Freight Forecasting and Estimating E-Commerce Delivery Trips for Northern New Jersey

TMIP Webinar

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Presentation Outline

1. NJTPA 2050 Freight Industry Level Forecasts Study Overview

2. E-Commerce Analysis Task Objective and Methodology

   A. E-Commerce Market Analysis

   B. Carrier Analysis and Trip Table Development

   C. Results

3. Opportunities for Further Research

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2050 Freight Industry Level Forecasts Study Goals and Objectives

1. Develop a clear, accurate and comprehensive picture of current and future regional freight activity out to 2050

2. Update and enhance the NJTPA Freight Forecasting Tool

3. Prepare regional, county, and top commodity profiles
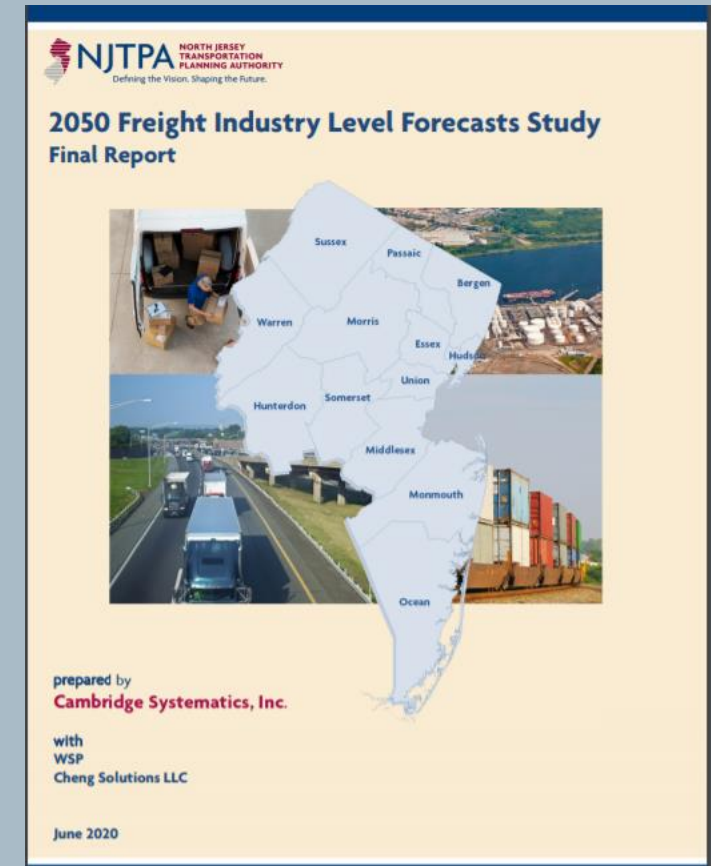
Background

- Previous Studies
  - 2040 Freight Industry Level Forecasts
  - Regional Freight Commodity Profiles

- Key Products
  - Freight Forecasting Tool (FFT)
  - Profiles

- New for the 2050 Study
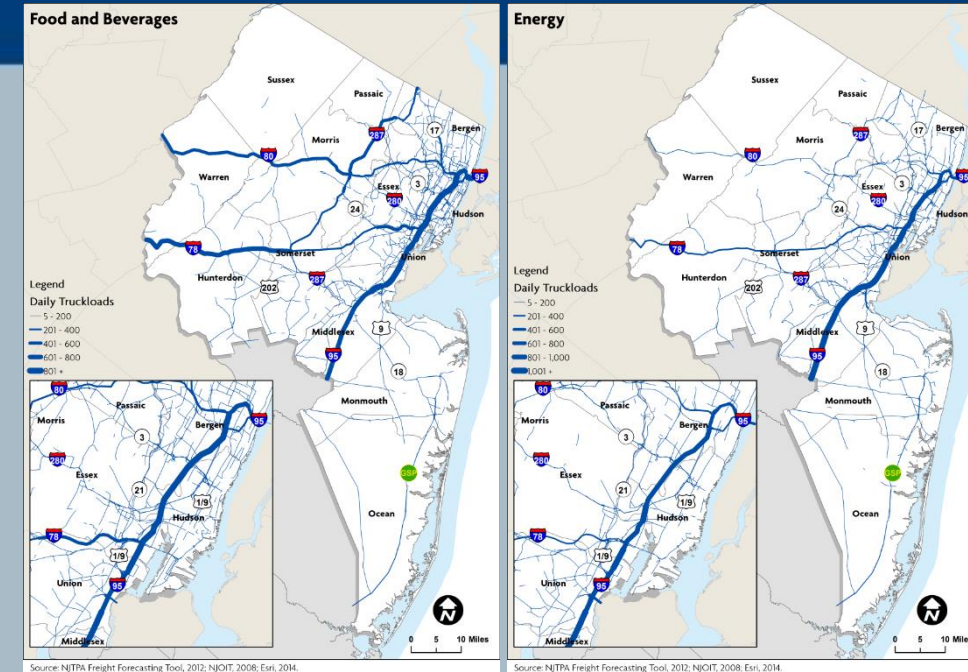 - Freight Analysis Framework (FAF)
  - E-Commerce
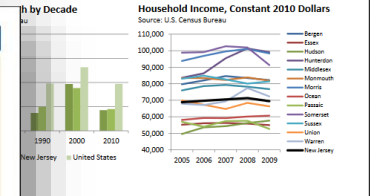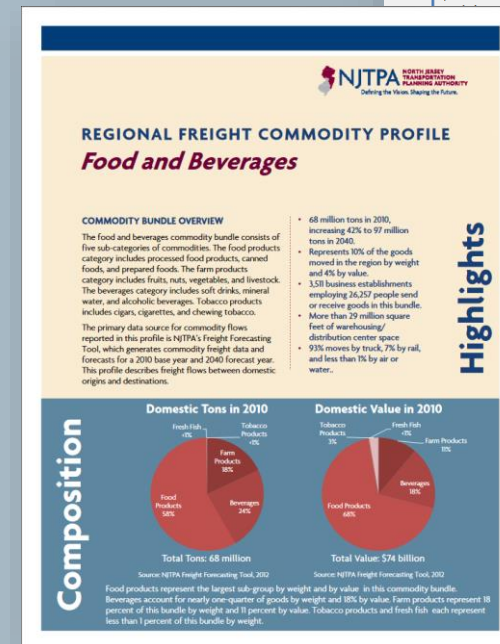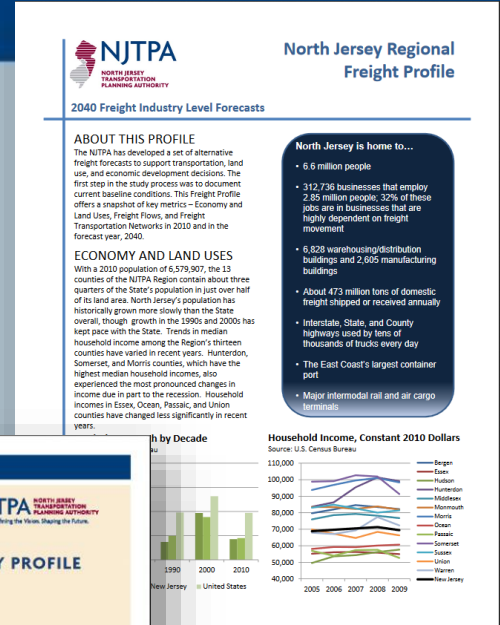
NJTPA Freight Forecasting Tool

