2015/2050

GEORGIA STATEWIDE MODEL PEER REVIEW REPORT

PREPARED FOR
GDOT OFFICE OF PLANNING

PREPARED BY
HNTB CORPORATION
191 Peachtree Street NE
Suite 3300
Atlanta, GA 30303
Phone: (404) 946-5700
Fax: (404) 841-2820
www.hntb.com

HNTB

CONTENTS

1. EXECUTIVE SUMMARY

Introduction

A peer review of the Georgia Statewide Travel Demand Model (GSTDM) was conducted via online conference over the course of four sessions in September and October of 2019. This document summarizes the peer review's content, key questions, and recommendations.

The purpose of the peer review was to gain feedback on the limitations of the model and to develop strategies for improving its data, methods, application, and usefulness for decision-making.

Panelists included:

- Thomas Hill, Florida DOT
- Guy Rousseau, ARC
- Zhang Huang, Atkins
- Johnathan Nicholson, Atkins
- Chris Simons, Citilabs
- Giovanni Circella, Georgia Tech
- Jennifer Zhan, Modern Mobility
- Kenneth Cervenka, FTA
- Sarah Sun, FHWA

The project team participating in the peer review consisted of:

- Habte Kassa, GDOT
- Sarah Lamothe, GDOT
- Daniel Dolder, GDOT
- Jing Xu, HNTB
- Chandra Khare, HNTB
- Kai Zuehlke, HNTB
- Krishnan Viswanathan, Cambridge Systematics
- Sheldon Harrison, Cambridge Systematics
- Mike Sillence, Cambridge Systematics

The four sessions covered:

- September 9 – Model development timeline, previous peer review recommendations
- September 30 – Model structure, updates, and enhancements
- October 18 – Model calibration, validation, and application
- October 25 – Recommendations

Session 1: The first session began with an overview of the GSTDM development timeline. The GSTDM has evolved over the last decade, with official base and future year versions of 2006/2040, 2010/2040, and 2015/2050. A peer review conducted in 2012 produced recommendations that guided the subsequent updates and enhancements. Following the 2012 peer review, a scorecard was developed to prioritize the implementation of updates and enhancements. Discussion during the first session included the relationship between the statewide and regional models, the use of the GSTDM in statewide plans and studies, data sources, and zonal structure.

Session 2: The second session reviewed the passenger and freight model structures and updates applied to the traffic analysis zones and highway networks. Another topic was key enhancements applied to the model, including redefining long-distance trips, developing a time-of-day assignment model, and enhancing integration with MPO models. Much discussion during the second session centered on reconciling and forecasting socioeconomic data.

Session 3: Calibration and validation of the 2015 model constituted the bulk of the third session. Calibration involved updating the network and adjusting trip rates, friction factor coefficients, and speed and capacity adjustment factors. Origin-destination matrix estimation (ODME) was used to improve the validation without changing the model too drastically. Also discussed in the third session were other applications of the GTSDM, including use in various statewide plans, corridor studies, and policy analysis.

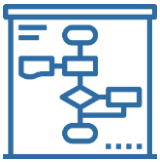
Session 4: The fourth session focused on gaining input from the panelists on recommendations.

Key Questions

Panelists were asked a set of key questions covering topics of interest to GDOT. Questions and discussion related to data sources, model structure, and freight.

Data – NextGen NHTS: The upcoming iteration of the National Household Travel Survey (NHTS) provides a key opportunity to improve the GSTDM by better understanding travel behavior, such as long-distance trip-making and use of emerging modes. Panelists recommended that in addition to the NHTS core survey data for the entire state, a strategic sampling plan be created to ensure representation of key demographic variables, including a balance of rural and urban areas.

Data – Big Data and Passive Data: Various GPS, cellular, Bluetooth, and crowdsourced data sources are becoming available, either directly from private companies or nationally enabled



by the Federal Highway Administration (FHWA) (e.g., through the National Performance Measures Research Dataset, NPMRDS, and potentially through NextGen NHTS). Panelists noted the usefulness of the NPMRDS for updating free flow speed lookup tables and validating trip distribution. However, cost is often a barrier to obtaining such big data and passive data.

Data – Projections Outside of Georgia: The GSTDM focused on network representation, zonal detail, and detailed projections within Georgia. Panelists recommended enhancing socioeconomic and traffic growth data sources for regions outside of Georgia by referencing statewide models in adjacent states.

Structure – Population Synthesis: Synthesizing population could eventually be useful with a tour and activity-based model, but panelists agreed population synthesis might not be necessary with a trip-based statewide model. As an intermediate step, household synthesis could help reduce aggregation error and facilitate the enhanced representation of additional modes.

Structure – Emerging Modes: When it comes to emerging modes, such as transportation network companies (TNCs), micro-mobility, and connected and autonomous vehicles, panelists noted that many assumptions would need to be made in the absence of good data. At the statewide level, autonomous trucking will likely play a role in the nearer future, while others would be better addressed with regional models.

Structure – Time-of-Day: In a recent enhancement, a post-processor was developed to generate time-of-day assignment. Given the geographic size and daily nature of the GSTDM, the panel discussed challenges involved in representing long-distance trips that begin the trip in one time period but end in another. A method was proposed to transfer trips between time bins.

Structure – Economic Modeling: In response to a question about enhancing the connection between economic models and the travel demand model, panelists pointed out that integration between REMI and the GSTDM is sufficient.

Freight – Freight and Commodity Flow Data: The panel recommended GDOT acquire an updated TRANSEARCH dataset to create a timeseries that can be used to analyze trends, particularly given Georgia's port expansions. The Freight Analysis Framework (FAF) was also recommended to supplement the commodity flow data to generate the GSTDM's truck traffic.

Freight – Port Growth: The panel discussed the GSTDM's ability to model freight as a valuable capability given the keen interest in studying freight and logistics, including the impact of recent port expansions.

Freight – Commercial Delivery: Panelists noted the challenges in capturing last-mile delivery trips of commercial vehicles, including limited data sources, model detail, and relevance at a statewide scale.

Recommendations

TOPIC	COMPONENT	2019 PEER REVIEW RECOMMENDATION	PRIORITY
Application	Mode Choice	Enable evaluation of high-speed rail	HIGH
Application	Mode Choice	Enable evaluation of managed lane facilities	HIGH
Application		Temporal validation/before & after studies/scenario testing/sensitivity testing	MEDIUM
Application		Enable evaluation of emerging technologies	LOW
Application		Enhance interaction with economic modeling	MEDIUM
Application		Coordination with GDOT rail/transit/freight Offices/teams to obtain data and experience using GSTDM	HIGH
Validation	Assignment	Compare congested travel time/speed with observed INRIX data	MEDIUM
Validation	Assignment	Validate volumes at the link level by direction	MEDIUM
Validation	Assignment	Validate screenlines by truck/non-truck volumes	MEDIUM
Validation	Assignment	Validate by regional-level vehicle-miles traveled (VMT) and vehicle-hours traveled (VHT)	MEDIUM
Validation	Distribution	Validate county-to-county flows	HIGH
Input Data	Freight	Update freight component using latest TRANSEARCH and FAF data	HIGH
Input Data	Passenger	NextGen NHTS (Sampling plan to ensure balance of rural and urban areas and key demographic variables)	HIGH
Input Data	Passenger	Include automobile ownership	MEDIUM
Input Data		Incorporate big data/passive data	LOW
Input Data		Enhance socioeconomic and traffic growth data outside of Georgia by checking adjacent state models	MEDIUM
Structure	Freight	Address non-freight commercial vehicles last-mile deliveries	LOW
Structure	Freight	Consider a separate trip table for light trucks	LOW
Structure	Freight	Apply different passenger car equivalent (PCE) factors to differentiate truck classes	LOW
Structure	Freight	Investigate supply chain freight modeling	LOW
Structure	Mode Choice	Develop discrete mode choice for all purposes	MEDIUM
Structure	Mode Choice	Consider destination choice models	LOW
Structure	Network	Utilize a true shape network	HIGH
Structure	Passenger	Incorporate population synthesis or household synthesis	LOW
Structure	Time-of-Day	Fully develop time-of-day assignment into model stream (instead of as post-processor)	LOW
Structure	Time-of-Day	Account for trips that begin in one time period and end in another	LOW
Structure		Consider modeling average weekday traffic	HIGH
Structure		Explore land use forecasting and allocation modeling, including PECAS, UrbanSim, or simpler model	LOW
Structure		Consider rebuilding the model from scratch to a new trip- or activity-based model	LOW
Structure		Full integration with MPO Models	MEDIUM

