



The Role of Urban Goods in Sustainable Transportation Systems

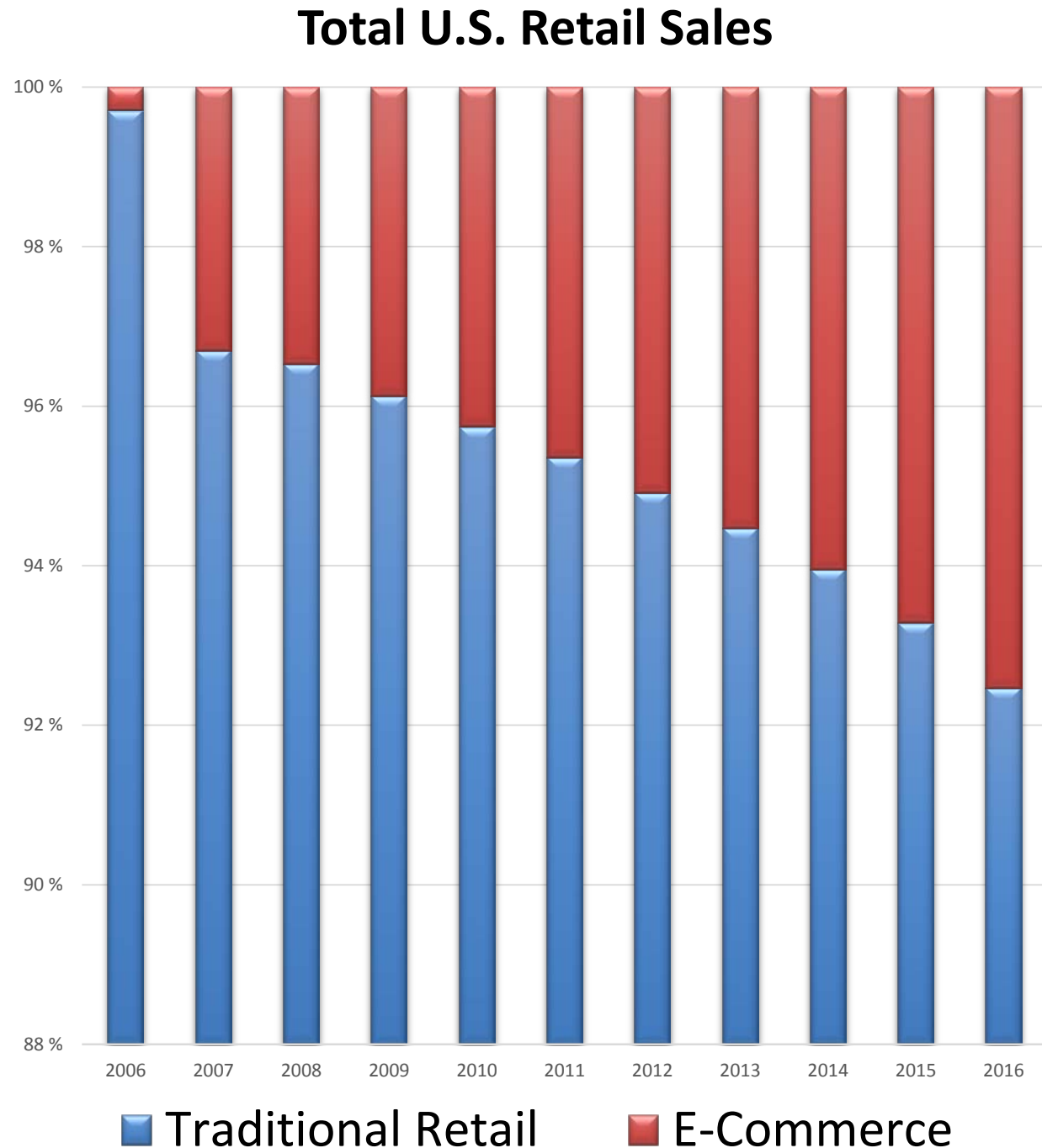
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How is e-commerce changing cities?



Seattle E-Commerce

- Amazon employs 40,000 people in Seattle
- 19% of all prime office space, the most for any employer in a major US City, in fact twice as large
- Home to United Parcel Service, Microsoft
- Offices of Alibaba, Facebook, Google, Uber, AirBnB

