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Project Title:

Warehousing and Distribution Center Facilities in Southern California: The Use of The Commodity Flow Survey Microdata to Identify Logistics Sprawl and Freight Generation Patterns

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Warehousing and Distribution Center Facilities in Southern California: The Use of The Commodity Flow Survey Microdata to Identify Logistics Sprawl and Freight Generation Patterns

Assessing how warehousing and distribution facilities contribute to land use changes and the decentralization of goods movement centers.

WHAT WAS THE NEED?

The impacts of the freight system include its link to the economy and quality of life. It is imperative that public and private efforts are invested to achieve a more sustainable system that maximizes its efficiency while minimizing the negative effects. Balancing these factors is complicated by the complexity of the system, lack of supporting knowledge and data, and appropriate decision support tools (e.g., models, planning guidelines).

Studying warehouses and distribution centers is important to improve the freight system because: 1) they are fundamental to goods movements, especially after the changes in logistics process experienced in the last few decades; 2) this sector has grown very rapidly in recent years; 3) modern distribution centers are very large facilities with sizes exceeding 500,000 square feet; 4) due to the large freight volumes handled, they generate (produce and attract) a large number of consolidated freight trips; and 5) low freight costs have allowed them to move away from the markets they serve, finding the required land without paying a premium. To this effect, this project intends to fill a gap by analyzing the freight patterns of one of the key economic agents of the freight transportation system: warehouses and distribution centers.



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WHAT WAS OUR GOAL?

The goal of this study is to provide Caltrans with a greater understanding of the complexity of the goods movement system in Southern California and in turn, assist the Department in more specifically assessing how warehousing and distribution facilities contribute to land use changes and the decentralization of goods movement centers, which can contribute to increases in vehicle miles traveled (VMT) and associated impacts.

WHAT DID WE DO?

Understanding freight patterns of warehouses and distributions centers benefits, directly and indirectly, all planning stakeholders in the State and Region. The following list describes the tasks developed as part of the study:

Task 1: Literature review. The team conducted a comprehensive literature review in two fronts: 1) warehousing and distribution centers freight activities in the Southern California Region; and 2) modeling techniques to assess logistics sprawl, and spatial and temporal effects.

Task 2: Data collection, gathering and assembly. During this task the research team gathered information such as land use and establishment data and acquired additional information from data aggregators to complement that available to the team. The team also identified important factors to be included during the modeling efforts. The team designed a survey instrument and surveyed (mail-out) a sample of warehouses and distribution centers in Southern California.

Task 3: Freight and spatial modeling. The team conducted spatial regression, and econometric modeling to: assess the logistics sprawl phenomenon; identify the factors that contribute to the location of facilities in specific areas; and, characterize the probabilistic distribution

of shipment distances from warehouse and distribution center facilities in Southern California.

Task 4: Analysis of results. The team analyzed the impacts of the results for the improvement of the CFS and related products data collection for the Census Bureau and identified the policy and planning implications of the research results.

Task 5: Reporting. The team produced a final report with the research findings. Conducted presentation of the results and wrote a journal article that will be published at the Transportation Research Record: Journal of the Transportation Research Board.

WHAT WAS THE OUTCOME?

In general, the results of this research are consistent with previous studies about the presence of logistics sprawl for Warehouses & Distribution Centers (W&DCs) in Southern California. However, the empirical evidence and modeling results suggest that:

- The deconsolidation trend did not continue after 2007-2008.
- W&DCs sub-industries (General Warehousing and Storage, Refrigerated Warehousing and Storage, Farm Product Warehousing and Storage, and other Warehousing and Storage) exhibit distinct geographic concentration and temporal patterns.
 - Changes in spatial location of the weighted geometric center.
 - The Gini coefficient for the W&DC industry (NAICS 493) is at around 0.4, while the sub-industries show concentration coefficients of less than 0.15.
- This trend could be the result of new logistics needs such as:
 - Trying to serve the markets in shorter delivery times; because disruptions in the industry after the 2008-2009 crisis; and,
 - Policy and environmental implications; and/or land value and availability.

- The survey responses offer some insights as respondents identified the economic crisis to be the factor with the highest negative impact to their operation, as well as the regulatory frameworks in the area.
- If the on-demand economy continues to grow, and express and rush distribution strategies become the norm:
 - More logistics facilities will be located within dense areas, as opposed to the deconcentrating effect characteristic of logistics sprawl.
- The average distance from the (weighted center) facilities to the Los Angeles Central Business District has dropped from 56.52 miles in 2012 to 33.9 miles in 2016.
- Still, the location of facilities is determined by variables such as access to highway and intermodal facility networks.
- Logistics clusters benefit from the services offered between industries.

The results of this research can help in the design and implementation of Local Freight Plans to be consistent with Sustainable Communities Strategies to improve the economic, social, and environmental conditions in those regions. This will also contribute to the efforts to implement the recently launched California Sustainable Freight Action Plan.

WHAT IS THE BENEFIT?

The research provides the State with planning tools (econometric and statistical models) to monitor and forecast the freight movements associated with warehouse and distribution center facilities. Exploring the distribution patterns of these facilities over time and the spatial concentration and temporal patterns of freight activity in Southern California serves as an indication of the expected trends in other locations such as the San Joaquin Valley.

The results can also help the State and planning organizations in the implementation and development of the sustainable freight policy. The models allow estimating the freight movements associated with these facilities and enhance modeling capabilities of various stakeholders.

LEARN MORE

<https://ncst.ucdavis.edu/wp-content/uploads/2015/08/NCST-Caltrans-Jaller-Warehouse-and-Distribution-Logistics-Sprawl-FINAL-July-19-2017.pdf>

IMAGE

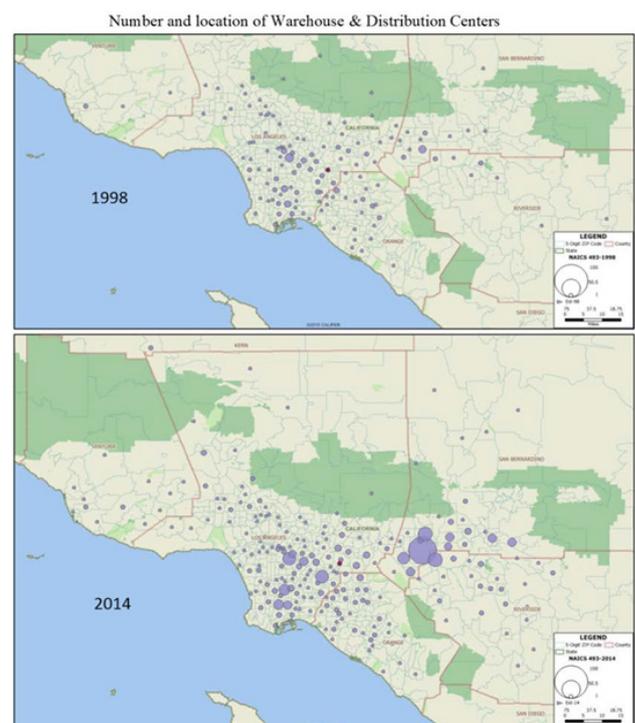


Image 1: Number and location of Warehouse & Distribution Centers