2. SESSION SUMMARIES

This section provides an overview of the four online peer review sessions. For each session, following a brief summary, main portions of the content are presented. Finally, questions raised and subsequent discussion during the peer review are documented.

SESSION AGENDAS

Session 1	Session 2	Session 3	Session 4
• Goals of Peer Review • Timeline of GSTDM Development • GDOT 2012 Peer Review and Recommendations • 2010 Base Year Model Review	• GSTDM Model Structure • 2010-2015 Model Updates • 2015 Model Enhancement	• 2015 Model Calibration and Validation • Other Applications of GSTDM	• Peer Review Recommendations & Future Enhancements

Session 1

Summary

The first session began with an overview of the GSTDM development timeline. The GSTDM has evolved over the last decade, with official base and future year versions of 2006/2040, 2010/2040, and 2015/2050. A peer review conducted in 2012 produced recommendations that guided the subsequent updates and enhancements. Following the 2012 peer review, a scorecard was developed to prioritize the implementation of updates and enhancements. Discussion during the first session included the relationship between the statewide and regional models, the use of the GSTDM in statewide plans and studies, data sources, and zonal structure.

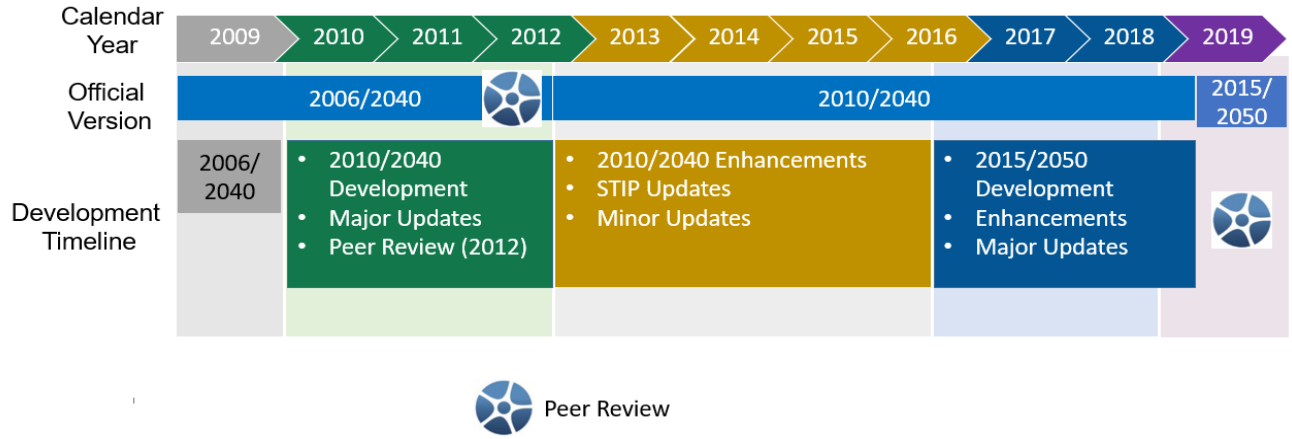
Goals of the Peer Review

The first session presented the purpose and goals of conducting the peer review, which were to:

- Provide comments to improve the GSTDM
- Gain insight regarding the model's ability to inform users in various decision-making processes
- Identify the limitations and deficiencies of the model and identify strategies for resolving them
- Obtain feedback and prioritize the action items for the next update
- Seek answers to specific questions regarding data, methods, and application

Model Development Timeline

A timeline detailing the development of the GSTDM was presented. A previous peer review was conducted in 2012 assessing the 2006 base year / 2040 horizon year model. The 2010/2040 model was developed starting in 2010 and was adopted in as the official version in 2013. Beginning in 2013, the 2010/2040 model was enhanced, and minor updates were applied, including accounting for projects in the updated STIP. Beginning in 2017, the 2015/2050 model began development, with more enhancements and major updates. In 2019, the 2015/2050 model was released, and the present peer review was conducted.



Previous Peer Review Recommendations

The 2012 peer review resulted in a variety of recommendations, many of which were implemented in the GSTDM. Following the 2012 peer review, a scorecard was developed to further prioritize and guide updates and enhancements to the model. The previous recommendations and scorecard improvements were presented during the first session of the 2019 peer review to provide peer review panelists historical context. The previous peer review recommendations and the scorecard are contained in the following tables.

Previous Peer Review Recommendations and Status

Timeframe	Peer Review Panel Recommendations on 2006-2040 Georgia Statewide Travel Demand Model (GSTDM)	Corresponding Improvements that have been done in the post 2010/2040 GSTDM enhancement and the current 2015/2050 GSTDM update	
Short Term (one to two years)	Identify intent and objectives for model application: 1) The statewide analysis needs include truck demand, long-distance travel, and long-range planning.	Yes	The truck model was updated to include non-freight trucks, the model specification was simplified as suggested in the peer review, and the mode choice routine was updated to be more responsive to changes in relative competitiveness between the truck and rail modes.
	Identify intent and objectives for model application: 2) The key policies in the model should include pavement preservation, high-speed rail, and toll roads.	No	Pavement preservation is likely to be considered during operational analysis. High-speed rail has not yet been implemented in Georgia. The toll roads currently are all in the Atlanta region and toll models usually utilize the time of day and peak direction, which requires more detail than is currently available in the statewide model.
	Identify intent and objectives for model application: 3) The complex and important behavior should include trucks, non-resident travel, and intercity travel.	Yes	The truck model was updated, the long-distance trip rates were also updated to use travel distance rather than time.
	Improve model documentation	Yes	The model documentation describes in detail the updates and enhancements applied in the GSTDM. It was improved by creating a general brochure, quick user guide, and the present model validation report. The brochure was created to provide general planners and GDOT management an overview of the GSTDM, including the model purpose, input data, model process, model outputs, and model applications. A quick user guide was developed for transportation planners who are not familiar with travel demand models. The user guide provides instructions on using CUBE or ArcGIS for opening the input and output networks as well as outlines the steps to run the model from Cube. The present model validation report for the 2015 update includes more details on the data source, data processing, and model validation performance.
	Further validate individual model components	Yes	The 2015 GSTDM has further validated individual model components as the peer review suggested. Details of the validation are provided in Chapter 8 of this documentation. Specific recommendations that were applied included: validation of distribution based on CTPP/ACS district-to-district origin-destination (OD) flows, comparison via OD scattergrams, and validation of the truck model after reducing its overspecification.
	Simplify and streamline the model where possible	Yes	The catalog was simplified via flow chart revisions and removal of unnecessary keys. SE data category reconciliation simplified model inputs (see Chapter 4). The freight trip generation and distribution specification were simplified as the original was considered overspecified based on the data at hand.

