How the Atlanta Regional Commission (ARC) Applies the Regional Model for Planning

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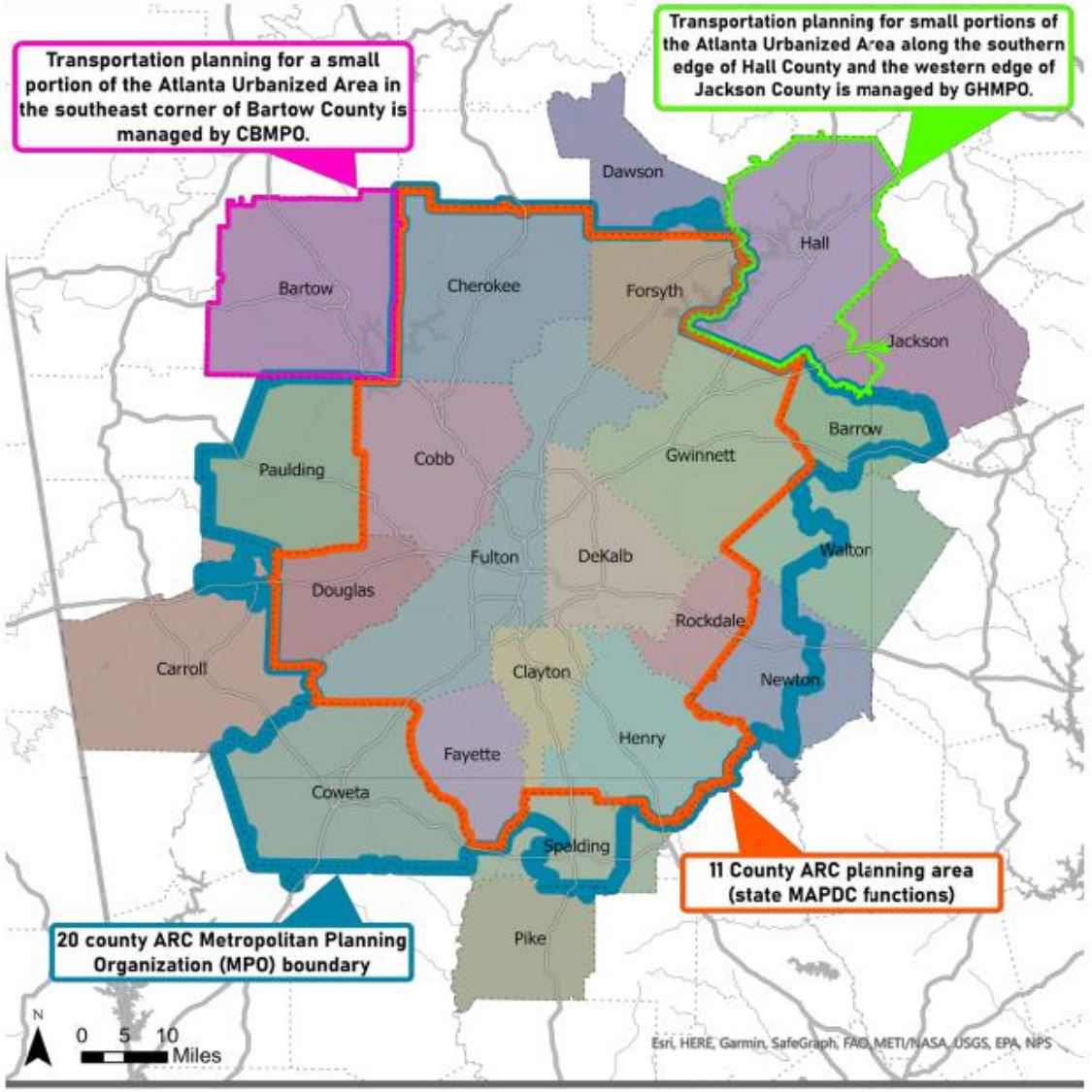
Atlanta Regional Commission (ARC)

- MPO for the Atlanta Region
  - 21-County Modeling Domain
  - 6,400 square miles
  - ~6 million people

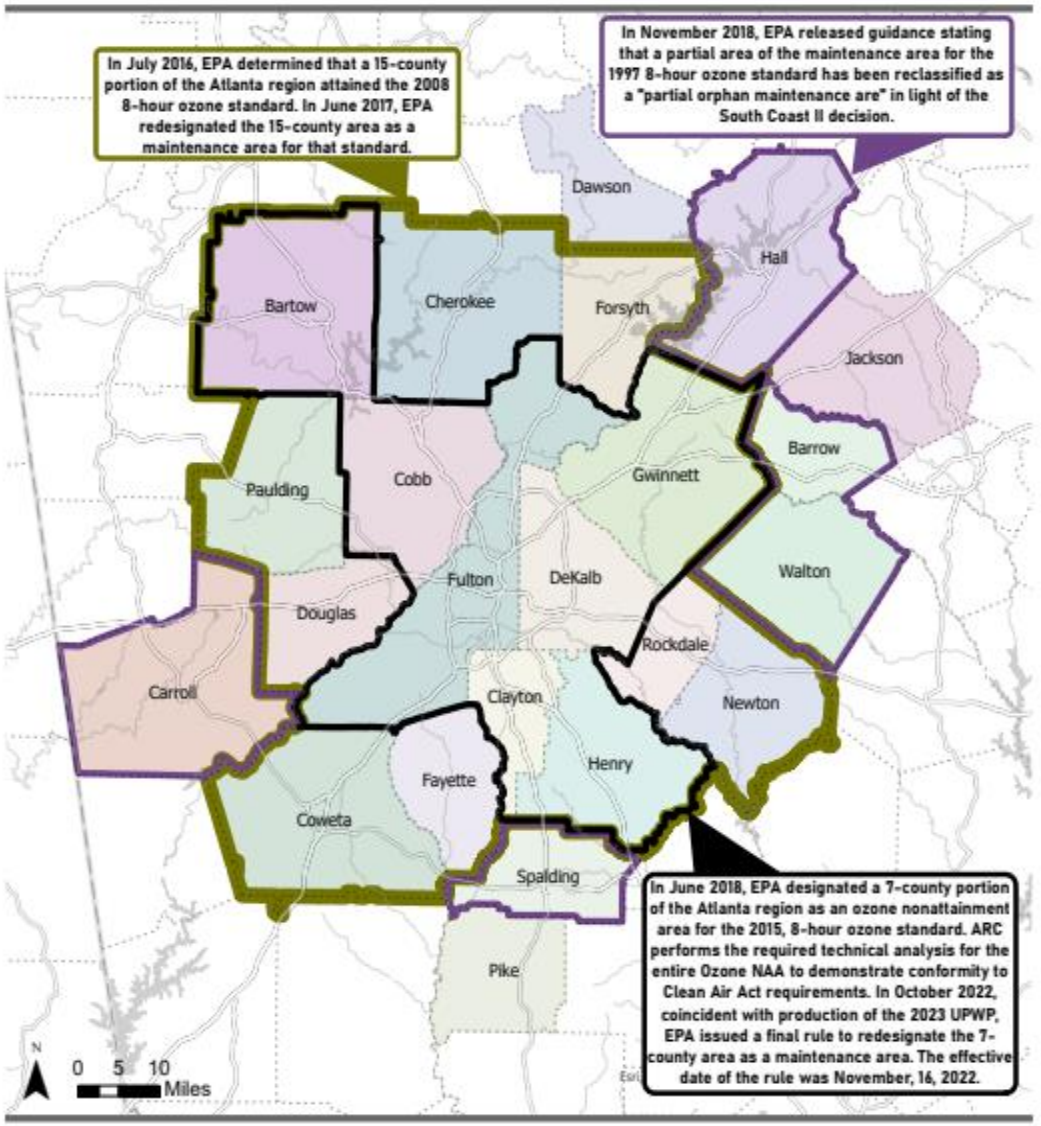
CURRENT MPO BOUNDARIES (FEBRUARY 2024)



Legend

- 20 county ARC MPO boundary
- Gainesville - Hall MPO planning area
- Cartersville - Bartow MPO planning area
- 11 county ARC planning area

ATLANTA REGION AIR QUALITY ANALYSIS BOUNDARIES



Legend

- 2015 Ozone Standard Maintenance Area (7 counties)
- 2008 Ozone Standard Maintenance Area (15 counties)
- 1997 Ozone Standard Partial Orphan Maintenance Area (5 counties)

Why Travel Demand Modeling?

