources to establish robust safety and security programs on their own.

POSITIVE TRAIN CONTROL PROGRAM

Positive Train Control (PTC) systems are integrated command, control, communications, and information systems for controlling train movements with safety, security, precision, and efficiency. PTC systems improve railroad safety by significantly reducing the probability of collisions between trains, casualties to railway workers, damage to equipment, and overspeed accidents. The system can recognize a threat of collision or accident and slow or stop a train automatically to avoid the incident. The National Transportation Safety Board (NTSB) has named PTC as one of its "most-wanted" initiatives for national transportation safety.

The Rail Safety Improvement Act of 2008 required all Class I railroads (the largest) and intercity passenger and commuter railroads to implement a PTC system on mainline track that carry passengers or TIH materials by December 31, 2015. Currently PTC is completely implemented in all Class I railroads in California.

Trucks

Trucks can weigh more than 30 times more than passenger vehicles and requires more stopping distance, especially when loaded. When involved in a collision, the size and weight of large trucks increase the severity of impact when a passenger vehicle is involved. Furthermore, truck crashes are more likely to result in severe injuries or fatalities than those involving only passenger cars; between 2013 to 2017, the number of collisions involving trucks increased by 23 percent. Also, during this period, statewide truck VMT increased by 15 percent, followed by an overall increase in the number of collisions per one million VMT. However, commercial truck collisions resulting in no injury or death increased only by 4 percent and injuries by 24 percent, though the number of commercial truck collisions resulting in a fatality decreased by 8 percent.

Another safety concern is distracted driving and driver inattention. A distraction is anything that diverts the driver's attention from his or her primary tasks of navigating the vehicle and responding to critical events. According to an in-cab driving study of commercial truck drivers by the Virginia Technical Institute, the most dangerous distraction observed was texting. Truck drivers who texted while driving had 23 times the risk of being involved in a crash or a near crash incident. However, texting and phone calls are not the only distractions. Others may include eating, drinking, grooming, handling in-vehicle navigation systems, and conversating with passengers.

The FMCSA and the PHMSA have published rules specifically prohibiting interstate truck drivers, bus drivers, and drivers who transport quantities of "placards", which are large amount of

hazardous materials, from texting or using hand-held mobile phones while operating their vehicles. The joint rules are the latest actions by the U.S.DOT to end distracted driving. Violations can result in fines and/or driver disqualifications and will impact a motor carrier's and/or driver's Safety Measurement System results.

With new electronic logging device rules, the monitoring of drivers' adherence to the hours of service rules will become more rigorous because computer programs will be tracking the driving and work activity of truck drivers. The California Trucking Association (CTA) has a long history of supporting truck safety initiatives, such as banning radar detectors, prohibiting the use of mobile phones while driving, and administering mandatory drug and alcohol testing. CTA is now calling for several additional safety improvements, such as mandatory use of devices to limit maximum truck speed and a national clearinghouse to track positive drug and alcohol test results and refusals to test.

COMMERCIAL VEHICLE ENFORCEMENT

The CHP provides safety oversight of approximately 8.5 million commercial vehicles. Currently, there are 54 commercial vehicle enforcement facilities (CVEF) located throughout the State. The CHP has jurisdictional authority over the CVEFs and maintains responsibility for commercial enforcement.

CHP mobile road enforcement units are used within their eight divisions throughout California's highways and county roadways (county roadways are often not necessarily seen as commercially traveled routes). The CHP conducts over 500,000 inspections annually in accordance with the Commercial Vehicle Safety Alliance standards set forth in the North American Standard Out-of-Service Criteria. The CHP also provides off-highway enforcement utilizing the Motor Carrier Safety Unit, which includes over 300 non-uniformed motor carrier specialists assigned to one of the eight state field divisions.

The CHP and Caltrans are the State agencies designated by the Governor's Office as the certifying officials for size and weight regulations and enforcement. The CHP is the primary agency responsible for the enforcement of size and weight statutes and regulations, pursuant to the California Vehicle Code (CVC) and Title 13, California Code of Regulations.

TRUCK WEIGHT LIMITS

California follows federal law by placing weight limits on trucks to protect pavement and bridges from damage and excessive wear and tear. Truck weight is also a major factor in the severity of truck-passenger vehicle incidents. Heavier trucks and trucks carrying loads exceeding maximum weight limits can be more difficult for the driver to control because they require increased stopping distance, have an increased potential to roll due to a higher center of gravity, generate higher speeds when traveling downhill, and have decreased steering capability, especially at higher speeds.

Table 4.2 shows a summary of the CVC weight limits. (Note: The information in this table is paraphrased for brevity. Refer to CVC Weight Sections 35550 – 35558 for more detailed information.)¹⁶⁸

Table 4.2: California Vehicle Code (CVC) Related to Vehicle Weight

Unit	Maximum Weight
Diesel Vehicle Combination Gross Weight	80,000 pounds
ZEV Vehicle Combination Gross Weight	82,000 Pounds*
Single Axle	20,000 pounds
Axle Group: less than 8'-6" (8-feet-6-inches) between outer axles	34,000 pounds
Axle Group: 8'-6" (8-feet-6-inches) or more between outer axles	Varies by distance between axle groups
Diesel Vehicle Combination Gross Weight	80,000 pounds
Source: California Vehicle Code Weight Sections 35550 – 35558	
*State exemption of an additional 2,000 lbs for zero-emission trucks from AB 2061.	

Caltrans often receives requests to increase truck (or axle) weight limits, or to implement programs that would collect additional fees for compensation of overweight loads. There are several reasons for these requests. Hauling larger loads with fewer trucks can help industries reduce transportation costs and increase efficiency. Competition and changing market conditions puts pressure on freight-dependent industries to lower costs in an effort to provide greater efficiencies and increases in service quality. Transportation costs and flexibility for load size can have a significant effect on economic sustainability, particularly for heavy bulk commodities and highly priced sensitive goods, such as agriculture, lumber and timber, and construction materials. It is paramount to the economic vitality of California that it maintains an efficient freight transportation system and support freight-dependent industries. It is also vital that decision makers and the public understand the trade-offs between economic benefits with increased infrastructure and safety costs that occur when increasing load limits.

To support cleaner truck technologies California passed AB 2061 in 2018. To the extent expressly authorized by federal law, the bill authorized a near-zero-emission vehicle or a zero-emission vehicle, as defined in subdivisions (c) and (d) of Section 44258 of the Health and Safety Code, to exceed the weight limits on the power unit by up to 2,000 pounds¹⁶⁹.

TRUCK PARKING

The demand for commercial vehicle parking far exceeds the supplied capacity in California. When originally conceived, public rest areas were meant to be temporary rest areas for short-term safety breaks for the traveling public. As the trucking industry expanded, these rest areas began to serve as long-term, overnight parking for long-haul commercial vehicle operators, thereby contributing to overcrowding. The lack of availability for truck parking is not just an issue for truck drivers who struggle to secure parking but also for neighborhoods adjacent to freight facilities such as ports, intermodal facilities, warehouse and distribution centers, and manufacturing. These neighborhood streets, empty lots, and business parking lots are used as truck parking when highway rest areas are full or closed. Besides creating safety hazards,

neighborhoods frequently must contend with noise, smell, vibration, degradation of air quality, loss of viewshed, and disruption to community cohesion.