Timeframe	Peer Review Panel Recommendations on 2006-2040 Georgia Statewide Travel Demand Model (GSTDM)	Corresponding Improvements that have been done in the post 2010/2040 GSTDM enhancement and the current 2015/2050 GSTDM update	
	Integration with REMI	Yes	REMI region information was included in the input network and output results to improve an efficient process to compare model inputs to REMI data and to summarize model outputs by REMI regions.
	Review NCHRP 08-84 Rural and Long-Distance Travel Parameters for Statewide Models	Yes	Long -distance was originally defined as trips with travel time more than 75 minutes. It was redefined based on the distance of 50 miles. The long-distance trip rates were reviewed and re-estimated using the 50-mile threshold.
Mid Term (three to five years)	Examine balance of network detail and TAZ detail	Yes	In the 2015 update, the input network has been greatly expanded to include minor arterials and above. Interchanges along all interstates have been reviewed and updated to the base year condition. TAZ boundaries have also been updated to accommodate the improved input network. SE data has been reconciled to use the NAICS categories and streamlined to four categories. Detailed statistics for all the updates are provided in Chapters 3 and 4.
	Incorporate FAF and ATRI data	No	This was not undertaken given available time and budget, but eventual acquisition of ATRI data may enhance the non-freight components that were added to the model. Currently, the approach used was to borrow from the examples in other states such as Wisconsin and Mississippi. FAF data is an alternative to TRANSEARCH and may be considered in the next major model update.
	Investigate overspecification in the freight model	Yes	The geographic based overspecification that included use of three separate sets of generation rates and distribution friction factors for Georgia I-I, Georgia-neighboring I-E/E-I, and Georgia - distant state I-E/E-I was removed. Instead, a simplified specification based on 2013 TRANSEARCH tonnage to employment for all geographies was used for the current freight model. Outliers were also kept but were handled via special generator functionality. Details are provided in Chapter 5.
	Consider two-way integration with the Atlanta Regional Commission (ARC) model	No	At the time of the 2012 peer review, the ARC model was a four-step model; however, in 2016 it was upgraded to an activity-based model (ABM). There are still ongoing changes in the ABM that include changes in zones and network. The integration between the two models would require significant effort and therefore was not carried out in the current update.
	Examine pivoting off-base year commodity flows or using TRANSEARCH forecasts	Yes	TRANSEARCH forecasts are unavailable for Georgia in the dataset used. Consequently, the GSTDM forecast year tonnages use the base year validated estimated tonnages from TRANSEARCH as the baseline and then use model SE growth to arrive at horizon year tonnage at the external locations. The regular freight trip generation functionality handles the internal GA trip generation using the provided GA 2050 SE data applied to the validated generation model from the base year. Details are provided in Chapter 5.
	Examine multiple scenarios for freight forecasts, ranging from low to medium to high, and multiple forecast years	No	This recommendation was not implemented as it is not a part of model development. However, it serves as a foundation for various studies like the statewide plan or freight model, and therefore could be done upon request when the need arises.
	Include further stratifications by income and value of time, particularly with regard to passenger rail or pricing studies	No	This has not been implemented due to an absence of passenger rail in Georgia and pricing studies require development of toll models that utilize the time of day and peak direction, which requires more detail than available in the statewide model.
	Consider destination choice models	No	Destination choice for distribution is the next likely step for the GSTDM but was not undertaken for this effort. It would require additional data that is not readily available.

Timeframe	Peer Review Panel Recommendations on 2006-2040 Georgia Statewide Travel Demand Model (GSTDM)	Corresponding Improvements that have been done in the post 2010/2040 GSTDM enhancement and the current 2015/2050 GSTDM update	
	Examine time of day assignment	Yes	A time of day function model for AM and PM peak periods was developed for the current GSTDM. Details are provided in Chapter 9.
	Establish carrier surveys and a data program	No	This activity can be considered but was not undertaken given time and budgetary resources.
Long Term	Acquire additional household survey data with a focus on obtaining rural information	No	The latest household survey efforts, the 2017 National Household Travel Survey add-on data effort in Georgia was focused on MPO and small urban areas. Rural area travel surveys can be done but would require additional funding. It should be considered during the next major model update.
	Explore statewide dynamic traffic assignment	No	This could be a long-term goal, as dynamic traffic assignment requires significant efforts and changes to the model to ensure it is accurate at a state level.
	Explore land-use forecasting and allocation modeling, including PECAS, Urbansim, or simpler model	No	This recommendation was not implemented due to the significant effort that would be required. Currently, only the Atlanta region is maintaining and updating a land use forecasting model, which supports the inputs for ARC's ABM model. All other regional commissions utilize simpler processes to estimate the land use and SE data.
	Develop discrete mode choice for all purposes	No	This would be a significant effort and depends on a variety of data including onboard surveys and data on trip making characteristics. This could be considered as an improvement in the long term.
	Consider rebuilding the model from scratch to a new trip- or activity-based model	No	Activity-based models require significant time, effort, and resources in terms of capital and labor. ABM development experience from other states should be obtained for GDOT to make the decision about if and when an ABM model should be built.
	Investigate supply chain freight modeling	No	This would require considerable effort but should be kept as an option when the budget and planning environment allows.

Scorecard

	Category	Item	Finding	Recommendation	Improvement Type	Priority	2019 Status
TAZ & Network	TAZ	MPO Identification	All MPOs are identified in the TAZs and roadway network, except Cartersville MPO (CBMPO) is coded as part of ARC and Gainesville is not identified	Identify Cartersville and Gainesville in the TAZs and roadway network	Enhancement	High	☑
		Employment Data	Employment categories and aggregation from NAICS categories are not consistent with MPO TDMs	Develop the framework for reconciling employment categories for next model update	Enhancement	High	☑
				Develop trip rates based on the new employment categories and NHTS data	Enhancement	Medium	☑
		Area Type Classification	Based on population density only	Redefine current area classifications based on population and employment density	Enhancement	High	☑
				Develop new area classifications in conjunction with facility type, capacity, and speed lookup tables for next model update	Enhancement	Medium	
		Accessibility Measure	Used to adjust trip production and attraction for trips grouped by geography	Revisit during model calibration	Enhancement	Low	
	Network & Attributes	Roadway	According to the model documentation, not all minor arterials are included (missing 21% by centerline mile or 5% by lane-mile compared to GDOT 445 report)	Conduct a network coverage analysis	Enhancement	High	☑
				Enhance network coverage by including more arterials, and/or adding in network attributes such as Divided Highway	Enhancement	Low	☑
		Managed Lane Facilities	Has a placeholder for toll script and converts toll rates and value of time to time penalty; no toll links included in the network	Enhance the ability to evaluate managed lane facilities	Enhancement	Low	
		Facility Type Category	Based on 2010 functional classification (HPMS)	Update as necessary with capacity and speed lookup table development	Enhancement	Medium	☑
		Terminal Time	Add terminal time based on area types	Update if necessary when area type classification changes	Enhancement	Medium	☑
		Roadway Capacity	Used daily capacity	Develop a new hourly capacity lookup table by current area type and facility type categories based on HCM 2010 and other sources, which will be in line with general engineering assumptions and available for time of day assignment	Correct Error	High	☑
			Generally used higher capacities for denser areas				
			Tends to overestimate multi-lane facility capacity				
			Used different capacities from MPO TDMs	Develop another hourly capacity lookup table by more detailed area type and facility type categories for next model update	Enhancement	Medium	☑
		Speed	Used higher speed in general compared to MPO TDMs	Develop a new speed table by area type and facility type based on posted speed and HCM	Enhancement	Medium	☑
4-Step Model Component	Trip Generation	Trip Attraction	Trips are grouped by different geographic areas and trip purposes. Trip rates are based on employment, population, and households. For trips within Georgia, the rates are also differentiated by urban and rural areas	Update trip rates based on latest NHTS add-on data as employment category reconciliated	Enhancement	Medium	☑
		Trip Balance	Trips are balanced at multiple levels for different trip purposes, including statewide, all MPOs, all non-MPOs, and individual MPOs	Include newly added MPOs	Enhancement	High	☑

