

Hidden and in Plain Sight: Impacts of E-Commerce in Massachusetts

MetroWest Regional Collaborative

Subregional Meeting

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E-Commerce Impacts

- Defining E-Commerce
- Why important for planning
- Trends
- Transportation Challenges
- Land Use Challenges
- Potential Policy Responses and Next Steps
- Actionable Steps to Manage Warehouse and Distribution Centers

Report Objective: Intended as a resource for municipalities and policy makers grappling with the rapid growth and multiplying impacts of this new form of commerce.



What do we mean by e-commerce?

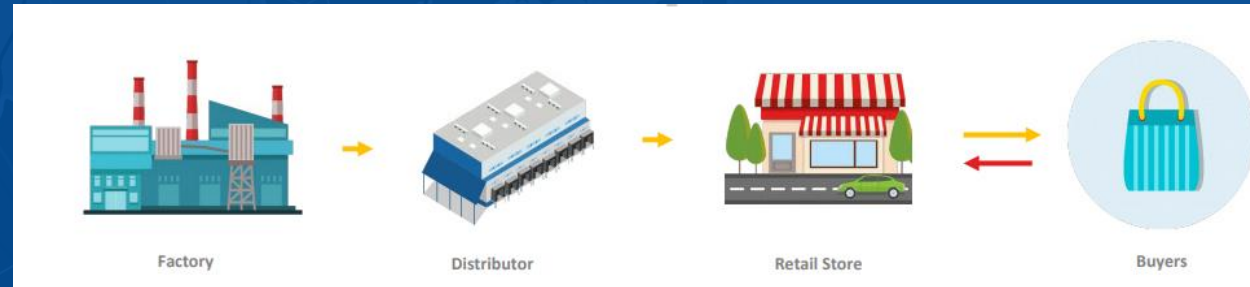
- The buying and selling of good or services via the internet, and the transfer of money and data to complete the sale.
- E-commerce **supply chain logistics** primarily refers to the processes involved in **storing and shipping inventory** for an online store or marketplace, including inventory management and the picking, packing, and shipping of online orders.



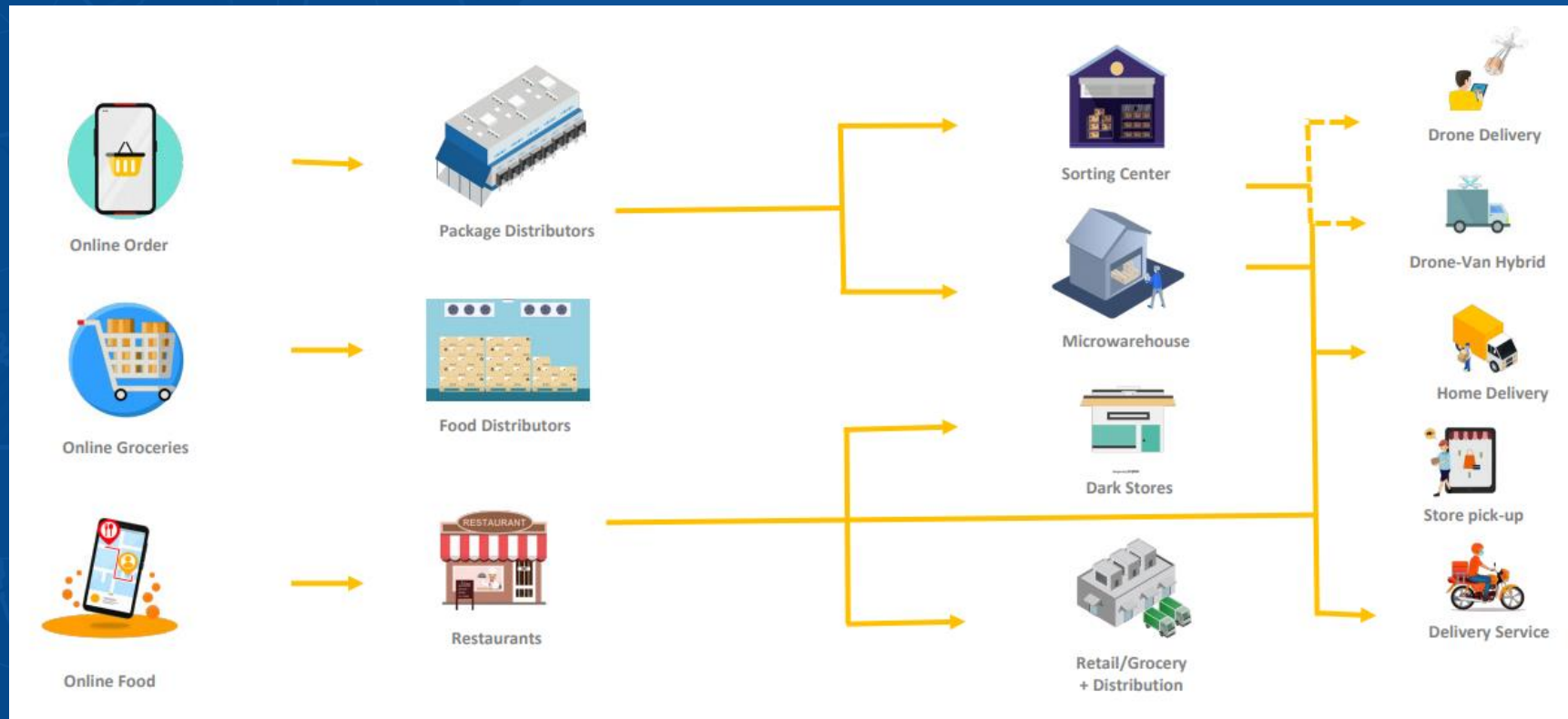
Modified from <https://www.the-future-of-commerce.com/2020/01/19/what-is-e-commerce-definition-examples/> and the Council of Supply Chain Management Professionals at <https://cscmp.org> and <https://www.shipbob.com/blog/ecommerce-logistics/>