Because of the limits on stays in public facilities and parking space shortages, truck drivers have few alternatives. Parking underneath overpasses, on roadway access ramps or roadway shoulders are typically unauthorized and pose safety risks for the driver and other users of the highway or road. Accelerating quickly enough to merge into the traffic stream from a parked position on the side of the road is particularly challenging for truck drivers. Additionally, errant vehicles may stray into these areas and strike parked commercial vehicles. Privately owned truck stops are also not plentiful and are frequently filled to capacity, hence they are not always available to provide long-term parking. A lack of facilities can influence which route is taken based on the availability of amenities, whether the trip is a long or short haul, the time of day, and the need for staging areas. Just-in-time delivery scheduling and “rolling warehouse logistics” put even greater demand on drivers and on truck parking facilities.

More information on truck parking is provided in **Chapter 3A, Existing Freight System Assets.**

DRUG AND ALCOHOL PREVENTION

The CHP continues to work closely with the trucking industry to educate and reduce impaired driving and to maintain the highest level of compliance. This is completed through the combined efforts of education and enforcement. Through the Commercial Industry Education Program, CHP personnel provide nearly 1000 safety presentations annually to motor carriers throughout California. The goal of the CHP’s motor carrier safety program is to ensure all motor carriers located in the state are inspected for continued compliance with state and federal drug and alcohol testing requirements. These inspections are necessary in the continued efforts to reduce the number of impaired drivers on the road.

Air Freight

FREIGHT SECURITY

As with its passenger counterpart, the airline freight industry is pressured to comply with stringent security requirements. As part of the 9/11 Commission Act of 2007, Congress requires all cargo transported in the holds of passenger airplanes originating in the U.S. to be screened at a level commensurate with passenger luggage. Since 2010, TSA regulations mandates the screening of all cargo before it is to be loaded and carried by air both within the U.S. and internationally. The deadline to meet this mandate was August 3, 2010 and TSA is charged with enforcing it thereafter.

As a solution to bottlenecks experienced at airports, which further impacts the global supply chain due to the complex screening processes for both passenger and cargo packages, TSA devised the Certified Cargo Screening Program (CCSP).¹⁷⁰ Under the CCSP, shippers, freight forwarders, logistics services providers, indirect air carriers, independent cargo screening firms, and air carriers can screen cargo via a secure chain of custody and pass it along where it can go directly onto the aircraft without undergoing additional screening. This approach effectively creates a distributed screening network, allowing screening to be performed at the most cost-effective point in the supply chain and mitigating the impact on system performance, thereby

expediting the flow of commerce. The CCSP is a flexible, voluntary program specifically designed to allow shippers with unique requirements to find the approach that best meets their needs. The CCSP requires airlines, freight forwarders, and shippers to assume the costs of these security measures and to establish a secure air freight transport chain.

NEXTGEN

The Next Generation Air Transportation System (NextGen) modernization of the U.S. air traffic system is due for implementation across the country in stages between 2007 and 2025. NextGen aims to transform America's air traffic control system from a ground-based system to a satellite-based system. Global Positioning System (GPS) technology will be used to shorten routes, save time and fuel, reduce traffic delays, increase capacity, and permit controllers to monitor and manage aircraft with greater safety margins. Planes will be able to fly closer together, take more direct routes, and avoid delays caused by airport "stacking" as planes wait for an open runway.

The FAA is undertaking a wide-ranging transformation of the entire U.S. air transportation system through the NextGen program, which is developed to reduce gridlock both in the sky and at the airports. In 2017, FAA published an Implementation Plan Update, including a summary of accomplishments and the NextGen priorities annual plan through 2019. The NextGen Integration Working Groups successfully completed 52 commitments in fiscal year 2017, advancing operational improvements to the National Airspace System (NAS) in all areas. In February 2017, the NAC chairman proposed that the NAC focus on implementing NextGen in the Northeast Corridor, recognizing that making continuous improvements to the system in the Northeast Corridor operationally benefits the entire U.S. aviation system. Although this national effort focuses more on flight improvement across NAS, operational improvements provide benefits to the air cargo industry as well.

Maritime Freight

The maritime industry has always placed a high priority on security. Terrorism, weapons and drug smuggling, customs duty evasion, and piracy have been among the chief safety concerns. The international dimensions of the shipping industry, the large number of maritime ports, the vast fleet of global shipping, the range of products carried in vessels, and the difficulty of detection has made the issue of security in shipping a persistent concern. For ports, vulnerabilities can range in levels of exploitation and severity from both land and water. Recently, more scrutiny from customs officials has focused on identifying illicit and/or dangerous cargoes within containers. All containers imported to U.S. seaports are scanned through radiation portal monitors (RPM) prior to leaving a marine terminal on trucks or rail cars. Other selected containers are also scanned or manually inspected by U.S. Customs and Border Protection (CBP) based on their assessment of risk or by random selection. The United States Coast Guard (USCG) inspects cargos and containers for compliance with the Federal Hazardous Materials Transportation Law (FHMTL) and the International Safe Container Act of 1977 (ISCA) (46 U.S.C. §80501-80509). Regulations implementing the FHMTL are codified in 49 C.F.R. § 107-180. Regulations implementing the ISCA can be found in 49 C.F.R. § 450-453. The Coast Guard inspects containers of general cargo to ensure hazardous materials are being shipped legally. Undeclared hazardous material shipments are a leading cause of transportation incidents.

The USCG also has responsibility for the Transportation Worker Identification Credential (TWIC) program. The TWIC program was developed following the legislative provision of the Maritime Transportation Security Act (2002, 2010) and the Security and Accountability for Every Port Act of

2006. The TWIC identification card is a tamper-resistant credential that contains biometric information about the holder, rendering the card useless to anyone other than the rightful owner.

VESSEL SAFETY AND SECURITY

The Maritime Transportation Security Act of 2002 (P.L. 107-295) was designed to protect the nation's ports and waterways from terrorist attacks. The basic elements of this legislation were adopted by the International Maritime Organization (IMO) in 2002 as the International Ship and Port Security code (ISPS). There are three important features of these interventions. First is the requirement for an Automated Identity System (AIS) to be fitted on all vessels from 300 gross tonnage and upward. The AIS requires vessels to have a permanently marked and visible identity number, and there must be a record maintained of its flag, port of registry, and address of the registered owner. Second, each port must undertake a security assessment of its assets and facilities, quantifying the effects of damages caused. The port must then evaluate the risks to its physical security, communication systems, and utilities. Lastly, all cargoes destined for the U.S. must receive customs clearance prior to the departure of the ship. It is proposed that biometric identification for seafarers are implemented and that a national database of sailors be maintained.

The ISPS code is being implemented in ports around the world. Without certification, a foreign port would have difficulty in trading with the U.S. Thus, it is becoming a factor in a port's competitiveness. The need to comply with ISPS has become an urgent issue in ports of various cargo volumes around the world. The costs of securing sites, undertaking risk assessments, and monitoring ships all represent an additional cost of doing business without any commercial return. U.S. ports have been able to tap funding from the Department of Homeland Security, but foreign ports must comply or else risk the loss of business. In 2008, legislation in the U.S. required that all containers being shipped to the U.S. undergo screening. Foreign ports will be expected to purchase gamma-ray and x-ray scanners, and undertake screening of all U.S.-bound containers, regardless of the degree of the security threat. This is a further financial and operational cost for foreign ports to comply with. Security has become an additional element in determining competitive advantage.

Land Ports of Entry Freight

BORDER SAFETY AND SECURITY

California and Mexico share over 130 miles of international border. The border is a vital economic gateway for international trade and a key contributor to the economic well-being of both countries. Under the auspices of the Department of Homeland Security, the U.S. Customs and Border Protection (CBP) safeguards the U.S. - Mexico Border. Its top priority is "keeping terrorists and their weapons out of the U.S. while facilitating lawful international travel and trade." Regarding to freight, the CBP's primary responsibility is to "safeguard America's borders thereby protecting the public from dangerous people and materials while enhancing the Nation's global economic competitiveness by enabling legitimate trade and travel."

