



Tools For Assessing **FUTURE TRANSIT RIDERSHIP**

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PROJECT OVERVIEW



I. Context

1. Transit in Atlanta

II. Travel demand models

1. 4-Step

2. Activity-Based

3. STOPS

III. Improving data inputs

IV. Recommendations

WHY TRANSIT?

- Reduces road congestion
- Improves air quality
 - Clean Air Act and federal funding
- Increases access, choice, mobility and equity
- Fosters economic development
 - Transit-Oriented Development
 - Expands workforce commuter shed
 - Global competitiveness

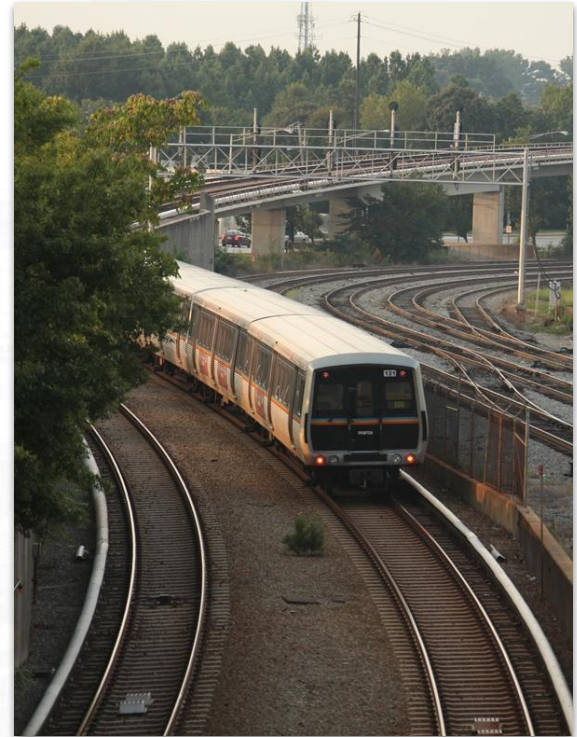


Image 1: Source, Trains Magazine

WHY TRANSIT IN ATLANTA?

- Rapid projected growth
 - 3rd fastest growing US metro¹
- Extensive sprawl and automobile dependence
 - 4th most congested city²
 - 91% of the MSA population lives outside of Atlanta³
- Environmental, equity and quality of life concerns

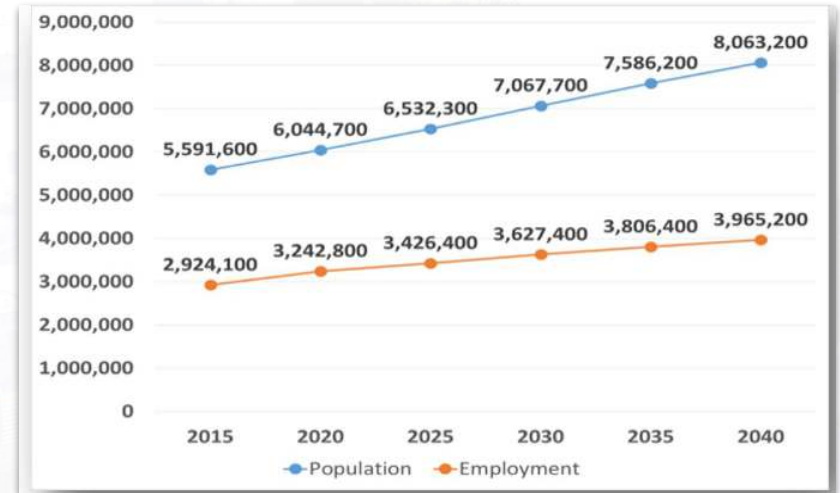


Image 2: Source, ARC

1. Numeric increase from 2016-2017. US Census Bureau
2. INRIX Transportation Analytics (2017)
3. US Census Bureau 2017 Estimates: (MSA - ATL / MSA)



WHAT ARE ATLANTA'S FUTURE TRANSIT PLANS?