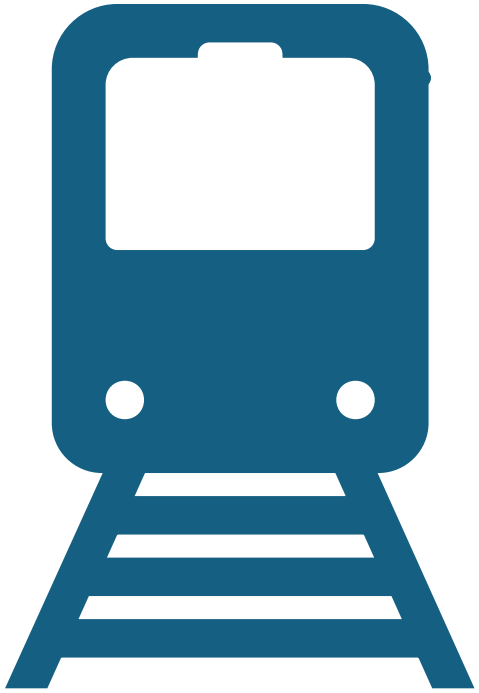
Bipartisan Infrastructure Law Section 11205

Travel Demand Data and Modeling

- The BIL requires the Secretary to—
  - carry out a study that gathers travel data and travel demand forecasts from a representative sample of States and MPOs and compares travel demand forecasts with observed data; and to use this information to develop best practices or guidance for States and MPOs to use in forecasting travel demand for future investments in transportation improvements; [§ 11205(b)(1)]
  - seek opportunities to support States' and MPOs' transportation planning processes by providing data to improve the quality of transportation plans, models, and travel demand forecasts; and [§ 11205(b)(2)]
  - develop, and make publicly available, a multimodal web-based tool to enable States and MPOs to evaluate the effect of highway and transit investments on the use and conditions of all transportation assets within the State or area served by the metropolitan planning organization, as applicable. [§ 11205(b)(3)]

How does ARC use its Travel Demand Model for Planning?

- Forecast why, where, when, and how people will travel around metro Atlanta
- Estimate travel demand in the absence of empirical observations
- Support the development of the Metropolitan Transportation Plan (MTP) and environmental justice studies
- Scenario testing: alternative land uses, roadway & transit networks, transportation policies (managed lanes, reversible lanes, high occupancy vehicle (HOV) lanes, express toll lanes, commercial vehicle truck lanes, etc.)
- Project planning and corridor studies: Project prioritization, project-level analysis
- Estimate motor vehicle emissions for air quality conformity determination of the transportation system integrated with a mobile emissions model (EPA's MOVES model)



Modeling for Policy Analysis at ARC

- Make sure the model can address pressing regional transportation planning issues in Metro Atlanta, such as dynamic pricing on express toll lanes to improve travel time reliability.
- Apply rigorous sensitivity tests and scenario analyses via extreme cases (“book ends”) and stress-testing.
- Model should address planning issues like social equity, teleworking, peak spreading, freight, special events, and non-motorized travel.
- Modeling AVs and Autonomous, Connected, Electric, Shared (ACES or CASE) vehicles in a series of hypothetical scenarios
- Account for TNCs in modeling, despite the scarcity and limited availability of TNC data in a traditional household travel survey

ARC Travel Demand Modeling Process

- Atlanta Regional Activity-Based Travel Demand Forecasting Model fully documented on ARC Model Documentation (atlregional.github.io)

- Current model development, deployment and implementation on ActivitySim - AMPO Foundation

- Travel demand modeling tools and dashboards:
- Activity Based Model - ARC (atlantaregional.com)
- ARC ABMVIZ (atlregional.github.io)
- https://atlregional.github.io/ActivityViz/
- 2019 NHTS NexGen Origin Destination Local Add-on (arcgis.com)

Features of ARC Travel Demand Modeling Process

Realistic

Multimodal routable networks

Accurate

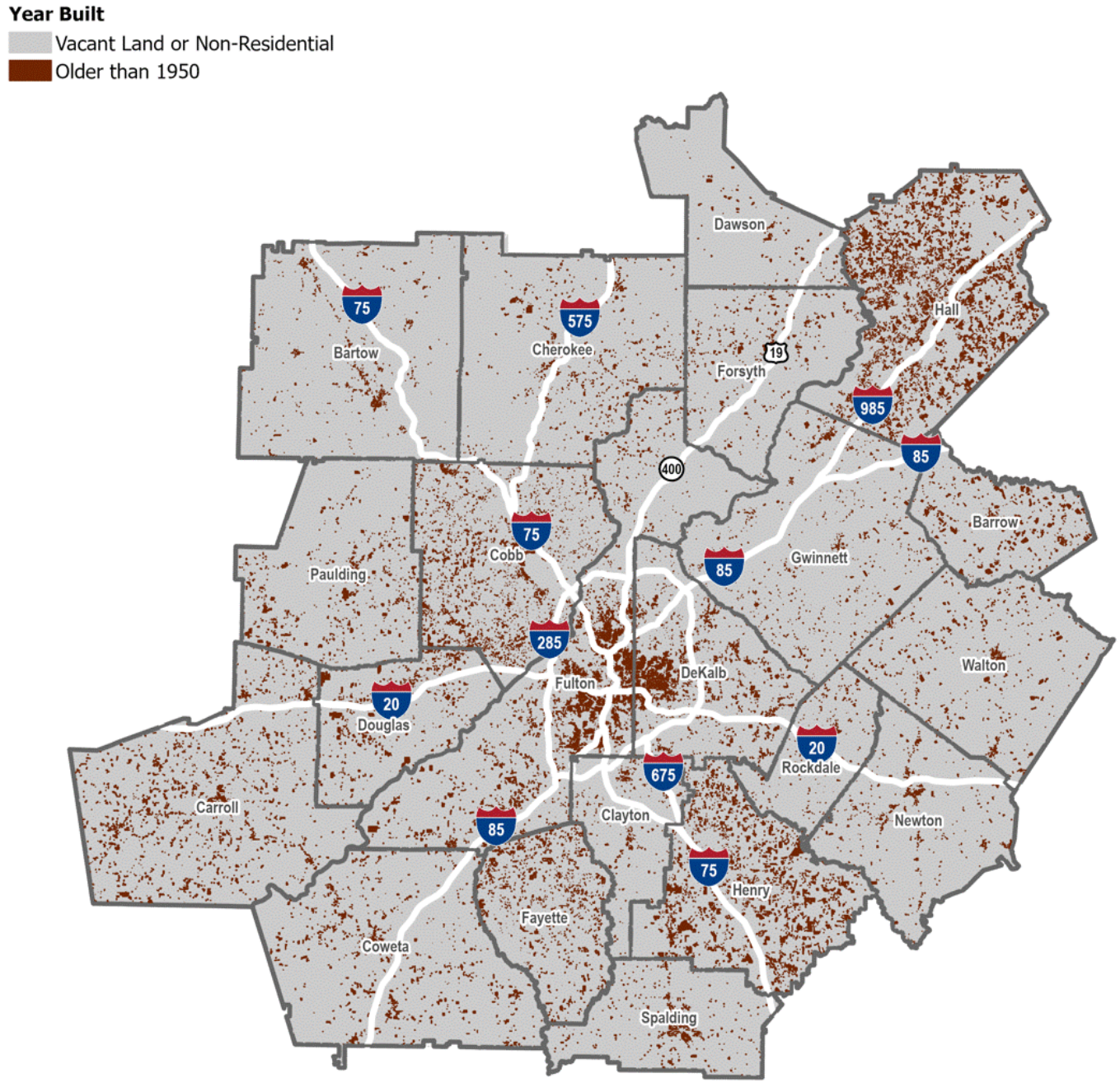
Represent existing and future conditions