- Processes commodity flow data to generate alternative forecasts to reflect user-selected scenarios

- Key inputs:

  - Commodity flow data (FAF)

  - FAF disaggregation data (employment, waybill, terminals, etc.)

  - Economic forecast(s)

  - Make-use tables

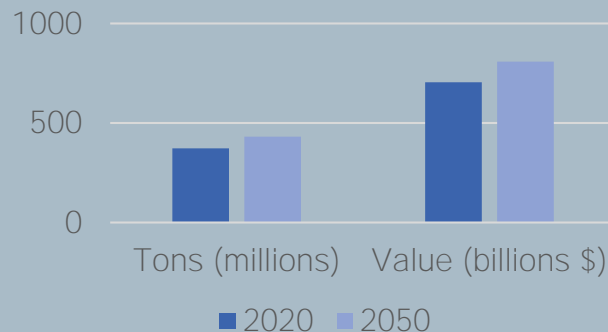 - "What-if" scenario factors
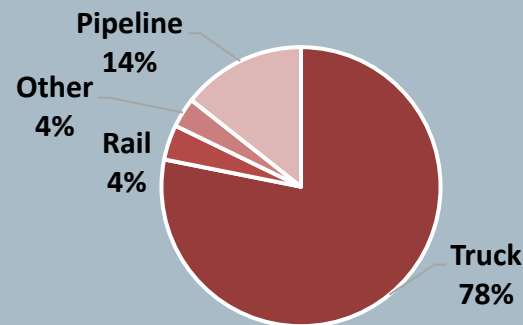
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NJTPA Freight Forecasting Tool

Outputs:

– Commodity flow summary tables, charts, maps

– Commodity bundle trip tables for assignment to travel demand model network (NJRTM-E)
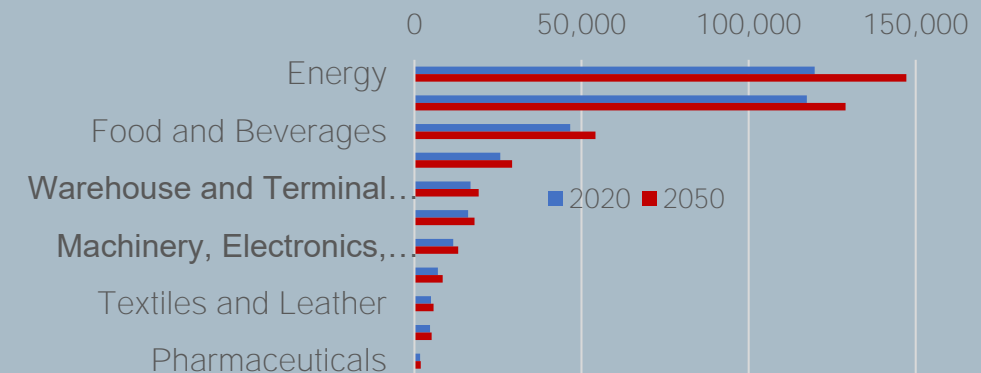

Food and Beverages

Legend
Daily Truckloads
— 5 - 200
— 201 - 400
— 401 - 600
— 601 - 800
— 801 +

Source: NJTPA Freight Forecasting Tool, 2012; NJOIT, 2008; Esri, 2014.