Amazon's Test Bed





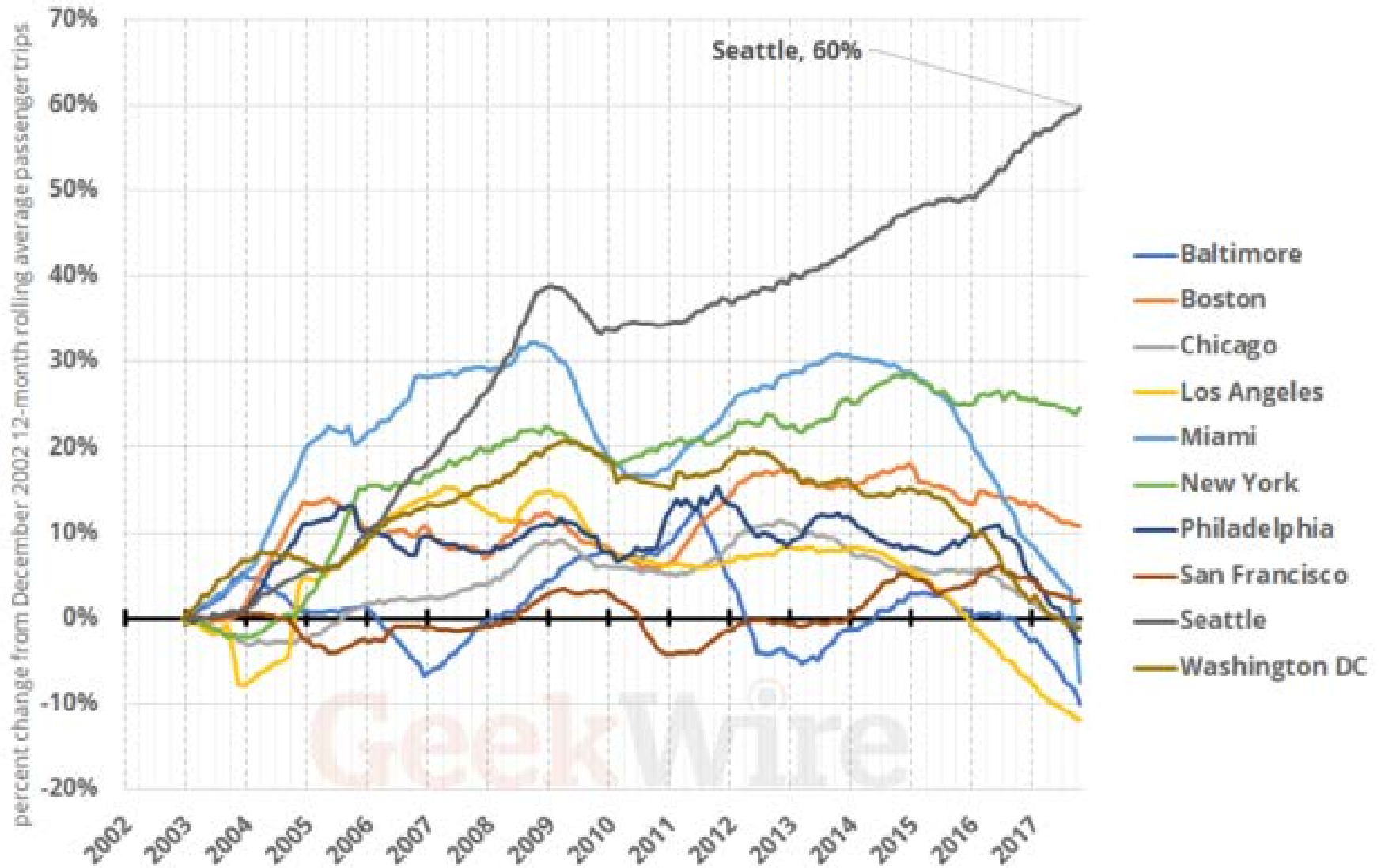
Washington's Growth Management Act

- Goal Statement: The Urban Growth Area accommodates growth consistent with the Regional Growth Strategy and growth targets through land use patterns and practices that create vibrant, healthy, and sustainable communities.
- Decrease greenhouse gas emissions through land use strategies that promote a mix of housing, employment, and services at densities sufficient to promote walking, bicycling, transit, and other alternatives to auto travel.
- Add 86,000 residences between 2006 and 2031, and 146,700 jobs