Auditable

Fully documented and able to record & share incremental changes to model

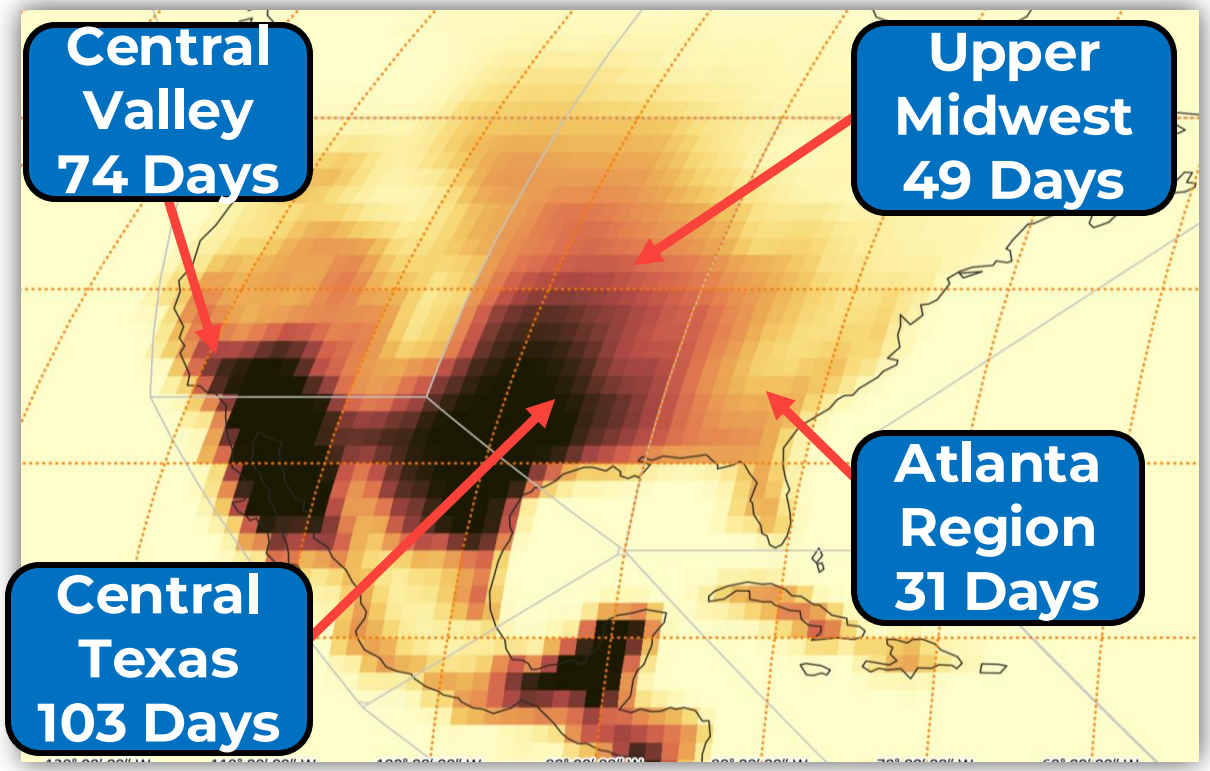
Modeling and Land Use: Residential Construction Growth by Decade

Residential growth significantly slowed down in the last decade. Many counties have limited available land for residential growth. What strategies can be pursued in local future land use plans to ensure adequate workforce housing is available?



Modeling and Climate Change: The Atlanta Region is Forecast to have 31 Days of 95°+ Temperatures by 2100

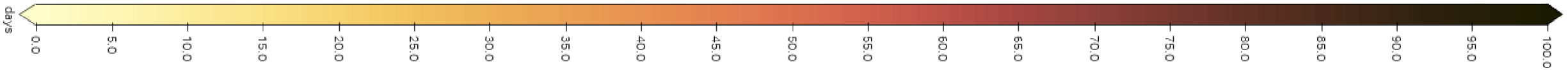
IPCC "Intermediate Scenario" assuming global CO_2 emissions remain around current levels until 2050 – then decrease



Other areas in the nation are forecast to have significant increases in the number of hot days, including many **population and agricultural centers**

Area	1981-2010	2021-2040	2041-2060	2061-2100
Atlanta Region	**12**	**20**	**24**	**31**
Upper Midwest	22	34	40	49
Calif. Central Valley	33	48	55	74
Central Texas	63	84	92	103

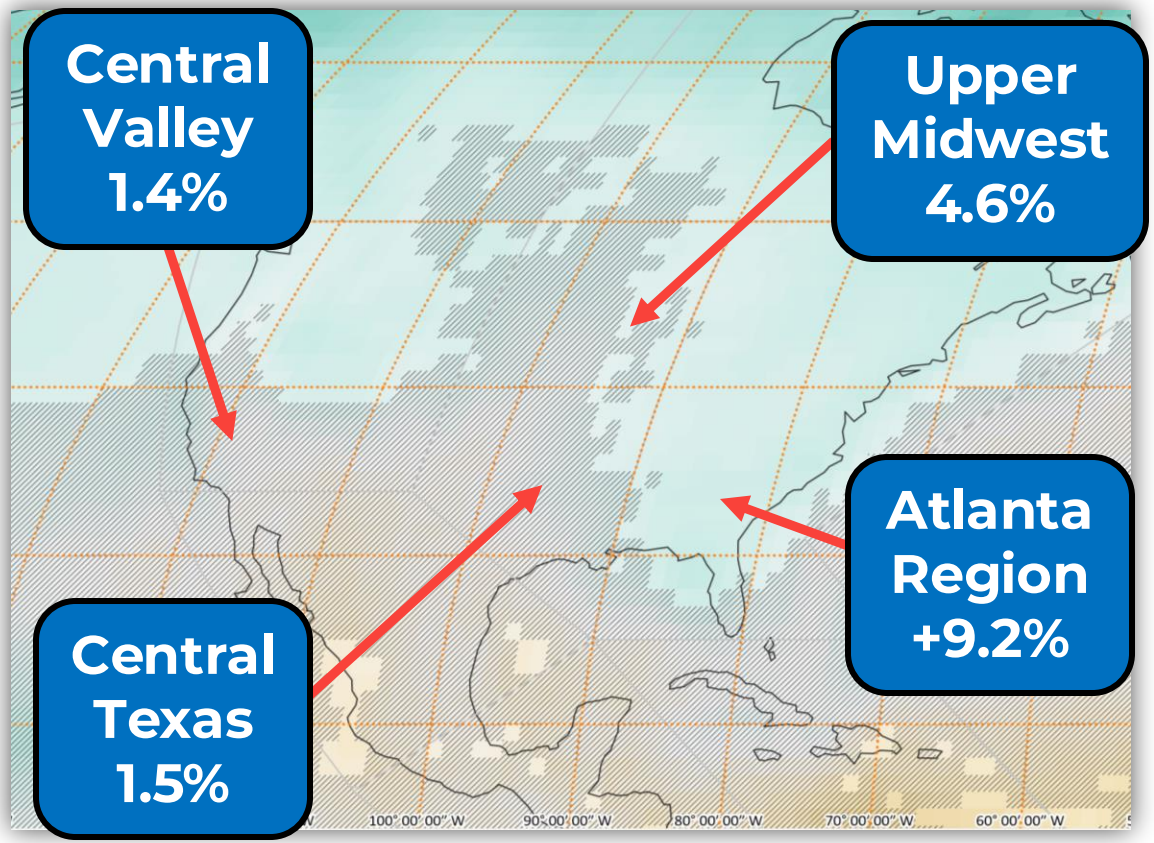
Legend: Days at or above 95°F



Source: https://interactive-atlas.ipcc.ch/

Modeling and Climate Change: Metro Atlanta is Forecast to Have 9.2% More Annual Precipitation by 2100

IPCC "Intermediate Scenario" assuming global CO_2 emissions remain around current levels until 2050 – then decrease

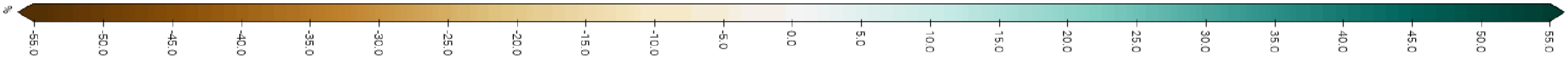


The climate is forecast to be wetter in the eastern United States. Climate models are not in agreement for the **Midwest and Southwest** (note the hatched areas).

If precipitation forecasts are accurate, many areas in the Nation – such as the Southwest - will have significant water supply challenges due to the increase in forecast temperatures. **ARC population and employment forecasts will be reevaluated in the future to incorporate the potential impact of climate change**. Additional analysis is needed.