Supply Chain Logistics

Traditional Delivery Model



Trending Delivery Model

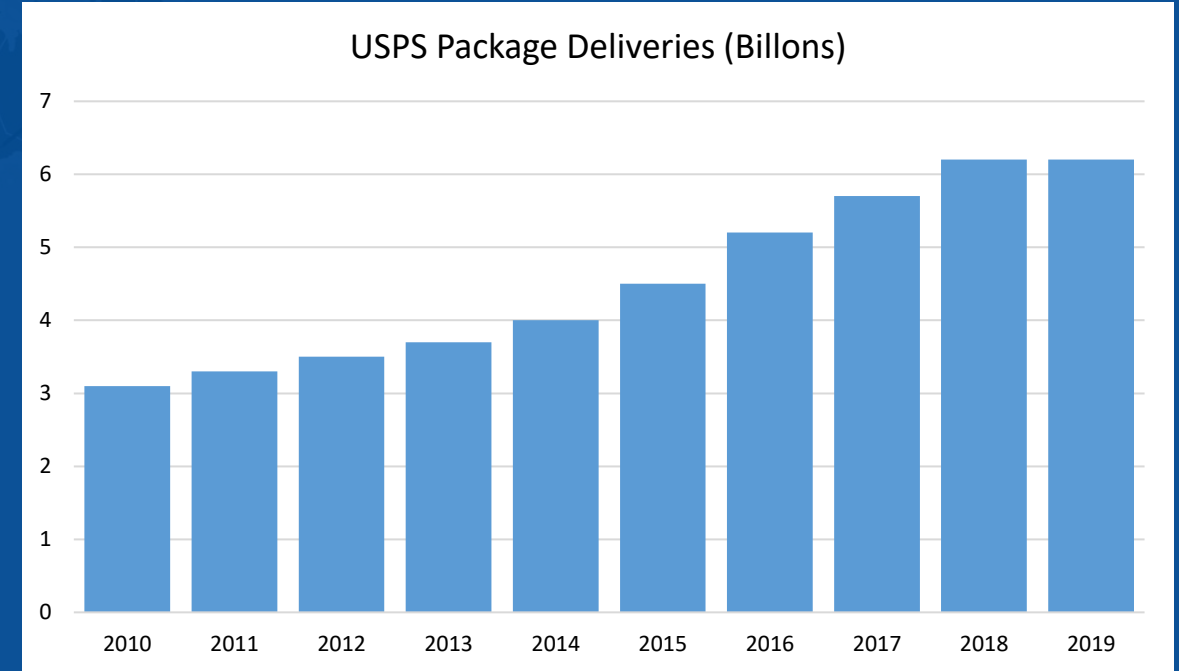
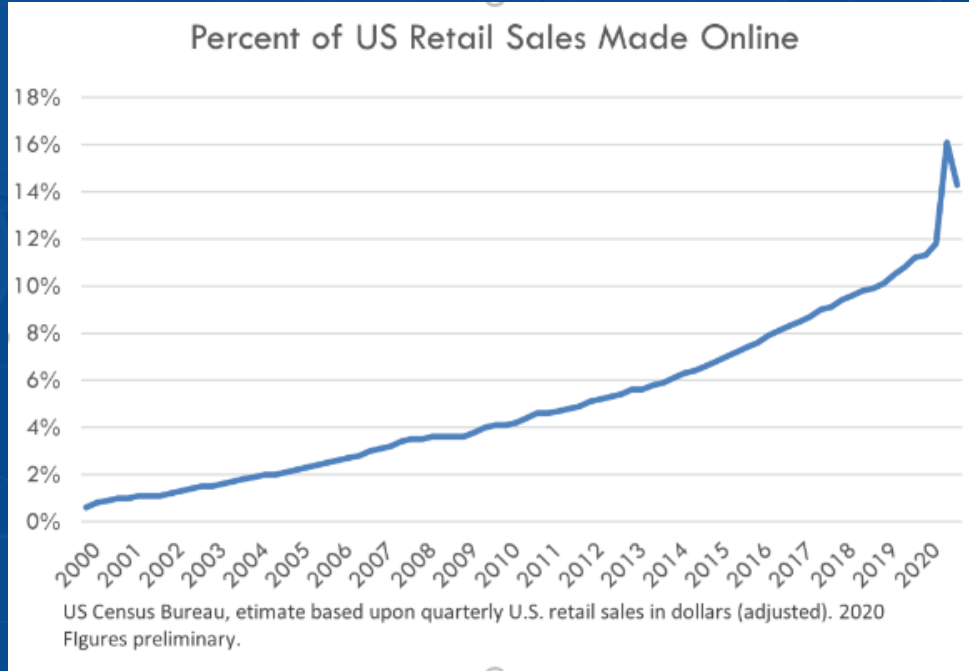


Why is this important?