The CBP creates and implements programs using sophisticated technologies, and trains personnel to help achieve the goals of securing U.S. ports and borders while supporting and expediting trade. Initiated after 9/11, the Free and Secure Trade (FAST) Program is a commercial clearance program for known low-risk shipments entering the U.S. from Mexico and Canada.

FAST allows for expedited processing for commercial carriers who have completed background checks and certain eligibility requirements.

Customs Trade Partnership Against Terrorism (CTPAT) is a voluntary government and business initiative intended to build cooperative relationships that strengthen and improve the overall international supply chain and U.S. border security. Nationwide, there are over 78,000 commercial drivers enrolled in the program and over 10,000 companies worldwide are certified under CTPAT. Free and Secure Trade (FAST) membership, a commercial clearance program for known low-risk shipments entering the United States from Canada and Mexico, is \$50 U.S. or Canadian currency and covers five years. One of the key benefits of enrollment for carriers is access to dedicated lanes in transborder shipments which allow for greater processing speed and overall efficiency. For the U.S., Mexico, and Canada, the program helps to support supply chain security while promoting economic prosperity.

In 2016, the U.S. CPB announced the full implementation of Automated Commercial Environment (ACE). As the platform that enables the United States' Single Window, ACE provides a single, centralized access point for the trade community to connect with CBP and its Partner Government Agencies. ACE is the system of record by which electronic trade transactions are conducted and recorded by CBP. ACE has streamlined collection and improved enforcement. With the ACE cargo processing system, trade transactions are more efficient, standardized, simplified, less costly, and more predictable for importers and exporters.

CBP has also been working to design a government-wide 'trusted trader' partnership program that would integrate CBP's C-TPAT and the Importer Self-Assessment with other U.S. government trusted trader programs. In July 2016, CBP published the draft "Trusted Trader Strategy Framework" whose objective is to co-create a strategy in terms and practice, one which acknowledges the significant commitment of partnership between the U.S. government and trade, in global trade and security. The Trusted Trader framework begins with a foundation of security and continues through current certified membership in C-TPAT baseline of engagement. This Trusted Trader pilot program was announced on June 16, 2014 in Federal Register 79FN13992 and transforms the existing Importer Self-Assessment program into the new Trade Compliance Program, which provides importers and exporters a platform to achieve an integrated partnership for security and compliance. The pilot program has since been continued and expanded. In January 2018, CBP, the Trusted Trader Subcommittee members, and the Trusted Trader Pilot participants met in Long Beach, California.

Freight Transportation Resiliency

"Freight resiliency" is the ability for the freight system to quickly detect, absorb, and recover from disruptions and return to a balanced and synchronized operating environment. These disruptions can range in severity and scale, and from small-scale events with a localized impact (such as a power outage at a distribution center), to large events with far-reaching effects (such as earthquakes, mudslides, or terrorist attacks). The ability of freight mobility to rebound depends on many factors, including: the structure of the specific freight system (manufacturing, shipping, processing, delivery), personnel training, transportation redundancies (such as having multiple options, modes, or routes), time of year, and public and private actions taken to preserve, restore, or unintentionally further disrupt service in case of a disaster or disruption to freight mobility.

In 2022 the Infrastructure Investment and Jobs Act amended Section 70202 of title 49 of the United States Code to improve State Freight Plans to include strategies and goals to decrease the severity of impacts of extreme weather and natural disasters on freight mobility.¹⁷¹ In Section 6.A California's resiliency goals and strategies are identified. These Goals and strategies were developed through the California Freight Advisory Committee and will guide California towards a safe and sustainable freight system.

Resilience in the state's freight system is needed for California to meet its growing needs for efficient freight mobility, as well as to help meet challenges presented by California's changing climate and human threat landscape impacts. Without resiliency, infrastructure will be subjected to faster deterioration due to extreme weather events. The public will be faced with increases in system disruptions, and private enterprises in the California economy may lose competitiveness. The 2018 update to California's Fourth Climate Change Assessment has shown a dramatic shift in California's climate future that will affect people, the natural landscape, and infrastructure. Table 4.3 shows the key findings from the Fourth Climate Change Assessment for statewide climate trends that are expected to occur between 2050 and 2100 and suggestions from the California Freight Resilience Alliance¹⁷². Effects on freight are added to this summary table to illustrate potential outcomes because of these changing climate conditions.

Table 4.3: Key Findings Adapted from California's Fourth Climate Change Assessment to Include Potential Impacts to Freight Systems

Climate Stressor	Future Change	Impacts to Freight
Temperature	By 2100: 5.6°-8.8° increase in daily temperature	Increase in daily temperatures can lead to hotter warehouses and damage to truck tires and engines. Workers will need more protections from overheating (e.g., access to air conditioning, more frequent breaks, and shorter shifts).
Water	By 2050: Water supply from snowpack is projected to decline by two-thirds	Agricultural shortages could arise from the limited water supply, which would change patterns of freight from California's Central Valley to more reliance on food imports from other countries.
Wildfire	By 2100: Average land area burnt will increase by 77%	Road closures from damaged highways could result in freight trucks needing to be rerouted to other highways that may be further away, thus increasing delivery and shipping costs and times.
Sea Level Rise	By 2100: <ul style="list-style-type: none"> - 31%-67% of Southern California beaches may completely erode - \$17.69 billion worth of residential and commercial buildings could be inundated statewide 	Inundation could cause relocation of container yards, commercial buildings, and warehousing, especially those found in coastal areas that have not implemented adaptation measures. Impacts from sea level rise are projected to inhibit operations and accessibility for rail and vehicular facilities at all of California's ports.

	<ul style="list-style-type: none"> - The number of highway miles exposed to coastal flooding will triple 	<p>Flooding of highways will lead to road closures which could affect the trucking industry.</p>
<p>Source: California's Fourth Climate Change Assessment</p>		

The projected changes in California's climate highlight the need for transportation systems to be resilient and quickly regain a balanced and synchronized operating environment despite changing circumstances. System disruptions are almost impossible to predict with accuracy because they can stem from many sources and have many different types of impacts. This highlights the need for the freight system to be flexible and be able to swiftly recover from shocks. **Table 4.4** shows disruption events and possible corresponding freight impacts to illustrate unpredictability the freight system faces.

The wildfires that now occur nearly year-round in California are recent examples highlighting the need for a resilient freight system. From 2017 to 2022 California experienced some of the most devastating fires in its history, whether in terms of acres burned, structures destroyed, or lives lost. These fire events interrupted freight rail and roadway mobility and closed freight-related businesses. The interruptions, though necessary to save lives and speed up emergency crew movements, impede freight movements and shipments of goods, both perishable and shelf stable. The rate of natural disasters is predicted to increase due to California's changing climate.