	Category	Item		Finding	Recommendation	Improvement Type	Priority	2019 Status
4-Step Model Component	Trip Distribution	Validation - Trip Length and Average Travel Time	II Long Trips	Modeled TT = within 1 minute of observed TT	Once the rural and long distance travel parameters are redefined, update the friction factors and revalidate trip distribution pattern	Enhancement	High	☑
			IE Short Trips	Modeled TT = within 1 minutes of observed TT				
		Validation - District-to-District Work Flows		Overall highly correlated to survey data including 2009 NHTS, 2010 Longitudinal Employer-Household Dynamics (LEHD), and 2006-2008 ACS. However, there are discrepancies at RC level. For example, GA Mountains, Three Rivers, NE GA regions show 43%-56% underestimation compared to 2009 NHTS.	Compare volumes and VMT at RC level to GDOT observed data and compare work-flow against CTPP	Enhancement	Medium	☑
	Mode Choice	Model Coefficients	IE Long (>75 min) & Far (State zones)	Distance based auto share was developed using 2001 NHTS	Explore if 2009 NHTS or FHWA TAF 2008 data can be used	Enhancement	Medium	☑
			IE Long (>75 min) & Near (Census tracts, Counties and Regional Planning Council zones)	The model was obtained from *"Bay Area/California HSR and Revenue Forecasting Study;"* the coefficients were adjusted to match the mode shares observed in FAA airport boarding data, Amtrak boarding data and 1995 American Travel Survey	Explore new data sources from other peer states that are more relevant to Georgia to adjust the coefficients for better validation	Enhancement	Low	☑
			IE Short (<75 min)					
			II Long & II Short					
		Air	Input Data	Only direct flights within GA due to lack of data of transferring flights; Includes only trips > 100 mi and with one trip end in GA	Explore more recent data source that can help model transfer of flights and improve validation at individual route level	Enhancement	Low	☑
			Validation	Boardings for 20 air routes were compared with those from FAA Origin and Destination Survey (DB1B) 2010; Modeled trips within 12% of observed				
		Train	Input Data	Amtrak - 4 services Includes only trips > 50 mi and with one trip end in GA	Overall validation is good. Should rail mode become a major share, better route level validation will be required. This may require improvements or addition of rail related parameters like access and egress time, parking costs, terminal times, etc.	Enhancement	Low	☑
			Validation	Boardings for 4 Amtrak routes were compared with those from AMTRAK Factsheet and Origin and Destination Survey 2007; Modeled trips were within 5%				
		High Speed Rail	Input Data	There is no HSR in GA currently	Conduct sensitivity analysis to test the model for reasonable ridership. Use other studies and/or FRA Connect Tool for comparison.	Enhancement	Low	
			Validation	No validation conducted				
		Average Auto Occupancy Rate		Use average auto occupancy rates to convert person trips to vehicle trips; the rates are different from MPO TDMs' rates; MPO rates are from NPTS 1990, while the latest NPTS is in 1995	Use NHTS Add-On data to update	Enhancement	Low	☑
	Trip Assignment	Passenger Car Equivalent (PCE) Factor		Used one number for all the freight vehicles (PCE=2)	Apply different PCE factors to differentiate truck classes to better account for the truck movement impact on traffic condition	Enhancement	Low	
		Volume Delay Function (VDF)		Congested travel time is calculated by the VDF; the coefficients for different link classes need to be examined	Explore new data sources such as HERE data to improve the VDF curves	Enhancement	Low	☑

Questions and Discussion

Much of the first session was spent with the team members presenting the background information. Several questions and responses that arose during the course of the first session are summarized below. Other questions regarding the relationship between GSTDM and MPO model zones and networks were deferred to the second session. The first key question was also discussed (see the key questions section).

Can you talk briefly about the interaction between the GSTDM and the Statewide Freight and Logistics Plan (GSFLP) and other statewide plans?

The initial urgency to develop the GSTDM was to support the GSFLP, which was a high priority of the governor around 2011. Unlike other statewide models, the GSTDM has a freight component. The freight and passenger modules have their own generation components, which come together during assignment.

Many statewide plans rely on the GSTDM. These include the Statewide Transportation Plan and the Statewide Transit Plan. Each project team might make its own enhancements to adapt the GSTDM. The GSTDM is not just a model on the shelf, but is being used in quite a few studies, with requests coming from consultants, MPOs, cities, etc. It would be useful to arrange a meeting with the consultant teams working with the various statewide plans to review the GSTDM data and needs.

When you built the statewide model, did you look at the urban forecast volume of traffic on major roadways?

When we developed urban area models, we used MPO growth rates and assumptions. We did not use their actual land use data. We often had a problem with local growth assumptions. The greater the growth that MPOs forecast, the more funding they will get for transportation. GDOT manages models for 14 MPOs, but we ask MPOs to forecast their socioeconomic data.

One of the procedures we have is to provide them with the REMI forecasts. We have a procedure to curb their aggressive growth assumptions. We have developed the SE data development guide they can use, but we are still having issues.

Florida has the same problem. All MPO forecasts are high. We were required by statue to have medium growth rates. When developing the statewide model, we had to tamp down MPO projected growth.

Session 2

Summary

The second session reviewed the passenger and freight model structures and updates applied to the traffic analysis zones and highway networks. Another topic was key enhancements applied to the model, including redefining long-distance trips, developing a time-of-day assignment model, and enhancing integration with MPO models. Much discussion during the second session centered on reconciling and forecasting socioeconomic data.

Updates

TAZ updates included updating socioeconomic data from 2010 to 2015 and reconciling employment categories. Highway network updates involved changing the area type definition to include not only population density but also employment density. Standard functional classification, number of lanes, and traffic counts data were also updated. Free flow speeds were updated based on observed National Performance Measures Research Dataset (NPMRDS) data. A freight model update included using InfoGroup for freight employment estimation.

Enhancements

Two key enhancements included updating the definition of long-distance trips and developing a time-of-day assignment. Another major enhancement was better coordination with MPO models. In addition, the catalog was updated, networks were made available in geodatabase format, and model documentation was improved.

A research project was briefly presented that proposes a methodology to update the GSTDM zonal system, socioeconomic inputs, and the transportation network to make them consistent with the corresponding features in the MPO models. Several recommendations were implemented into the GSTDM.