Energy

Legend
Daily Truckloads
— 5 - 200
— 201 - 400
— 401 - 600
— 601 - 800
— 601 - 1,000
— 1,001 +

Source: NJTPA Freight Forecasting Tool, 2012; NJOIT, 2008; Esri, 2014.

NJTPA Region Freight Flows, 2020 and 2050, by Weight and Value

■ 2020 ■ 2050

Tons by Mode, 2020

Pipeline 14%
Other 4%
Rail 4%
Truck 78%

Thousands of Tons by Commodity Group, 2020-2050

0   50,000   100,000   150,000

Energy
Food and Beverages
Warehouse and Terminal…
Machinery, Electronics,…
Textiles and Leather
Pharmaceuticals

■ 2020 ■ 2050

NJTPA Freight Forecasting Tool

Applications:

- Regional freight forecasting/planning
- Subregional/county freight and comprehensive plans
- Public and stakeholder engagement and education
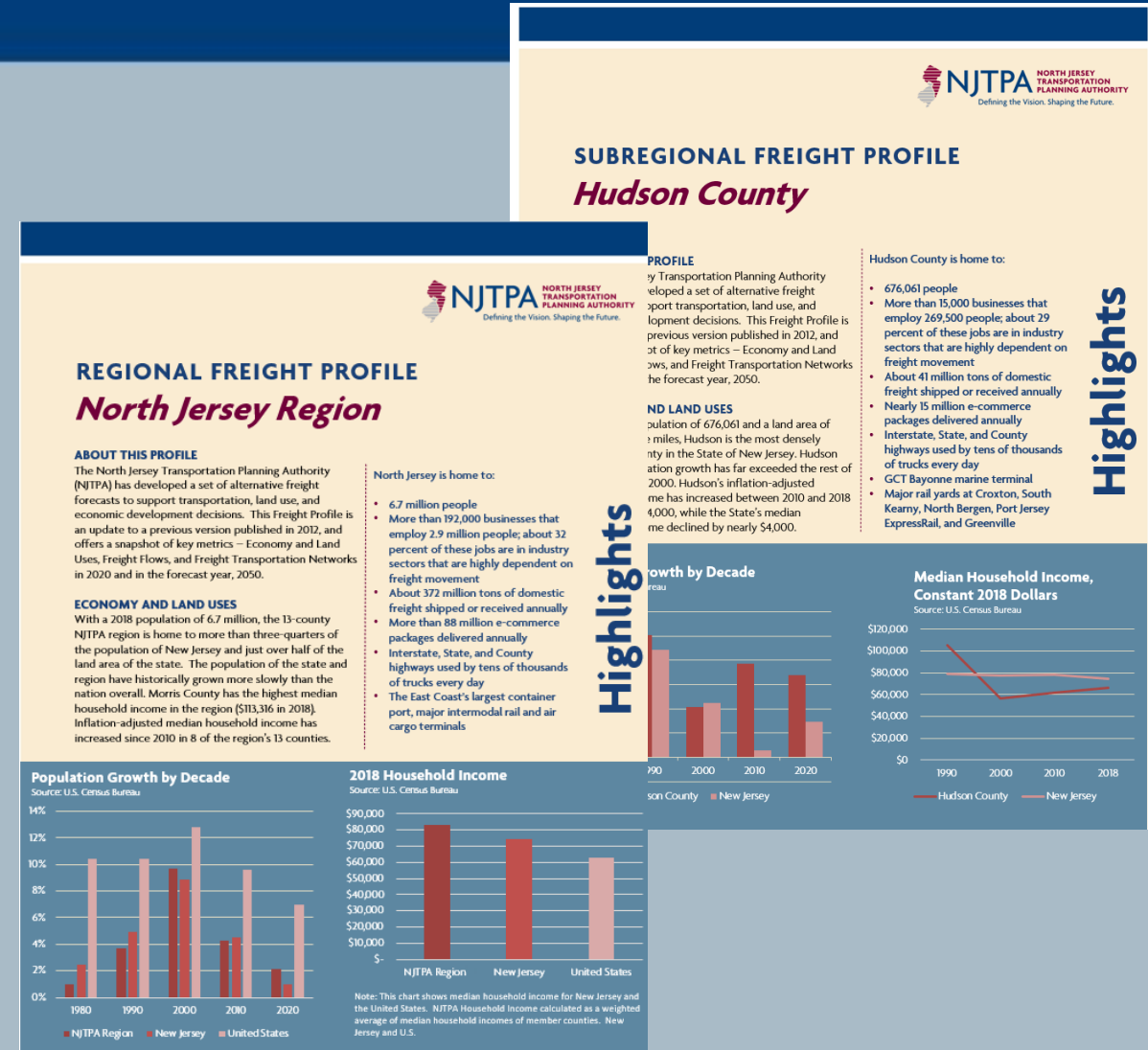
Need for E-Commerce Analysis

- E-commerce delivery is an increasingly important step in the logistics chain for consumer goods

- Region's stakeholders ask about increase in parcel delivery vehicle traffic, parking issues, etc.

