



Caltrans Division of Research,  
Innovation and System Information

# Research



# Results

Planning/ Policy  
&  
Programming

## Spatial Dynamics of Warehousing and Distribution in California (METRANS)

To provide information on warehouse and distribution trends and provide the basis for predicting future trends, as well as for examining impacts of these trends.

### WHAT WAS THE NEED?

Population and economic growth, shifting supply chains and distribution practices, economies of scale in warehousing, and California's role in international trade are affecting the growth and spatial patterns of warehousing and distribution (W and D) activities.

### WHAT WAS OUR GOAL?

The goal of this research was to document and analyze the location patterns of warehousing and distribution activities in California.

### WHAT DID WE DO?

This research was conducted in two parts. First, the contractor conducted a descriptive analysis of W and D trends from 2003 - 2013 using Zip Code Business Pattern data, documenting changes in the number of W and Ds, comparing changes within and outside metropolitan areas, and across regions of the state. The contractor then examined changes in the extent of clustering at varying geographic scales and considered W and D spatial trends in the context of larger population and employment trends.

The second part of the research examined possible explanatory factors associated with W and D location trends, including population and employment density, access to major import/export nodes, transport facilities, or markets, demand for larger facilities, or changes in the structure of supply chains. The contractor then estimated cross section and longitudinal models to test relationships between explanatory factors and W and D locations.

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**Project Title:**

Spatial Dynamics of Warehousing and Distribution in California

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**Task Manager:**

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

## WHAT WAS THE OUTCOME?

The research led to the following more general observations. First, warehouse location patterns overall are quite stable. W and D locations are largely a function of the population and employment distribution. Just as California's population and jobs are concentrated in a few very large metro areas, so are W and D activities.

At the same time, there were some hints of spillover effects from Los Angeles and San Francisco, including decentralization of W and D employment within these metro areas.

Second, explanatory factors associated with W and D locations are consistent with the industry location literature. Employment density, proxy for land price and land scarcity is consistently significant, as is measure of labor force access.

Although W and Ds locate further from seaports and airports, this is largely a function of the geography of California's big metro areas. All metro areas, but one have seaports and airports located in the urban core. These findings are consistent with the literature for intermodal terminals and highway access. The presence of linked industries (transportation, manufacturing, and wholesale trade) have mixed effects, but seems to be more important for mid-size metro areas.

Finally, the models' results provided further evidence that the overall pattern of W and D activities to be quite stable. Absent major external shocks, W and Ds will remain concentrated in the largest metro areas, and those in less populated areas will continue to cluster around high access nodes of the highway network.

## WHAT IS THE BENEFIT?

The benefit of this study to Caltrans is two-fold. First, W and D centers are major truck traffic generators. If location patterns shift over time, associated truck travel demand will also shift, affecting the highway system. Second, factors affecting W and D locations suggest fewer, but larger scale operations, located further from population centers. More concentration implies greater localized impacts, while decentralized locations may imply more truck traffic and truck Vehicle Miles Traveled (VMT). In summary, this study provides a comprehensive analysis of the underlying dynamics of truck demand so that the appropriate Department plans, and policies can be developed which addresses these factors.

## LEARN MORE

<https://www.metrans.org/sites/default/files/researchproject/Spatial%20Dynamics%20of%20Warehousing%20and%20Distribution%20in%20California.pdf>

## IMAGE

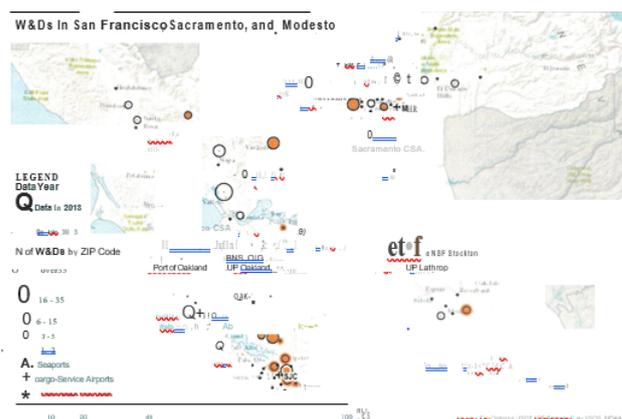


Image 1: Distribution of W and Ds in 2003 and 2013 in San Francisco, Sacramento and Modesto