iTRAM 2018 Update & Right-Sizing Activities

MTMUG

January 10th, 2022

Background

- In 2019, Iowa's iTRAM model was slated for standard updates to common components but,

- Right-Sizing offered functions to be added to help with common planning questions

- Development of Right-Sizing functions were implemented in:
  - iTRAM and,
  - The DMAMPO model with instructions for other ISMS models

Right-Sizing Definition

▶ Right-Sizing: A process by which a transportation agency makes intentional decisions to adjust the size, extent, function and composition of its existing or planned infrastructure and service portfolio in response to changing needs over time.

Source: Stantec Consulting Services, Inc. on behalf of the City of Rochester. Rochester Innerloop 2013 (video screenshot). https://youtu.be/ZluEwhJx7nE
(Future development areas shown in purple)

Right-Sizing Focus

- Iowa DOT identified the following as the areas of focus for the Right-Sizing Demonstration in iTRAM

- Project Goal and [=] Outcome:

  - High-Cost/Low Volume Road Assessment = Preservation Cost

  - User Benefits and Costs = User Cost and Crash Cost

  - Capacity Threshold Assessment = Alternative Economic Futures
    - Telework
    - E-commerce
    - Trade Scenario

Right-Sizing Focus

- Due to the scale of iTRAM and conditions presented by the COVID-19 Pandemic, an MPO candidate was sought for demonstration of:
  - Telework Reductions
  - E-Commerce Retail Impacts
- The Des Moines Area MPO was selected due to:
  - Two Amazon facilities being opened
 - Concentrated workplace restrictions being implemented due to COVID-19

iTRAM

Preservation Cost

Purpose: To summarize the VMT exposure in terms of highway preservation costs

- Summarizes the maintenance cost by trip

- Preservation costs are differentiated by roadway and volume level

- > 90 percentile areas have greater costs relative to each user

Findings;

- Follow population and activity patterns

- Expose a widespread condition of underutilization
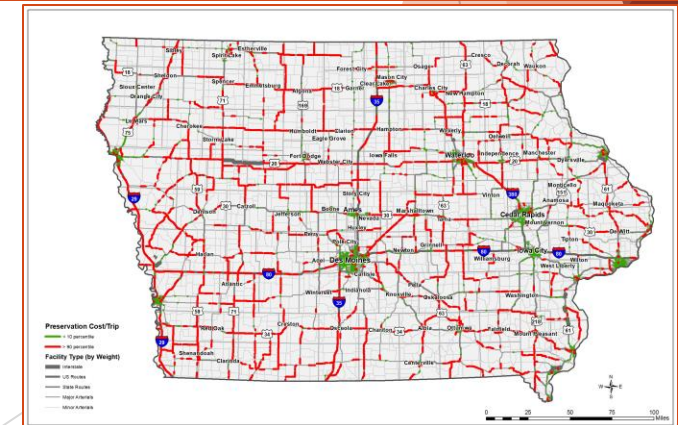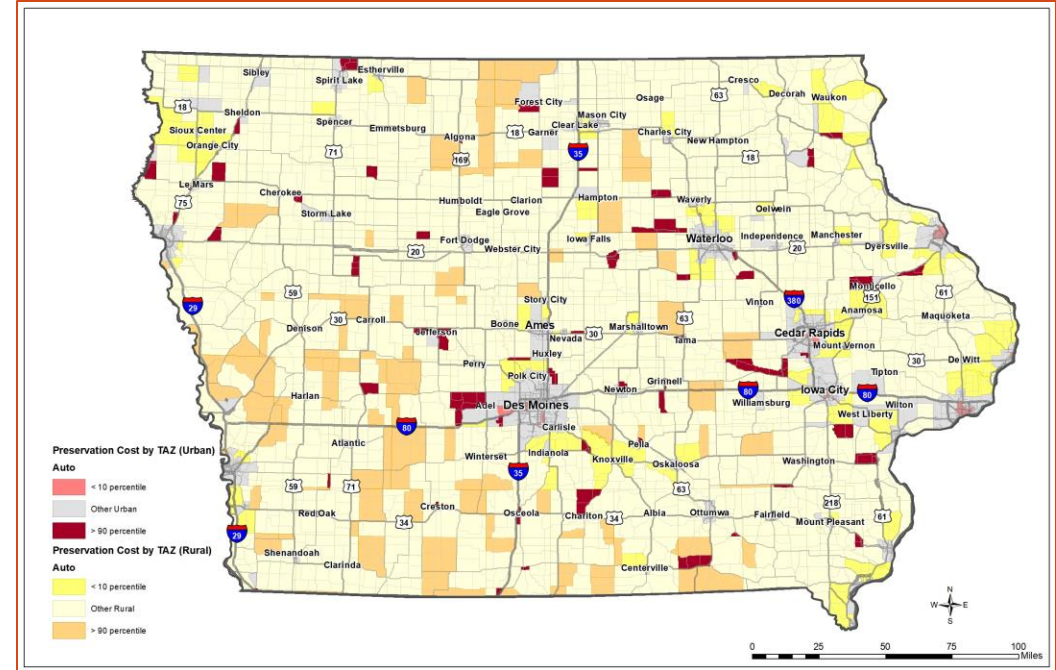
User Cost

Purpose: To summarize the user cost of driving with the value of the activities/destinations accessed

- Summarizes cost of time and distance traveled
- > 90 percentile areas have greater costs to access these areas

Findings;

- Follow population and activity patterns
- Expose areas that might be at danger of not offering basic or emergency services
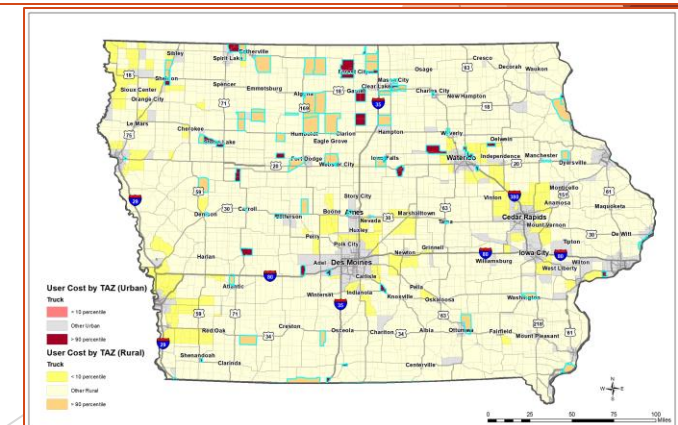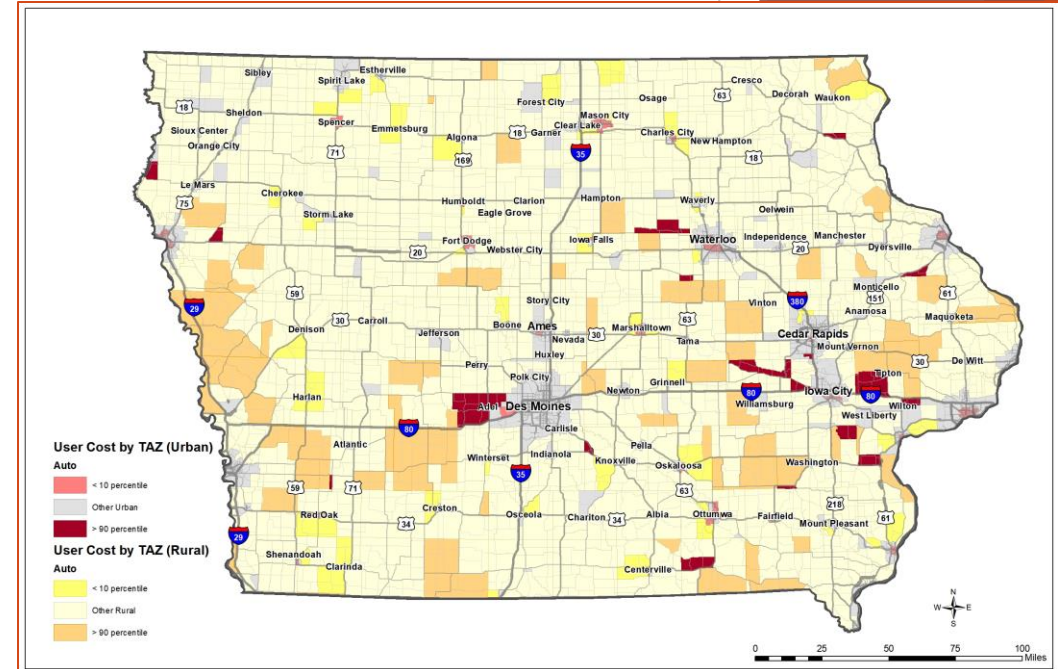
Crash Cost