- The "last mile" e-commerce delivery trip is not accounted for in commodity flow databases

- Identifying delivery trips in GPS/probe sources is difficult

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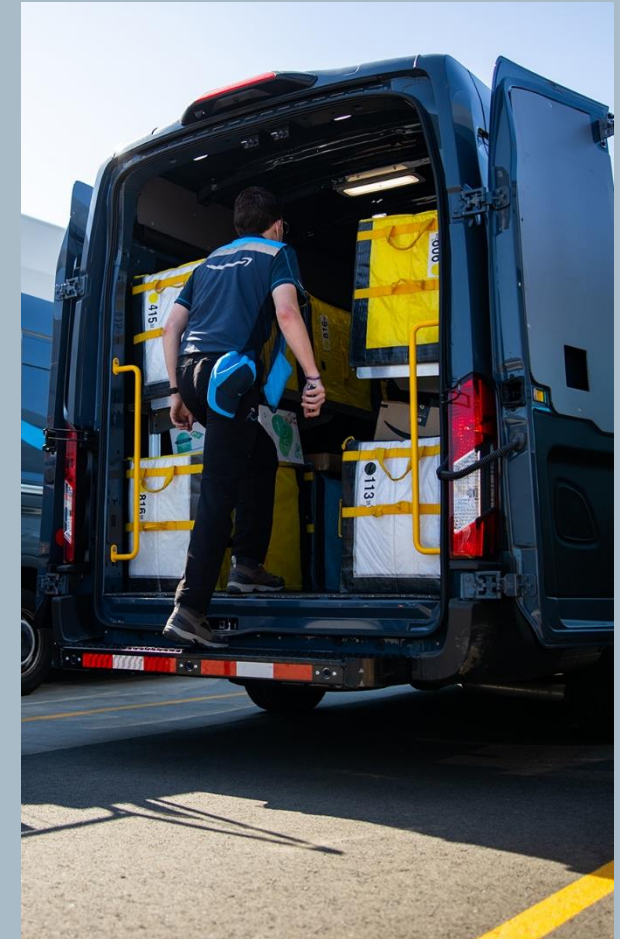
E-Commerce Trip Table Development

Two Analysis Components:

Market Demand

+

Delivery Vehicle Travel Pattern

→

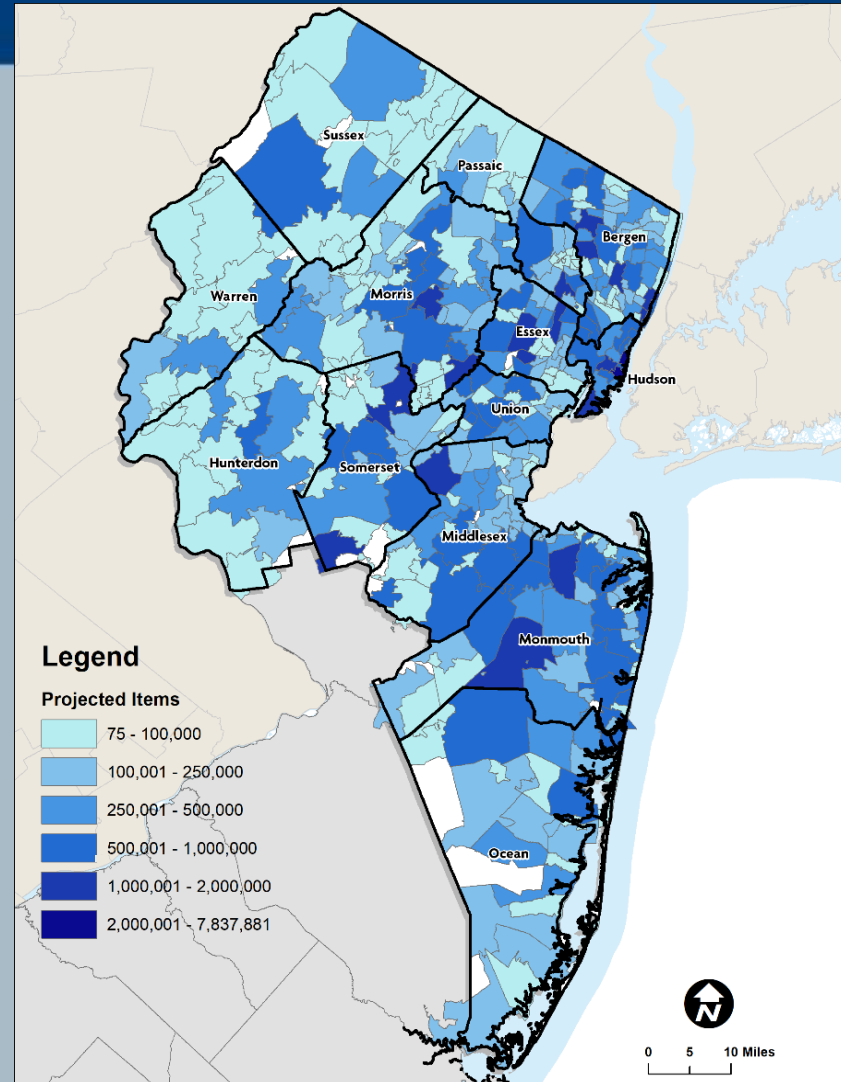E-Commerce Delivery Vehicle Trip Table

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E-Commerce Market Demand

- Primary data source: Rakuten Intelligence
- One year (Q3 2018 – Q2 2019)
  - Number of Parcels and Items by zip code
  - Product categories
  - Distribution of parcels by delivery carrier (USPS, UPS, FedEx, Amazon, and others)
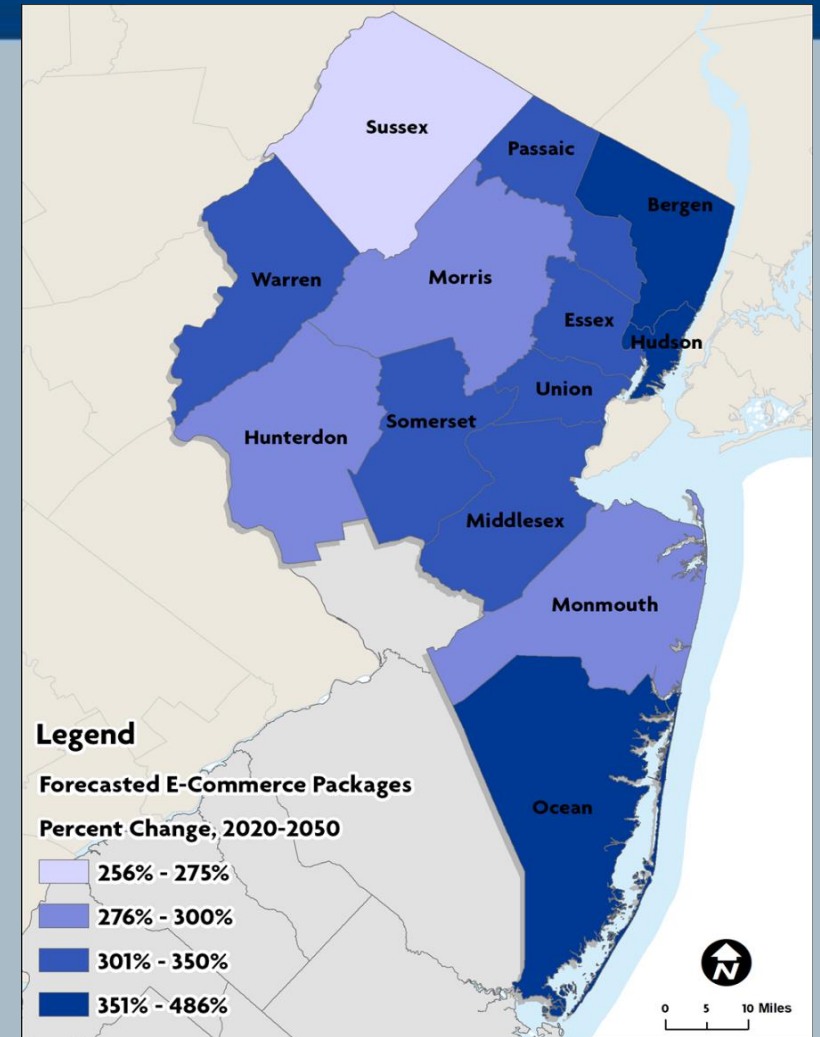
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E-Commerce Market Demand

Total packages delivered annually:

88.1M

Total items delivered annually:

126.1M

Avg of 1.4 items per package

Legend

Projected Items

- 75 - 100,000
- 100,001 - 250,000
- 250,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 2,000,000
- 2,000,001 - 7,837,881

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0   5   10 Miles

E-Commerce Market Demand

- Trend: E-Commerce as % of retail sales
  - 1998: 0 percent
  - 2019: 12 percent
  - 2050: 46 percent

- Zip code level demographic forecast
  - Population
  - Households
  - HHI
  - Median age