Questions and Discussion

During the course of the periodic online peer review sessions, questions often arose between sessions. These were summarized and addressed at the beginning of the next session. The questions and responses below were discussed during the second session.

What is the statewide model set up to predict: average weekday daily traffic (AWDT) or average annual daily traffic (AADT)?

The freight component of the model uses annual tons converted to average weekday tons. GDOT's traffic counts from the Traffic Analysis and Data Application (TADA) used in validation are AADT.

Could you explain more how the delta matrix process was applied?

Validation was conducted both before and after the delta matrix. However, the GSTDM Report documents the post-delta matrix results. The origin-destination adjustments were applied prior to the delta matrix. The delta matrix addressed different vehicle classes.

Did you investigate change in travel behavior due to change in socioeconomic data or networks or both (i.e., scenario testing)?

We did not conduct scenario testing comparing actual versus observed data based on two selected years.

Did you compare congested travel times with observed travel times?

We did not explicitly compare the model's daily congested travel times with observed data.

Regarding socioeconomic data, how do you reconcile forecasts from Regional Economic Models, Inc. (REMI) and the state demographer?

We used REMI and the Georgia Office of Planning and Budget's forecasts as control totals. We also considered MPO-provided growth rates to identify areas within MPOs where development is projected to be focused. We often selected REMI over other data sources when there were differences.

Will GDOT consider at some point converting to a statewide activity-based model (ABM)?

At this point, GDOT does not have plans to make the statewide model activity-based, considering the amount of data and effort that would be required to develop a statewide ABM.

Did you consider Connected and Autonomous Vehicles as a mode choice?

Not explicitly at the present time.

Are some of the major investments in Georgia, such as Port of Savannah Expansion and inland ports reflected in the future GSTDM? If they are not included in the current 2050 future scenario, is there a plan to model those and estimate the impact on statewide travel patterns, particularly for freight? If so, are the assumptions included in the documentation?

Yes, the Port of Savannah expansion and the development of inland ports have been reflected in the future models and are covered in the documentation.

Was there a comparison made between 2010 employment data and 2015 info group data? 2010 employment data had data quality issues and required manual efforts.

We used 2015 InfoGroup locations-specific data. However, we still did quite a bit of post processing and cleaning. We used Georgia Department of Labor county totals to provide controls for InfoGroup data. The locations were pretty good; however, the employee count often was off. Location data only was not looked at in detail comparing 2010 and 2015 data.

Can you explain a bit more about the population and employment forecasting process?

We factored down the employment figures to use for the current and base year population and employment ratios.

Session 3

Summary

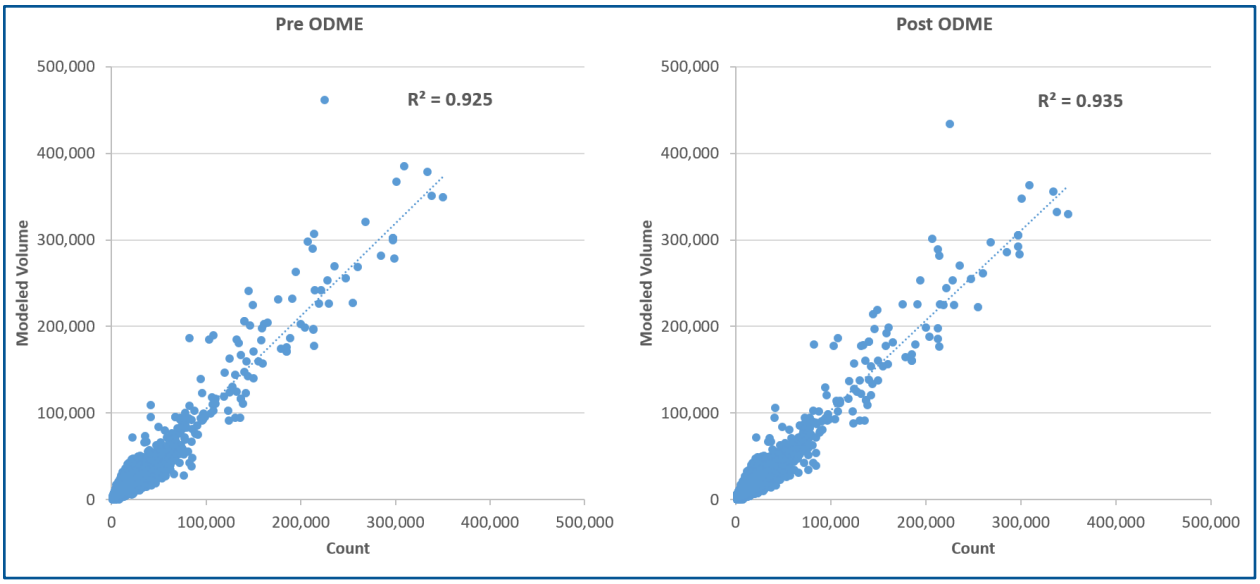
Calibration and validation of the 2015 model constituted the bulk of the third session. Calibration involved updating the network and adjusting trip rates, friction factor coefficients, and speed and capacity adjustment factors. ODME was used to improve the validation without changing the model too drastically. Also discussed in the third session were other applications of the GTSDM, including use in various statewide plans, corridor studies, and policy analysis. The third session also included discussion of several of the key questions (see the key questions section).

Calibration and Validation

Calibration involved adjusting a variety of network, generation, and distribution parameters to validate the model. Network adjustments involved fixed network links, such as dangling links, enhancing connectivity, or adding interchanges. As a result, network coverage improved. Also, centroid connectors were moved for better representation of roadway access locations. Trip generation calibration entailed adjusting trip generation rates by purpose and region, modifying buffer region productions and attractions (north and west buffer zones), and adjusting HBW trip rates in some counties. Updating friction factor coefficients and speed and capacity factor adjustments were additional calibration measures.

Origin-Destination Matrix Estimation (ODME)

One of the main sets of questions asked during the second session was regarding the degree to which the ODME process changed the model results. In response, during the third session the project team presented validation results both before and after application of ODME to demonstrate model improvement but not wholesale changes. For example, the figures below show link volume scatterplots pre- and post- ODME. ODME improved the R-square from 0.925 to 0.935.



Applications of the GSTDM

Recapping discussion that arose during the first two peer review sessions, applications of the GSTDM were reviewed. The GSTDM is widely used in a variety of statewide and corridor studies including the Statewide Transportation Plan and State Rail Plan. The GSTDM has been used to investigate policy issues, such as the return on investment of HB 170-funded projects. It has also been used for the Georgia Freight and Logistics Commission, as well as a variety of corridor studies and studies of county-to county flows.

Questions and Discussion

Have you run the GSTDM on Cube version 6.4.5?

A base year test run saved between three and four hours relative to the previous Cube version. Runtime was previously between 11 and 12 hours and is now seven and a half hours with version 6.4.5.

Are truck restrictions included to prohibit trucks on the downtown connector?

There is not a total truck exclusion to allow for trucks with local destinations, but there is a penalty on the downtown connector to discourage downtown connector use.

Would GDOT consider separate truck tables, such as light-duty, medium-duty, and heavy-duty trucks?

The model does currently have medium and heavy trucks, which are split into freight and non-freight. We can change how we report the assigned number. However, the model does not have light trucks.

Session 4

Summary

The fourth session focused on gaining input from the panelists on recommendations. The discussion was structured around the key questions (see the next section). However, a few recommendations were received after the third session that were described at the start of the fourth session.