Table 4.4: Event Types and Possible System Failures

Disruption Source	Event Type	Possible System Failures
<p>Natural Hazards</p>	<p>Wildfires</p>	<ul style="list-style-type: none"> • Damage and loss of electrical grid infrastructure* • Road closures • Damage to transportation and supply chain* infrastructure • Post-Fire Debris Flows* • Evacuations *
	<p>Increased Tornado/Hurricane Strength</p>	<ul style="list-style-type: none"> • Damage and loss of electrical grid infrastructure* • Damaged or destroyed buildings • Inaccessible roads
	<p>Sea Level Rise/Storm Surge</p>	<ul style="list-style-type: none"> • Flooding • Salt water intrusion and corrosion of electronic systems • Damage to rail, highway, seaport, airport infrastructure • Liquification*
	<p>Winter Storm</p>	<ul style="list-style-type: none"> • Road Closures* • Delays in Goods Movement *

	Intense Precipitation	<ul style="list-style-type: none"> • Flooding • Flash Flooding* • Low visibility • Washout of roads and rail substrates
	High Winds	<ul style="list-style-type: none"> • Downed power lines • Vehicles blown off roadways or overturned • Increased threats to bridges • Delays to air freight flights
	Increased Temperatures	<ul style="list-style-type: none"> • Vehicles overheating • Tire blowouts • Rail track expansion and buckling • Thermal expansion of bridge joints
	Cliff Retreat/Coastal Erosion*	<ul style="list-style-type: none"> • Unstable roadways • Inaccessible roads • Loss of connectivity between cities
Geophysical	Tsunamis	<ul style="list-style-type: none"> • Flooding • Saltwater intrusion and corrosion
	Earthquakes and surface rupture	<ul style="list-style-type: none"> • Uneven pavements • Downed powerlines and communications • Liquefaction*
	Sinkholes	<ul style="list-style-type: none"> • Unstable roadways
	Landslides (mass movement)	<ul style="list-style-type: none"> • Inaccessible roads • Debris clogging tunnel passages
	Volcanic Eruptions	<ul style="list-style-type: none"> • Inaccessible roads • Disruption to aviation traffic* • Impacts from Ashfall*
Human Activity	Transportation Accidents	<ul style="list-style-type: none"> • Traffic congestion • Closed roads
	Utility Failures	<ul style="list-style-type: none"> • GPS failures • Telephone failures • Electrical Grid failures • Fuel shortages
	Cyber Attacks	<ul style="list-style-type: none"> • Disrupted distribution operations
	Terrorism/Physical Attacks	<ul style="list-style-type: none"> • Destroyed infrastructure • Closed roads
	Economic Shocks	<ul style="list-style-type: none"> • Disrupted freight operations
	Civil Unrest	<ul style="list-style-type: none"> • Disrupted freight operations

		<ul style="list-style-type: none"> • Inaccessible distribution centers • Closed roads • Goods unable to be sold • Boycotts
	Hazardous Materials	<ul style="list-style-type: none"> • Regional road closures • Impacted Communities • Habitat and environmental disaster
	Nuclear/ Radiological Incidents	<ul style="list-style-type: none"> • Disrupted freight operations • Evacuations • Transportation Infrastructure and utility damages
	Electromagnetic Pulse	<ul style="list-style-type: none"> • Loss of communication networks • Disruption to electric power grids •
	Changes in ordinance and law	<ul style="list-style-type: none"> • Tariffs • Hours of Service • Stay at home orders
<p>Sources: California's Fourth Climate Change Assessment, *California Resiliency Alliance¹⁷³</p>		

The rapid development of e-commerce, economic globalization, just-in-time production, and logistics and supply chain systems over the past decades have led to a significant need for efficient and effective management of freight movements. Businesses and consumers have become increasingly dependent on the freight transport system to deliver their goods on time, because increasingly, far less inventory is stored in regional warehouses and stores. Freight movement in the U.S. has increased dramatically over the past 20 years with relatively little expansion of the highway system during that time. Significantly more freight is being moved on the same relative number of lane miles, which results in increased delays from higher traffic volumes and more maintenance needs on the road network.

Disruptive, weather-related events have increased dramatically over time. Individuals, businesses, industries, and public sector government agencies are not immune to sudden events that disrupt normal daily activities. Trucking companies, rail carriers, infrastructure managers, and terminal and port operators must invest to prevent or mitigate the effects of disasters. Whether attributable to acts of nature, human error, mechanical failure, or intentional disruptions, identification of future threats and plans for the ability to quickly respond to them is needed.

Due to increased goods movement activity, it is imperative for the freight system to be equipped to handle climate, environmental, human, and geophysical events. While it is difficult to predict when an event may occur, it is important for the system, as well as both the public and private sectors, to be prepared for its eventuality. Failure to adapt can be disastrous to individuals, businesses, governments, and the economy.

California's vast geography presents a diverse array of projected climate change impacts including more frequent devastating wildfires, stronger storms that produce more precipitation

leading to more frequent flooding, longer and more severe droughts, rising sea levels, and more extreme high and low temperatures. Understanding where portions of the freight system are projected to experience impacts from climate change will be an essential step for limiting disruptions to freight activity in California. To ensure the safe movement of goods throughout the State, transportation systems will require establishing thoughtful and collaborative adaptation strategies for vulnerable facilities that are essential to freight activity. Facilities in forested areas that are prone to wildfire may consider incorporating defensible space and fire-resistant building materials to prevent damage from wildfire events. Bridges and drainage features must be wide enough to accommodate for higher projected runoff during storms in both urban and rural areas to avoid damage and closures due to flooding. Facilities in mountainous regions may require slope stabilization treatments in areas susceptible to landslides. Freight operations in coastal areas may require actions to protect, accommodate, or retreat inland to avoid significant impacts from sea level rise and storm surge. Adaptation strategies such as these will be integral to maintain a safe and resilient freight transportation system in California.

Two important points should be considered when planning for a resilient freight system:

- A mutual public-private sector understanding of capabilities and expectations is integral to building and supporting a resilient system.
- Cross-sector communication, pre-, during, and post-event is critical to restoring freight flows after a significant disruption.

Importance of Resiliency in Freight

EFFECTS TO A NON-RESILIENT SYSTEM

The impacts to a freight system unprepared for freight network resiliency have far-reaching consequences outside of private industry profit margins. Disruptions in freight movements can mean freight industry workers are unable to reach or perform their jobs, thus experiencing a loss in wages. Agricultural crops can decline in quality or even spoil if trucks are delayed between farms and distribution points. Delays in shipping products to consumers could have disastrous consequences, such as diabetic patients not receiving their insulin shipments on time, or that stores not stocked with goods necessary for helping residents weather a severe storm event.

Local, regional, state, and federal governments can be severely affected fiscally if the freight system is not adequately prepared for a major climate, human, or geophysical event. Ignoring the need for repairs, retrofitting, or adaptation measures could accelerate the failure of vital infrastructure, thereby substantially increasing the costs to repair after an event more than proactively maintaining it.

BENEFITS OF A RESILIENT SYSTEM

A freight system that has been successfully adapted to the projected changes in climate and any subsequent impacts will be better suited to quickly recover from disaster events, thus saving time, money, and lives. Private industries and public agencies can ensure a resilient system by adapting infrastructure to withstand greater shifts in climate. Proactively adapting freight transportation infrastructure to climate change will culminate in a freight system that can better withstand the challenges posed by future climate-driven events.

Public incentives are available to private businesses, such as rebates for installing solar infrastructure, which helps the state more quickly adopt climate adaptation measures, thus increasing California's resilience to energy demands. Solar infrastructure can safeguard a business to ensure refrigeration systems can still run, even in power outages, which will prevent inventory from spoiling. Other public measures, such as increasing funding for elevating bridges over bodies of water to accommodate for higher water levels from increases in precipitation or sea level rise, identifying areas prone to rockslides or mudslides and fortifying the area to protect the roadways and traveling public, or by communicating road closures and openings quickly so that truckers and delivery trucks can get back on their regular routes are examples of ways California can increase resiliency for the freight system.

Accommodating disruptions within the freight transportation system often needs a variety of measures. Reliable freight transportation is a prerequisite for an efficient supply chain. As ground transportation systems have become more congested and less able to accommodate shifting demands, improving resilience of the transportation system itself becomes a priority.