Investing in Bike Infrastructure



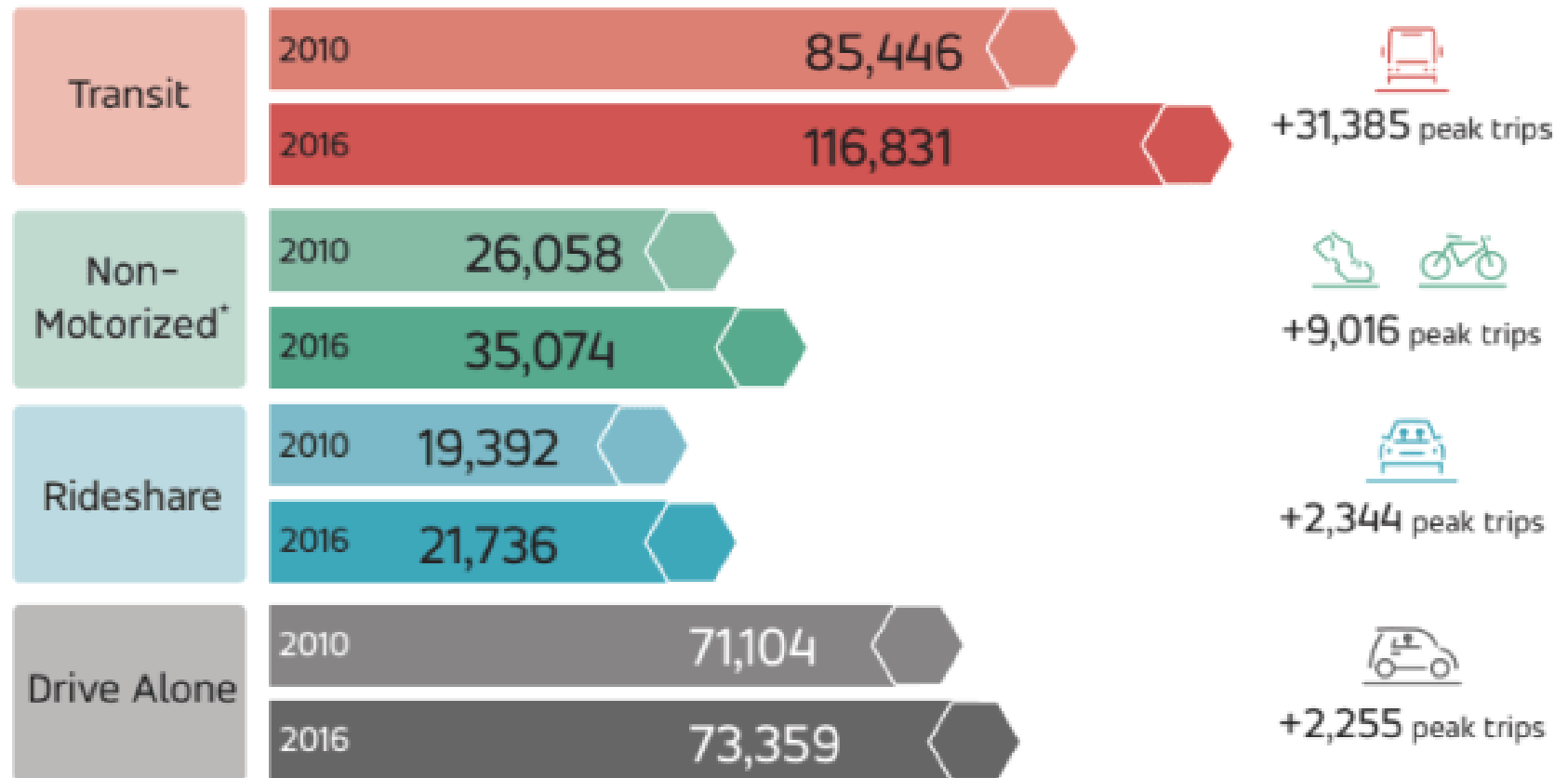
Change in Bus + Rail Ridership



data via Federal Transit Administration's National Transit Database - <https://www.transit.dot.gov/ntd>

Mode Share 2010-2016

Downtown Daily Commute Trends



* Non-motorized commuters consists of walk, bike, telework, and flex schedule

Seattle Climate Action Plan

- Reduce GHG emissions in the passenger transportation and building energy sectors by 62% by 2030
- Reach Zero Net Greenhouse Gas (GHG) Emissions by 2050
- Prepare for the likely impacts of climate change
 - Develop a Freight Master Plan that includes goals to make freight movement more efficient and reduce its impact on greenhouse gas emissions.
 - Waste reduction, compost, recycling

The Urban Freight Lab

- Members of the Urban Freight Lab at UW, in partnership with the City of Seattle Department of Transportation, are using a systems engineering approach to solve delivery problems that overlap cities' and businesses' spheres of control.
- The Urban Freight Lab is a living laboratory where potential solutions are generated, evaluated, and pilot-tested inside urban towers and on city streets.
- Members of the Urban Freight Lab fund the Lab and dedicate senior executives' time to it.
 - Charlie's Produce
 - Costco Wholesale
 - Nordstrom
 - UPS
 - USPS

Cities struggling



Thousands of customers in just one building



Photos by UW SCTL Center

Final Fifty Feet Research Project

The final 50' of the urban delivery system:

- Begins at the city-owned Commercial Vehicle Load Zone (CVLZ) or alley,
- Or in a privately-owned building's loading bay or dock, and
- Ends wherever the owner takes receipt of goods.



Photo by University of Washington

Final 50' Research Project Goal #1

Reduce dwell time, the time a truck is parked in a load/unload space.

Public and private benefits include:

- Lower costs for delivery firms, and therefore potentially lower costs for their customers;
- More efficient use of truck load/unload spaces creates more capacity without building additional spaces; and
- Room for other vehicles to move through alleys.



Final 50' Goal #2

Reduce failed first deliveries to:

- Improve urban online shoppers' experiences and protect retailers' brands;
- Lower traffic congestion in cities, as delivery trucks could make up to 15% fewer trips while still completing the same number of deliveries;
- Cut costs for the retail sector and logistics firms;
- Cut crime and provide a safer environment;
- Ensure that all city neighborhoods can receive online orders, not just a few.