- Traffic impacts
- Competition for curb space
- Footprint of sorting, fulfillment, delivery/distribution centers
- Impacts to brick and mortar retail
- Restaurant and grocery industries
- Equity
- Building design
- Automated deliveries (streets, buildings)

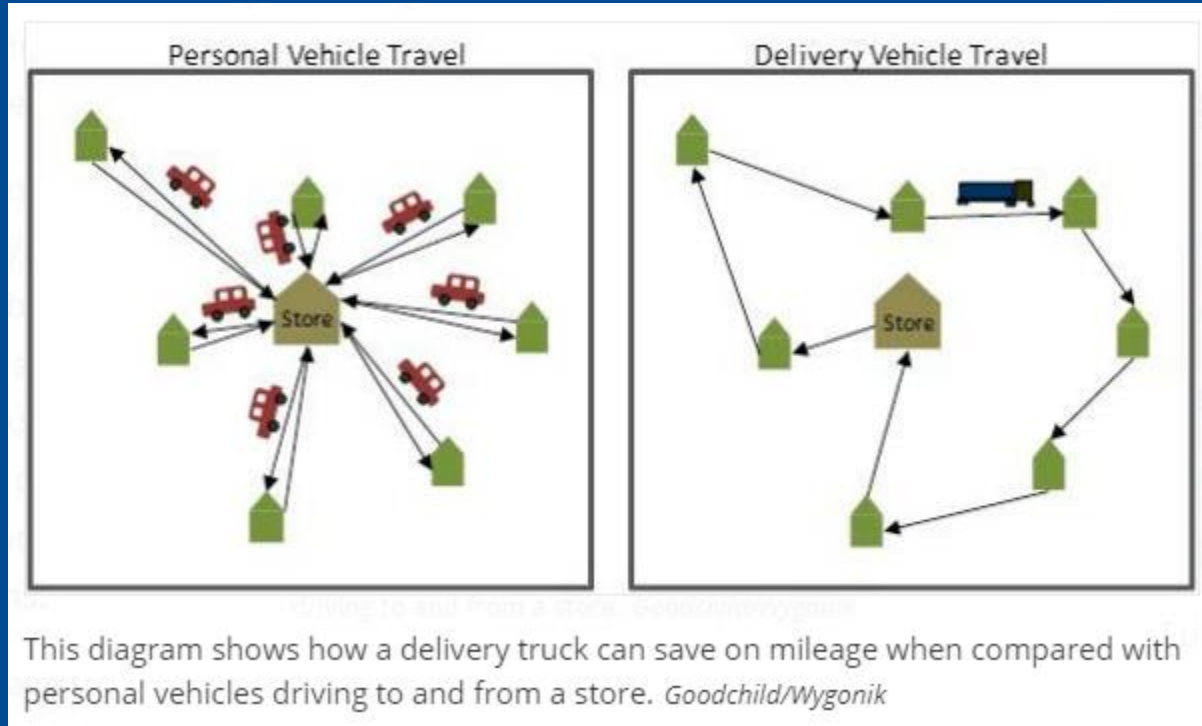


National Trends



- In 2019, Amazon delivered 2.5 billion packages in the U.S. or 20 packages for every household. Due to the pandemic, analysts forecast this number will increase by at least 20 percent. (To Deliver More Goods Faster, Amazon is Getting Closer to Your Door, Boston Globe. December 5, 2020)
- 2017-2020 prepared meal deliveries in US rose 44%
(Online Food Delivery, Statista. <https://www.statista.com/outlook/374/109/online-food-delivery/united-states>)
- In the U.S., shopping from home presently accounts for about 14 percent of all purchases. Of these purchases, an estimated 5 percent are same-day deliveries, which may increase to 15 percent within 5 years. (Foreseeing the Impact of Transformational Technologies on Land Use and Transportation, NCHRP Research Report 924, 2019)

Transportation Challenges



If e-commerce is optimized, it could be environmentally beneficial and reduce VMT.

But there are factors to consider:

- Customers both shopping on-line and in stores (trips not being offset).
- Size and emissions of delivery vehicles.
- Multiple boxes from multiple warehouses via a single online order.
- More people choosing same-day or next-day shipping, requiring more vehicles and less optimized distribution/routing.

(The Hidden Environmental Cost of Amazon Prime's Free, Fast Shipping, BuzzFeed, 7/21/18)

- E-commerce return rates can be 30% or higher (in-store: 10%).