Current Efforts

PRIVATE SECTOR

The Burlington Northern Santa Fe (BNSF) rail line publicly releases its yearly "Corporate Responsibility and Sustainability Report," which outlines the continuing efforts to, "enhance safety, including efforts to reduce energy consumption and carbon emissions with more sustainable operations."¹⁷⁴ As a rail operator that carries more than 40 percent of America's freight and as North America's second largest freight railroad network operating over 32,500 miles of track, BNSF has been striving to ensure its operations are resilient. The largest concern for BNSF is the event of a hazardous waste spill. The company operates under "Common Carriage" responsibilities, meaning that it is required to make reasonable accommodations for the transportation of any hazardous material or commodity. In 2017, BNSF carried over 1.3 million customer hazmat shipments across its network. To reduce the risk of accidents, BNSF uses, "wayside detectors, track inspections, reduced speeds, positive train control, and stronger tank cars." Crude oil and ethanol are among the hazardous materials BNSF transports, and BNSF requires that trains travel no faster than 50 miles per hour (mph), with speeds under 35 mph in areas with 100,000 or greater inhabitants.

Union Pacific Railroad (UPRR), the largest railroad operator in the U.S. after BNSF, is also concerned with the human element of potential disruptions. A 2016 report published by UPRR, the "2016 Building America Report - A Report to Communities on Our Social, Environmental, and Economic Sustainability Progress," addresses a variety of concerns the company faces during its day-to-day operations, such as environmental health, employee and customer safety, and resource management. UPRR, similar to BNSF, is also highly concerned with hazardous material transportation safety. The UPRR report stresses emergency response trainings for first responders, UPRR employees, and volunteers.

By offering paid employee training on safety procedures while transporting hazardous materials, BNSF and UPRR set an example of how private responsibility is taking the lead to benefit public well-being. Employee, volunteer, and first responder training directly increases resiliency in an emergency, because well-organized and orchestrated disaster relief actions can improve responds to events and improve situation assessments. Also, the practice of using new

technology, stronger equipment, and reductions in train speeds reduces the vulnerability of the freight system from accidents that can contribute to spills, destruction of property, injuries, or deaths.

PUBLIC SECTOR

Caltrans has conducted Climate Change Vulnerability Assessments for each of their 12 Districts to learn the extent to which the SHS will be affected by a changing climate by horizon years 2025, 2055, and 2085. These vulnerability assessments explore how rising temperatures, sea level rise, storm surge, and rates of wildfire may impact the SHS. To follow up on the District Vulnerability Assessments, Caltrans has produced 12 Adaptation Priority Reports which further examine the level of vulnerability of individual state transportation assets using an array of exposure and consequence metrics to identify which parts of the SHS represent the highest adaptation priorities in each District. Caltrans is currently beginning the process of updating each of these reports to keep pace with the latest climate science and will broaden the scope beyond the SHS to include rail and transit infrastructure. The outcomes of these vulnerability assessments and adaptation priority reports and any subsequent updates will lead each of the 12 Caltrans districts to develop their own Climate Adaptation Strategy. These strategies are intended to guide decisions to address the vulnerable areas of highways, with the aim to develop and incorporate design changes and other adaptation features that will help protect the SHS and its users from potential climate change impacts.

Additional guidance has also been developed by Caltrans for incorporating climate change considerations into Comprehensive Multimodal Corridor Plans. This guidance, released in early 2022, includes details for a large variety of strategies that District planners should consider to properly address any current or projected climate change impacts through each step of the corridor planning process. Properly accounting for climate change in corridor planning will result in more careful consideration of climate change at vulnerable locations during subsequent phases of planning and project development. This guidance coupled with freight considerations along these routes will improve resilience of freight transportation systems in areas where corridor planning has taken place.

Caltrans has administered the Climate Adaptation Planning Grants for three fiscal years (2017-2020). These grants, totaling \$20 million, are funded through SB 1, a transportation funding bill passed by the California legislature and backed by voters in 2018. Adaptation Planning Grants aim to advance climate planning on California's transportation infrastructure, including roads, railways (public railways that both private and public rail lines use), bikeways, trails, transit lines, bridges, bus terminals, seaports, and airports.

The Climate Adaptation Grants awarded to tribal, regional, and local governments within California are helping communities plan for improvements to their transportation infrastructure in the face of increased extreme heat events, precipitation, drought, storm surges, sea level rise, and wildfires due to climate change. Over 40 planning grants were awarded, empowering communities throughout California to safeguard their transportation systems against disruptions caused by a changing climate. Findings from these plans aid local, regional, and state efforts of increasing climate and system resiliency while decreasing vulnerabilities regardless of source type. These efforts ensure that the freight system (and by extension California's economy), environment, and residents are resilient to any disasters that may disrupt normal life.

A new program was created in the State budget through Senate Bill 198, the Transportation Infrastructure Climate Adaptation Strategy (Planning) Grant Program, which includes a one-time allocation of \$50M for Caltrans to administer additional adaptation planning grants to tribal, regional, and local agencies with a focus on project-level planning. These adaptation planning grants are being included in the Sustainable Transportation Planning Grant Program, and it will include a 10% tribal set-aside and will award 50% of projects to benefit underserved communities. SB 198 also created two capital infrastructure adaptation programs to oversee implementation of the new federal PROTECT Program. The Federal Infrastructure Bill created a new, first of its kind climate adaptation and resilience program, the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program. This program will allocate ~\$631M to California over five years to advance transportation resilience projects.

In 2021, the Infrastructure Investment and Jobs Act amended Section 70202 of title 49 of the United States Code to improve State Freight Plans to include strategies and goals to decrease the severity of impacts of extreme weather and natural disasters on freight mobility.¹⁷⁵ The California Resiliency goals and strategies are identified and can be seen in **Table 4.5**. These Goals and strategies were developed through the California Freight Advisory Committee and will guide California towards a safe and sustainable freight system. Within the IIJA \$8.7 billion of funding went to the Promoting Resilient Operations for Transformative, Efficient and Cost-Saving Transportation (PROTECT) discretionary grant program to assist local agencies to improve the resiliency of on system transportation infrastructure¹⁷⁶. The program will provide federal funding to projects that enhance resiliency to environmental, climate and emergency response vulnerabilities.

In 2020 California Executive Order N-79-20 directed the state to transition to Zero-Emission vehicles by phasing out gasoline powered cars, trucks, and equipment. This order will reduce fossil fuel demand to achieve state emissions goals. By 2045 all new sales of medium and heavy-duty trucks will be required to Zero-emission. This change in the freight transportation system will require future resiliency strategies to include ZEV infrastructure on alternative routes to ensure redundancy.

In response to global disruptions due to the COVID-19 pandemic, Executive Order N-19-21 that will invest \$1.2 Billion for supply chain to support the States Port and freight corridors. CalSTA has guidelines a call for projects that will be a one-time funding for port and freight infrastructure funding. Projects for this funding will directly address sustainable and resilient freight system.

Table 4.5: Safety and Resiliency Goal: Objectives and Strategies

Objective	Strategies
<p>Objective SR-1: Reduce rates of incidents, collisions, fatalities, and serious injuries associated with freight movements</p>	<p>Strategy SR-1-A: Expand the system of truck parking facilities</p> <ul style="list-style-type: none"> Execute the recommendations from the 2020/21 California Truck Parking Study to expand existing public and private sector truck parking facilities and the development of new parking facilities in strategic locations.

