TDOT
Department of Transportation

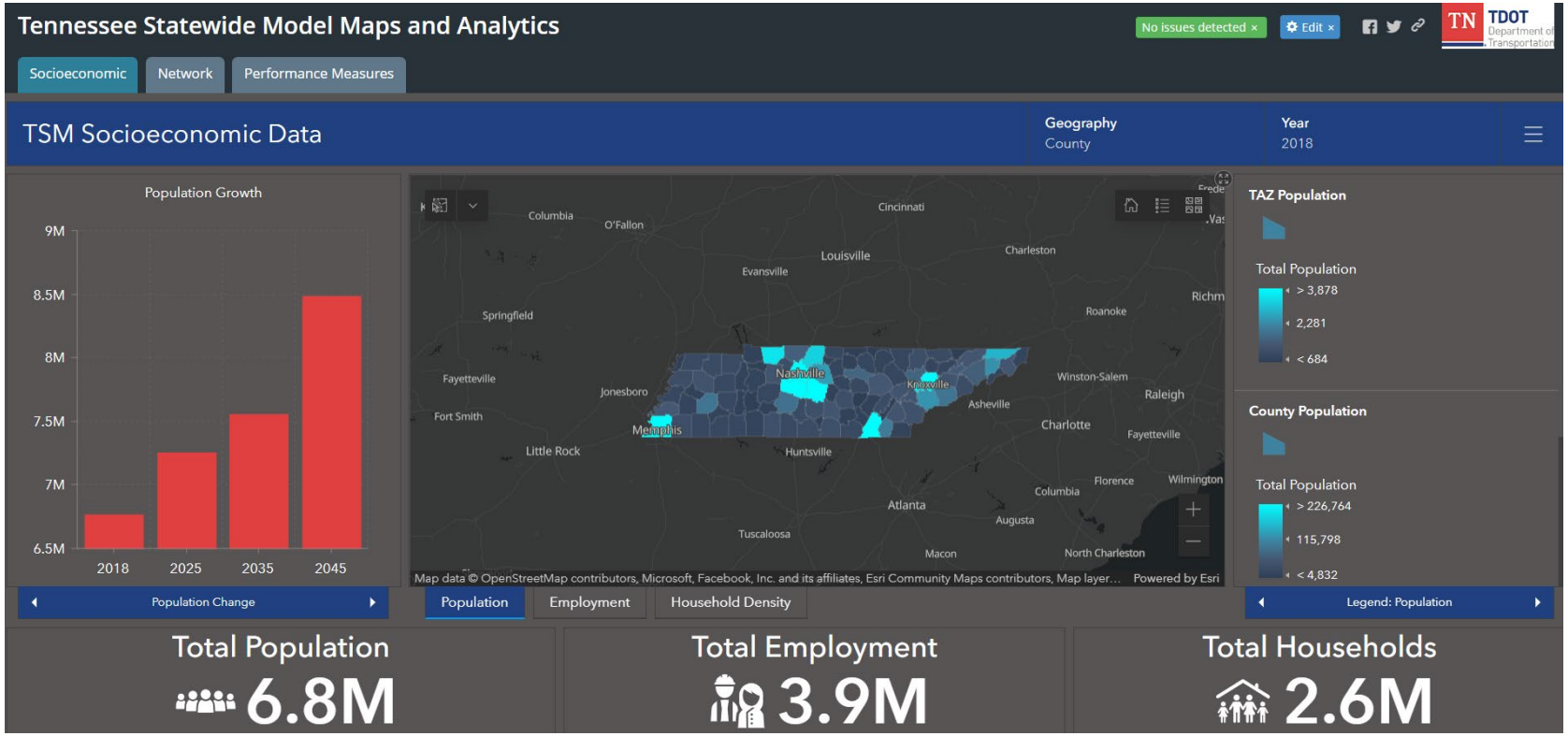
TSM v4 Dashboard

TNMUG –Tennessee Modeling User Group

Presented By-
Marshall Wilson
Long Range Planning Division
October 12, 2022

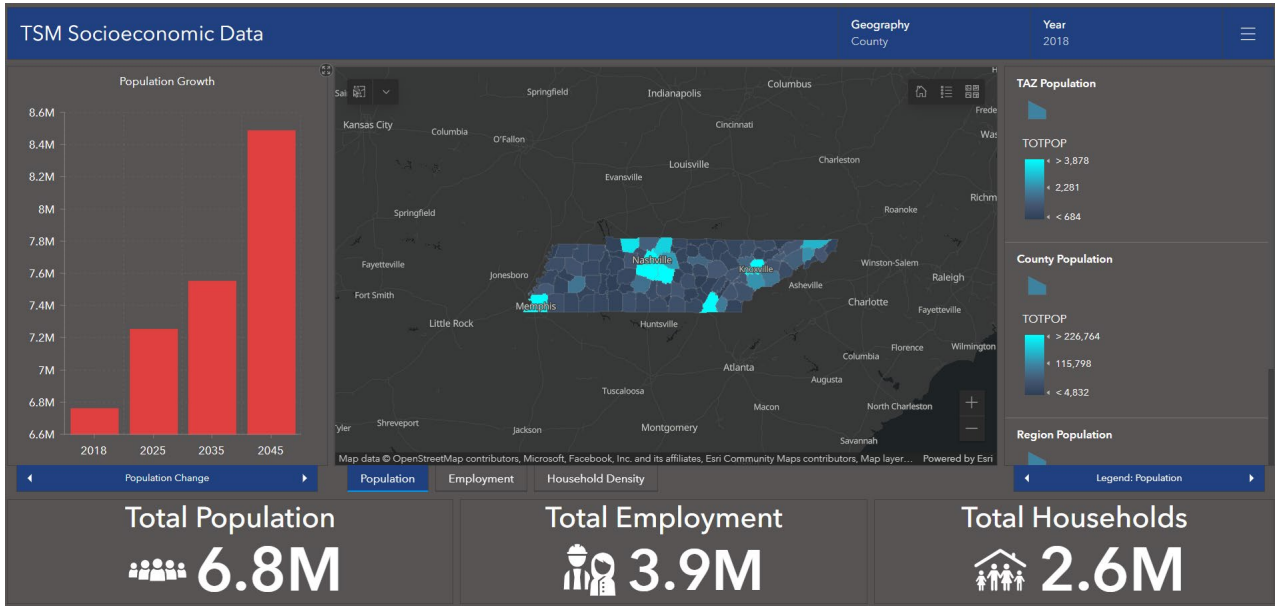
Project Overview

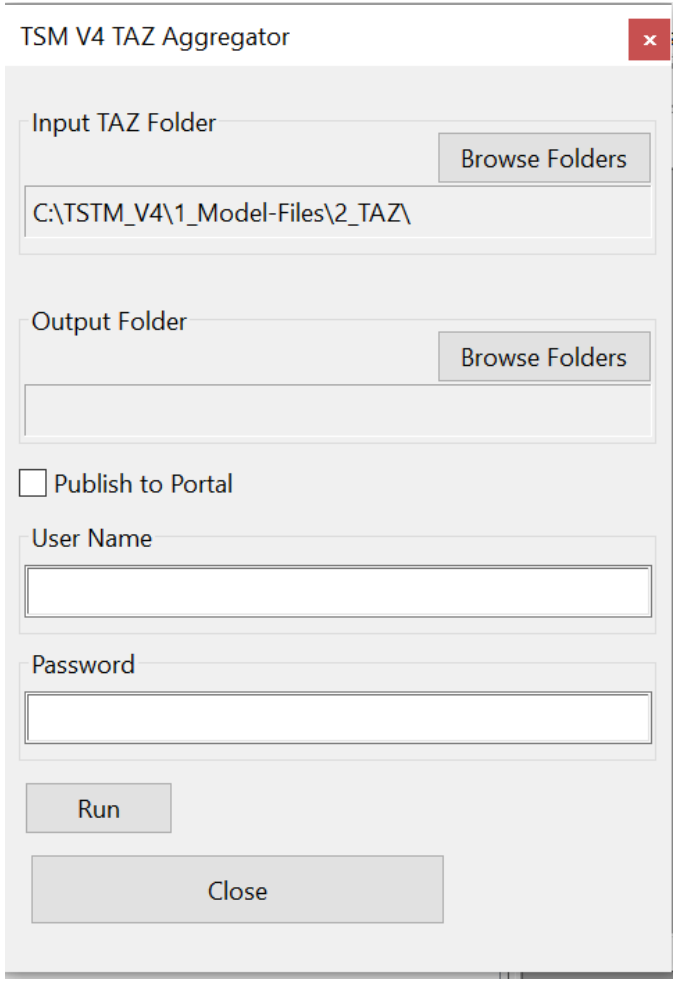
- Purpose: visualize vital TSM forecast data in an interactive web application hosted on the TDOT GIS Portal.
- Not yet published, expected release first quarter 2023
- Will be a tabbed map series containing several dashboards
- Socioeconomic (TAZ) dashboard recently developed
- Network data dashboard currently under development