Purpose: To summarize the locations that are most crash prone in relation to the trip

- Summarizes the crash impact to the trip maker involved

- Uses FHWA crash costs and crash data

Findings;

- The highest count of crashes is in urban areas

- The greatest cost per trip is in the rural areas

- Further routing investigation can connect the populations disproportionally impacted
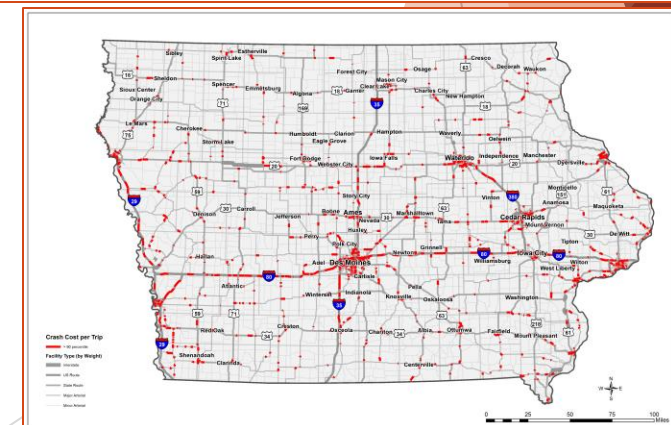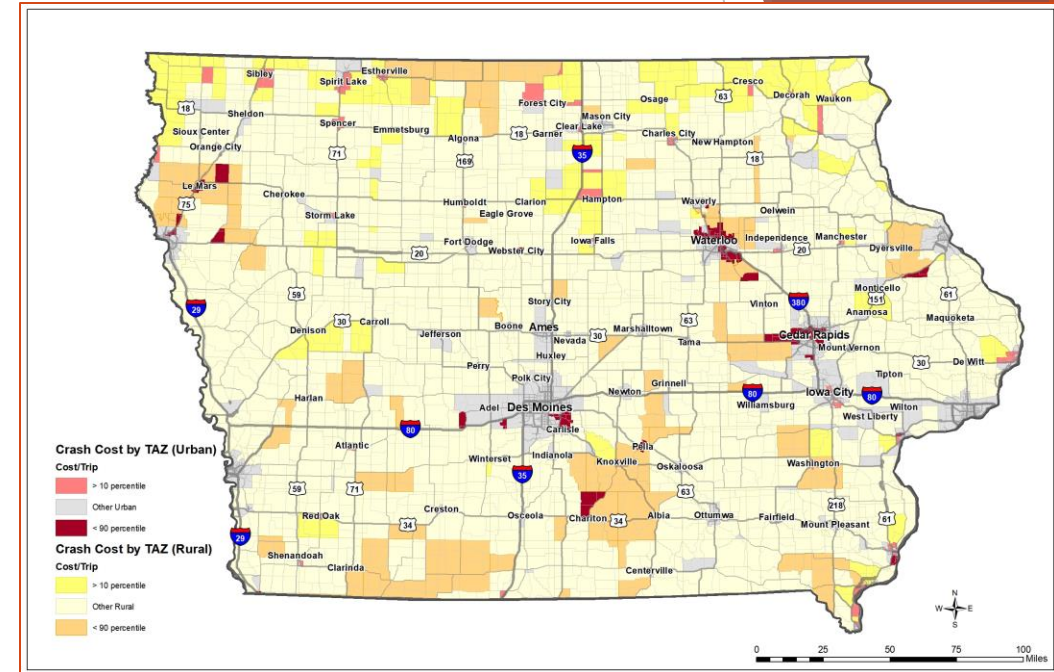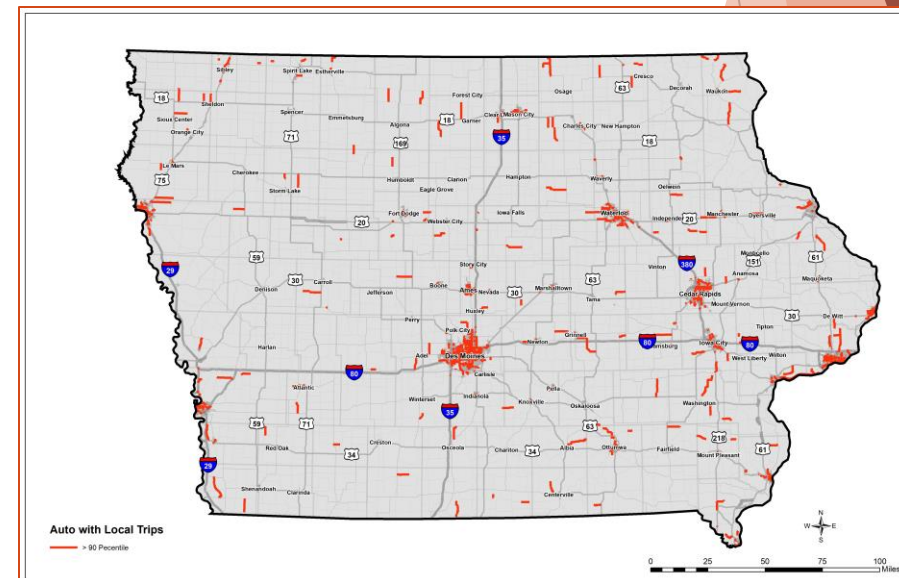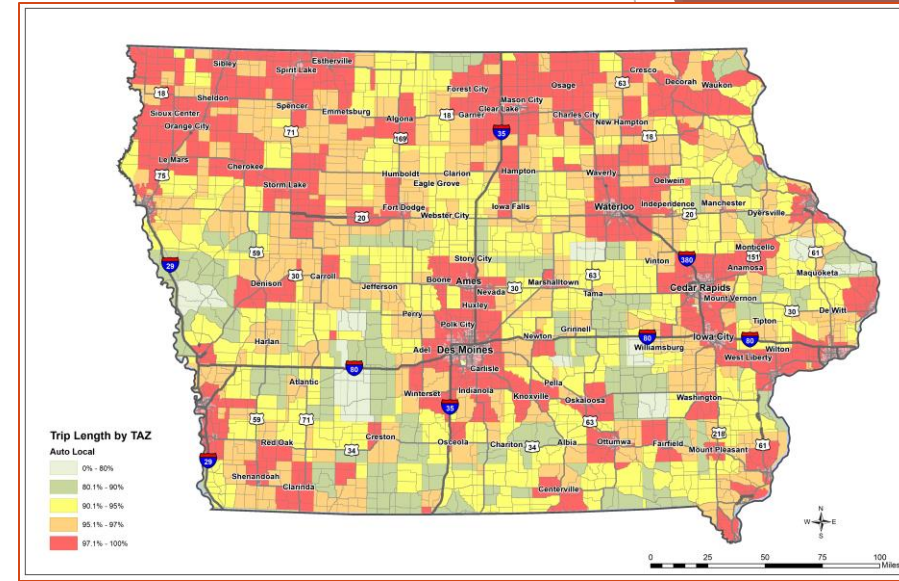
Trip Length Assessment Functionality