Legend

Forecasted E-Commerce Packages Percent Change, 2020-2050

- 256% - 275%
- 276% - 300%
- 301% - 350%
- 351% - 486%

Source: Cheng Solutions and Cambridge Systematics, 2020

Carrier Logistics Analysis
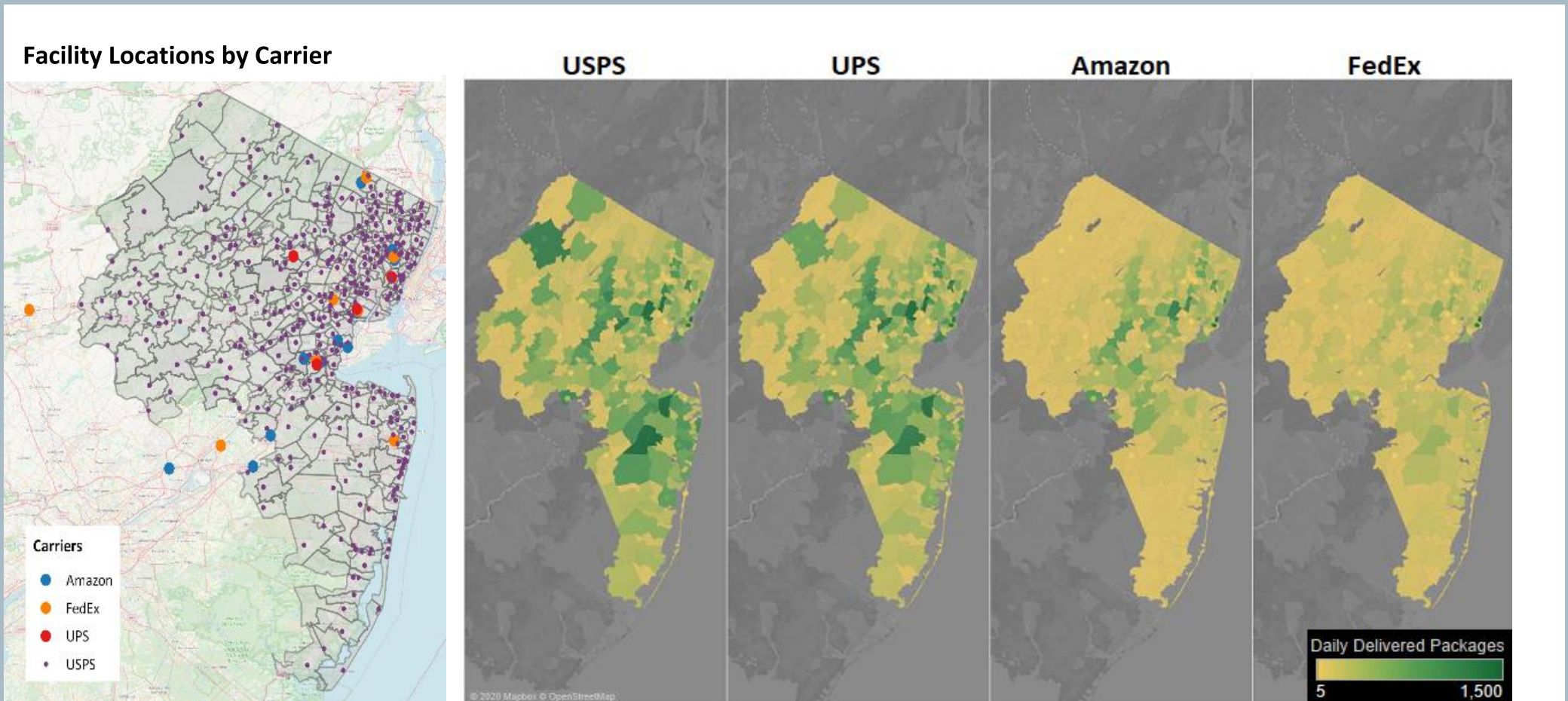
- Top 4 carriers deliver 97 percent of e-commerce shipments in the NJTPA region