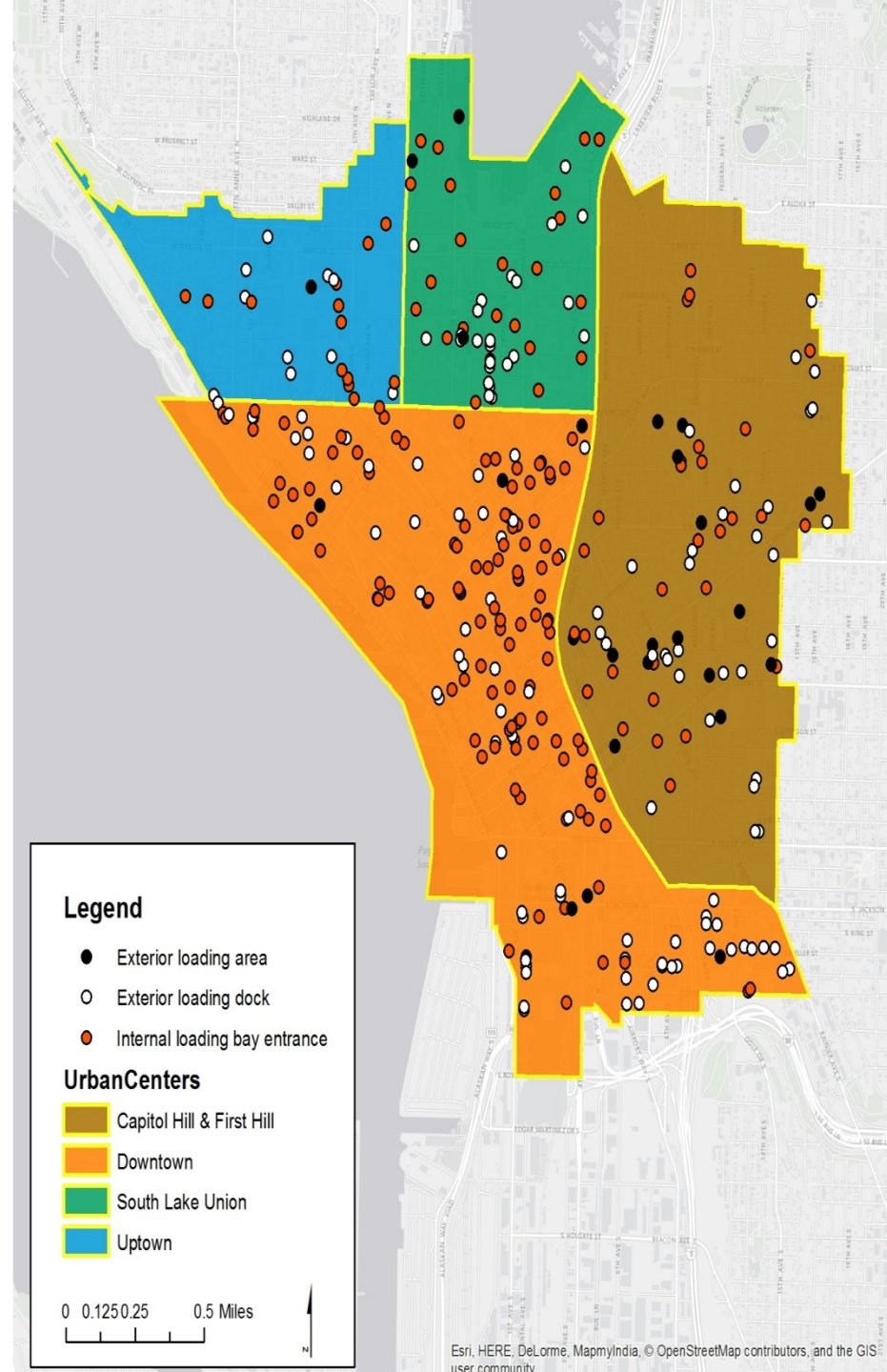
Research and Data Collection Activities

- Developing accurate geospatial databases of freight infrastructure
- Understanding use of existing infrastructure
- Evaluating new technologies for addressing urban freight challenges
- Estimating the impact of delivery services on VMT, GHG, and other pollutants
 - Existing modes and new modes
- Understanding delivery process steps and time characteristics
- Understanding the impact of truck activity on cyclist safety and behavior

Survey Results for One Center City

- 175 internal loading bay entrances;
- 137 exterior loading docks; and
- 26 loading exterior areas.

87% of all downtown buildings rely on deliveries from the City's curbs and alleys.



Final 50' Goods Delivery System Analysis

Key Finding:

Processes inside the City's towers control the number of failed-first-deliveries, as well as the truck dwell time in curb, alley and private parking spaces.