- 22 miles of light-rail transit
- 22 miles of commuter rail*
- 14 miles of bus rapid transit
- 26 miles of arterial rapid transit
- 2 new transit centers
- New fixed-route bus services
- Upgrades to existing rail stations
- Over \$2.7b in investment

**not included in More MARTA plans*

More MARTA Atlanta Program

- A** BeltLine Northeast LRT
- B** BeltLine Southwest LRT
- C** Campbellton Rd LRT
- D** Clifton Corridor LRT
- E** Crosstown Downtown East Extension
- F** Crosstown Downtown West Extension
- H** Capitol Ave BRT
- I** North Ave- Donald L. Hollowell Pkwy BRT
- J** Northside Dr BRT
- K** Peachtree Rd ART
- L** Cleveland Ave ART
- M** Metropolitan Pkwy ART
- N** Frequent Local Bus Service
- O** Greenbriar Transit Center
- P** Moores Mill Transit Center
- Q** MARTA Stations
(not shown on map)

(LRT) Light Rail Transit
(ART) Arterial Rapid Transit
(BRT) Bus Rapid Transit

Project schedules and funding plans are being developed.

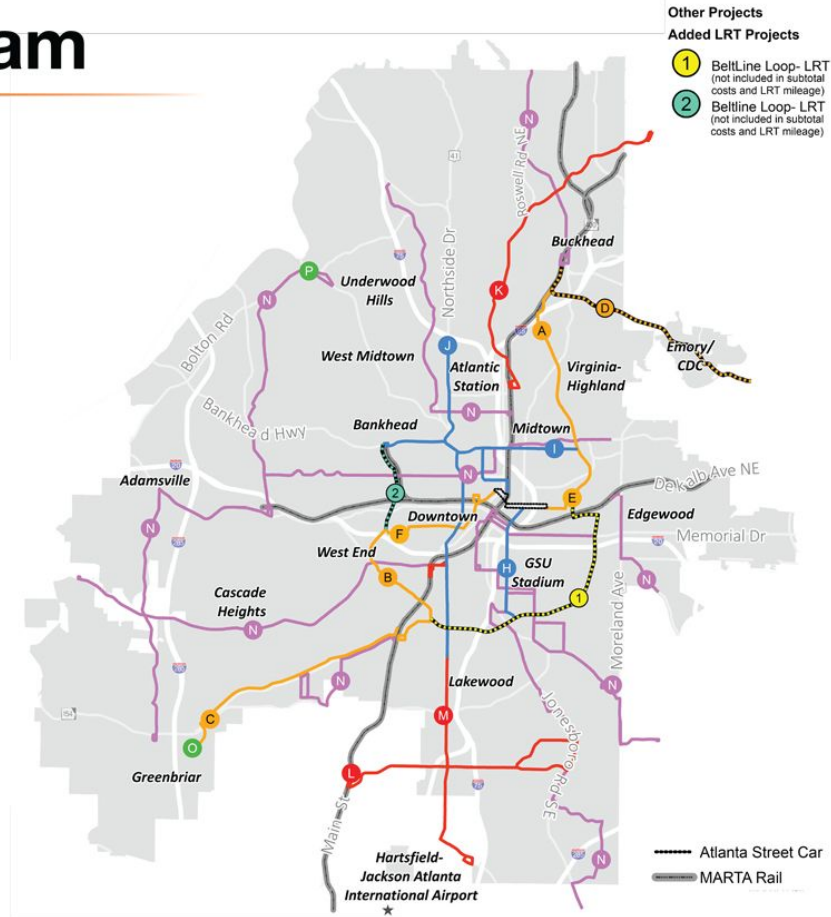


Image 3: Source, MARTA



WHY IS RIDERSHIP FORECASTING IMPORTANT?

- Allocates transportation supply to meet demand
- Guides capital investment, infrastructure and service improvements
 - Makes for more informed spending
 - **\$85 billion** proposed in long-term capital investments through 2040⁴
- Increases funding opportunities
 - Transit funds are worth billions; bad models do not get funding
 - Reliable models are required to receive competitive federal funding
- Helps gain support from relevant stakeholders



HOW DO YOU FORECAST RIDERSHIP?

4-Step Model

- Trip Generation
 - Estimate total trips between TAZs
- Trip Distribution
 - Where do trips go?
- Mode Choice
 - Car, bus, train, walk?
- Trip Assignment
 - Which route will be taken?


Activity-Based Models (ABM)

- Predicts behavior based on **choices** of individuals/households
- Forecasts household and personal level travel **choices**
- Uses socioeconomic inputs obtained from regional surveys




WHY USE AN ACTIVITY-BASED MODEL?