Purpose: A feature of the model update is the thematic display of originating traffic, as categorized by generalized trip length

- Local is 0-50, Inter-City is 50-150, Statewide is 150-300, and Inter-state is 300+ miles
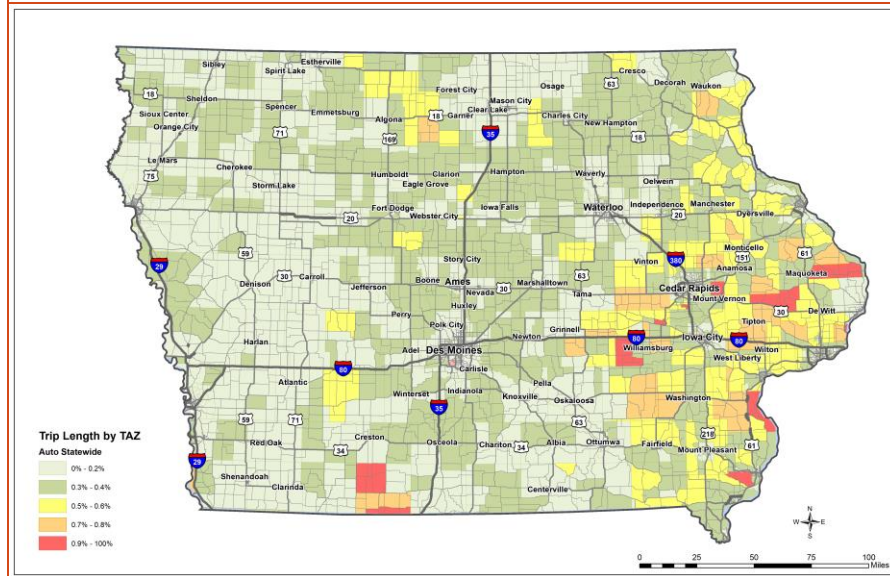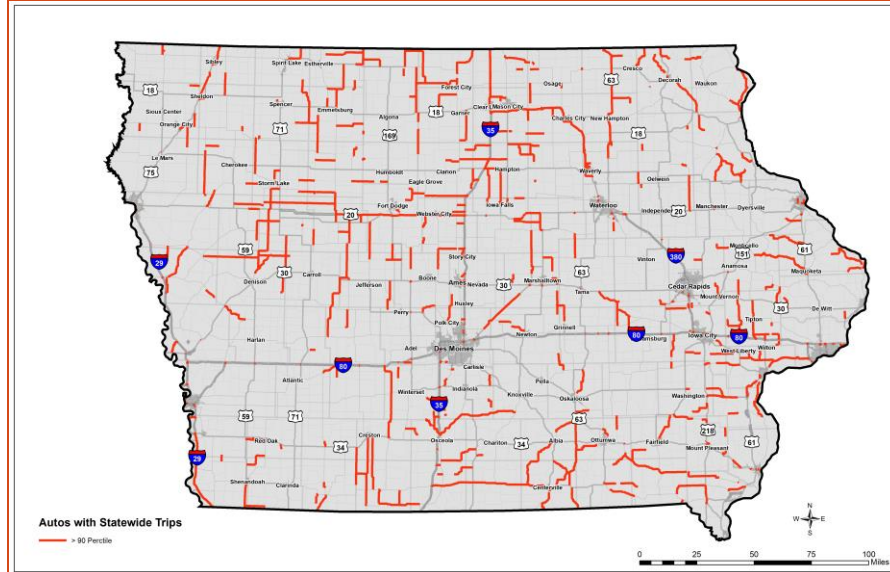
Findings;

  - The vast majority of trips are local

  - Regional variation by length does occur and leads to further discussion on how users choose or are forced to use the system as a product of their home.

Trip Length Assessment Functionality
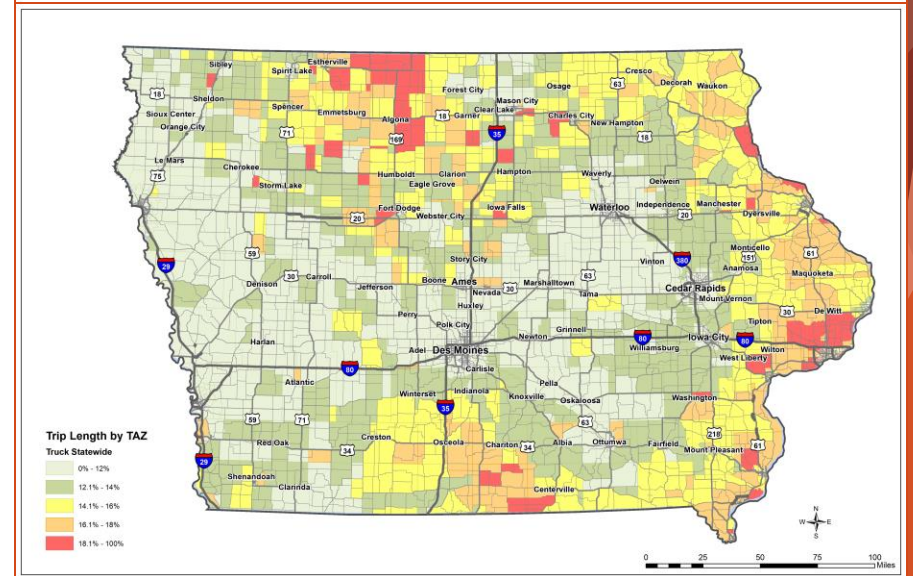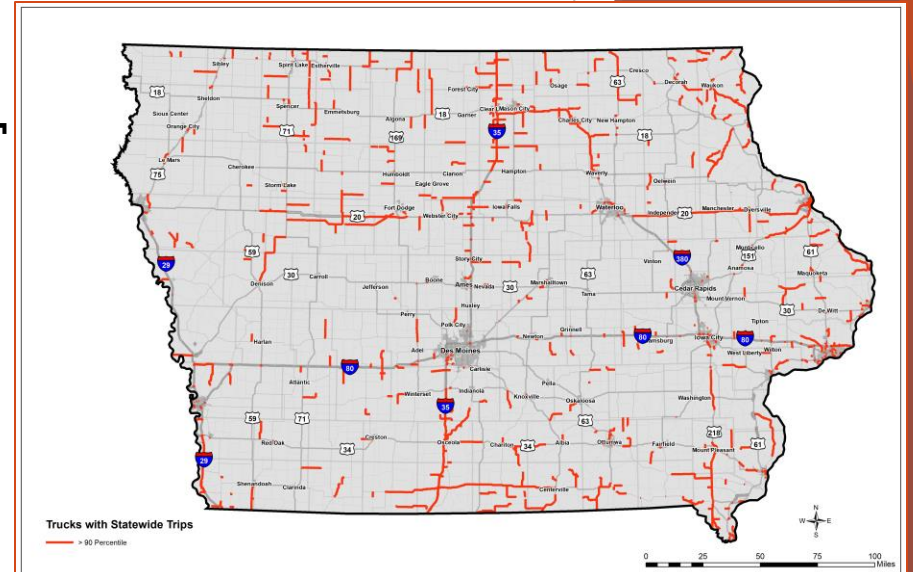
Trade Scenario