Areas where climate models are in Low Agreement

Legend: % Change in Annual Precipitation



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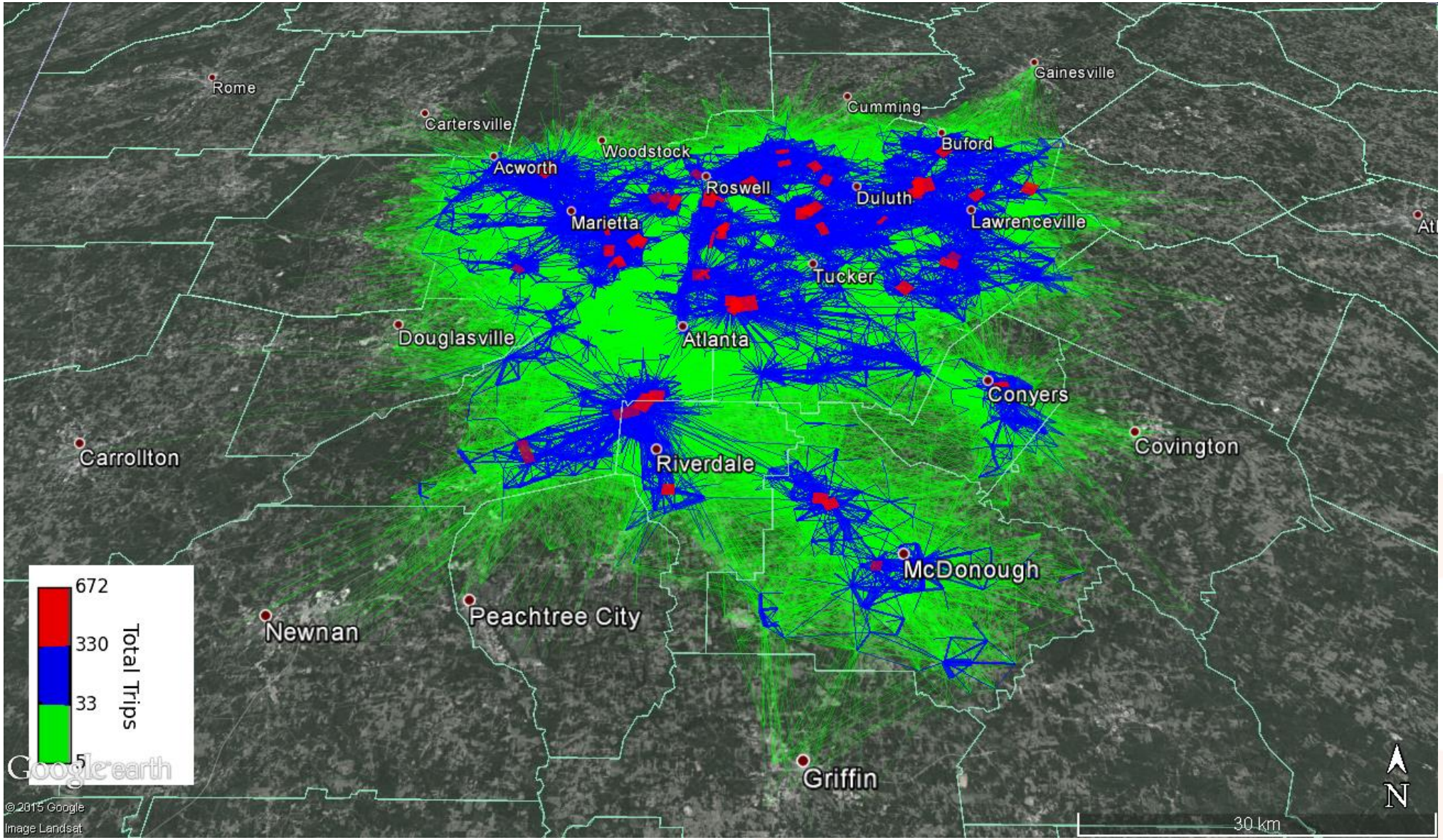
ARC Model for 2024 MTP/TIP Update

- 2020 Baseline (Forecast Network-Years 2030, 2033, 2040, 2050)
- 2020 Decennial Census
- 2017-2021 American Community Survey 5-year data
- 2019 GDOT Traffic Counts in Georgia (drakewell.com)
- GDOT's Classification Counts for Truck Traffic
- 2019 Speeds & Travel Times from INRIX & NPMRDS
- SRTA Toll Transactions Data & Express Toll Lanes Data
- Atlanta Airport Ground Access Mode Choice Model and Air Passenger Model with Enplanements & Deplanements data from the FAA and Atlanta Airport's Master Plan

Other Model Data Components

- 2019 NextGen NHTS Trip Origin-Destination "Big Data"
- 2019 Atlanta Regional Commuter Survey
- 2019 Atlanta Regional Transit On-Board Survey
- 2018 Externals Model Update (I-E / E-I and E-E) using Mobile Device Trip Origin-Destination (O-D) Data from AirSage, and GDOT's Statewide Travel Demand Model
- **2024** NextGen NHTS Traditional Household Travel Survey Local Add-On scheduled for Georgia (and metro Atlanta) in 2024 in conjunction and partnership with GDOT and USDOT/FHWA, TPF - Solicitation Details (pooledfund.org) and NextGen NHTS OD Data: Overview, Products, and Use Cases (tetcoalition.org) (The Eastern Transportation Coalition)

Atlanta's Single-Occupant Vehicles Origin-Destination Desire Lines



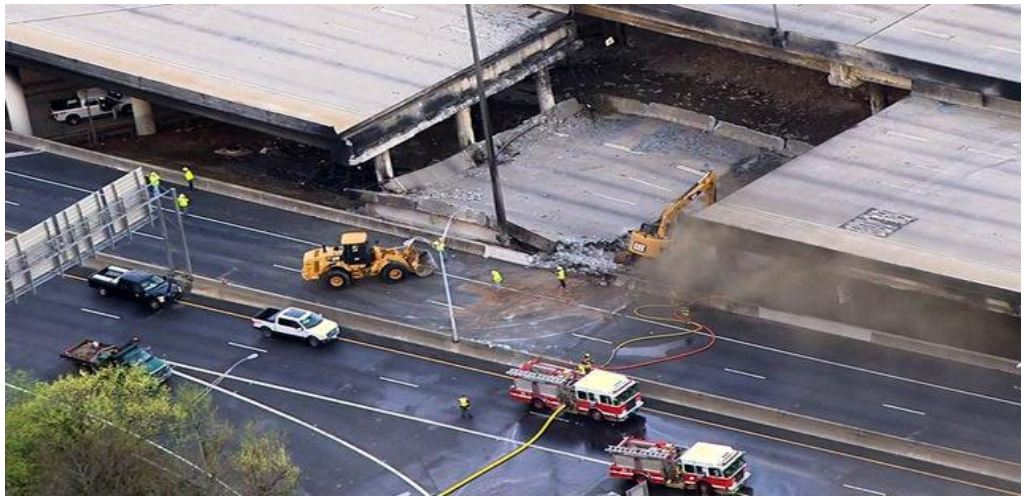
ARC Projects with Static & Dynamic Traffic Assignment (Regional DTA) Models

- Activity-Based Model – Dynamic Traffic Assignment Integration (SHRP2 C10) with INRIX Data
- I-85 Bridge Collapse Travel Patterns (SHRP2) with Streetlytics Data
- Externals Model with Airsage Data
- I-285 / GA-400 Interchange Reconstruction Commute Options with Streetlight Data
- Volume-Delay-Reliability Functions (SHRP2 L04) with NPMRDS Data

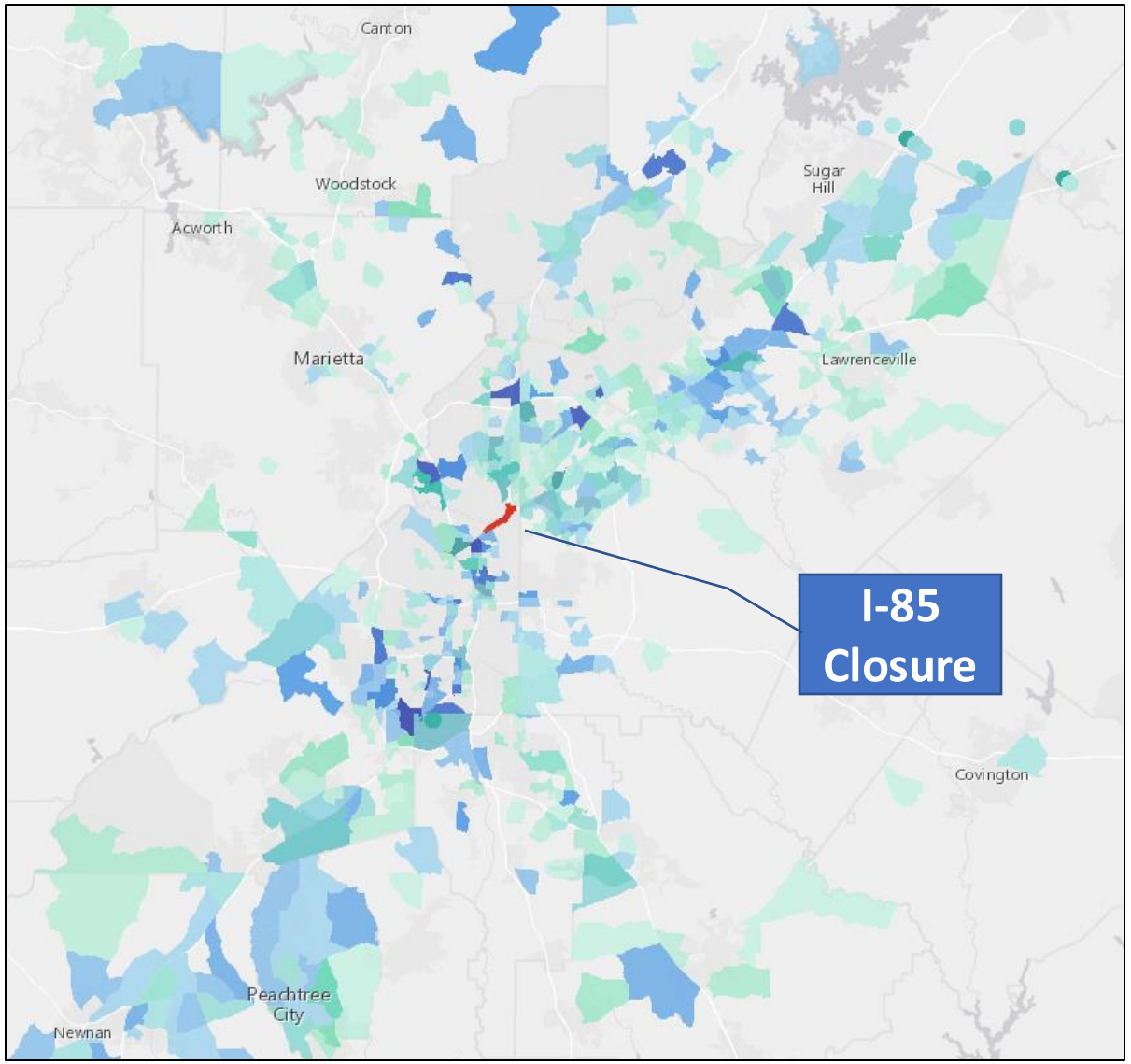
March 30, 2017
I-85 Bridge Collapse
Travel Patterns Analysis with Streetlytics Data