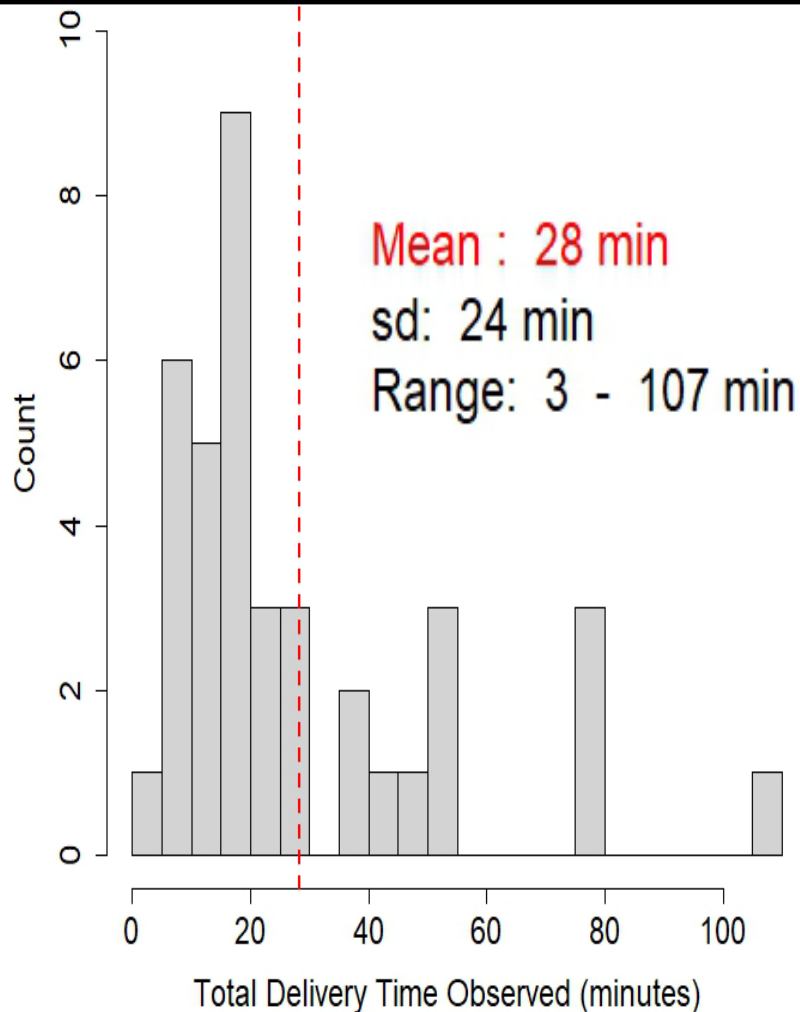
Photo: Seattle Municipal Tower



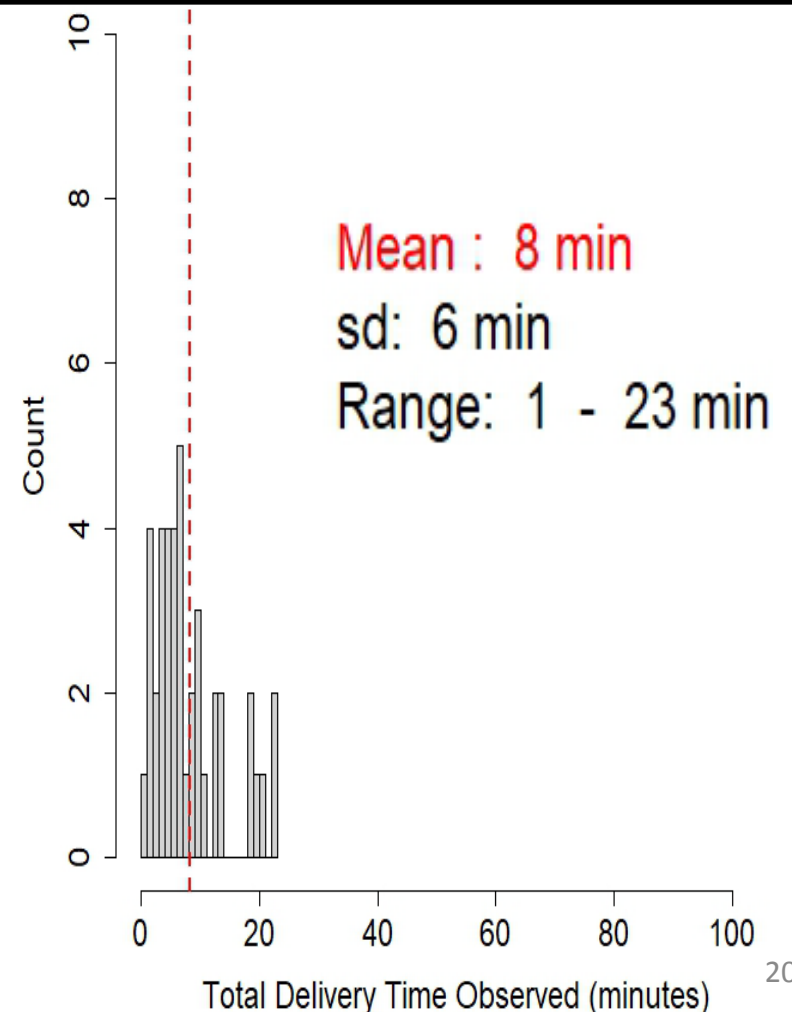
Truck Dwell Time

Retail Building

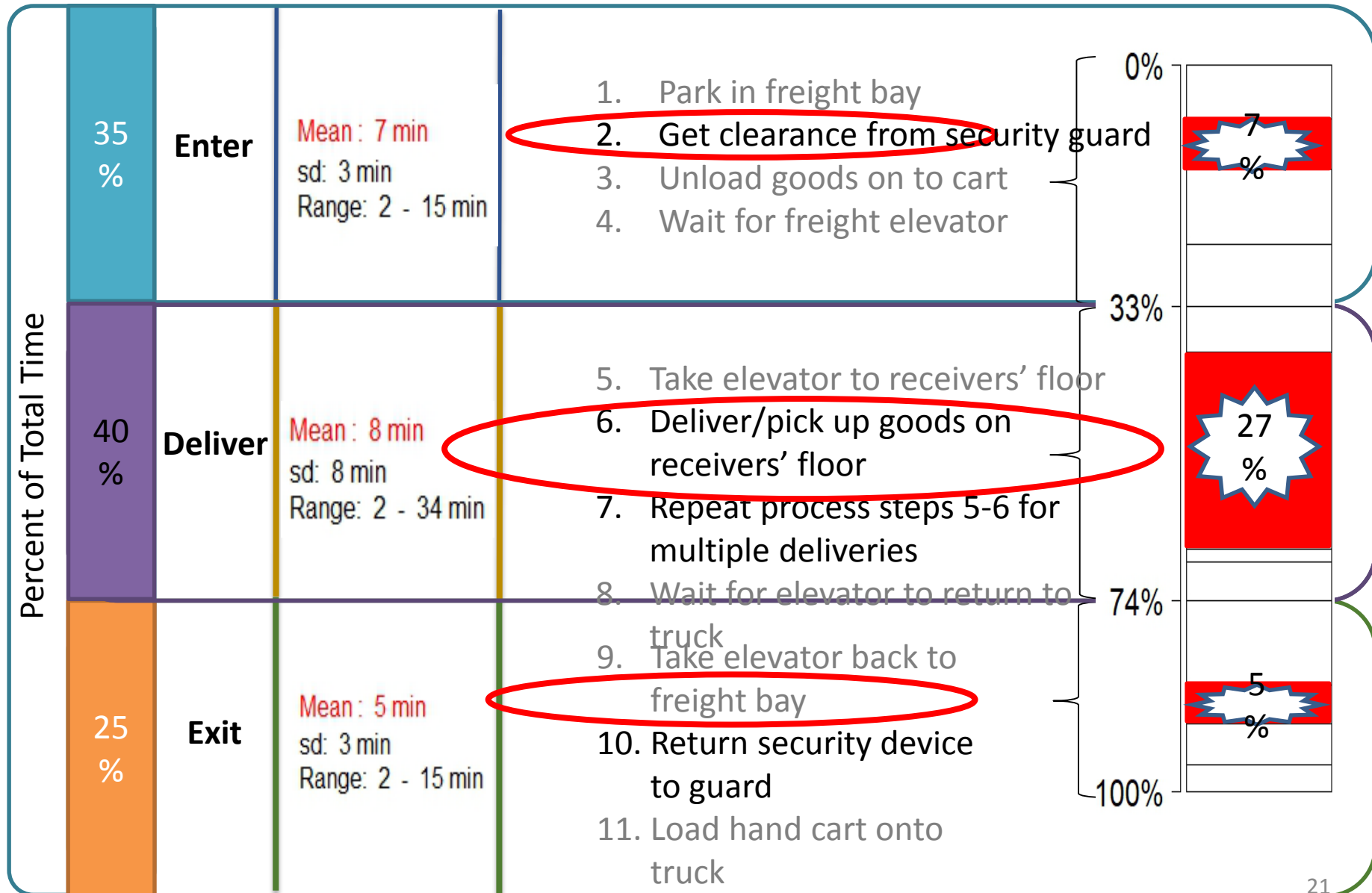
(n = 38)