Purpose: To analyze network performance with the shift of an international commodity originating from Iowa

- Evaluated impacts up and down the supply chain

- Scenario focused on increased truck-bound cereal grains to East Asia, and less to domestic and Canadian markets

Findings;

- Trips formerly for domestic markets hit neighboring states/roadways hard

- Exports to West Coast and Ontario increase

- Some mode shift changes occur with some changes to barge and rail use
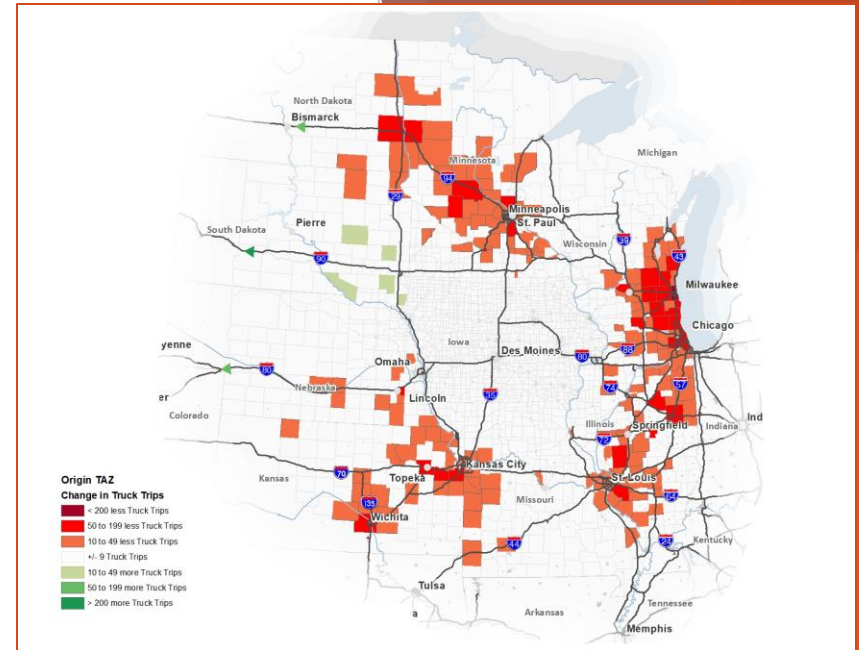
DMAMPO

Telework - Background

Purpose: To analyze network performance with a reasonable/ongoing telework economy

- Evaluated industry research data for the population that would likely reduce HBW trips

- Specific interest was taken in Des Moines area projects such as the ICM on I-235

Telework - Assumptions

Moody's Analytics estimated job impacts from COVID-19

Comparing Iowa Statewide Employment Forecasts

Forecast Version
- Post-Covid
- Pre-Covid

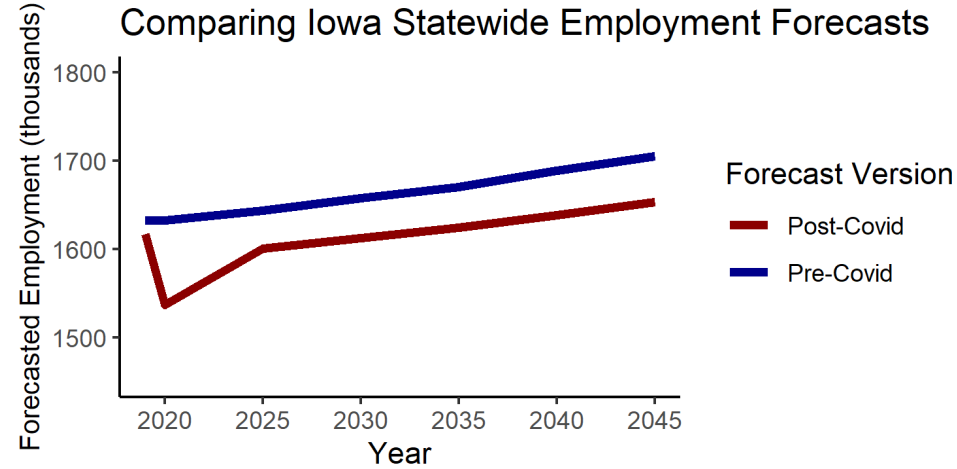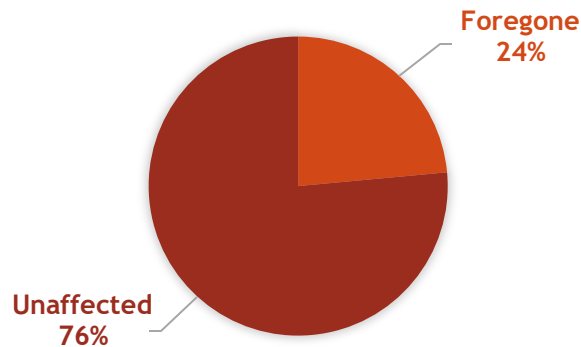(Y-axis: Forecasted Employment (thousands); X-axis: Year)

Estimate of max daily HBW trip reduction with telework

- Foregone 24%
- Unaffected 76%

BLS Telecommute potential by industry

Industry	Percent share of employed able to telework (April 2020)	Labor market outcomes		Percent change in employment (February–April 2020)			Percentage-point change in unemployment rate (February–April 2020)		
		Percent change in employment (February–April 2020)	Percentage-point change in unemployment rate (February–April 2020)	Able to telework	Not able to telework	Difference	Able to telework	Not able to telework	Difference
Financial activities	81.1	-6.1	3.7	-5.8	-7.2	1.4	2.8	7.2	-4.4
Information	80.4	-11.8	9.3	-2.1	-37.3	35.2	5.8	21.1	-15.3
Professional and business services	71.6	-9.6	5.5	-6.4	-16.8	10.4	3.5	10.0	-6.5
Public administration	57.0	-3.8	3.4	-1.5	-6.7	5.1	3.2	3.8	-0.6
Education and health services	47.9	-13.9	9.4	-12.5	-15.2	2.8	8.8	9.9	-1.1
Manufacturing	41.0	-13.7	9.2	-3.9	-19.5	15.5	4.3	12.3	-8.0
Mining, quarrying, and oil and gas extraction	40.3	-14.9	4.2	5.5	-24.8	30.3	4.2	5.1	-0.8
Other services	39.9	-27.2	19.4	-8.4	-35.9	27.5	10.6	24.3	-13.6
Transportation and utilities	32.7	-10.9	8.7	4.7	-16.9	21.6	4.9	10.4	-5.5
Wholesale and retail trade	26.5	-16.4	12.6	-9.4	-18.6	9.2	7.6	14.2	-6.6
Construction	20.7	-16.6	10.2	-11.9	-17.8	5.8	5.1	11.3	-6.2
Leisure and hospitality	20.3	-42.0	32.1	-25.5	-45.1	19.6	22.9	34.1	-11.2
Agriculture, forestry, fishing, and hunting	8.1	-1.2	-1.7	-4.3	-1.0	-3.3	-5.9	-1.3	-4.5
Total	45.8	-15.6	10.8	-7.9	-21.2	13.3	6.2	14.3	-8.1