I-85 Bridge Collapse

- ***March 30 2017***: Fire underneath I-85 NB caused the bridge to collapse and altered the commutes for hundreds of thousands of commuters.
- Around ***250,000*** trips go through the impacted area each weekday.
- Eastern half of the I-285 perimeter impacted the most, but travel was impacted all throughout the region, with a minimum of ***30%*** increase in volumes across network.
- Many MARTA stations, especially those in the northern part of the region, have experienced large ***increases*** in ridership after the bridge collapse.
- ***75%*** of the businesses in the area have experienced a loss of customers due to the collapse.
- ***Bridge reopened on May 15, 6 weeks later*** …



Who travels on I-85?



http://arcg.is/0LC1mW

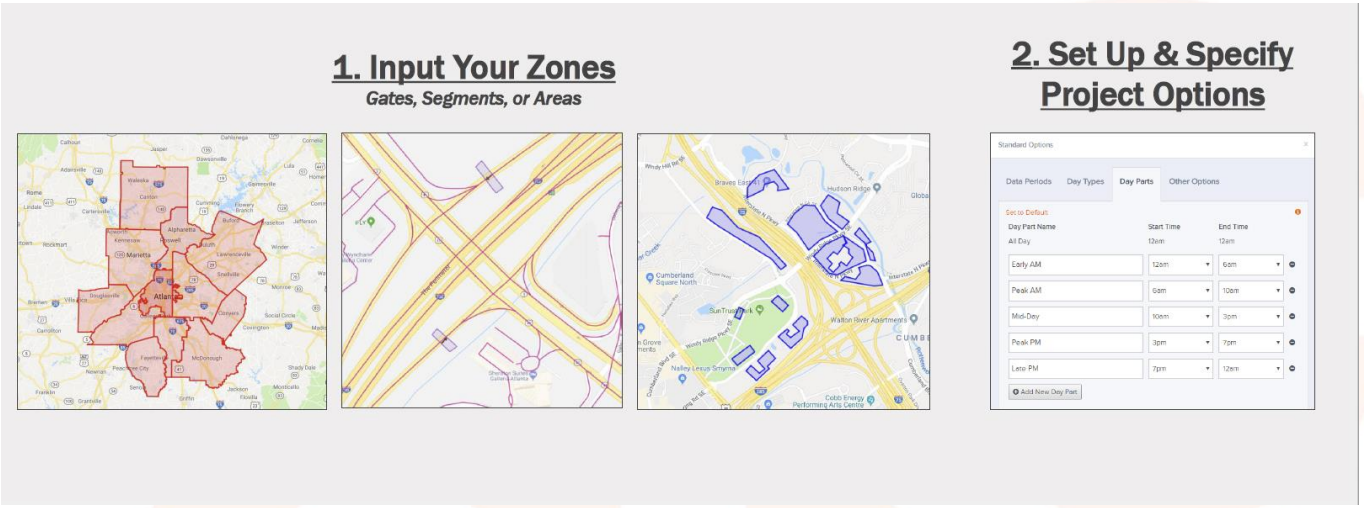
- The affected area on I-85 is a critical link in the transportation network
- In the morning travel period, trips routinely flow from as far south as Newnan and from as far north as Cumming (Data source: Streetlytics)

Trip Origins	Trip Destinations
> 1,000 to 2,500	> 1,000 to 2,500
> 675 to 1,000	> 675 to 1,000
> 325 to 675	> 325 to 675
> 200 to 325	> 200 to 325
> 150 to 200	> 150 to 200
> 100 to 150	> 100 to 150
> 50 to 100	> 50 to 100
> 25 to 50	> 25 to 50
> 8 to 25	> 8 to 25
0 to 8	0 to 8

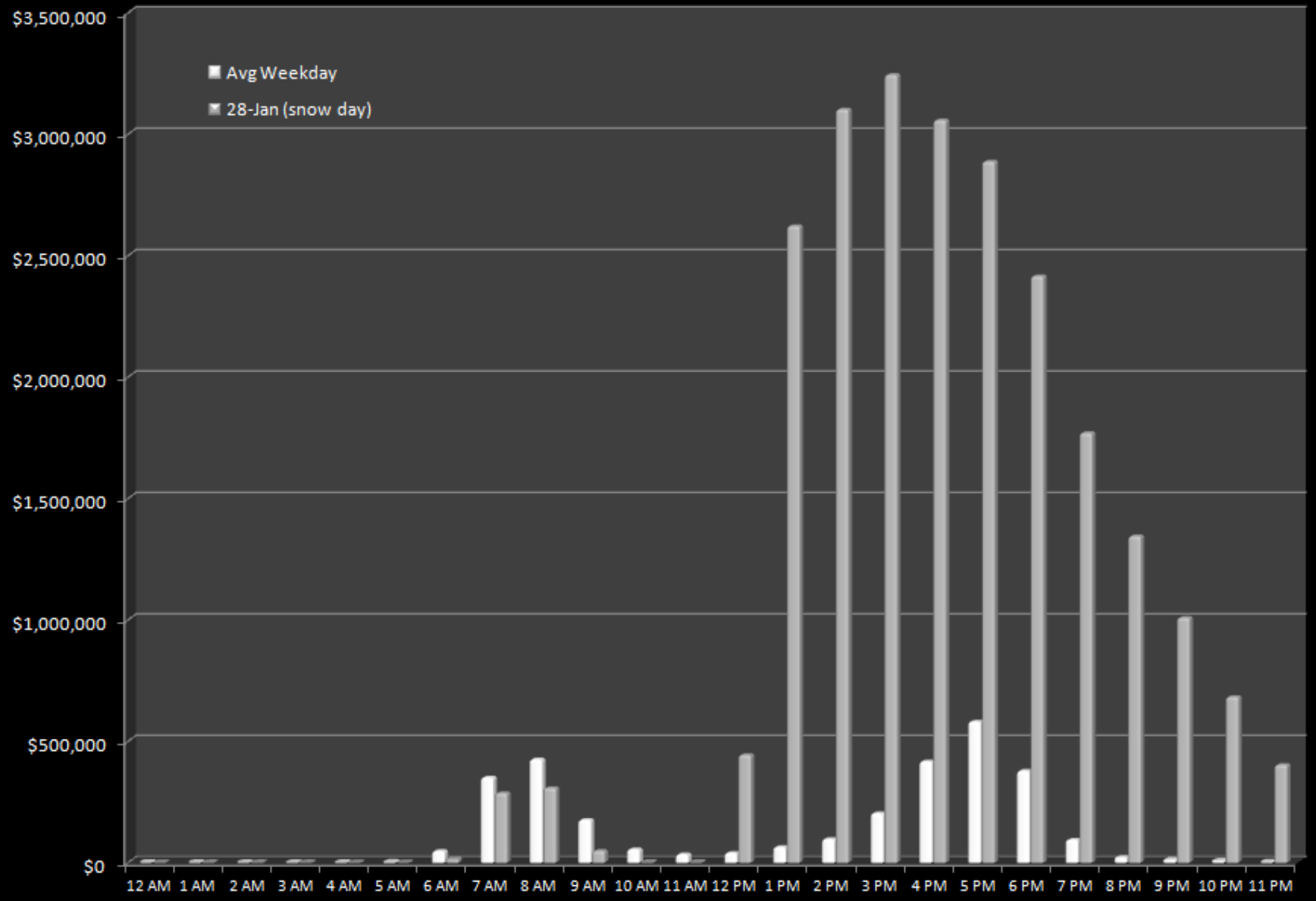
Green = trip origins
Blue = trip destinations