Questions and Discussion

The recommendations received after the third session were distilled from sources, including:

- Travel Model Validation and Reasonableness Checking Manual
- Traffic Assignment and Feedback Research to Support Improved Travel Forecasting
- Traffic Forecasting Accuracy Assessment Research (08-110)

The recommendations included:

- Temporal validation and before-and-after studies
- Validate volumes at the link level by time period and direction
- "Directional truck and non-truck screenline and cordon volumes for different time periods, auto travel time contours (isochrones) to and from selected points, district-level VMT and VHT checks"

Final Thoughts and Recommendations

After discussing the key questions, the conversation was opened up for any final thoughts and recommendations.

Many recommendations were provided throughout the course of the peer review. The wish list is too big to be implemented. Given limited resources, the recommendations will need to be prioritized to answer the most urgent questions. Important considerations in assessing improvements to a statewide model include: what are the major uses of a statewide model? How would the new feature improve model fidelity at a statewide level? How much does it cost to develop and maintain? How about model run time?

Ongoing coordination among study teams will enhance application and integration of the GSTDM into those studies. The Statewide Transit Plan used the GSTDM to understand the trends in demand from region to region to inform future regional transit needs. The GSTDM could be enhanced by long distance mode choice. With an aging population, there could be more utilization of alternative modes in the future.

Sensitivity testing should be more rigorous. You do not want to be surprised by model results. The issue of reconciling MPO and state projections should also be addressed.

There are challenges in building a statewide model that has enough fidelity to inform corridor or MPO-level projects and decisions. The current GSTDM is the first TDM that has been used for various corridor studies. In terms of spatial zonal representation, the GSTDM has a little over 3,000 zones whereas MPOs have over 1,300. Corridor studies primarily use the GSTDM to inform growth rates. At the corridor level, there are often deviations in specific point volumes. However, from a growth rate standpoint, we have not received many complaints. We did, however, receive some feedback from the State Rail Plan team regarding the incomplete rail representation.

Positive feedback on the model we have been receiving includes its use in conjunction with TREDIS to analyze the long-term economic impact of investment and the return on investment of HB 170-funded projects. One corridor project team noted the model is very well calibrated and did not need further refinement. However, despite the positive feedback, we do not want to stop improving the model, knowing there are deficiencies. That is the purpose of calling for the peer review.

3. KEY QUESTIONS

Panelists were asked a set of key questions covering topics of interest to GDOT. These topics included questions and discussion related to data sources, model structure, and freight.

Data

NextGen NHTS

Question: What additional information can we request as a part of Next Generation NHTS to improve GSTDM? Should GDOT request increased coverage or does GDOT have suggestions for survey questions on the 2020 NHTS add-on survey?

The upcoming iteration of the National Household Travel Survey (NHTS) provides a key opportunity to improve the GSTDM by better understanding travel behavior, such as long-distance trip-making and use of emerging modes. Panelists recommended that in addition to the NHTS core survey data for the entire state, a strategic sampling plan be created to ensure representation of key demographic variables, including a balance of rural and urban areas.

Big Data and Passive Data

Question: What is your experience incorporating passive data in Statewide models? What were the benefits and challenges on doing so? What sample size did you aim to reach? How would you apply big data from technologies like NPMRDS, GPS, Bluetooth, crowdsourcing, etc. to improve statewide models (such as updating the VDF curves)?

Various GPS, cellular, Bluetooth, and crowdsourced data sources are becoming available, either directly from private companies or nationally enabled by FHWA (e.g., through the National Performance Measures Research Dataset and potentially through NextGen NHTS). Panelists noted the usefulness of the NPMRDS for updating free-flow speed lookup tables and validating trip distribution. However, cost is often a barrier to obtaining such big data and passive data.

States are increasingly using big data in performance-based planning and programming. For example, ARC used the NPMRDS to update free-flow speed lookup tables by time of day and area type. Using the NPMRDS is better than using the speed limit for representing free-flow speed on arterials because it is able to capture the observed effects of signal density. NPMRDS was also used to adjust the volume delay functions by the time of day. Similarly, as part of the most recent GSTDM update, the NPMRDS was used to update the daily volume delay functions.

The NextGen NHS will contain passive data, but the specifics are not yet determined. Although there is interest in at least county-to-county flow data, cost prohibitions might limit it to MSA-to-MSA or UZA-to-UZA.

StreetLight location-based services data has been used to validate trip distribution in the Los Angeles region. Standardized vendor quotes for statewide county-to-county flow data for trips by time of day and trip purpose would be valuable.

Projections Outside of Georgia

Question: The GSTDM model boundary coverage includes detailed zones within Georgia, buffer zones for adjacent states and remaining states represented by a single zone. The updates to the zones outside of Georgia assumes simplistic and uniform growth rates for zones in adjacent states. What is the best way to obtain data sources for regions outside of Georgia to estimate the socioeconomic growth and traffic growth, including model shares (trucks vs auto)?

The GSTDM focused on network representation, zonal detail, and detailed projections within Georgia. Panelists recommended enhancing socioeconomic and traffic growth data sources for regions outside of Georgia by referencing statewide models in adjacent states.

Structure

Population Synthesis

Question: Does incorporating a population synthesis model in a traditional four-step model offer a better understanding of how travel happens, especially in the face of new mobility options?

Synthesizing population could eventually be useful with a tour and activity-based model, but panelists agreed population synthesis might not be necessary with a trip-based statewide model. As an intermediate step, household synthesis could help reduce aggregation error and facilitate the enhanced representation of additional modes.

Although incorporating population synthesis into the GSTDM is currently a low priority, GDOT is interested in exploring expanding the model's capability to address a variety of questions, including emerging modes (see the next question). Population synthesis can help by representing population in more detail.

Short of population synthesis, it is possible to synthesize households, each with attributes such as household size, income, number of workers, number of children, number of automobiles, etc. In conjunction with regression models, this method can approach activity-based model trip generation with a trip-based model. It can reduce aggregation error by creating up to six or seven dimensions instead of two or three dimensions with typical cross-classification models. At the household level, trip interactions are possible, enhancing the model's ability to disaggregate and predict trip patterns.

However, synthesizing population or even households would be a time- and resource-intensive process. It comes down to what types of questions GDOT wants to be able to understand at a statewide level and if it wants to spend the resources to develop the capability.

Emerging Modes

Question: There are quite a few emerging modes, such as transportation network companies (TNCs), micro-mobility, and connected and autonomous vehicles. In a statewide context, representing them in the model framework is not as crucial as in an urban and regional model. Nevertheless, understanding the impacts of these modes on travel behavior can influence travel at the statewide level as well. How are other states trying to represent these new emerging modes? Since much of the data regarding these trips are held in private hands, what data sharing and partnership models have you considered?

When it comes to emerging modes, such as TNCs, micro-mobility, and connected and autonomous vehicles, panelists noted that many assumptions would need to be made in the absence of good data. At the statewide level, autonomous trucking will likely play a role in the nearer future, while others would be better addressed with regional models.

Florida is exploring this question but has not implemented any changes. It is a question of what is worth representing and how you represent it.

This year ARC is looking at how autonomous vehicles could be incorporated into the ABM. To carry this out, many assumptions regarding autonomous vehicles would have to be tested under numerous scenarios. Assumptions include whether a particular household would have autonomous vehicles and how people within the household would interact. Scenarios could be tested, but incorporating such assumptions into the planning process might not make sense at this point.