	<p>Strategy SR-1-B: Promote public-private partnership for implementation of truck stop and shipping terminal vehicle charging or charge-in-motion</p> <ul style="list-style-type: none"> Support ARB, PUC, and Energy Commission efforts to work with electric utilities, technology providers, truck stops (and NATSO), and freight terminals to employ electric charging terminals along key freight corridors. Likewise, Caltrans should continue to study inductive charging opportunities within its right-of-way. <p>Strategy SR-1-C: Develop design guidelines for truck routes that consider other modes</p> <ul style="list-style-type: none"> Utilizing logistics land use guides, develop a context-sensitive roadway design document that supplements Caltrans' Complete Street Guidance <p>Strategy SR-1D: Prioritize projects that address high-crash, truck involved locations</p> <ul style="list-style-type: none"> Collaborate with California Highway Patrol and use a common set of performance measures to identify commercial vehicle crash hot spots statewide. Use this information to improve State and regional prioritization efforts and to focus safety-related funding efforts.
<p>Objective SR-2: Utilize technology to provide for the resilience and security of the freight transportation system</p>	<p>Strategy SR-2-A: Expand the number and scope of cargo security screenings</p> <ul style="list-style-type: none"> Work with State and Federal homeland security partners to ensure that future transportation design decisions near sea, air, and land ports of entry account future space requirements for cargo screening facilities. <p>Strategy SR-2-B: Ensure consistent and effective safety and security requirements at all California ports</p> <ul style="list-style-type: none"> Ensure consistent and effective safety and security requirements at all California ports Strengthen partnership between State, federal, and private stakeholders to ensure the safe and secure access of goods moving to and from the State's sea, air, and land ports of entry. <p>Strategy SR-2-C: Identify alternate freight routes to maintain freight movement at times of disruption by disaster</p> <ul style="list-style-type: none"> Conduct an alternative routes study to ensure continuity of freight movement during and immediately following a disaster. This study would include bringing critical trade lanes online and ensuring relief materials reach California's residents and businesses. Existing evacuation routes and plans must be integrated into the proposed alternative routes study. <p>Strategy SR-2-D: Support V2V and V2I communication alerts on congestion and safety hazards</p>

	<ul style="list-style-type: none"> • Monitor technological innovations and invest appropriately in V2V and V2I infrastructure that will allow freight users advanced information on congestion, safety hazards, and traffic information (i.e. red light count down, speed limits, etc.). This information can help truck drivers make active choices about how they select their route and how they operate their commercial vehicles. <p>Strategy SR-2-E: Promote technology to support monitoring of truck parking locations and areas where rail traffic commonly stops</p> <ul style="list-style-type: none"> • Increase transportation security and decrease theft by placing cameras and other technologies in truck parking areas and near rail locations where intermodal trains frequently stop. <p>Strategy SR-2-F: Support the creation and development of a freight technology research center to advance research in innovative freight practices and incubate innovations to meet future demand</p> <ul style="list-style-type: none"> • Support the creation of a freight technology research center at the university level, or within a state agency department, to undertake freight related research and development.
<p>Objective SR-3: Develop freight resiliency strategic plan</p>	<p>Strategy SR-3-A: Develop resiliency vision, goals, and objectives</p> <ul style="list-style-type: none"> • Work with agency partners to develop a vision for a resilient freight system. This vision would be supported by goals and a series of objectives. The Freight Resiliency Strategic Plan would focus on identifying future issues as it relates to national disasters, sea-level rise, and the individual resiliency of major trade lanes in California. Collaborate with State, regional, and local agencies to leverage funding opportunities for implementation of climate resiliency work, adaptation plans, climate action plans, and/or master plans to increase resiliency of assets against climate related events. <p>Strategy SR-3-B: Identification of high priority safety concerns, critical infrastructure, and aspects of the State's key supply chains that have resiliency concerns</p> <ul style="list-style-type: none"> • Increase the resiliency of California's key industry supply chains. Identify and prioritize improvements to improve safety and keep business moving – these improvements could include rebuilding, strengthening, or improving facilities.
	<p>Strategy SR-3-C: Incorporate resilience strategies contained in port plans prepared pursuant to coastal commission guidelines</p>
	<ul style="list-style-type: none"> • Work with the State's port authorities to incorporate resiliency strategies as part of Caltrans roadway improvement plans – in particular, assist ports in preparing for increased sea levels.

- Collaborate with partners to develop Vehicle Grid Integration as a resiliency strategy. This capability allows for battery-electric vehicles and other equipment to communicate with the grid when charging, especially in places where trucks are likely to plug-in for extended sessions like truck parking sites. This is also a technology that could promote resiliency for equipment like electric-powered Transport Refrigerator Units, particularly when shore powering at port terminals and warehouses.

Source: Chapter 6A, CFMP 2023

COVID-19 and the Lasting Impacts on California's Supply Chain

Coronavirus Disease 2019 (COVID-19) was arguably the most impactful event for California's freight industry in decades. In March 2020, as COVID-19 cases began to rapidly increase, many businesses, schools, and other civic places began to shut down or limit activities. Yet, California's freight sector kept operating to move goods essential to sustaining life in both California and throughout the United States.

Almost overnight in early March 2020, the California freight sector underwent a dramatic shift. Suddenly, with many schools and businesses closed, and restaurants operated in limited capacity in some areas, Californians became more reliant on grocery stores and goods directly delivered to their place of residence. Prior to the pandemic, many Californians ate meals at schools and restaurants near their place of employment, as well as used supplies at offices and schools. However, with the shift to remote learning and teleworking, the food and supplies used at places of residence dramatically increased. Food products that sometimes were delivered in bulk to restaurants, like cheese, had to be repackaged to meet consumer needs and be placed at grocery stores.¹⁷⁷ Panic buying and changes in where consumers used products led to shortages in goods—for instance—nearly half of all grocery stores in the United States were out of toilet paper on April 19, 2020. The toilet paper shortage was in part due to panic buying, but also due the type of toilet paper typically used at a residence—the toilet paper manufactured for residential use is usually of a higher quality than the bulk toilet paper manufactured for schools and offices.¹⁷⁸ In those early months of the pandemic, warehouses started to rapidly fill with goods that were not being shipped out to businesses that were closed or limited by the pandemic. Non-essential goods like Easter holiday-related supplies were not able to be cleared from warehouses. Meanwhile, there was limited space to store essential goods coming in through California's ports.

In the years following the beginning of the COVID-19 pandemic, California saw record volumes of TEUs at ports¹⁷⁹, heavily driven by the return of empty containers to Asia.