- Behavior / **choice** based
- Accounts for **trip-chaining**
 - Every trip in an ABM starts and ends at home
 - It allows for a more logical explanation of human behavior
 - The order in which trips are made has behavioral significance in forecasting
 - Allows for a more logical explanation for daily behavior
- Numerous individual characteristics of travelers can be taken into account
 - Traditional 4-Step models assumed all travelers either have the same attributes, or divides them into discrete classes
 - ABMs model **individual** travelers, and therefore can account for a more continuous distribution of traveler choices



Activity-based models are optimally suited for predicting long-range regional transportation patterns across a multitude of travel modes.

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- **Ridership Forecasting has improved with the introduction of regional models, such as ABMs.**
 - **Regional models require extensive amounts of data.**
 - **This causes delays in allocating transit funding.**
 - **Delays result in increased project costs.**



WHAT IS STOPS?

- Simplified Trips On Project Software
- Follows a conventional 4-step travel modeling process:
 - Generation and distribution data is replaced with CTPP data
- Uses performance-based General Transit Feed Specification (GTFS)
 - A standardized database to compare transit systems across the country
- Relies on framework of a given regional model

WHAT IS STOPS?

- FTA uses two components to evaluate proposed major transit projects:

- Predicted number of trips generated
- Changes in automobile Vehicle Miles Travelled

- STOPS predicts travel patterns for No-build and Build scenarios

- STOPS quantifies FTA's trips-on-project evaluation measure for FTA major capital funding

- STOPS can compute the change in Vehicle Miles Travelled based on the change in overall transit ridership

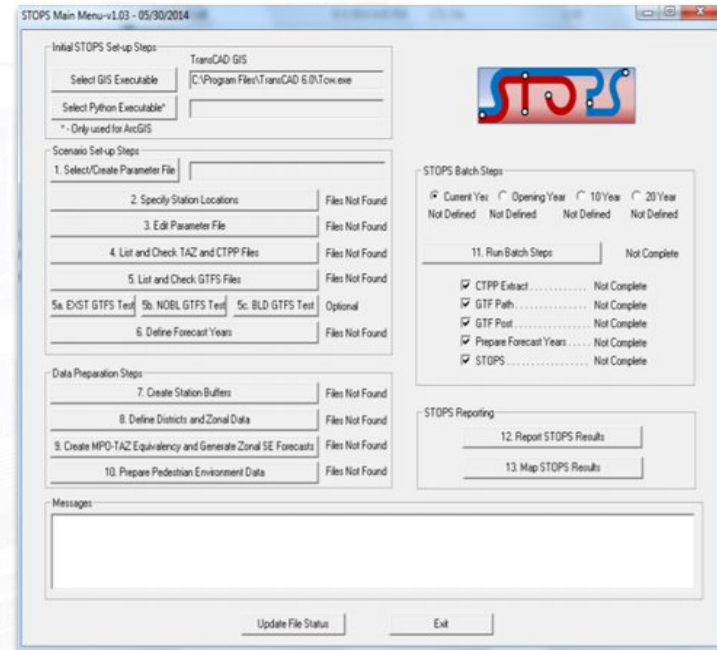


Image 4: Source, FTA

WHY USE STOPS?

Image 5: Source, FTA

Region	STOPS Run Time (recent experience)	Regional Travel Model Run Time (No Build + Build)
Jacksonville / Northeast Florida	<1 hour	8-16 hours
Miami / Southeast Florida	3-5 hours	3 days (full run)
Orlando / East Central Florida	1-2 hours	8-12 hours
Tampa / West Central Florida	1-2 hours	4.5-7 hours

Run time for **STOPS** is less than HALF of regional model

WHY USE STOPS?