I-285 @ GA-400 Interchange Reconstruction Commute Options with Streetlight Data

- Goal: Better Understand Travel Behavior Using Origins and Destinations with Select Links Analysis for Different Employment Centers and Activity Centers
  - Trip Duration &TLFD (Trip Length Frequency Distribution)
  - Commercial Trips & Personal Trips
  - Provide Alternative Commute Options to Travelers Affected by Interchange Reconstruction



INRIX: Fulton/DeKalb Delay Cost Average Weekday vs. January 28, 2014



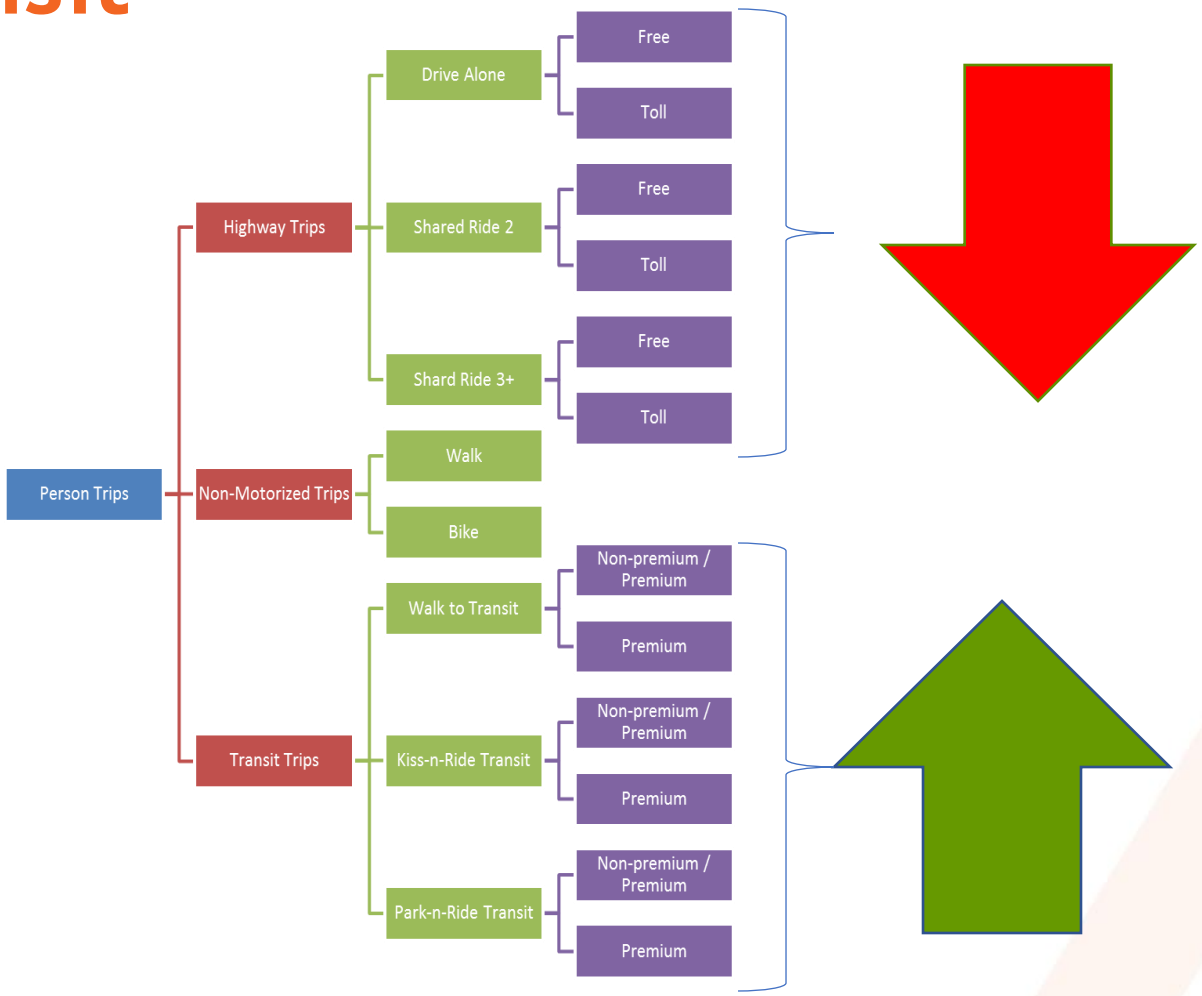
ARC Migrating Away from CT-RAMP: Taking Care of Business and moving to ActivitySim (Python)

- Address Java Vulnerabilities
  - Background
    - CT-RAMP uses Apache Log4j 1.x for loggings
    - Log4j 1.x has reached end of life in 2015 and is no longer supported by Apache
    - ARC reported “Critical Vulnerability” for unsupported Log4j version
    - ARC reported “High/Medium Vulnerability” for Java JDK and JRE versions
  - Solution
    - Update JDK and JRE to later versions
    - Migrate from Log4j 1.x to Log4j 2.x
  - Concerns
    - Might need considerable modifications to CT-RAMP source code if updating Java versions
    - Log4j versions 2.0-beta through 2.17.0 also have their own security vulnerabilities
    - On-going discovery of Log4j 2.x vulnerabilities will require constant updates

ARC ABM Sensitivity Testing

Grouping	No.	Description	Incorporation
Highway Capacity	1	1/2 base capacity	Cube script
	2	Base capacity	
	3	2x base capacity	
Transit Fare	4	No fare	UEC
	5	1/2 base fare	
	6	Base fare	
	7	2x base fare	
Fuel Cost	8	1/2 base fuel cost	UEC / Cube script
	9	Base fuel cost	
	10	2x base fuel cost	
Transit IVTT	11	95% base transit IVTT	UEC
	12	Base transit IVTT	
	13	105% base transit IVTT	

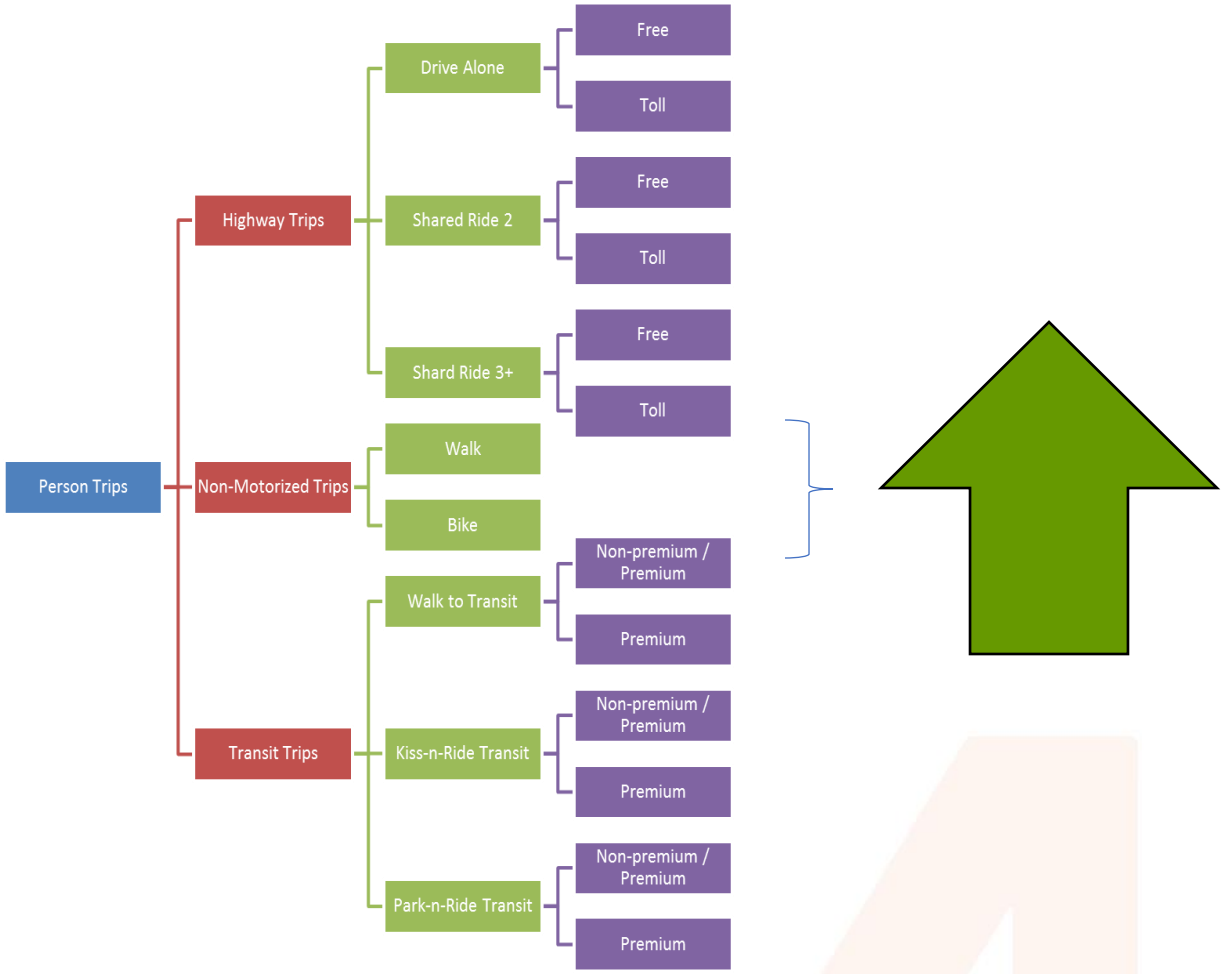
Scenario Modeling for Planning: Increase Propensity & Willingness to Use Transit



