



CALTRANS DIVISION OF RESEARCH,
INNOVATION AND SYSTEM INFORMATION

Research Results

Planning, Policy
and
Programming

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Project Title:

Coping with the Rise of
E-Commerce Generated Home
Deliveries Through Innovative Last
Mile Technologies and Strategies

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Coping with the Rise of E-Commerce Generated Home Deliveries Through Innovative Last Mile Technologies and Strategies

Developing a Vehicle Routing and Facility Location Model to
Evaluate Various Last-Mile Strategies and Technologies.

WHAT WAS THE NEED?

To keep up with the growing demands of e-commerce, last mile companies and academics have developed, evaluated, tested, and implemented various last-mile strategies around the world. These include the use of consolidation (e.g., urban consolidation centers, staging areas, delivery hubs) facilities and/or collection strategies (e.g., lockers, pick-up and drop-off centers) coupled with the use of Alternative fuel Delivery Robots (ADRs) and Unmanned Aerial Vehicles (UAVs or drones), and the use of new delivery services (e.g., crowd shipping).

The literature has mostly focused, however, on studying such strategies independently. Research is still needed to understand how these strategies could work under an integrated system.

WHAT WAS OUR GOAL?

We developed a Vehicle Routing and Facility Location model to evaluate last-mile strategies/technologies.

WHAT DID WE DO?

This project aimed to connect space and time decisions to the assessment of different strategies and technologies to quantify traffic impacts over the road network, changes in vehicle-miles-traveled displaced by drones, ADRs, or bikes and greenhouse gas emissions.



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California's transportation system

WHAT WAS THE OUTCOME?

The results suggested that last-mile deliveries using a fleet of electric delivery trucks can make urban freight economically viable, environmentally efficient, and socially equitable compared to diesel trucks. This study also found consolidation facilities and light duty delivery vehicles to be less cost-effective and less resistant to demand uncertainty than other distribution strategies. Finally, the use of ADR and drones from delivery vans saw significant advantages over other strategies.

WHAT IS THE BENEFIT?

The findings provide insights to the Caltrans Offices of Freight and Multi-Modal Planning, as well as the Research and Modeling Branches, and are consistent with the California Freight Mobility Plan, the California Transportation Plan (2050), and other important efforts that seek to move goods more effectively and efficiently. These findings also provide insights for e-commerce retailers looking to optimize their last-mile distribution operations and balance sustainability and reliability to cater to a market demanding increasingly customer-focused services.

LEARN MORE

For more details, see the attached report.
<https://escholarship.org/uc/item/5t76x0kh>

IMAGES