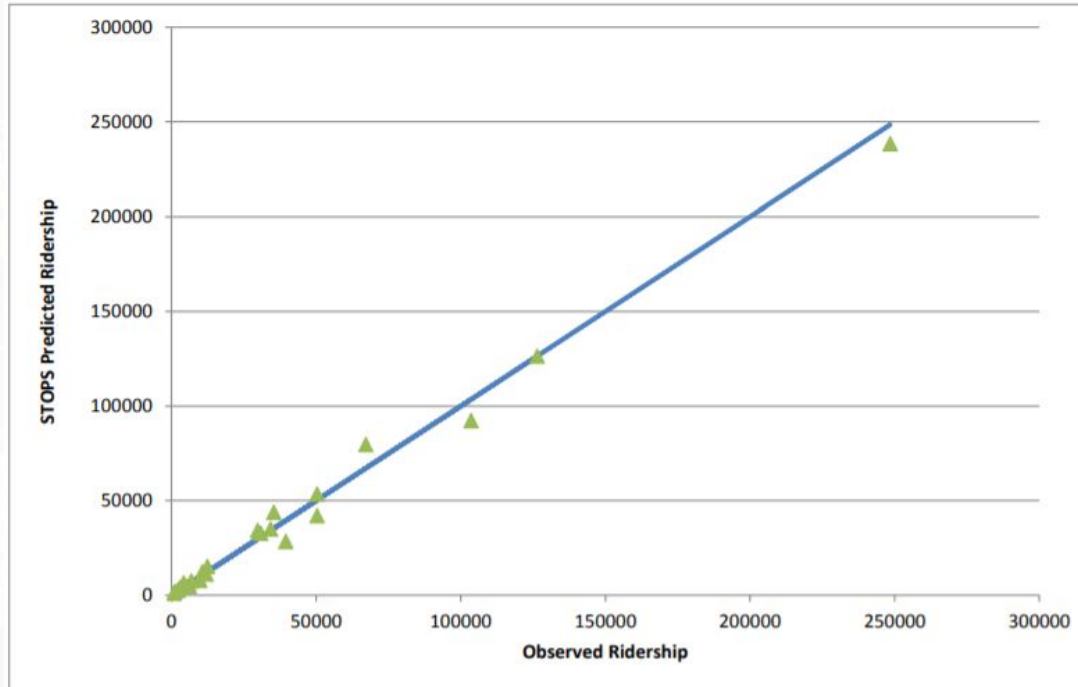
Image 6: Source, FTA

Implications for FTA reviews				
Source of forecast	FTA review of formally submitted forecasts			
	Transit rider survey data	Properties of the travel model	Validation vs. current riders	Plausibility of forecasts
Regional model	●	●	●	●
Incremental model	●	●	●	●
STOPS			●	●

The lower scrutiny threshold by the FTA reduces review time by **50%**

IS STOPS RELIABLE?

Image 7: Source, FTA



Predicted and Observed Weekday Ridership on Fixed Guideway Systems Used in STOPS Development



WHAT ARE THE LIMITATIONS OF STOPS?

- It relies on regional travel models for roadway travel condition, travel times, and distances
- It focuses on ridership forecasts for fixed transit systems
- Variables such as accessibility are not considered in determining future year travel patterns



WHICH MODEL IS PREFERRED?

- ABMs incorporate vast amounts of data to realistically model regional travel patterns
- STOPS utilizes federally standardized data sets in conjunction with inputs based on regional models and local datasets to create small-scale models of fixed-route systems
 - Designed to augment an existing regional model, such as an ABM
 - Not an independent system capable of modeling all regional travel patterns
- Both models should be used in tandem
- Both models are limited by the quality of the data inputs they are provided with

WHY UPDATE THE DATA?

Large Scale Changes In:

- Gas Prices
- Employment

Industry Disruptors

- Uber, Lyft, & Other Rideshares
- E-Scooters
- Electric & Autonomous Vehicles



Image 8: Source, Milwaukee Journal Sentinel



AUTOMATIC FARE COLLECTION

- Smart cards collect data for each system entry and exit in addition to facilitating fare payment
- Data can be assigned to unique users via the smart cards
- Most useful in networks that require users to “tap” upon entry **AND** exit

AUTOMATIC FARE COLLECTION



Image 9: Source, MARTA



AUTOMATIC PASSENGER COUNT SYSTEMS

- Image sensors typically allow for highly accurate passenger counts
 - Accuracy can be verified with CCTV
 - Modern sensors can distinguish people entering and exiting from inanimate objects, such as luggage and strollers
- Critical for accurate ridership values on systems without faregates