(Q4 2018 – [The Surprising Effect of E-Commerce on Urban Real Estate Markets](#), Area Development)

Transportation Challenges

Traffic and GHG

- UPS and USPS: growth in e-commerce is outstripping ability to adopt EVs to reduce carbon footprint. (Bloomberg, 3/5/2020).
- 33% of NYC residents more likely to order delivery online with new apps and dine out less. (NYU Rudin Center, 2018)
- More than one-third willing to pay extra for same day delivery; expedited one-hour delivery requires an average of 1.4 miles per delivery versus 0.2 miles per average next-day delivery. (NYU Rudin Center, 2018; UC Davis, 2020)
- Income was largest factor on decision if/how much to shop online; no clear evidence that online shopping is reducing trips. (NYU Rudin Center, 2018; Texas A&M Transportation Institute, 2017)



Transportation Challenges



Curb Impacts

- In cities commercial vehicles comprise nearly 30% of parking activity in cities and that more than 50% of parking violations committed by commercial operators. (Smart Cities Dive, 2020)
- Curb management pilots underway in Seattle, D.C., Toronto, Boston

Challenge: Lack of data on deliveries in defined geographies (cities, towns, neighborhoods) and whether e-commerce is creating trips, or replacing trips.

Land Use Challenges

- Sustaining consistent and faster delivery times has caused e-commerce companies to add facilities closer to consumers as part of their regional warehouse and distribution center networks.
- Siting warehouse and distribution centers closer to consumers has become an integral component of the “last mile” delivery process and resulted in a high demand for industrial real estate.

(The Shed of the Future. E-commerce: Its Impact on Warehouses, Deloitte Real Estate, 2014)