Residential Building

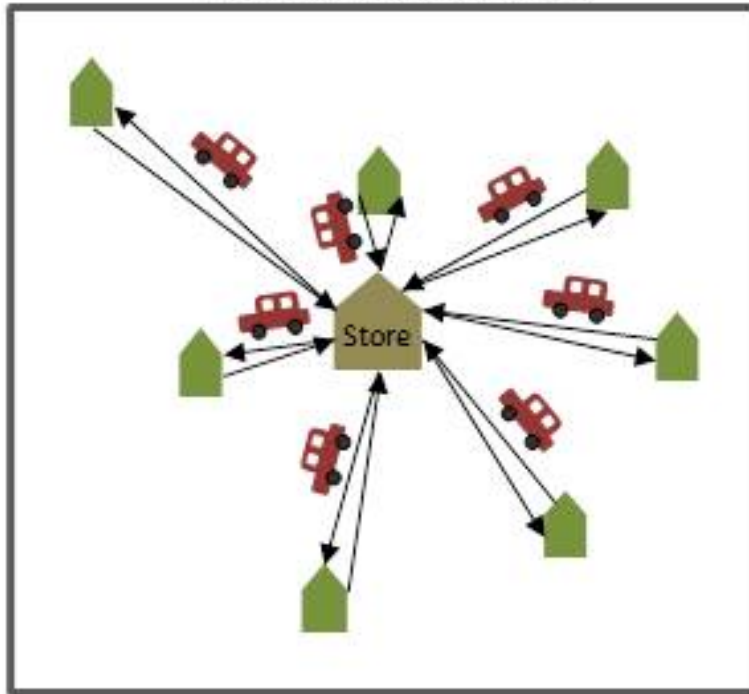


Dwell Time Break-Down

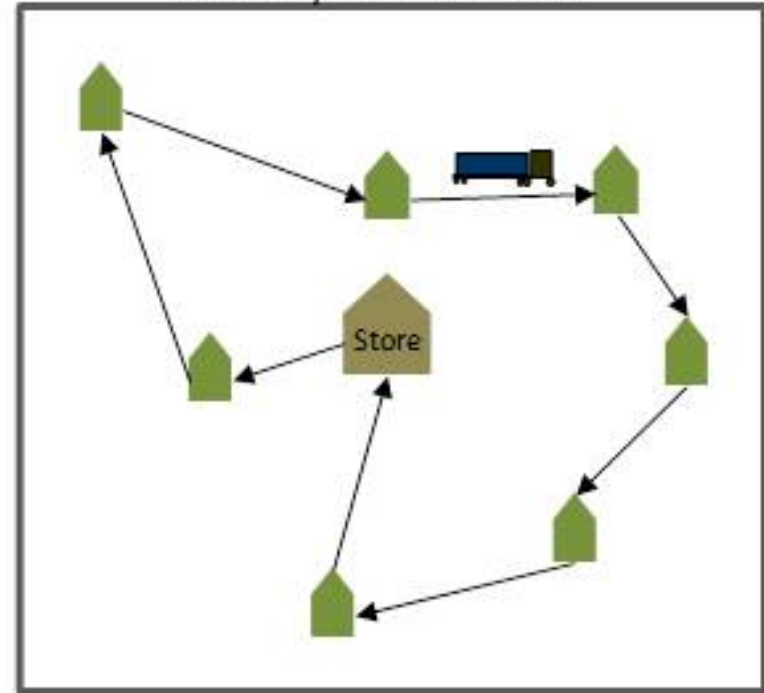


What impact do delivery services have on sustainability?