Source: Authors' calculations based on Februrary–April 2020 Current Population Survey data and O*NET job-content data.
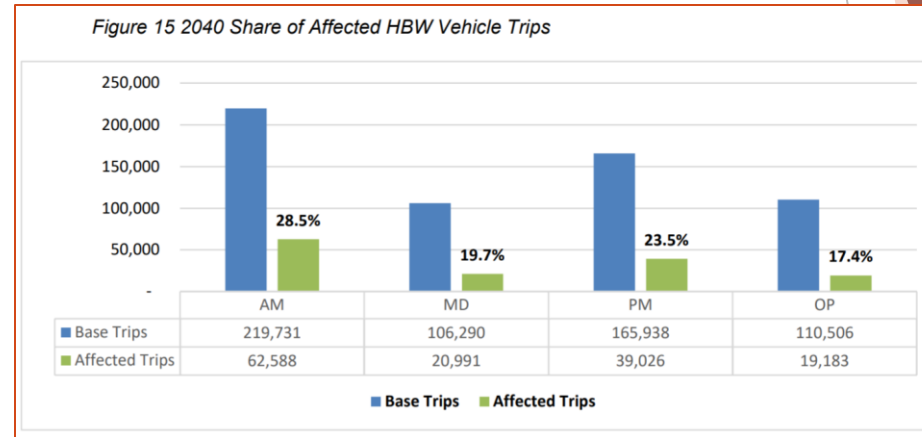
Telework - Results

Congested VHT
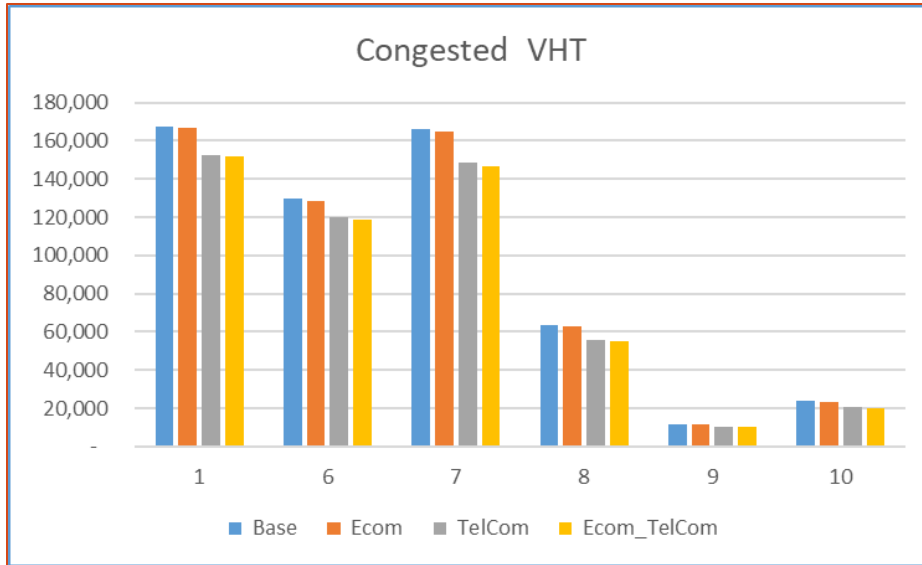
Horizonal values are facility codes, 1=Interstate

Highlighted Findings:

▶ Telework can have a sizable impact on certain sectors and households

▶ Telework does not have enough of an impact to forego/delay construction to reduce congestion

Share of affected HBW trips

Figure 15 2040 Share of Affected HBW Vehicle Trips

	AM	MD	PM	OP
Base Trips	219,731	106,290	165,938	110,506
Affected Trips	62,588	20,991	39,026	19,183

Average Congested Speed

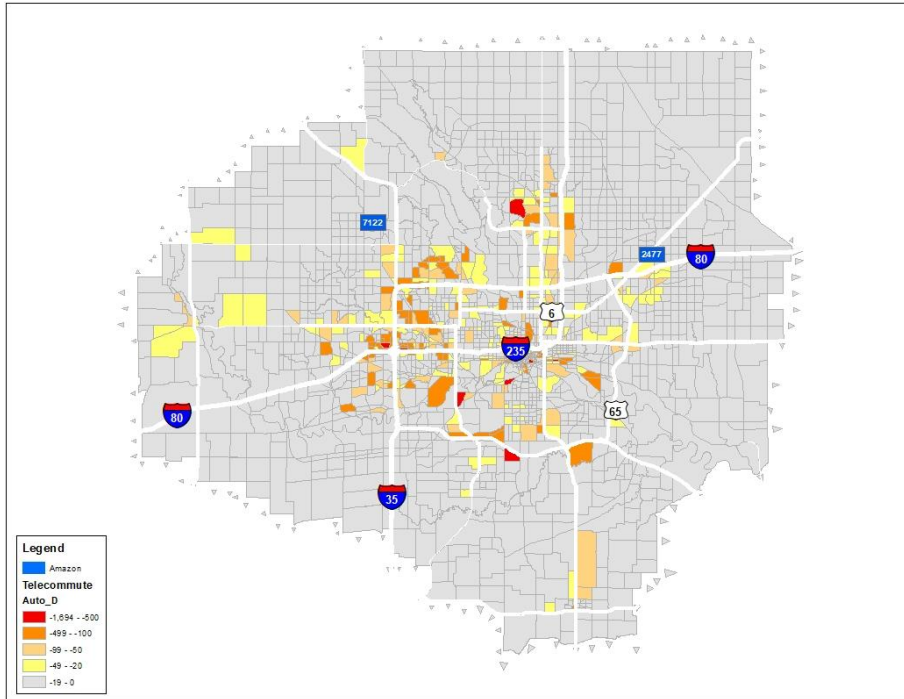|	FACTYPE	Base	Ecom	TelCom	Ecom_TelCom
1	Interstate	54.9	54.9	57.5	57.5
6	Principal arterial	27.6	27.7	28.8	29.0
7	Minor arterial	25.8	25.9	27.1	27.3
8	Collector	32.1	32.1	33.2	33.4
9	Minor Collector	37.4	37.4	37.9	38.0
10	Local	25.6	25.6	26.4	26.4
	TOTAL	35.8	35.9	37.5	37.7