Land Use – Impact on Retail Infrastructure

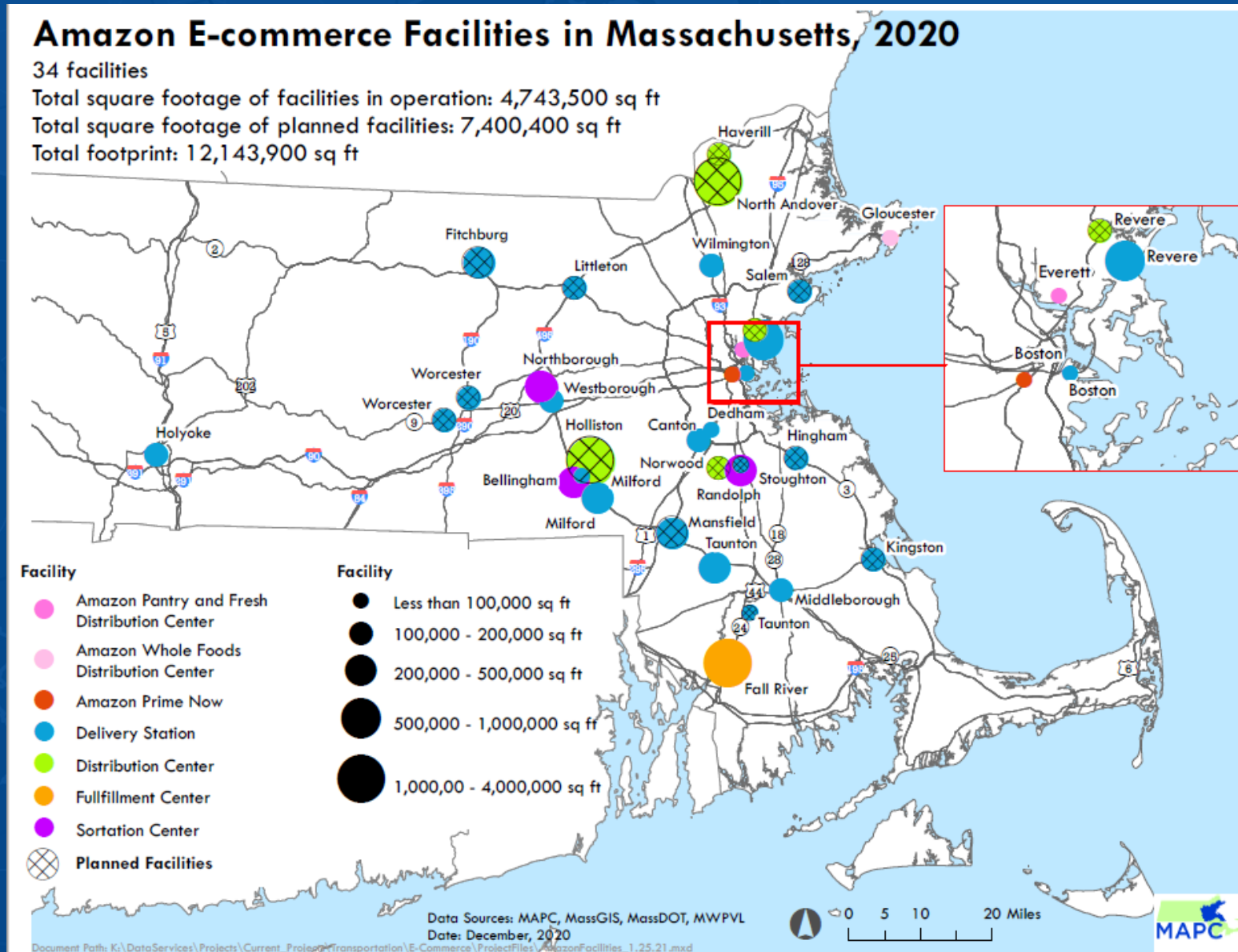
Malls and Brick-and-Mortar Retail

- Is vastly overbuilt.
- Is experiencing significant and steady closures, vacancies, and declining profits.
- Nationwide, store closures reached an all-time high in 2017 and again in 2019.
- But retail sales are not declining. The retail landscape is shifting from malls and brick-and-mortar stores to warehousing and distribution centers.
(The Pandemic will Change American Retail Forever, The Atlantic, 4/27/20, The Atlantic, What in the World Is Causing the Retail Meltdown of 2017?, The Atlantic, 4/10/17)
- **The decline of traditional retail and dramatic increase in e-commerce predate and have been accelerated by the pandemic.**

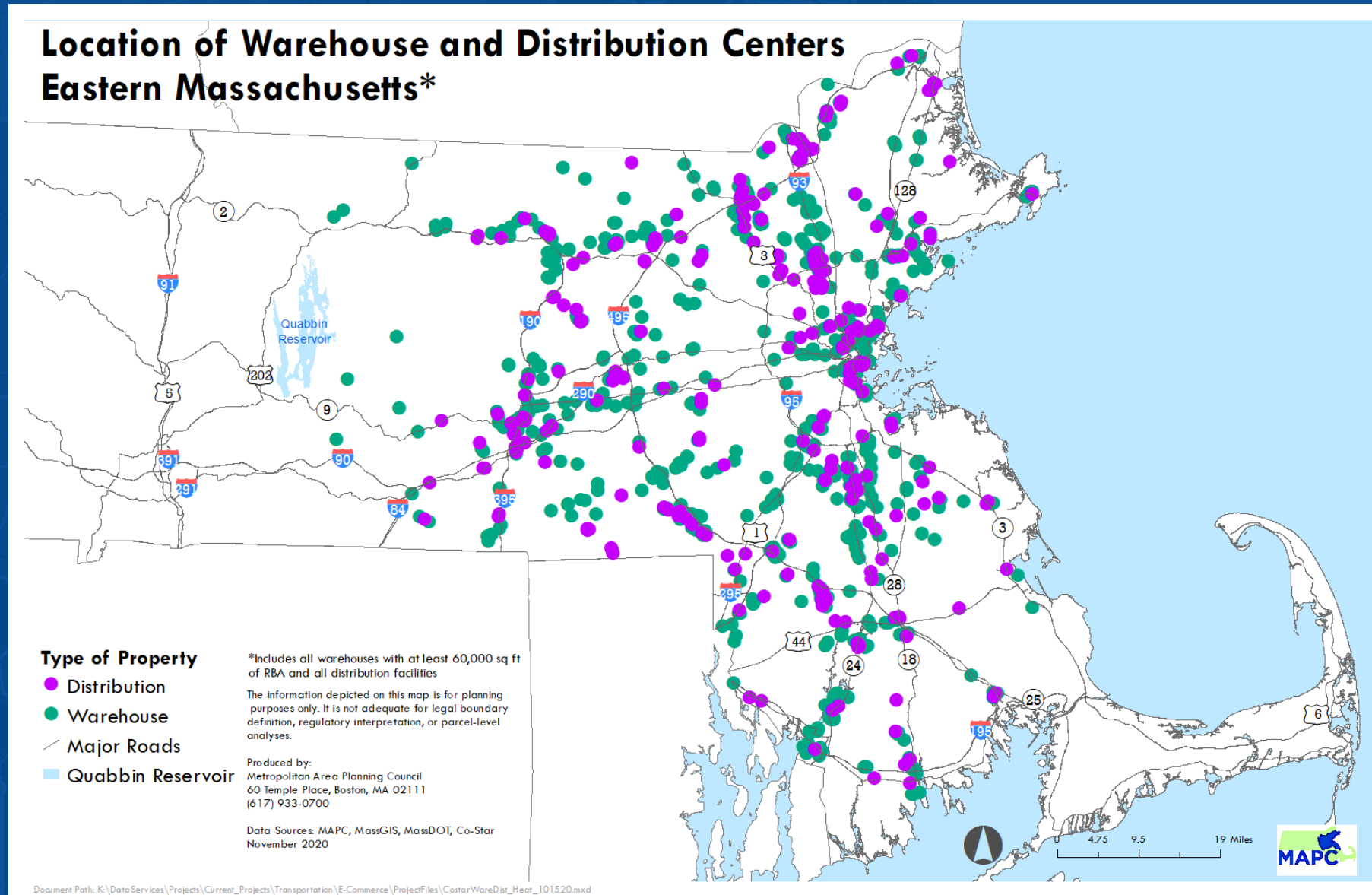


Amazon Fulfillment Center in Fall River
(Boston Globe and Boston Business Journal)