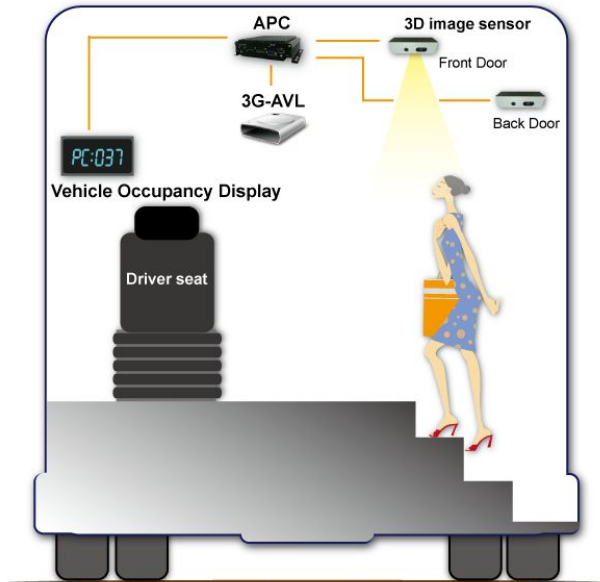


Image 10: Source, EcAF Technology

APP-BASED CROWDSOURCING

- Allows for direct observation of:
 - Travel Habits
 - Route Choices
 - Origins & Destinations
- Obtains information from any app with location services enabled
- Improves customer service opportunities

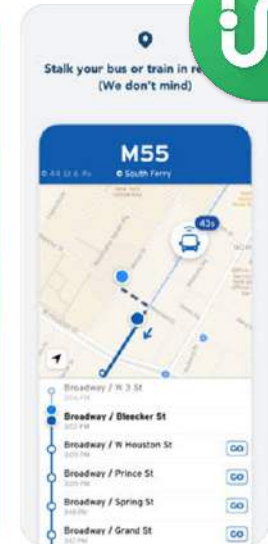
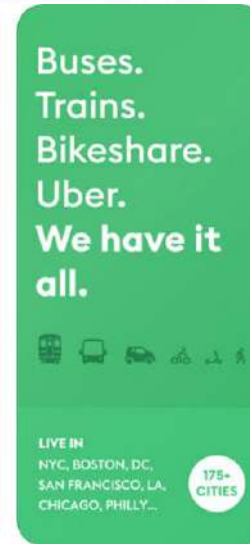


Image 11: Source, Transit App

BLUETOOTH TECHNOLOGY

- Can locate devices and observe their movement, even when GPS is not enabled
 - Up to 250 devices can be detected by a single sensor
- Not dependant on an internet or cellular network connection
- Lower battery consumption when compared to Wi-Fi connections & Satellite-Based GPS Systems
- Ample opportunity for improved customer service
 - Contactless payment
 - Improved communication
 - Location-specific advertising
 - Improved accessibility

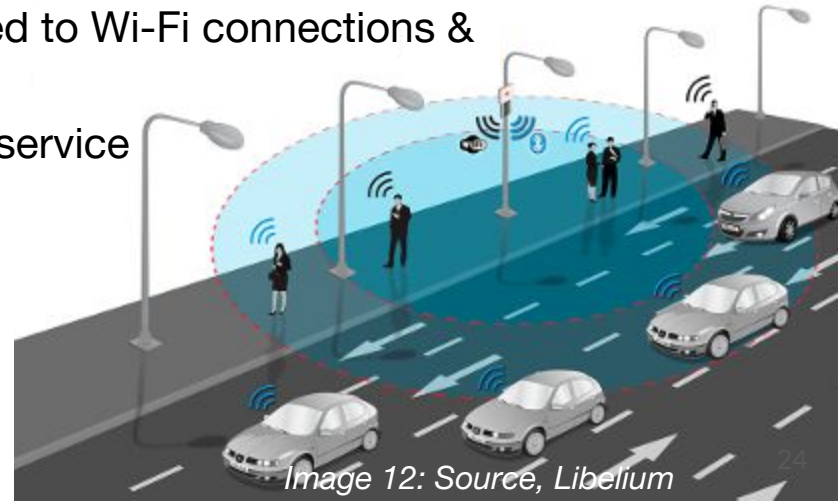


Image 12: Source, Libelium



RECOMMENDATIONS



- I. Continue to use an activity-based model for regional transportation planning**
- II. Incorporate STOPS into modeling practices for transit-specific projects**
- III. Improve data inputs by increasing survey frequency and engagement**
- IV. Incorporate data from new sources using new and improving technologies.**