Telework - Results

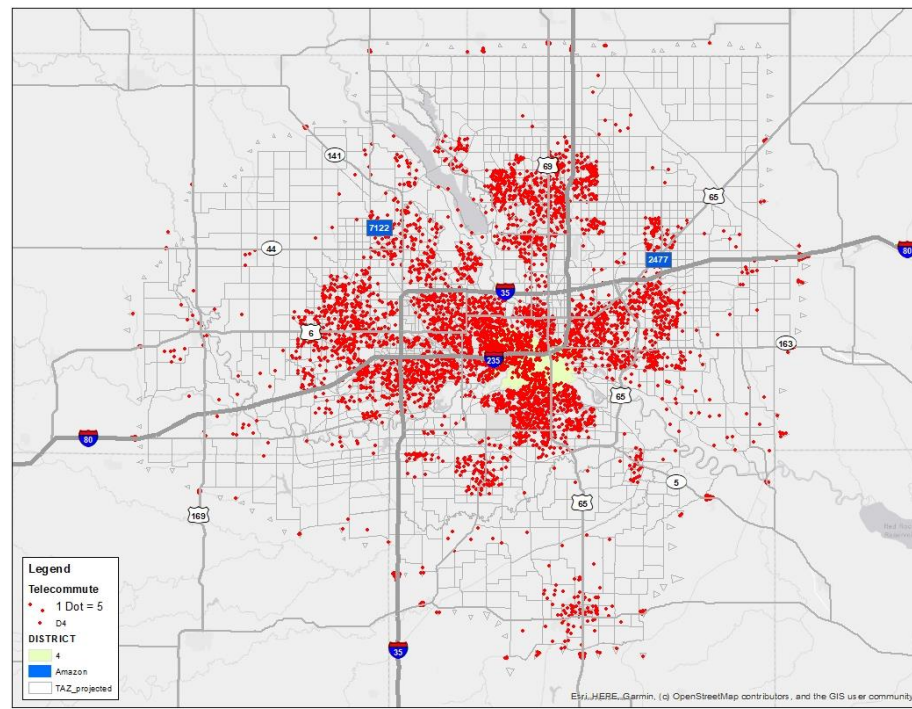Volume Difference
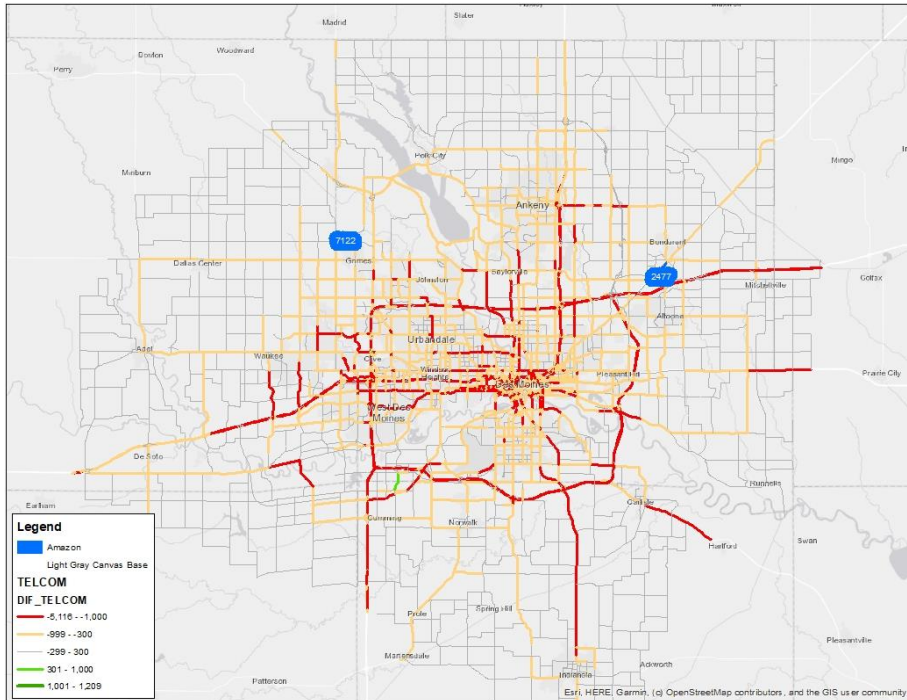
Telecommute LOS Change
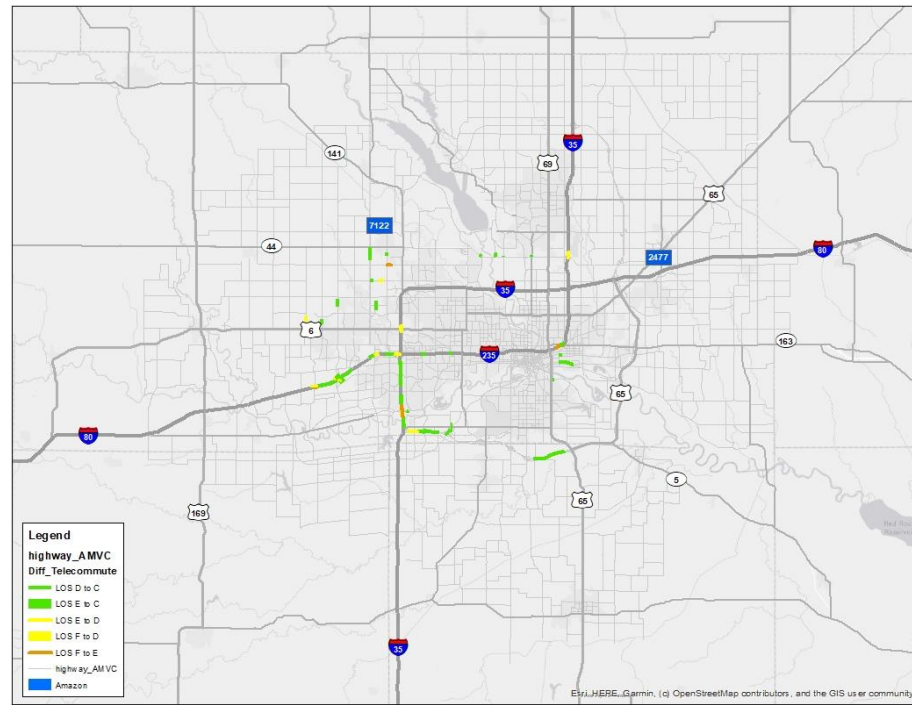
Telework - Results

Auto trips change by destination

Districting, home locations in relation to work location

E-commerce - Background

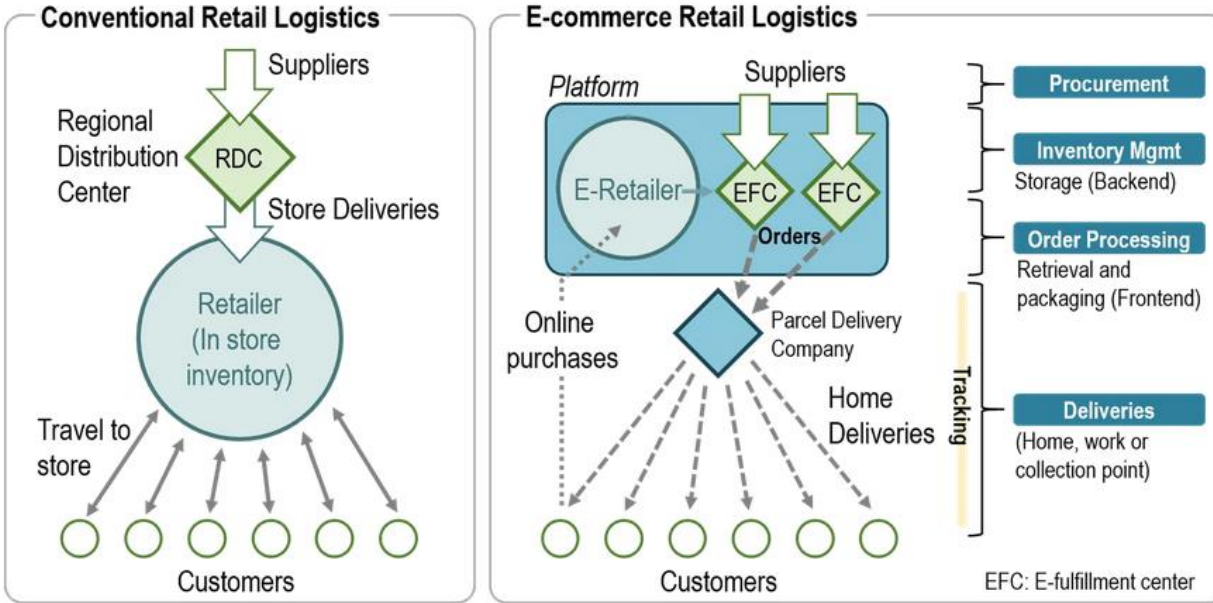Purpose: To analyze network performance with a reasonable replacement of Brick & Mortar with on-line shopping/delivery