TMIP is promoting exploratory modeling and analysis for robust decision-making. Essentially, to date, the industry has been asking models to predict possible outcomes without having existing data related to these new modes. To address this problem, exploratory modeling utilizes experimental design and machine learning techniques to give insight into some possibility, not probability. The biggest challenge is model run time. Hundreds of runs are needed to explore the possibilities.

Although micro-mobility might be considered to operate in a sphere of less than five miles, such a small area for which a statewide model is not adequate. From a statewide perspective, bigger data impacts might be gleaned from autonomous trucking. Most freight travels on interstates where interruptions are limited and where companies might be more willing to automate the fleet.

Time-of-Day

Question: The time-of-day assignment is a post processor subroutine and uses generalized factors in estimating the peak period traffic. What is the best way to represent the long-distance trips that begin the trip in one-time period but end in another? Also, is there a suitable way to represent the managed lanes projects whose operations have dependency on the time period (like reversible lanes or HOT lanes)? Are there any changes recommended in the trip types like trips by HOV or trips by willingness to pay tolls?

In a recent enhancement, a post processor was developed to generate time-of-day assignment. Given the geographic size and daily nature of the GSTDM, the panel discussed challenges involved in representing long-distance trips that begin the trip in one time period but end in another.

A method was proposed to transfer trips between time bins. Cube has the capability to capture volume in time bins. If a trip is a five-hour trip, the trip can be loaded in the first hour, but information about the trip can also be saved for subsequent trips and preloaded to those hours. It is a pseudo dynamic traffic assignment option that could be applied without having to go to a full dynamic traffic assignment.

Economic Modeling

Question: How can the GSTDM enhance economic modeling? The current status quo has REMI attributes coded on the network links. There has been consideration of nesting TAZs within REMI zones for ease of availability and processing of inputs and outputs. Should additional consideration be given to REMI results being iteratively fed back into the trip generation assumptions given the interdependencies between the economics and transportation infrastructure?

In response to a question about enhancing the connection between economic models and the travel demand model, panelists pointed out that integration between REMI and the GSTDM is sufficient.

REMI forecasts are used in development of socioeconomic data for the GSTDM. Additionally, REMI uses GSTDM outputs as inputs. For example, congestion can impact access to jobs and economic attractiveness of an area. Currently, there is two-way integration between the two models. There is not a clear need for or path to creating automatic feedback.

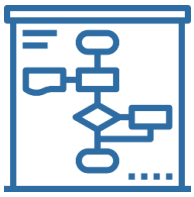
Freight

Freight and Commodity Flow Data

Question: Does commodity-based truck flow represent truck traffic sufficiently? What other data sources can be utilized in addition to TRANSEARCH that has been used for GSTDM?

The panel recommended that GDOT acquire an updated TRANSEARCH dataset to create a timeseries that can be used to analyze trends, particularly given Georgia's port expansions. The Freight Analysis Framework (FAF) was also recommended to supplement the commodity flow data to generate the GSTDM's truck traffic.

GDOT already has past TRANSEARCH data. As Georgia continues to invest in strategic port infrastructure, it would be valuable for GDOT to obtain another TRANSEARCH dataset that can be used to analyze flow data over time. In addition to the GSTDM, the data will be useful for other ad hoc analyses, including select link analysis. TRANSEARCH is valuable because of its detailed county-to-county commodity flow data that one does not obtain with FAF.



However, FAF can be a good additional source of freight data. It is actually based on the shipper, so you can see where commodities are actually produced and where they are actually destined to arrive. FAF and TRANSEARCH can be combined and used to enhance the GSTDM.

Port Growth

Question: In light of the Georgia State Legislature's recently created Georgia Freight and Logistics Commission in 2019, how can GDOT's statewide travel demand model best determine, then forecast, what share of truck trips from Savannah pass through Metro Atlanta without an origin or destination in the region?

The panel discussed the GSTDM's ability to model freight as valuable capability, given the keen interest in studying freight and logistics, including the impact of recent port expansions.

Commercial Delivery

Question: How are commercial vehicles making last-mile deliveries handled? Are supplementary data like ATRI used to develop these trips in other states?

Panelists noted the challenges in capturing last-mile delivery trips of commercial vehicles, including limited data sources, model detail, and relevance at a statewide scale.

The GSTDM has separate modules for freight and passenger vehicles. The passenger model includes commercial trucks that might be large but that do not carry freight. In urban areas, non-freight commercial trucks making deliveries can be a significant portion of traffic. This is increasingly true with the growth of ecommerce.

The first- and last-mile are difficult to capture in statewide models because there is not enough detail in network or zonal representation. The issue might be better addressed with MPO models that provide a high level of detail. In the next GSTDM update, the number of zones is anticipated to expand significantly. When this happens, the GSTDM will be better equipped to represent last-mile deliveries. However, the costs and benefits of developing this part of the model would have to be evaluated, answering the question "What benefit does it add to the statewide model?".

4. RECOMMENDATIONS

The peer review discussion produced recommendations for further improvement of the GSTDM. Recommendations covered various topics, including the structure, input data, validation, and application of the model. Common model components addressed by the recommendations include passenger and freight generation, mode choice, and assignment. Priority was assigned to each recommendation based on a synthesis of the discussion, including the need and state of the practice.

Model Application

Enable Evaluation of High-Speed Rail

Enhancing the model's mode choice to enable to support the evaluation of high-speed rail is a high priority for GDOT. The GSTDM has traditionally focused on the highway mode and utilized a partial mode choice component. The next update should enhance the representation and calibration of the passenger rail component as well as implementing full mode choice.

Enable Evaluation of Managed Lane Facilities

Managed lanes are being developed within urban areas. Various options exist to represent managed lanes at a high level in a statewide model. One approach could be to model flow rates, not toll rates explicitly. The statewide model could potentially set a baseline that could be analyzed in more detail in MPO studies. Enabling the GSTDM to evaluate managed lane facilities is a high priority given the ongoing development of a managed lane system.

Scenario and Sensitivity Testing

The peer review recommended conducting analysis to test the model's response under various conditions. A variety of terms can be used to describe this concept, including sensitivity testing, scenario testing, before-and-after studies, and temporal validation. Sensitivity and scenario testing involve assessing the model's response to changes in various conditions (e.g., varying socioeconomic data or volume delay functions). Before-and-after studies are conducted to evaluate a model's prediction of a project's impacts against observations after the project's implementation. Temporal validation more broadly extends the concept further by comparing future scenarios against observed data over time.

Discussion during the peer review included the importance of the model's ability to quantify major travel pattern changes due to such scenarios as major port investments. This could be achieved through a systematic program of scenario and sensitivity testing.

See the validation recommendations below for more related information.

Enable Evaluation of Emerging Technologies

As discussed in response to the emerging modes key question, emerging modes and technologies are unlikely to have a large near-term impact on statewide modeling. However, autonomous trucking and other emerging technologies could be evaluated as part of the next update.

Enhance Interaction with Economic Modeling

Discussion surrounding the economic modeling key question noted the integration between REMI and the GSTDM is sufficient. However, future work could seek to enhance the use of the statewide model in economic modeling and vice versa.

Coordination

The GSTDM serves as a vital resource for GDOT and its partners to analyze transportation investments. Coordination between the model development team and model users, who are often project teams for other plans and studies, could facilitate both the streamlined use of and improvements to the model.