Adjust transit constants – fewer auto trips

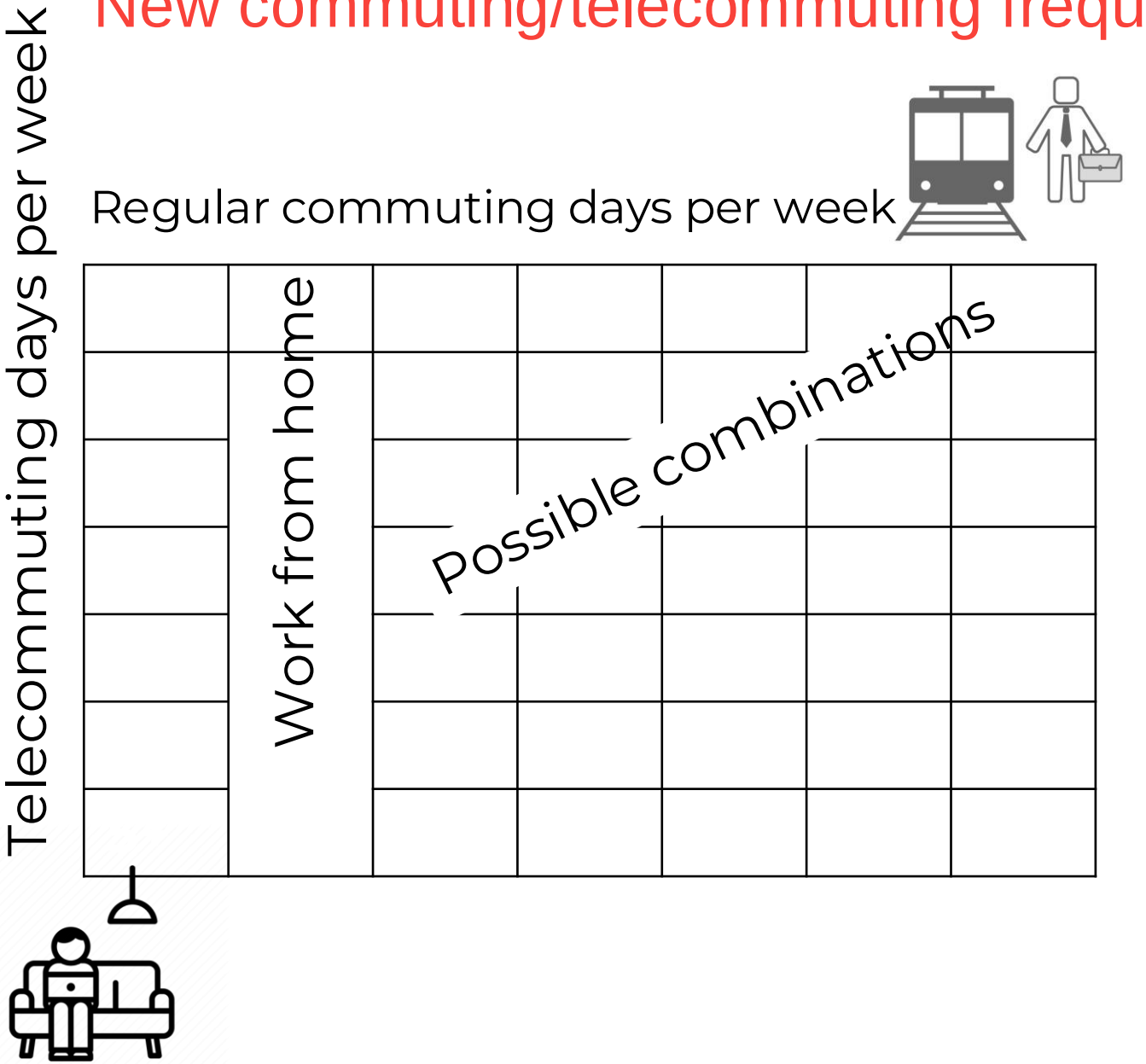
For specific access modes, purposes, market segments, origins/destinations, etc.

Scenario Modeling for Transportation Planning: Testing Active Transportation Modes with the ABM



- Adjust non-motorized constants in ARC's ABM UECs (Utility Expression Calculations)
- Increased density & land use mix have positive effects on walk & bike

Post-Pandemic Travel Behavior / Telemobility Modeling: New commuting/telecommuting frequency model



Main factors defining commuting/telecommuting frequency:

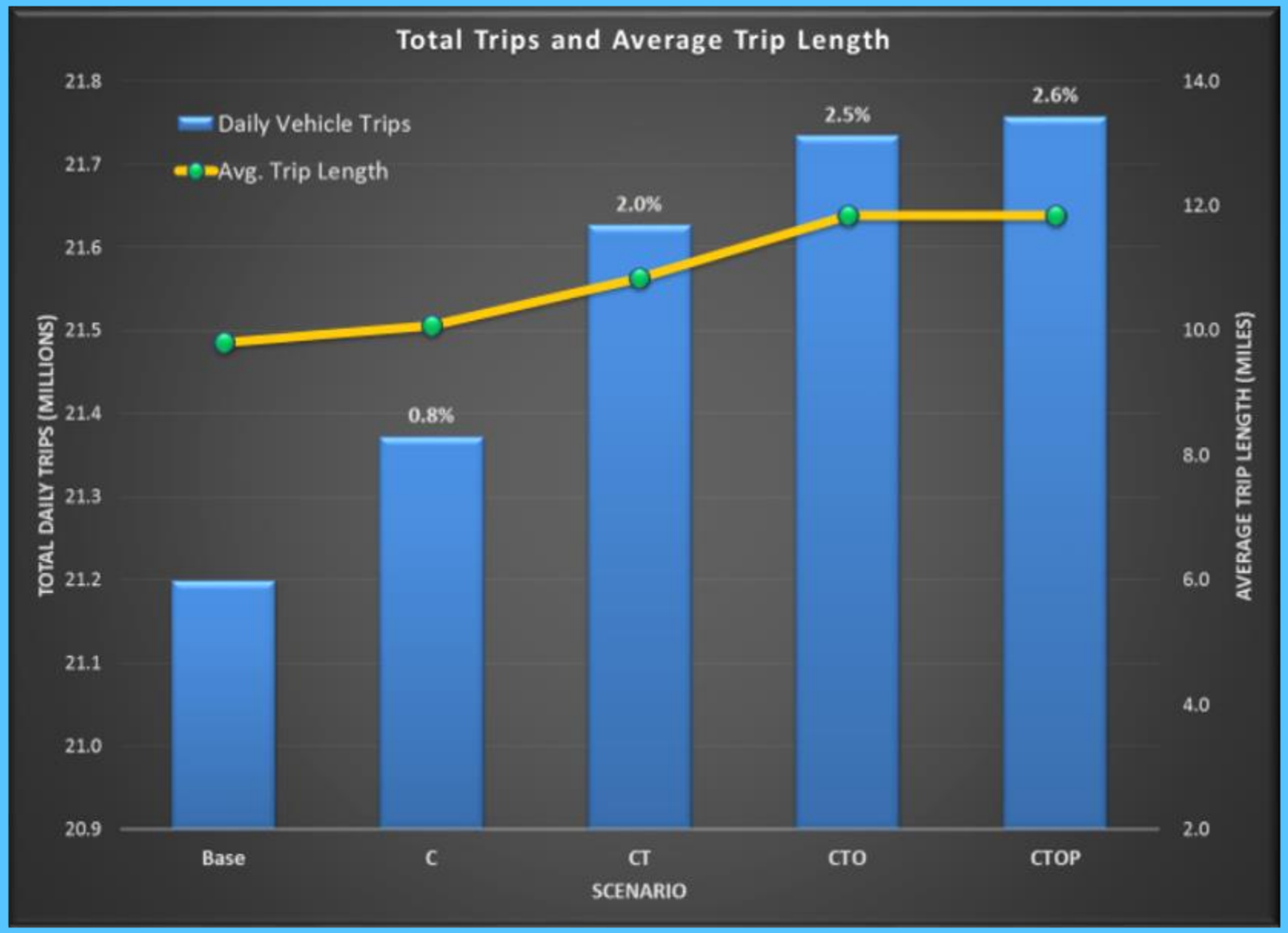
- Full-time or part-time
- Industry/occupation (NAICS)
- Distance to work
- Worker's Age
- Worker's Income
- Worker's Gender
- Presence or absence of children within the household

