

Planning/Policy/ Programming

August 2025

Project Title: California Multimodal
Supply Chain Resilience

Task Number: 4476

Start Date: August 01, 2025

Completion Date: December 31,
2026

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California Multimodal Supply Chain Resilience Analysis

Data-Driven Methodology to Enhance California Freight Resilience and Reduce Supply Chain Vulnerability to Climate Hazards.

WHAT IS THE NEED?

The freight system and supply chains are essential to economic growth and societal well-being by enabling the efficient movement of goods. However, they face increasing disruptions from geopolitical events, pandemics, natural disasters, and shifts in commerce causing significant economic and social impacts like job losses, material shortages, increased prices, and delivery delays. Globally, over 56% of companies experience supply chain disruptions annually. In the U.S., natural disasters caused \$1.2 trillion in damages between 1980 and 2022. This figure reflects overall impacts and contributes to the closure of up to 60% of affected small businesses.

Given these risks, there is a pressing need to build freight resilience and the capacity to prepare for, withstand, and recover from disruptions. This project seeks to develop a methodology to assess the vulnerability of California's freight systems and supply chains and identify strategies to improve resilience, particularly in light of climate change and its disproportionate impacts on vulnerable communities.

WHAT ARE WE DOING?

The project presents a comprehensive, data-driven approach for identifying high-risk freight corridors, assessing vulnerabilities from natural hazards, and modeling resilient alternatives for truck freight movement across California. Built on a foundation of prior research, the methodology integrates advanced freight flow modeling, spatial analysis, and risk assessment tools, such as the National Risk Index (NRI) and a revised Standardized Spatial Risk Index (SSRI), to assess infrastructure exposure to hazards like wildfires, earthquakes, and floods. This multi-layered approach also factors in environmental justice by incorporating community vulnerability data from



DRISI provides solutions and knowledge that improves California's transportation system.

CalEnviroScreen.

The project is organized into a series of coordinated activities that begin with ongoing management and documentation efforts, including regular meetings to track progress, address emerging issues, and ensure effective communication with the California Department of Transportation (Caltrans). A core component involves developing and implementing a methodology to identify critical freight infrastructure and assess risks from various natural hazards. This includes mapping freight flows using diverse data sources, evaluating infrastructure vulnerability, and identifying high-risk corridors and the communities most susceptible to disruptions.

Building on this foundation, the next phase involves conducting scenario-based analyses to understand the impacts of potential disruptions and evaluate the redundancy of the freight network. This enables the identification of low-risk alternative routes and the prioritization of mitigation strategies. The findings from these analyses are then compiled into a final report, which includes recommendations for enhancing freight system resilience. To ensure transparency and stakeholder engagement, the project also includes public dissemination through a webinar.

WHAT IS OUR GOAL?

The project aims to help Caltrans develop a Strategic Freight Resilience Plan by identifying vulnerable freight infrastructure, assessing climate risks, and proposing mitigation strategies. It uses data-driven analysis to model safer routes and improve community resilience, building on the research team's past work in supply chain and infrastructure resilience.

WHAT IS THE BENEFIT?

The project will help Caltrans prioritize investments and mitigation efforts to protect critical freight routes from natural hazards, reducing supply chain disruptions. It will improve the state's ability to

maintain goods movement during emergencies, benefiting the economy and vulnerable communities. Overall, it supports a safer, more reliable, and resilient freight transportation network.

WHAT IS THE PROGRESS TO DATE?

The contract with the research team has been fully executed, and the project officially began on August 1, 2025.