- Focus on mapping top 4 carriers' logistics chains

Lasership 2%
All Other 1%
FedEx 11%
Amazon 18%
USPS 34%
UPS 34%
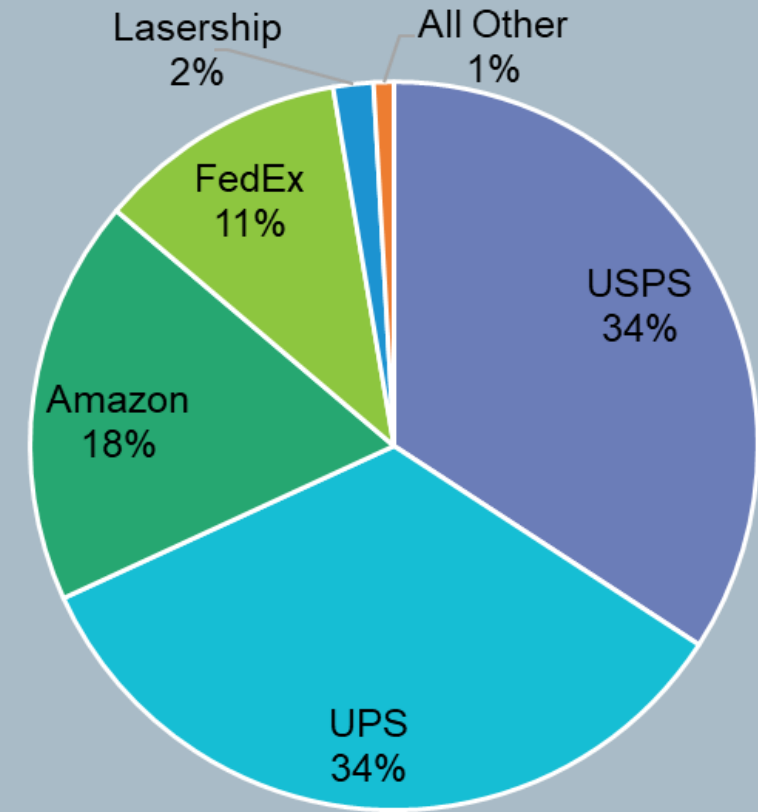
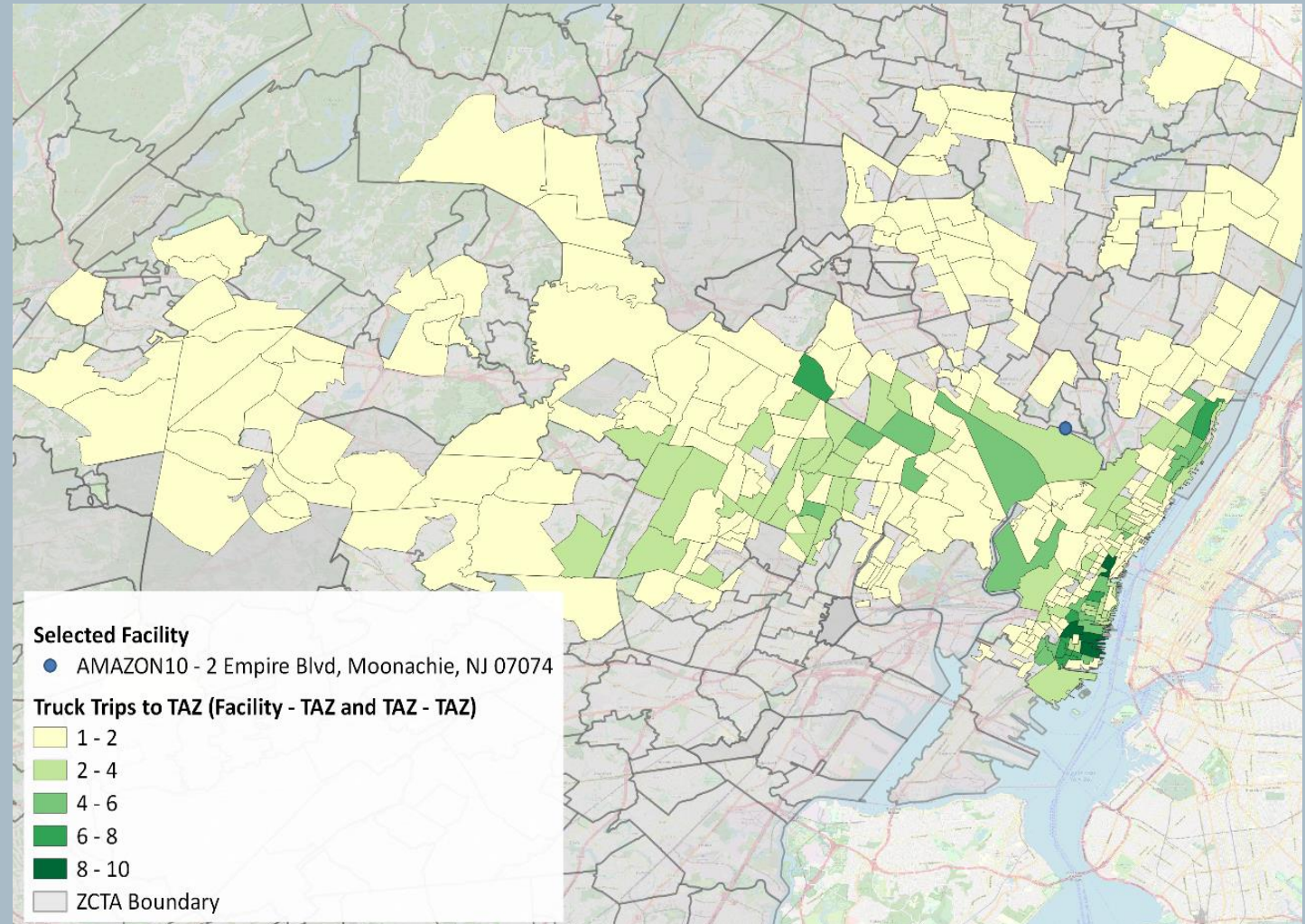**Source: Rakuten Intelligence, 2019**

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Map Logistics Chains and Facilities

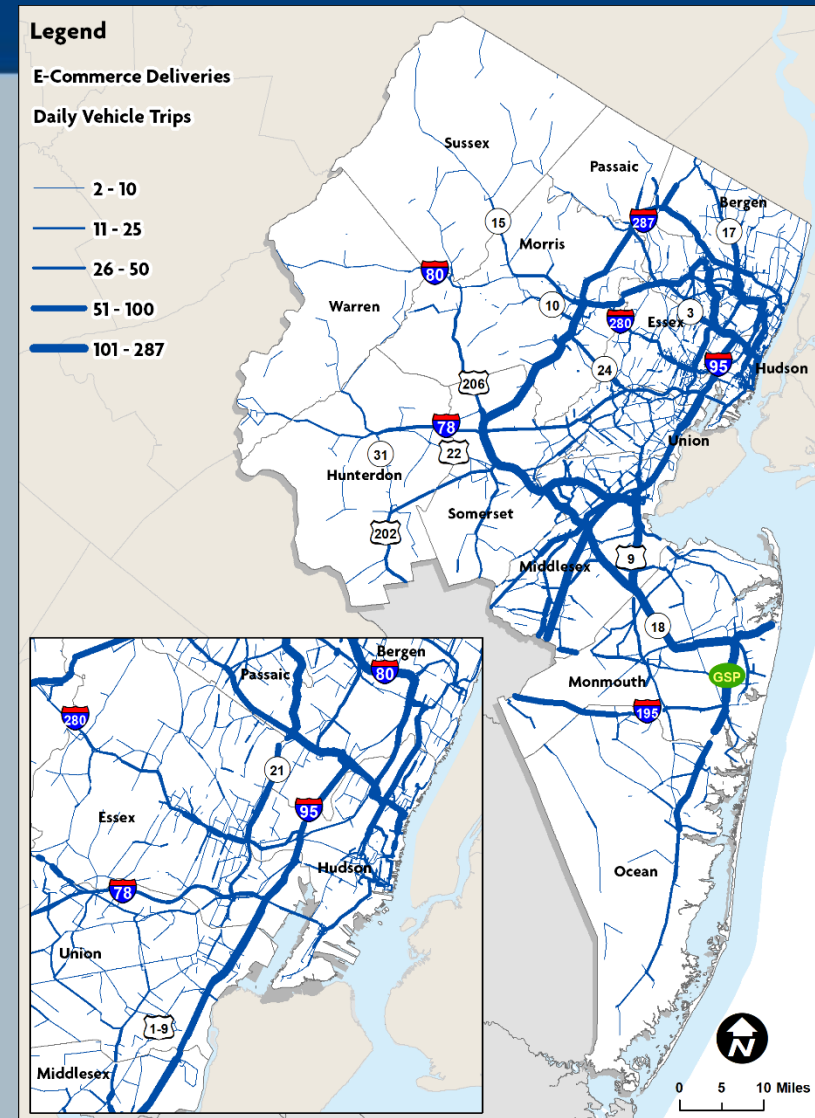Facility locations and daily delivered packages by zip code and carrier