C/AV Modeling Scenarios

- Incremental Approach

Scenario				
2040 NB	C	CT	CTO	CTOP
baseline	• capacity increase	• capacity increase	• capacity increase	• capacity increase
		• decrease in travel time disutility	• decrease in travel time disutility	• decrease in travel time disutility
			• reduction in vehicle operating cost	• reduction in vehicle operating cost
				• reduction in parking cost

C/AV Model Results



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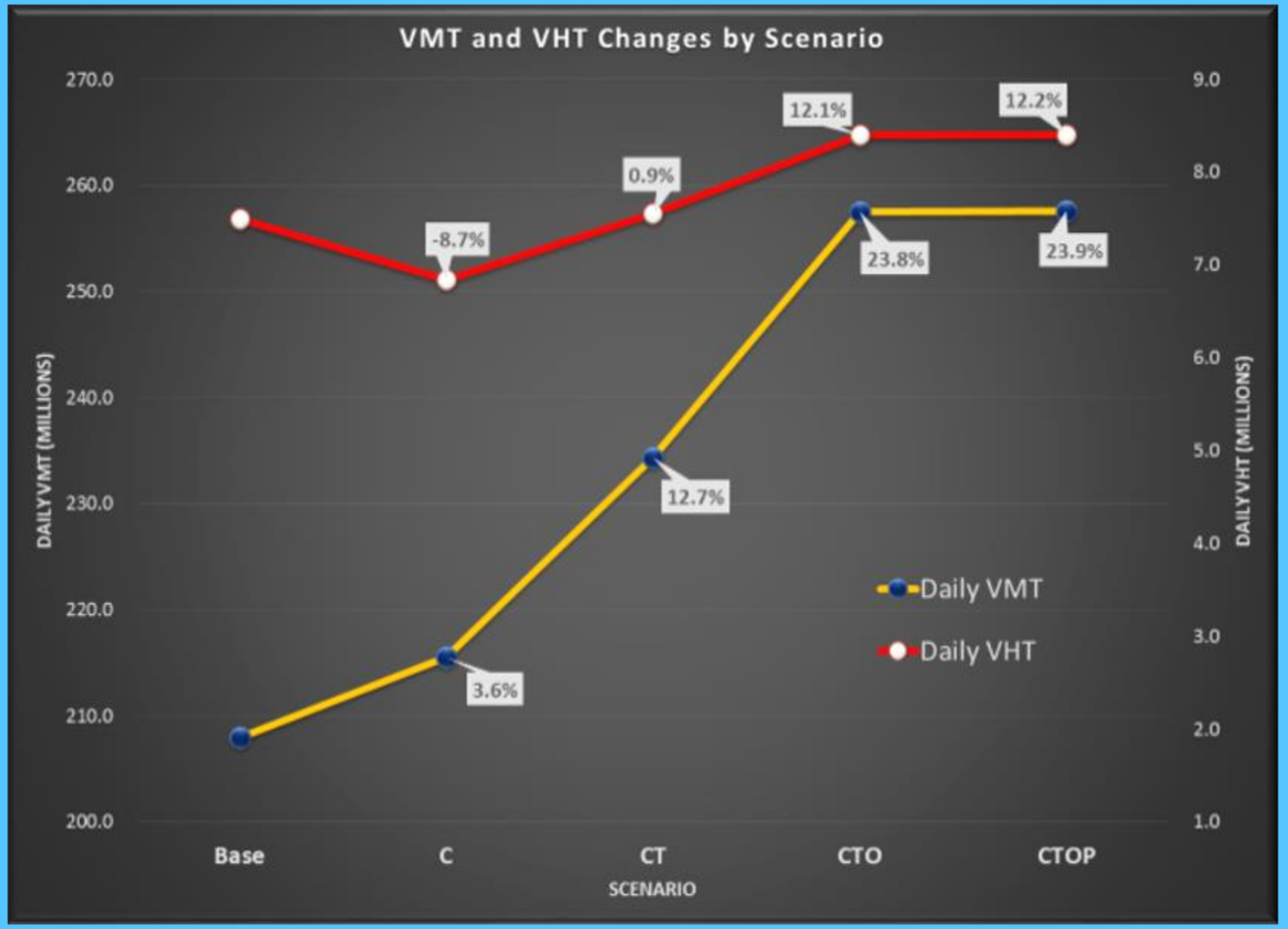

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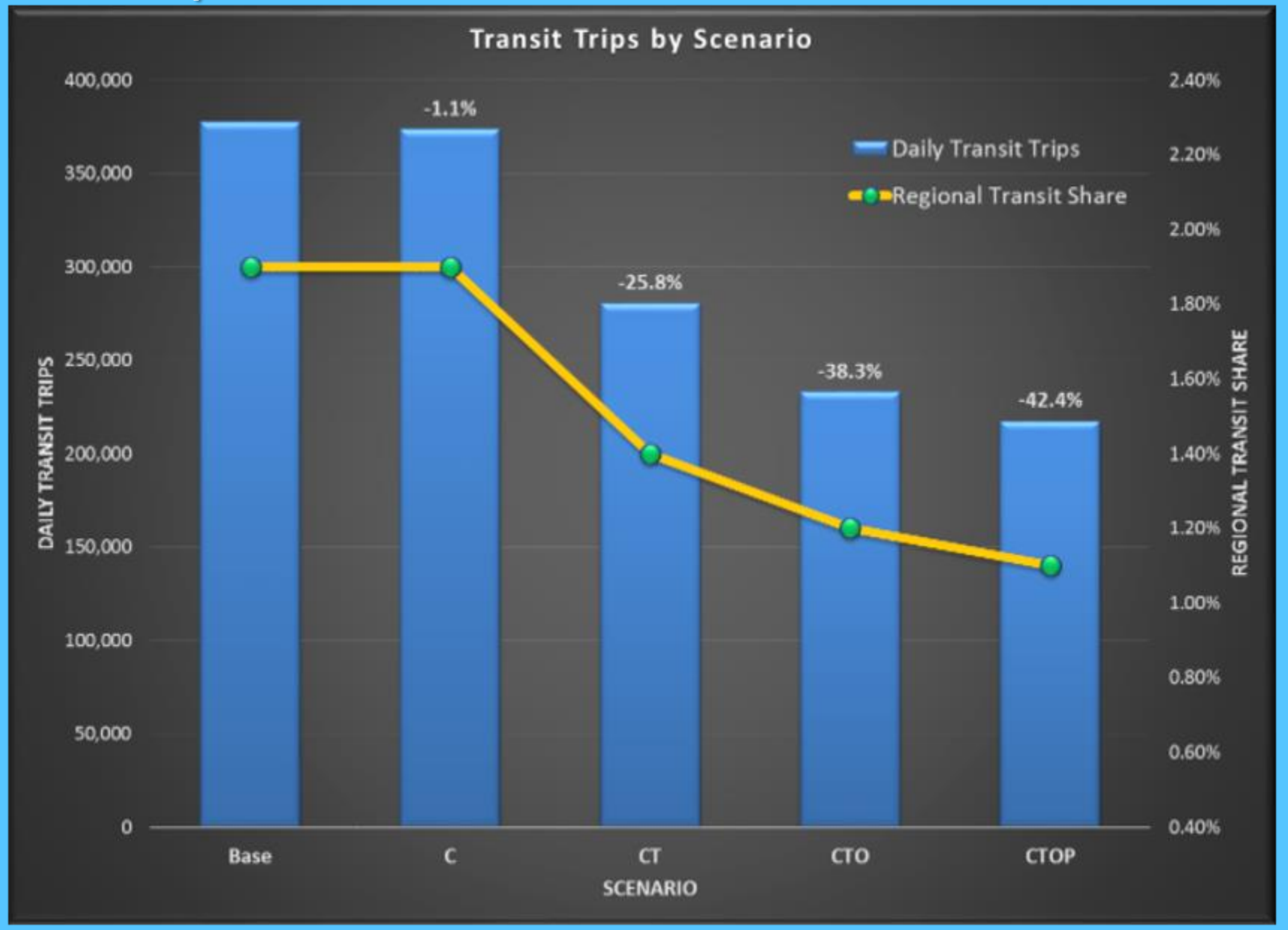

Thanks!

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