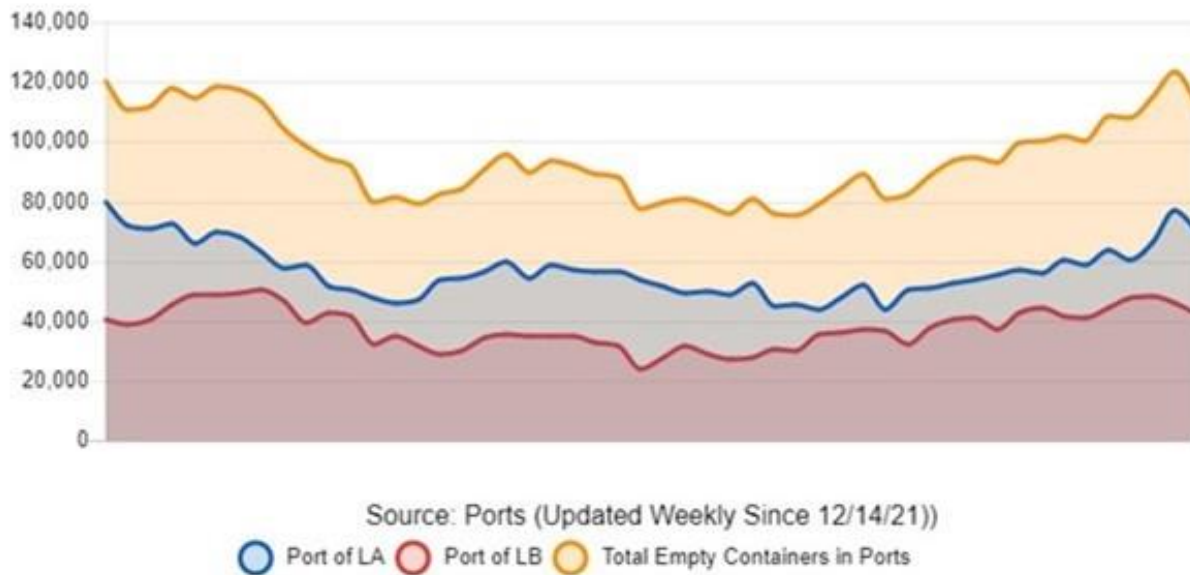


Figure 4.18: Empty Container Tracker

Congestion reached all-time levels at the ports, and ships at anchor or loitering reached all-time high levels at the San Pedro Port Complex and the Port of Oakland.¹⁸⁰ This was driven by several factors including, increase in demand for consumer goods (especially e-commerce, accelerating an already increasing year-over-year growth in e-commerce), decline in consumer traveling expenditures, home improvements to accommodate teleworking and virtual schooling, record consumer debt, government stimulus checks, lack of available workers in sectors of the freight industry, and demand for essential goods needed to combat and protect against COVID-19.¹⁸¹ Consumer packaged goods—goods that are packaged for purchase at places like grocery stores—saw a 19% increase in demand in 2020 compared to 2019.¹⁸² This demand for consumer goods sent shipping rates to record levels. This also meant that the prices for goods and materials also soared as demand outpaced the ability to produce and ship supply.

On November 16, 2021, San Pedro Bay saw an all-time high of 86 ocean-going container vessels at anchor or loitering in/near the Bay. CARB documented the air quality impacts of having these large vessels parked in the Bay,¹⁸³ but there are also other concerns of having ships anchoring or loitering in the Bay, including impacts to coastal aquatic habitat and animals (such as whale strikes by ocean-going vessels), and potential safety concerns by having so many vessels within the Department of Defense missile test ranges. In mid-November 2021, the Ports of Los Angeles, Long Beach, and Oakland and their partners implemented the Pacific Maritime Management Services (PacMMS) that established a queuing system for ocean-going container vessels to remain outside the boundaries of a Safety and Air Quality Area (SAQA) off the coast of California until a berth is available at a port.¹⁸⁴ This allows vessels to slow-steam in the Pacific Ocean, potentially reducing fuel consumption and emissions, without losing its spot in the queue for a berth at a port terminal. With PacMMS in place, the Marine Exchange of Southern California reported that the number of ships at anchor or loitering in San Pedro Bay dropped to 12 on January 9, 2022 despite 109 vessels expected to have made it to the Bay by that day (with

97 vessels in queue). This late 2021- early 2022 surge in demand was driven by some of the same factors as the rest of the pandemic but was also driven by beneficial cargo owners and businesses wanting to ensure they received their goods from overseas markets in time for when they were most needed. The timing concerns resulted from prior pandemic-induced supply chain congestion experiences, as well as the fear of work stoppage during labor contract negotiations between the ILWU and PMA.¹⁸⁵

The rush to move goods across the Pacific to California put enormous strain on an already stressed supply chain. Warehouses in Southern California reached a 0.6% vacancy rate.¹⁸⁶ Inbound containers were left at the ports for long periods of time, creating space constraints and inefficiencies in port operations.¹⁸⁷ Containers were left on chassis on streets (including residential streets).¹⁸⁸ Containers were stacked anywhere they could be supported and monitored. Chassis and containers became in short supply.¹⁸⁹ In some cases, the demand for empty containers in Asian markets became so great that it made more financial sense for carriers to send back containers empty than with American exports. And several carriers began to skip calls to Oakland and other West Coast ports to only focus on the San Pedro Bay ports—especially impactful to California's agricultural markets that relied on exports and imports through the Port of Oakland.¹⁹⁰

Shipments by rail were also impacted. Class I Railroads had reduced workforce leading up to the pandemic and during the early months of the pandemic. With the growth in consumer demand, the railroads were not able to match the workforce needs of clients during some months of the pandemic.¹⁹¹ While hiring began to ramp up, inland railyards began to run out of space to store goods as warehouses and other freight facilities in key destinations such as Chicago, Dallas, St. Louis, and Kansas City were also near capacity.¹⁹² This resulted in rail-bound cargo at the San Pedro Bay ports destined for inland intermodal facilities (also known as IPI - Inland or Interior Point Intermodal) dwelling for more than 16 days on average during some months.¹⁹³

As record number of TEUs flow through the ports to inland destinations, eventually the containers are returned to the ports, often empty. The large number of empty containers stored at the ports create space concerns and inefficiencies as well.¹⁹⁴

As negotiations between ILWU and PMA extended into 2023, California has appeared to lose market share to East and Gulf Coast ports. The East and Gulf Coasts ports also experienced greater levels of congestion and vessels anchoring off the coasts, likely due to vessels skipping calls to the West Coast.

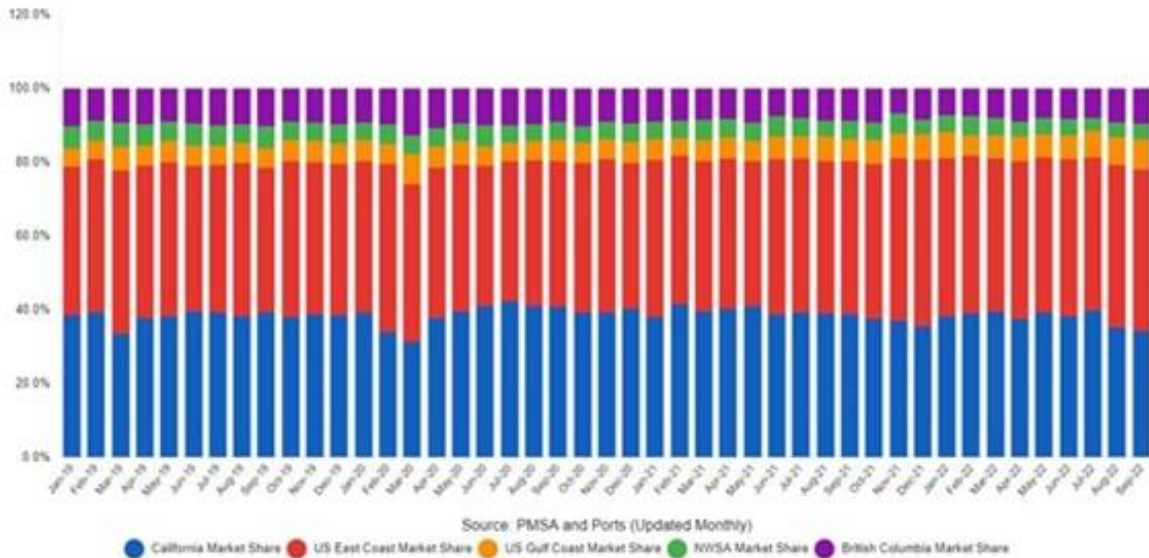


Figure 4.19: Inbound Loaded TEU Market Share USA & Canada Ports

The pandemic highlighted just how critical California's freight industry is to supply the goods of the nation. The movement of goods has often been viewed as "invisible," in that when consumers purchase something, they are likely not aware of the complex journey it likely took for a good to be manufactured, packaged, and shipped to a store or place of residence. The COVID-19 pandemic heightened the public awareness of the supply chain due to the lack of available goods like sanitizing wipes, toilet paper, meat, and semiconductor chips (creating new motorized vehicle supply shortages).¹⁹⁵ This helped lead to historical investments in the supply chain and freight infrastructure at the state and federal level. The pandemic also showed that there can be a high societal cost for keeping the economy moving during uncertain times, as several workers supporting the movement of goods through California lost their lives during the pandemic. The Pacific Maritime Association reported that 13 longshore workers at the Ports of Los Angeles and Long Beach alone died through January 2021 in the first year of the pandemic.¹⁹⁶ The lessons learned developing health and safety protocols for freight workers during the COVID-19 pandemic will be vital for keeping workers safe in future outbreaks.