Trip Table

Develop carrier-specific load factors and estimate trips from each facility to each Traffic Analysis Zone (TAZ)
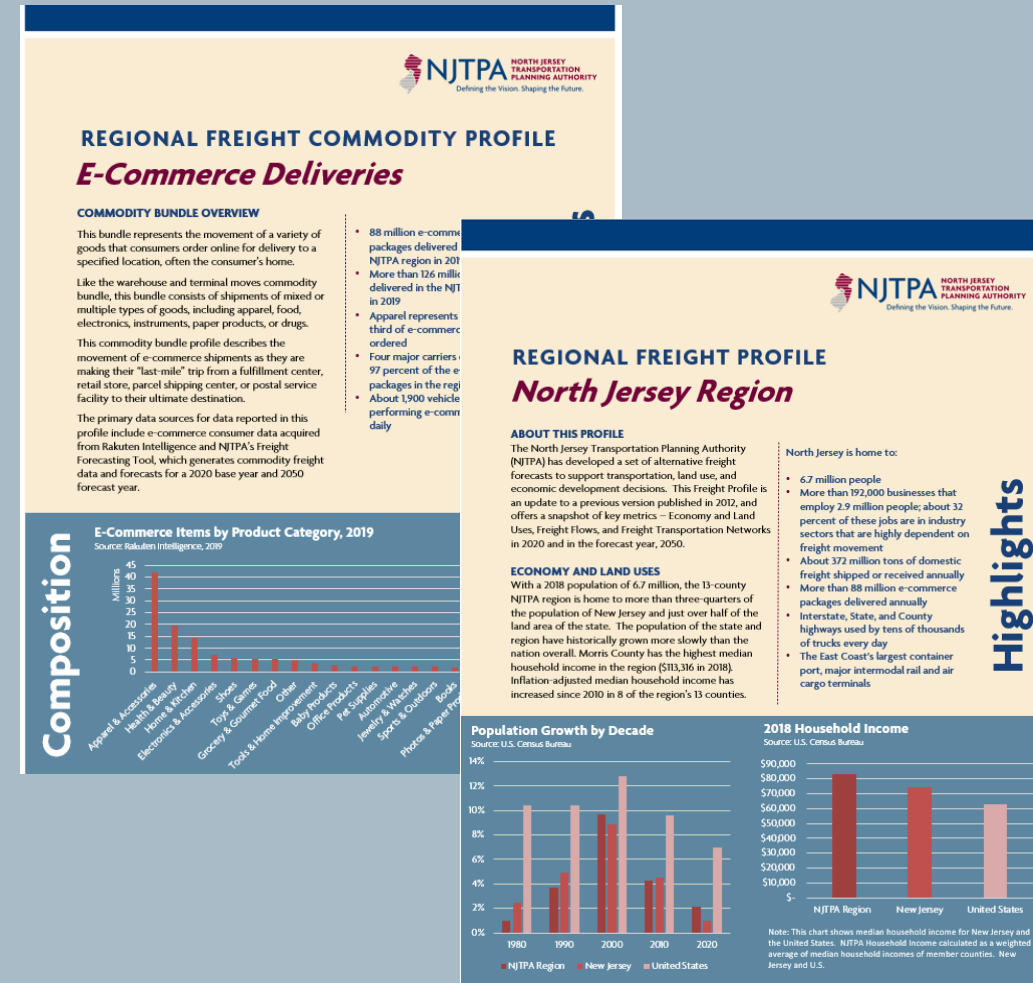
Trip Table Assignment

E-commerce table assigned to NJRTM-E as one of 12 FFT commodity group trip tables

Study Products

- Regional Freight Profile

- 15 Subregional Freight Profiles

- 12 Regional Commodity Profiles

- Final Report and profiles are on NJTPA's website:

  njtpa.org/2050FreightForecasts

Opportunities for Further Research

- Market research to validate/enhance the vendor-sourced data

- Potential use of LBS or other vehicle tracking data

- More carrier logistics research to enrich the carrier assumptions

- Expanded local data collection to validate the modeled estimates of vehicle trips

- Expanded demographic forecasting to include key variables

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Thank You!

Defining the Vision. Shaping the Future.

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