Amazon E-commerce Facilities in Massachusetts, 2020



Warehouse and Distribution Centers - Eastern Massachusetts



Potential Policy Responses to E-Commerce

- **Regional Coordination Among Municipalities**
 - Develop a transportation and land use design playbook for municipalities.
- **Create Visibility into the Growing E-commerce Industry**
 - Adopt legislation requiring e-commerce companies to report information and metrics (e.g., location of facilities, employment, transportation).
- **Create Incentives for Efficient Deliveries**
 - Set a fee structure that incentivizes companies and customers to opt for more sustainable delivery operations (e.g., combine orders into a single delivery, use common delivery/pick up areas, and not choose expedited deliveries).
- **Track Innovations in E-commerce**
 - Monitor new developments against public-sector performance standards (e.g., traffic congestion, GHG emissions, employment, equitable service).
- **Implement Curb Management Strategies**
 - Apply dynamic pricing models (e.g., peak-period surcharges for deliveries).
 - Establish enforcement mechanisms (e.g., in-field and/or remote (camera, GPS)).

Next Steps and Areas for Further Research

- **Data Collection**

- On-line sales versus traditional retail
- Changes in employment sectors (e.g., income, demographics and geography)
- Fiscal impacts of e-commerce
- On-line vehicle delivery patterns and volumes
- Consumer preferences and shopping habits

- **Management of Warehouse and Distribution Centers**

- **Data Sharing Legislation**

- **Information Sharing**



Actionable Steps to Manage Warehouses and Distribution Centers

- Traffic Impact Studies
- Trip Forecasting
- Site Plan Review
- Traffic Mitigation
- Restriction Zones
- Off-Site Parking
- Traffic Demand Management (TDM) Program
- Fueling Operations
- Vehicle Excise Tax
- Vehicular and Roadway Signage
- Idling
- Truck and Van Drivers
- Project Monitoring Post Occupancy and Corrective Actions

Thank You!

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Appendix

Regional Studies Incorporating E-commerce

California Freight Mobility Plan (2020)

<https://dot.ca.gov/programs/transportation-planning/freight-planning/cfac/cfmp-2020>

NJTPA – 2050 Freight Industry Level Forecasts (2020)

<https://www.njtpa.org/2050FreightForecasts.aspx>

Industrial Warehousing in the SCAG Region (April 2018)

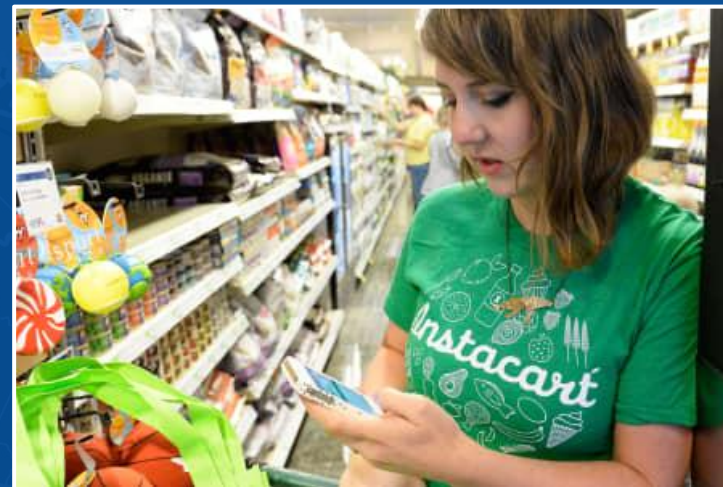
https://scag.ca.gov/sites/main/files/file-attachments/industrial_warehousing_report_-_revised_2018.pdf?1605989650

Studies are limited and analysis focuses on the context of freight and e-commerce.

Land Use – Restaurant and Grocery Industries

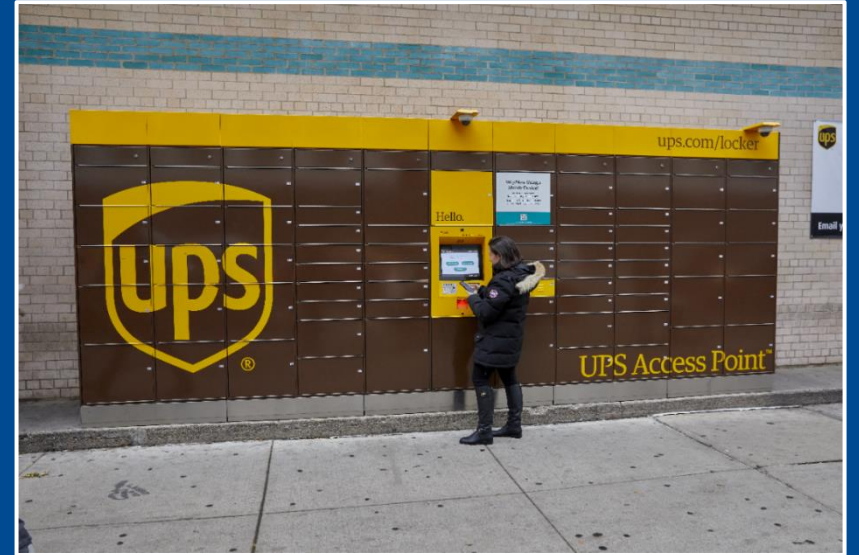
- Undergoing disruption by e-commerce.
- As of November 2020:
 - Online grocery sales for home delivery and pickup reached \$5.9 billion.
 - Volume of orders has more than tripled to almost 63 million
 - Number of customers has more than doubled to nearly 39 million.
 - Increase in the average amount of spending per order and shopping frequency.