ACTIONS THE STATE OF CALIFORNIA TOOK TO ADDRESS COVID-19 SUPPLY CHAIN ISSUES

In June 2022, the California State Legislature enacted Governor Newsom's Port and Freight Infrastructure \$1.2 billion budget proposal through Senate Bill 198 (SB 198; Chapter 71, Statutes of 2022), which also provided policy direction for CalSTA to implement the Port and Freight Infrastructure Program. The program seeks to improve the capacity, safety, efficiency, and resilience of goods movement to, from and through California's maritime ports, while also reducing greenhouse gas emissions and harmful impacts to communities adjacent to the corridors and facilities used for goods movement.

The State of California also took several other actions to try and combat COVID-19's impact on the supply chain. In the early days of the pandemic, Governor Newsom signed EO N-52-20 that temporarily suspended restrictions of selling of commercial food at the state's rest areas to

increase the number of convenient food options available to truck drivers.¹⁹⁷ Governor Newsom also signed EO N-19-21 which aimed to strengthen the resilience of California's and the nation's supply chain. Several notable actions took place since the signing of EO N-19-21, including:

- Caltrans temporarily increased the maximum allowable gross vehicle weight on non-federal roadways in order to facilitate a greater number of goods moving from ports to freight facilities.¹⁹⁸
- A few state agencies identified underused or excess land to allow for the temporary storage of shipping containers. The Department of General Services signed a lease with Chunker, the national warehouse marketplace, at six sites for one year, with an option for a second year. The state lands can support up to 20,000 shipping containers.¹⁹⁹
- Caltrans also signed short-term leases with private entities that authorized storage of containers on excess Caltrans lands around Southern California that is estimated to be able to hold over 800 shipping containers.
- CalSTA and U.S. DOT signed the Emerging Projects Agreement, a strategic partnership for up to \$5 billion in loan financing to advance a comprehensive, statewide portfolio of freight, goods movement, and supply chain resiliency projects.²⁰⁰
- The Department of Motor Vehicles doubled their capacity to conduct commercial driving tests to help combat a national shortage of workers.
- The California Department of Food and Agriculture (CDFA), in partnership with the U.S. Department of Agriculture, established a 22-acre pop-up container yard to assist agricultural exporters in storing goods and transferring them into containers.
- CalSTA, Caltrans, and the Federal Railroad Administration initiated the Supporting Environmental and Community Advancement and National Security (SEACANS) Program in partnership with other regional, state, and federal partners. Southern California's RTPs estimate a total funding need of over \$800 billion over the next 20 years, far exceeding what funding is available in the short term. SEACANS seeks to improve Southern California's multimodal freight network and support a more fluid supply chain beginning at the seaports and extending into the interior of the nation, with an emphasis on optimizing freight rail for inland import/export movements. With rigorous technical analysis and regular coordination amongst stakeholders, the state can seize a generational opportunity to leverage available capital funding dollars and design for the freight network growth Southern California needs for the 21st century.

CALIFORNIA SUPPLY CHAIN SUCCESS INITIATIVE

With the many supply chain challenges faced during pandemic, GO-Biz, CalSTA, POLB, POLA, the Port of Oakland, CDFA, and the Center for International Trade and Transportation (CITT) at California State University, Long Beach (CSULB) collaborated to bring together participants from various sectors of the supply chain and government to identify key issues and agree on practical short-term solutions that can lead to long-term, sustainable progress. Dubbed the California Supply Chain SUCCESS Initiative, this collaboration began in the summer of 2021 and contained four key focus components: a background report that looked at "how did we get here," a social media campaign sharing valuable knowledge about the supply chain, a virtual workshop, and small group roundtable gatherings of key supply chain leaders.²⁰¹ Some of the needs identified by the Initiative included:

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 - Increased supply chain data visibility
 - Establishment of a state or federal level representative/coordinating body for the California supply chain

- Address barriers at intermodal facilities to efficient cargo flows
- Investments in systems, workforce development, equipment, and infrastructure to help meet demand
- Expanded hours of operation at port terminals, warehousing, and railways
- Expansion of storage and buffer locations for temporary storage spaces on unused land
- Address market failures and rewards for industry inefficiencies

California agencies will continue to collaborate over the coming months and years to implement the recommendations of the Initiative.

LESSONS LEARNED FROM THE COVID-19 PANDEMIC

There were countless lessons learned for California's freight industry over the course of the pandemic. A few of the key lessons include:

- **On-Site Infection Testing, Personal Protective Equipment (PPE) and Sanitizing Materials** – On-site testing centers at freight facilities were critical in stopping outbreaks. Large supplies of PPE and sanitizing materials such as masks, gloves, face shields, disinfecting wipes and spray, hand sanitizer, and washing stations likely saved dozens of lives of freight workers in California. Early recognition of PPE and sanitizing materials needed for freight workers to safely keep working is essential to keep freight moving during a pandemic.
- **Vaccination Protocols and Clinics for Freight Workers** – Freight workers were among the first to be prioritized for vaccination. Having protocols that allow for early vaccination of freight workers is critical to keep goods flowing during future pandemics. Having vaccination clinics at major freight facilities is also essential to ensure vaccines are distributed quickly and efficiently.
- **New Ocean-Going Vessel Queuing System to Improve Safety and Air Quality** – The PacMMS queuing system cut down on vessel emissions in Southern California and the Bay Area, allowed for slow-steaming vessels, helped reduce the probability of whale strikes and other negative impacts on the coastal environment, and kept vessels out of the range of missile testing.
- **Underused Government Lands Used to Help Keep Goods Moving** – If government agencies sign temporarily leases with private entities to store containers, it can help improve cargo throughput at ports and nearby freight facilities by freeing up space at ports and warehouses and increasing the availability of chassis. Impacts to nearby communities should be carefully considered before signing agreements.
- **Potential Institution of a Fee for Long-Dwelling Containers at Ports** – The threat of fees per each container dwelling more than six days at the Ports of Long Beach and Los Angeles resulted in a significant drop in loaded containers dwelling at the ports.²⁰² While there can be other societal implications of assessing a fee, the threat of fees was enough to reduce containers from stacking up and lead to greater port efficiencies.
- **Domestic Manufacturing of Necessary Freight Equipment** – The surge in demand for cargo highlighted a need to have a ready-to-serve domestic stockpile of containers and chassis. Relying on foreign-sourced supply resulted in container and chassis shortages that led to greater inefficiencies in the supply chain and increased costs for shipping. This is especially critical at wheeled terminals where containers are put on chassis and moved by yard hostlers and left in parking spots for trucks to move out.²⁰³
- **Flexibility in the Packaging and Supply of Goods in Emergency Situations** – Packaging should be considered in freight resiliency planning. While we may not see a large-scale