- Evaluated the supply chain network as well as buyer needs/habits

- Focused on the impact of

  - Home Based Shopping trips [the shoppers themselves]

  - Combination vehicle trips [the delivery trips to stores]

  - Single unit trips [the local parcel delivery trips to homes]
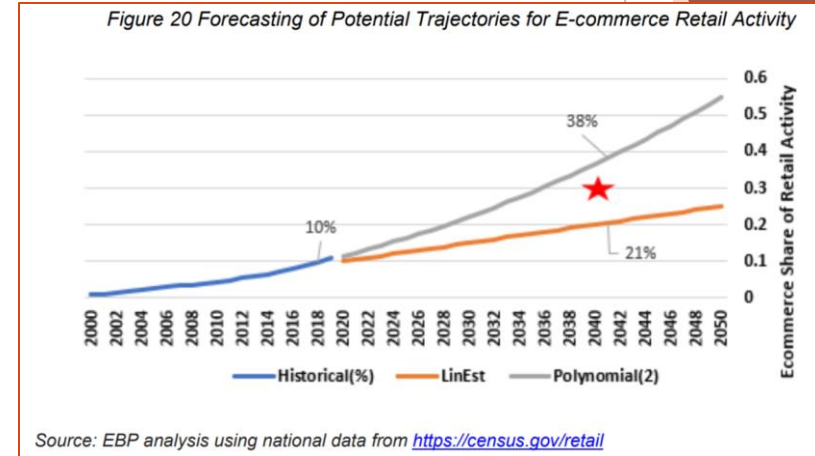
E-commerce - Assumptions

Logistics relationships

Conventional Retail Logistics
Suppliers → Regional Distribution Center (RDC) → Store Deliveries → Retailer (In store inventory) → Travel to store → Customers

E-commerce Retail Logistics
Platform: E-Retailer, EFC, EFC — Suppliers, Orders
Online purchases → Parcel Delivery Company → Home Deliveries → Customers

Procurement
Inventory Mgmt — Storage (Backend)
Order Processing — Retrieval and packaging (Frontend)
Deliveries (Home, work or collection point)
Tracking
EFC: E-fulfillment center

E-commerce share of retail

Figure 20 Forecasting of Potential Trajectories for E-commerce Retail Activity
Source: EBP analysis using national data from https://census.gov/retail

E-commerce share of all Home-Based trips

Diverted Ecommerce, 7%
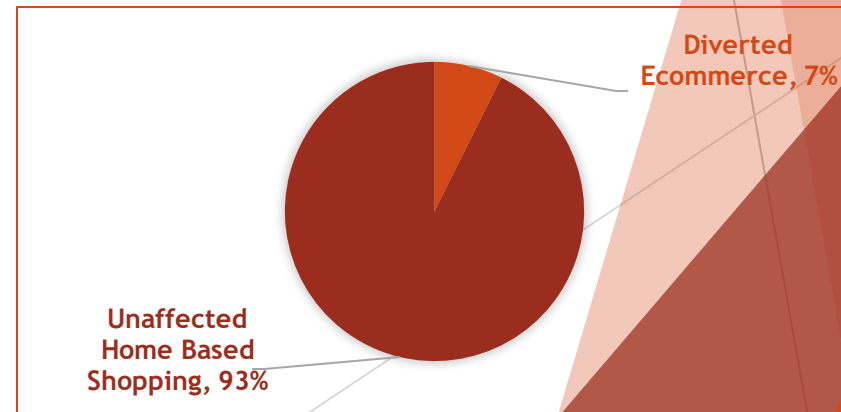
Unaffected Home Based Shopping, 93%

Retail trips targeted for a 30% reduction at specific land uses categories

- Regional shopping centers
- Neighborhood shopping centers
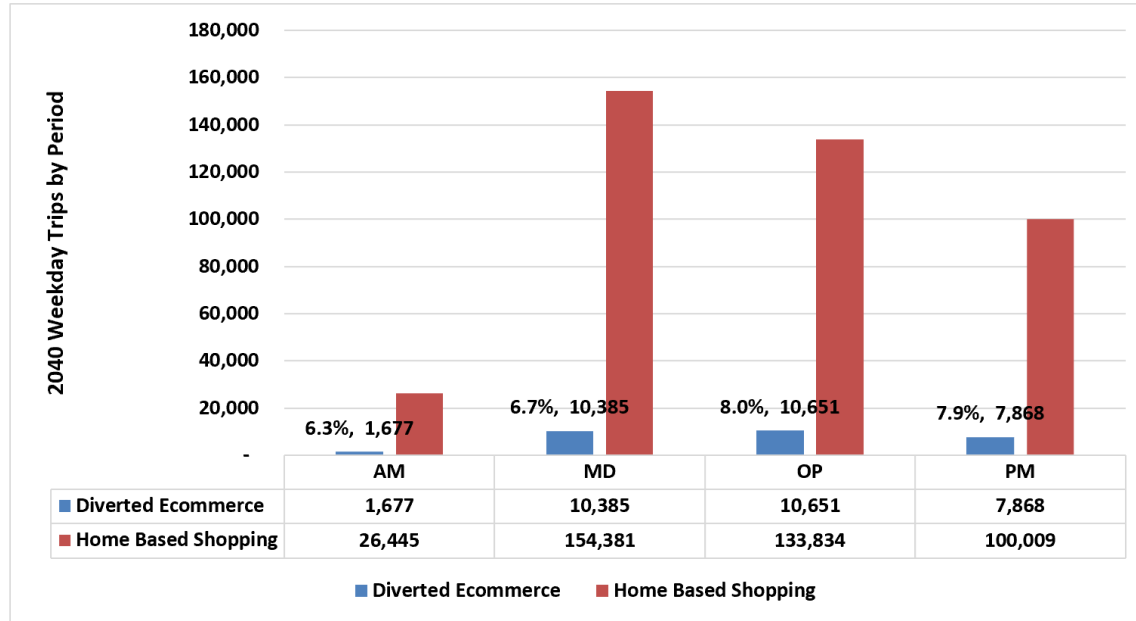- Community shopping centers/big box stores

E-commerce - Results

Ecommerce share or trips

	AM	MD	OP	PM
■ Diverted Ecommerce	1,677	10,385	10,651	7,868
■ Home Based Shopping	26,445	154,381	133,834	100,009