(Brick Meets Click – November 2020 Online Grocery Scorecard)
- Forecast that on-line grocery sales are expected to grow to 20% of total grocery retail by 2025.



Additional Research Topics

- Third-Party Delivery Service Fees
- Parcel Locker Siting and Access
- Dark Stores
- Social and Behavioral Implications
- Environmental and Equity Implications
- Labor/Employment Trends



What's driving e-commerce?

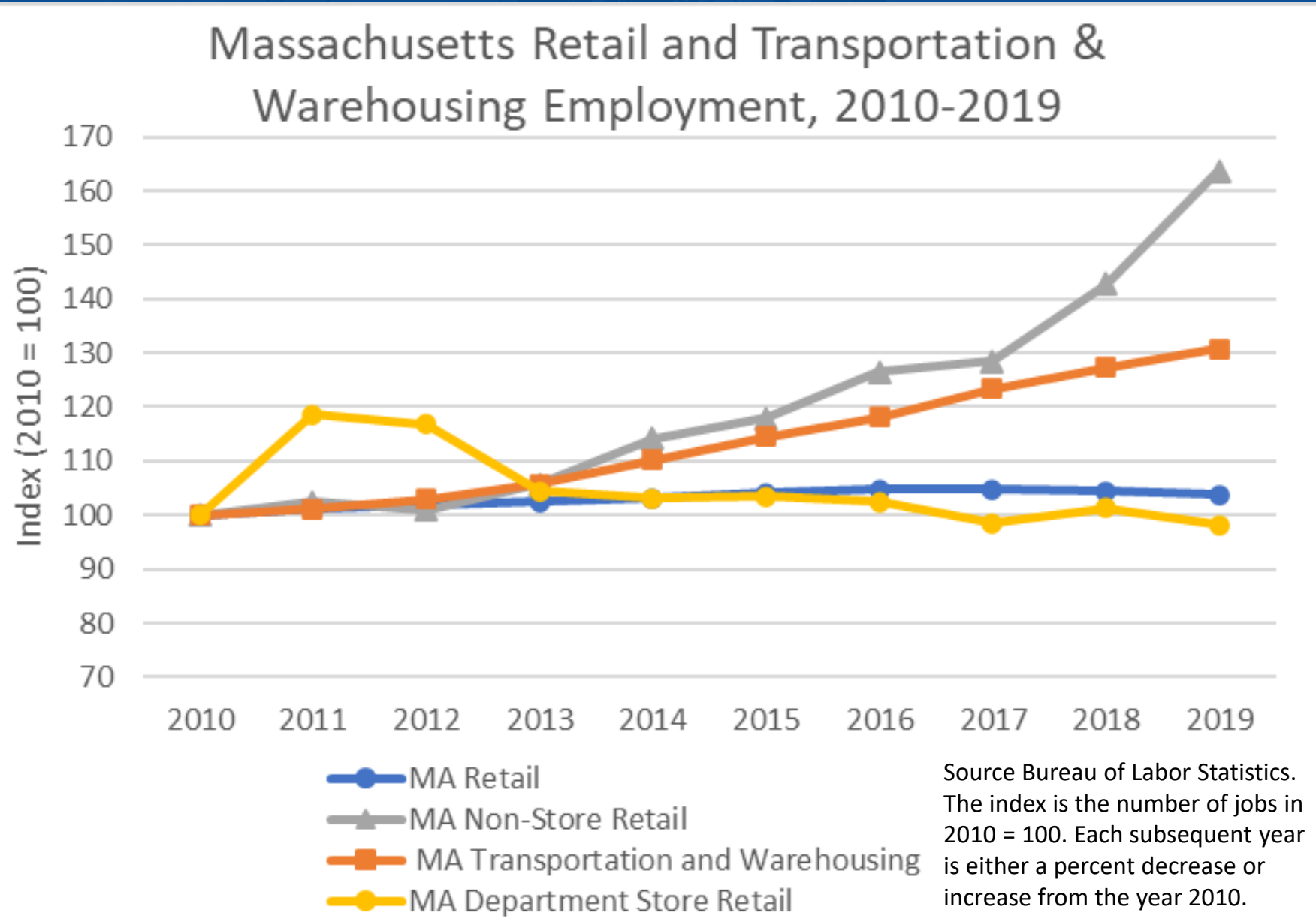
- Rapid change in mobile technology – can shop and deliver anywhere
- Rapid change in transportation technology – routemaking, AVs, EVs, drones, robots