Validation

The peer review recommended a variety of specific ways to improve the validation of the GSTDM. One resource mentioned during the discussion was *Traffic Assignment and Feedback Research to Support Improved Travel Forecasting.*[1] The report suggested that "validation should be accorded a greater priority in the model development process [and] … it should be disaggregate in nature…"

Compare Congested Travel Time and Speed with Observed Data

As noted in the second peer review session, the recent GSTDM update used observed speeds from the NPMRDS to update free-flow speeds. However, the peer review panel recommended congested speeds or travel times also be compared against observed data, such as INRIX, despite the daily nature of the GSTDM.

[1] https://www.transit.dot.gov/sites/fta.dot.gov/files/traffic-assignment-and-feedback-research-to-support-improved-travel-forecasting.pdf

Validate Volumes at the Link Level by Direction

Moving beyond the standard daily modeled volume-count validation approach, the report *Traffic Assignment and Feedback Research to Support Improved Travel Forecasting* recommends validating volumes at the link level by direction and time period, if available. As the GSTDM currently runs as a daily model with time-of-day assignment as a post-processor (see the time-of-day key question), validation will likely remain daily. Although daily volumes are likely relatively balanced by direction, future work could explore this enhancement.

Validate Screenlines by Truck and Non-Truck Volumes

The report *Traffic Assignment and Feedback Research to Support Improved Travel Forecasting* suggested that screenline validation should be broken out by truck and non-truck volumes. In conjunction with the recommendation to utilize the latest freight flow data from TRANSEARCH and FAF (see below), this truck-specific screenline validation could help enhance the model's freight component.

Validate by Regional-Level VMT and VHT

One validation check applied in the GSTDM trip assignment was vehicle-miles traveled (VMT) by facility type. A recommendation would be to sub-divide this comparison within subareas or regions of the state. The recommendation also extended to vehicle-hours traveled (VHT) by subarea, although obtaining observed VHT data could be a challenge.

Validate County-to-County Flows

One check of trip distribution is trip flows between regional commissions based on American Community Survey (ACS) data. A recommendation of the peer review is to further disaggregate this check by conducting it at the county-to-county level. As noted in the big data and passive data key question discussion, the NextGen NHS will contain passive data, but the specifics are not yet determined. Although there is interest in at least county-to-county flow data, cost prohibitions might limit it to metropolitan statistical area (MSA)-to-MSA or urbanized area (UZA)-to-UZA.

Input Data

Several recommendations related to input data.

Update Freight Component Using Latest TRANSEARCH and FAF Data

As discussed during the freight and commodity flow data key question, the peer review panel recommended GDOT acquire an updated TRANSEARCH dataset in conjunction with FAF.

NextGen NHTS

As noted in the NextGen NHTS key question discussion, Georgia will be participating in the NextGen National Household Travel Survey with a sampling plan to ensure balance of rural and urban areas and key demographic variables. This data will prove to be indispensable to GSTDM updates.

Include Automobile Ownership

The GSTDM includes stratifications by income, area type, and household size. Trip rates are applied based on trip rates derived from the NHTS. A future enhancement would be to include household automobile ownership to further refine trip rates.

Incorporate Big Data and Passive Data

As discussed in the big data and passive data key question section, desire exists to utilize this emerging data source. However, cost will likely prohibit extensive application in the statewide model, with the exception of likely flow data expected as part of the NextGen NHTS.

Enhance Socioeconomic and Traffic Growth Data Outside of Georgia

As noted in the projections outside of Georgia key question discussion, the GSTDM focused on network representation, zonal detail, and detailed projections within Georgia. Panelists recommended enhancing socioeconomic and traffic growth data sources for regions outside of Georgia by referencing statewide models in adjacent states.

Structure

Several recommendations centered on the model structure and can be subdivided into freight, passenger, mode choice, network, time of day, and other.

Address Non-Freight Commercial Vehicle Last-Mile Deliveries

The commercial delivery key question discussion noted that although commercial deliveries can represent a significant and growing portion of trips, the usefulness of including them in a statewide model might not be worth the effort.

Consider a Separate Trip Table for Light Trucks

During the third session questions and discussion, a recommendation was made to create a separate trip table for light trucks.

Apply Different Passenger Car Equivalent (PCE) Factors to Differentiate Truck Classes

A low priority recommendation carried over from the scorecard that followed the 2012 GSTDM peer review, this item persists and could be implemented with the other truck-related recommendations.

Investigate Supply Chain Freight Modeling

A long-term recommendation from the 2012 peer review, this item urged the development of logistics and supply chain freight modeling similar to that then being developed by Florida DOT. This would require considerable effort but should be kept as an option when the budget and planning environment allows.

Develop Discrete Mode Choice for All Purposes

The GSTDM was developed with fixed automobile shares by trip distance. The implementation of a full mode choice module could support the evaluation of emerging policies, such as high-speed rail or managed lanes.

Consider Destination Choice Models

A short-term recommendation of the 2012 peer review, this step has not been implemented due to a lack of data.

Utilize a True Shape Network

Utilizing a true shape network would improve both communication and calculation. Data sources are now available to implement this network conflation on a statewide scale.

Incorporate Population Synthesis or Household Synthesis

As contained in the population synthesis key question discussion, population synthesis or household synthesis could help reduce aggregation error. However, it would be a resource-intensive undertaking with a low priority given other needs.

Fully Develop Time-of-Day Assignment into Model Stream

As noted in the time-of-day key question discussion, a recent enhancement developed a post-processor to generate time-of-day assignment that can support time-of-day analysis. However, given the size of the model, full conversion to a time-of-day assignment is not a high priority.

Account for Trips that Begin in One Time Period and End in Another

Also contained in the time-of-day key question discussion, a method was proposed to transfer trips between time bins. However, the process would also be computationally burdensome and be a low priority given other needs.

Consider Modeling Average Weekday Traffic

As captured in the second session questions and discussion, a panelist asked whether the model predicts average weekday daily traffic (ADWT) or average annual daily traffic (AADT). The model is currently calibrated against AADT at GDOT's count stations. Implementing this recommendation would involve developing factors to enable the model to predict average weekday conditions, which is of primary interest in most analysis.

Explore Land Use Forecasting and Allocation Modeling (including PECAS, UrbanSim, or simpler model)

This long-term recommendation of the 2012 peer review has not been implemented due to the significant effort that would be required. Currently in Georgia, only the Atlanta region is maintaining and updating a land use forecasting model, which supports the inputs for ARC's ABM model. All other regional commissions utilize simpler processes to estimate the land use and socioeconomic data.

Consider Rebuilding the Model from Scratch to a New Trip- or Activity-Based Model

Another long-term recommendation of the 2012 peer review, this also has not been implemented. Activity-based models (ABM) require significant time, effort, and resource in terms of capital and labor. As noted in the second session questions and discussion, GDOT is not currently planning to develop a statewide ABM.

Full Integration with MPO Models

As noted during the second peer review session, a recent research project contained recommendations for integrating the GSTDM and MPO models, several of which have been implemented.

Focusing on one aspect of integration, during the discussion of the economic modeling key question discussion (and also in the first session questions and discussion) the importance of reconciling MPO and statewide forecasts was raised. In response to this ongoing challenge, GDOT has developed checks and balances. While GDOT develops travel demand models for Georgia MPOs (outside of Atlanta), the MPOs develop the seriocomic data forecasts, which are reviewed by GDOT. Progress has been made, but there is still more to do. Panelists noted that reconciling MPO and state forecasts is an issue that is not unique to Georgia. GDOT is considering full integration of the GSTDM and MPO models in the future.