■ Diverted Ecommerce ■ Home Based Shopping

Percentages shown: 6.3%, 1,677 (AM); 6.7%, 10,385 (MD); 8.0%, 10,651 (OP); 7.9%, 7,868 (PM)
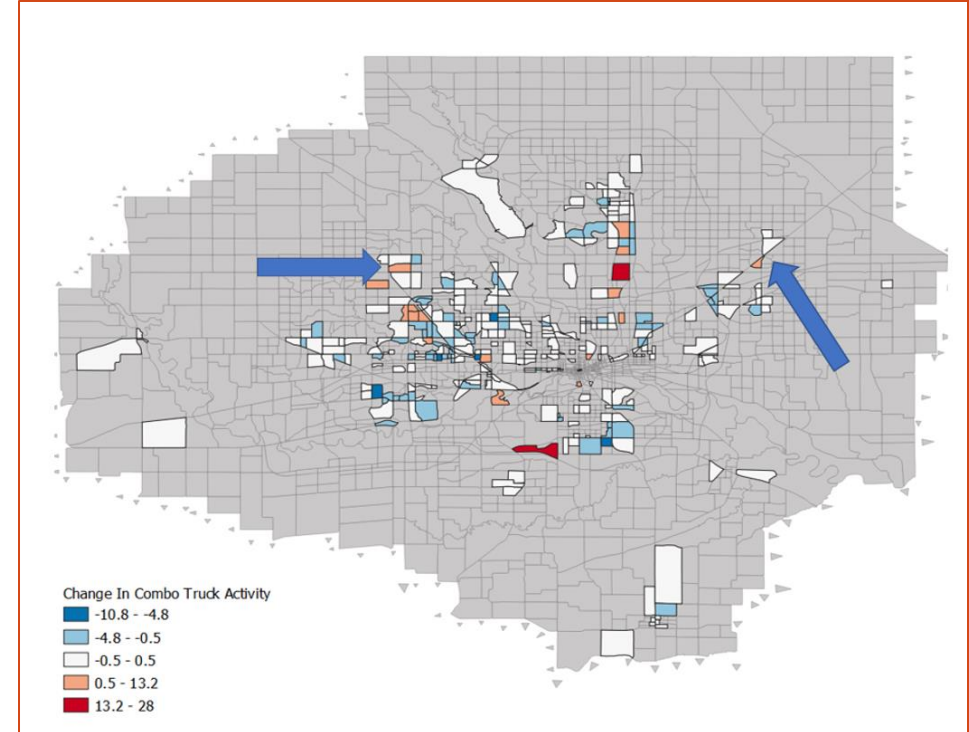
Y-axis: 2040 Weekday Trips by Period

Highlighted Findings:

▶ For the specific land uses, a 30% reduction only leads to a 7% reduction in HBS trips

▶ Further ISMS changes are needed to fully replicate local deliveries

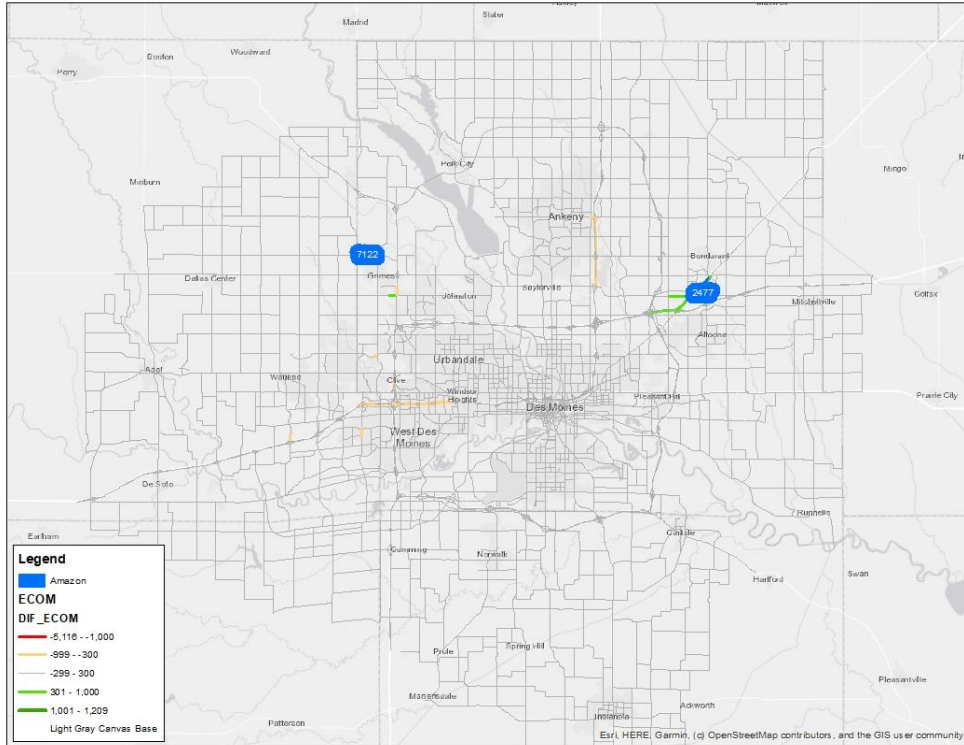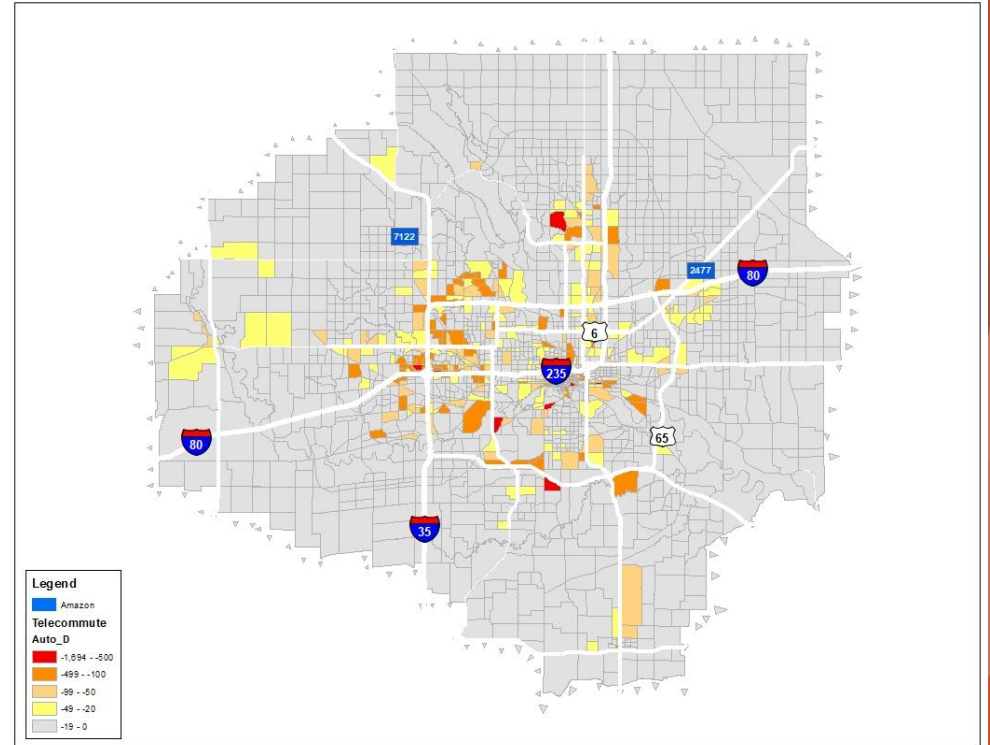## Combination truck change

Change In Combo Truck Activity
■ -10.8 - -4.8
■ -4.8 - -0.5
□ -0.5 - 0.5
■ 0.5 - 13.2
■ 13.2 - 28

Arrows designate Amazon regional [right] & delivery [left] facilities

E-commerce - Results

Retail trip change

Auto retail destination trip change

Considerations for the future

- Telecommuting
  - Expand on the income effects of telecommuting
  - Incorporate region-specific insights
  - Incorporate more detailed industry data

- E-commerce
  - Adjust the rate of e-commerce adoption and type of stores
  - Research the relationship of shopping potential and income level
  - Review the impact of online ordering and customer pickup

Thank you for your attention

JEFF VON BROWN, CPM

MODELING, FORECASTING & TELEMETRICS - TEAM LEADER

SYSTEMS PLANNING BUREAU

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