Urban Trends

- NYC: 1.5M deliveries each day in 2018; tripled in last 8 years
(April 2020 – Primed for Deliveries, Planning Magazine)
- London: congestion pricing reduced single car use from 50% to 37% since 2003, but over last 10 years delivery vehicles have increased 25%
(April 2020 - Primed for Deliveries, Planning Magazine)
- 2017-2018 survey of households in NYC and Paris:
 - 37% of NYC HHs select same-day delivery; willing to pay extra
 - Most still shop groceries in person
 - 90% of NYC HHs have had prepared food delivered via online
 - 33% of NYC HHs say they eat out less now that app food delivery available
 - Couples with children more likely to purchase non-food items online and more likely to do online grocery shopping to save time and avoid trip
 - INCOME was largest factor on decision if/how much to shop online; those with higher income more likely to own/use a car; in contrast, lower-income HHs less likely to shop online and have a car; suggesting that online shopping reinforces behaviors, not changes them
(Online Consumption and Mobility Practices: Crossing Views from Paris and NYC – NYU Rudin Center for Transportation – November 2018)

Massachusetts Trends








Consolidated Package Volume by Month for AvalonBay Communities in Massachusetts



November Scorecard: Online Grocery Delivery & Pickup

Total US – Past 30-day activity*

Total US – Past 30-day activity*		COVID-19 Monthly Survey						
Performance Metrics		Aug 2019	March 2020	April 2020	May 2020	June 2020	Aug 2020	Nov 2020
 Sales (Past 30 days)	\$1.2 B	\$4.0 B	\$5.3 B	\$6.6 B	\$7.2 B		\$5.7 B	\$5.9 B
 Spend (Average per order)	\$72	\$85	\$85	\$90	\$84		\$95	\$94
 Orders (# Past 30 days)	16.1 M	46.9 M	62.5 M	73.5 M	85.0 M		59.5 M	62.7 M
 Customers (Active during past month)	16.1 M	39.5 M	40.0 M	43.0 M	45.6 M		37.5 M	38.7 M
 Frequency (Average/active customer)	1.01	1.19	1.56	1.71	1.87		1.59	1.62

* Excludes online grocery orders shipped to home via common or other parcel couriers.

Sources: Brick Meets Click/Mercatus Grocery Shopping Survey, Nov, Aug, Jun & May 2020; Brick Meets Click/Symphony RetailAI Grocery Survey, April 2020; Brick Meets Click/ShopperKit Grocery Survey, March 2020; Brick Meets Click research, August 2019.



Sustainable Transportation Management



- Urban consolidation centers (where larger truck deliveries are transported to smaller vehicles, bicycles, etc.) and nighttime deliveries for restaurants and other businesses to reduce congestion (An Integrated Perspective on the Future of Mobility, Part 2: Transforming Urban Delivery – McKinsey & Company – September 2017)
- E-bike deliveries to reduce congestion, parking, and carbon footprint; Pasadena, CA, pilot program with UPS underway (Planning, April 2020) and in Miami, FL with DHL (Miami Pilots E-cargo Bikes to Reduce Congestion, Pollution, Smart Cities Dive, 5/18/20)
- Better curb management and more curb space for deliveries
- Pilot loading management zones (CurbFlow, Coord)
- Long-term: AVs, EVs, lockers, and even ground delivery droids (McKinsey, 2017)
- Designate truck restriction zones. (Planning Matters: Institutional Perspectives on Warehousing Development and Mitigating Its Negative Impacts, Journal of the American Planning Association (Vol. 85, No. 4))
- Charge for same day deliveries. (Shoppers Click, and City Chokes on Convenience, New York Times, 10/27/19)
- Require investments in electric trucks and vans. (Amazon Ordered 100,000 Electric Delivery Trucks, Doubling the Fleet in Europe and North America, Quartz, 9/19/19).
- Pilot zero emission zones. (Santa Monica to Pilot Zero Emissions Delivery Zone, Smart Cities Dive, 6/17/20)

Sustainable Land Use Management

- Require Monitoring
 - Employment distribution patterns at warehousing facilities.
 - Trips – truck types, automobile, walking, and bicycling.
- Develop a regional strategy to regulate/manage the siting of warehousing facilities.
([Testing for Efficacy: Assessing the Real Impacts of E-Commerce Policy and Practice](#), Meeting of the Minds)
- Adjust local tax rates to encourage/discourage siting of warehousing facilities.
(Planning Matters: Institutional Perspectives on Warehousing Development and Mitigating Its Negative Impacts, JAPA, (Vol. 85, No. 4))
- Modify zoning or building codes.
 - Warehousing
 - Increase space requirements for off-street loading and distribution.
 - Include provisions for landscaping and soundproofing.
(Planning Matters: Institutional Perspectives on Warehousing Development and Mitigating Its Negative Impacts, JAPA, (Vol. 85, No. 4))
 - Residential Buildings
 - Design with sufficient storage for packages and refrigerated areas for groceries.
(12/6/18 - [How Amazon Prime will Change the Way Our Cities Look](#), Boston Globe)
- Require implementation of carbon neutrality programs.
(By 2025, Amazon has the goal of using 100% renewable energy).

(Amazon Boosts Climate Commitments and Greenhouse Gas Emissions, The Verge, 6/23/20)