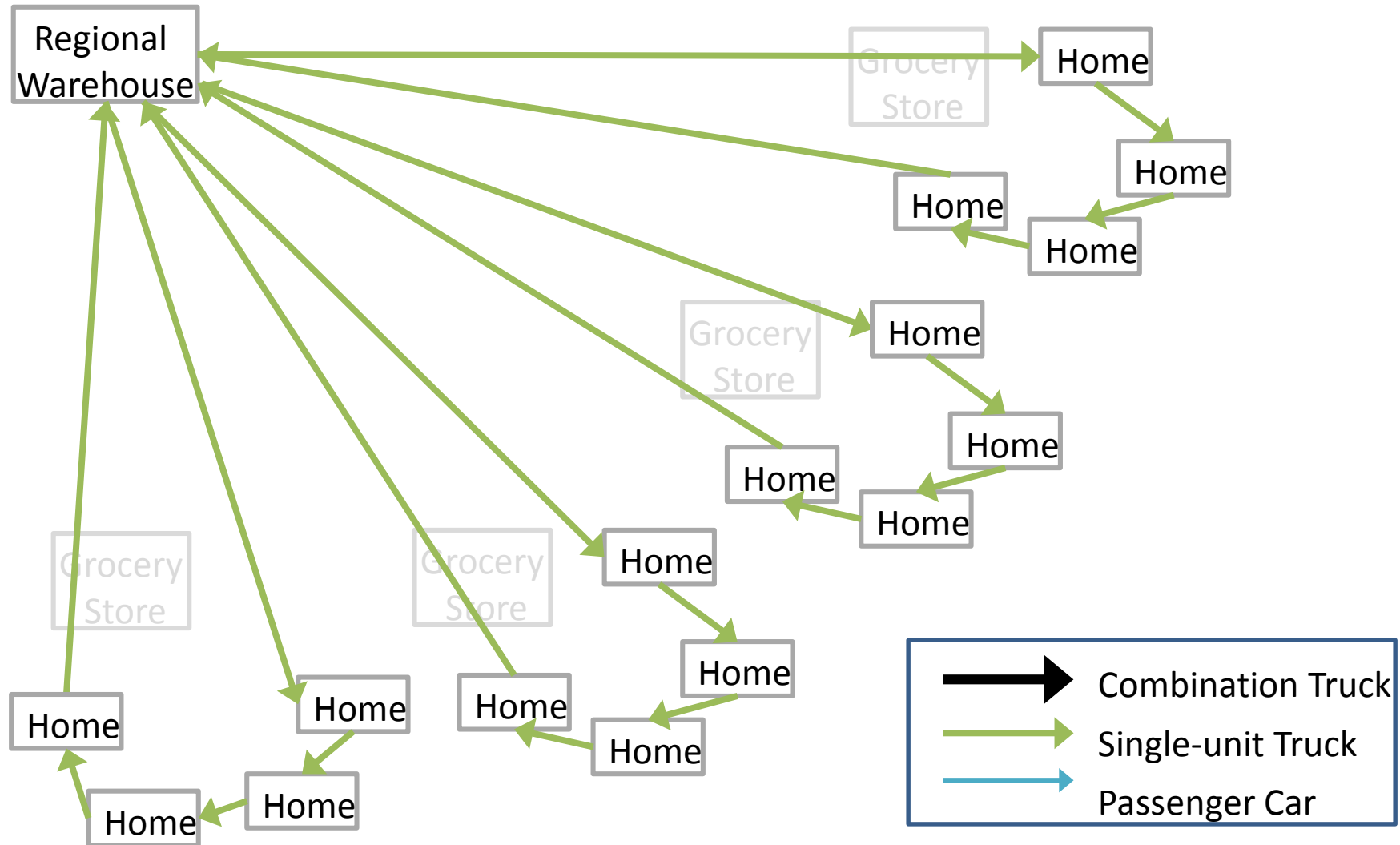
Personal Vehicle Travel



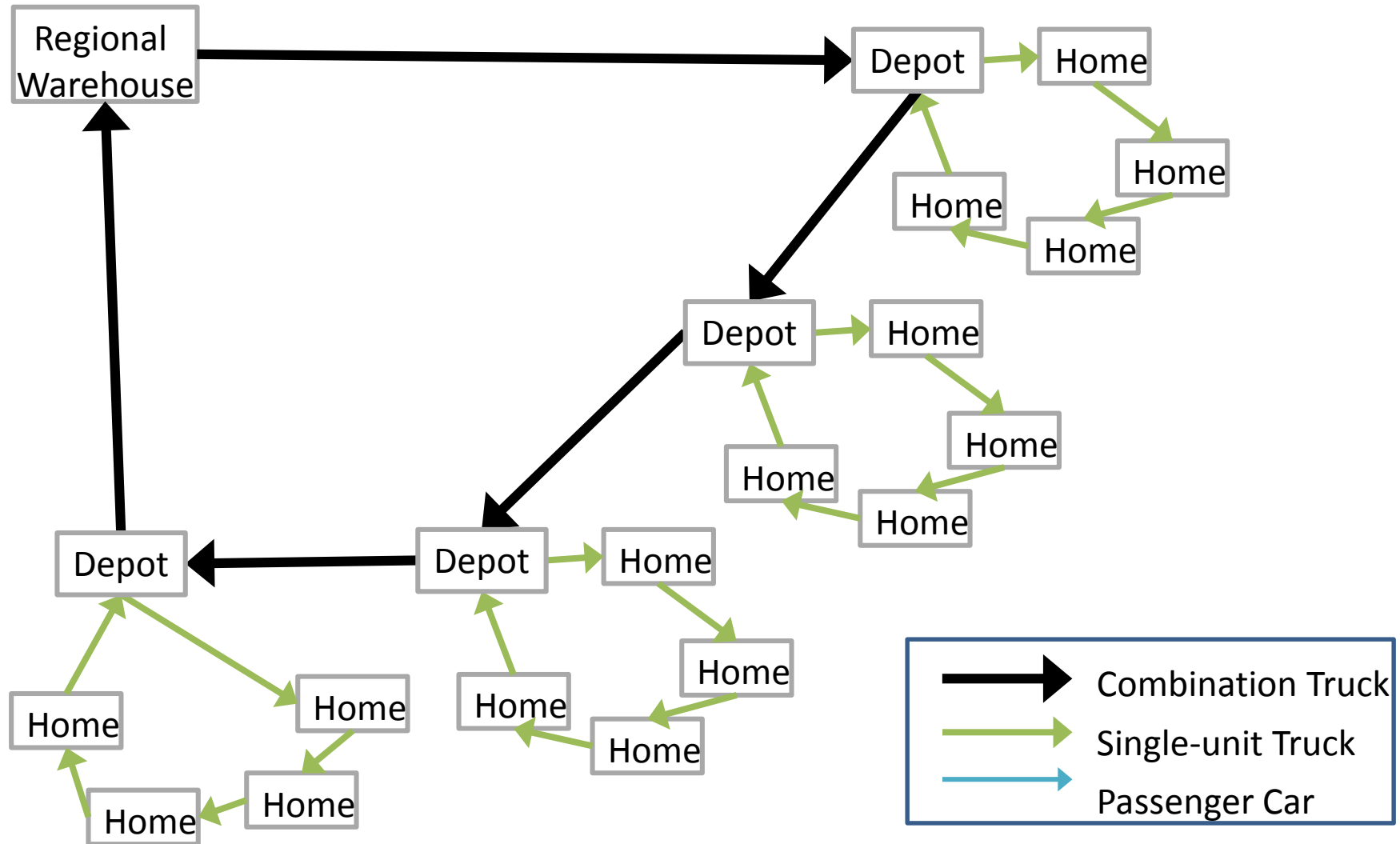
Delivery Vehicle Travel



Warehouse-based Delivery



Depot-based Delivery



Delivery Reduces Vehicle Miles Travelled in all Municipalities

						Travel
		VMT	CO2 (kg)	Nox (g)	PM10 (g)	time (min)
lowest	Seattle	1.1	1.1	2.7	0.10	2.1
	Black Diamond	1.4	1.7	3.8	0.13	2.6
	Sammamish	1.6	2.4	5.2	0.17	3.3
highest	Seattle	2.1	1.8	6.9	0.3	3.8
	Black Diamond	8.4	3.0	8.0	0.34	13.8
	Sammamish	8.6	3.3	10.3	0.46	14.0
		Passenger Vehicles				
		Local Depot Delivery				
		Regional Warehouse Delivery				

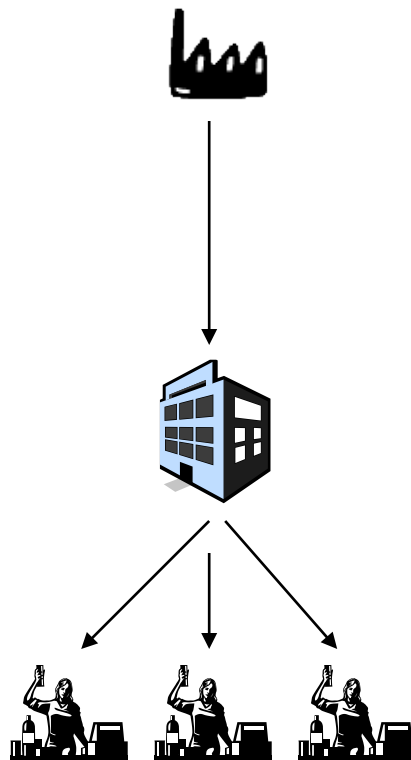
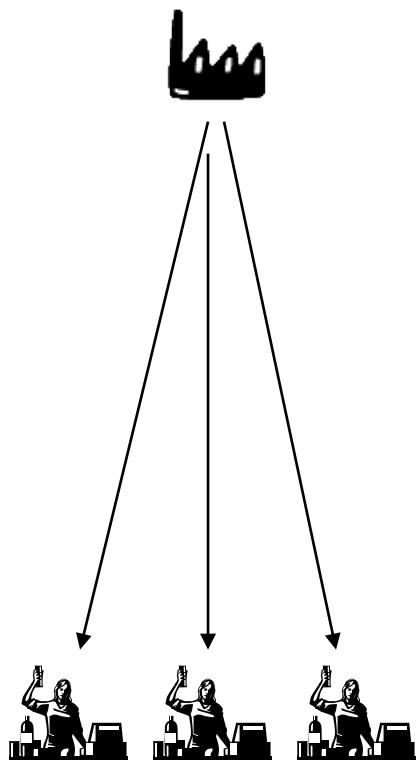
Are Delivery Services Part of a Sustainable Future?

- Indirect effects of reduced SOV trips
- Importance of
 - Depot location
(trade-off of consolidation versus direct shipping)
 - Consolidation (in-vehicle and delivery points)
 - Mode
 - Road network connectivity
- Must upgrade vehicle technology to reduce local pollutants

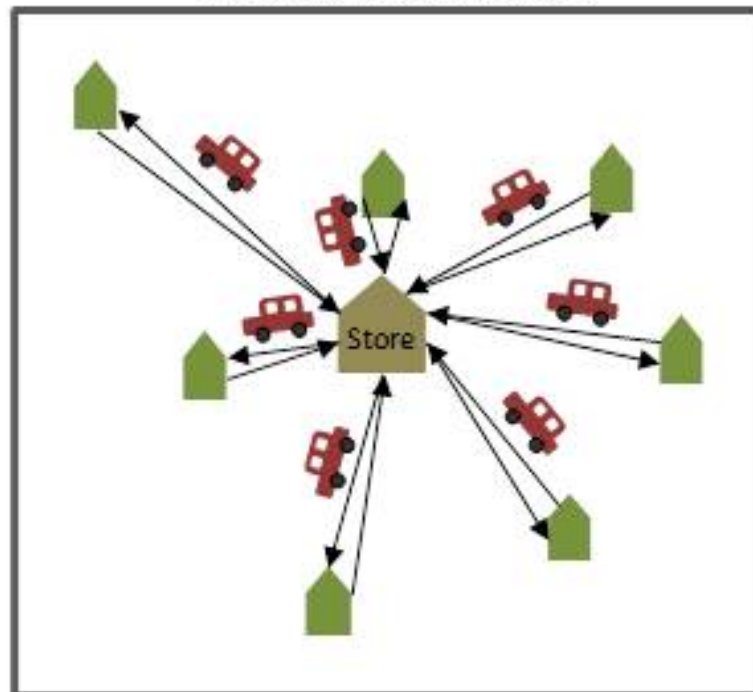
Questions?

<http://depts.washington.edu/sctlctr>

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Personal Vehicle Travel



Delivery Vehicle Travel