Dashboard 1: Socioeconomic

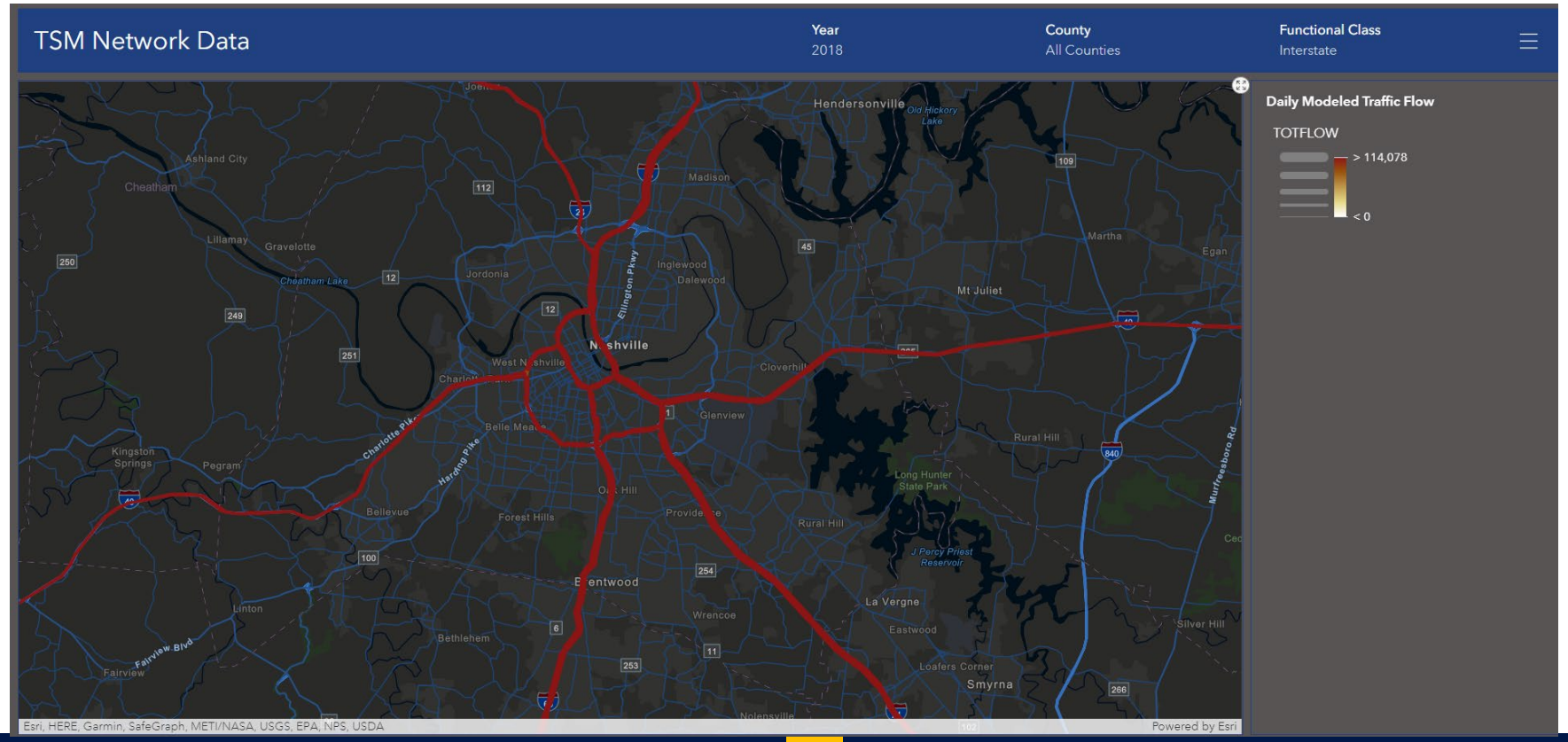
- Region, County, TAZ levels
- Aggregated TAZ Data
  - Population
  - Employment
  - Households
- Visualizes data for 2018 base year, as well as 2025, 2035, 2045 forecast years
- TSM Aggregator tool for generating county and region layers





Dashboard 2: Network

- Contains all TSM network segments
- Modeled daily flow for base and forecast years
- Selectors for year, county, functional class



Dashboard 3: Performance Measures

- AM/PM congestion
  - Travel time and flow comparisons
- Volume/Capacity ratios
- Project impacts

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Statewide Land Use Model Validation

TNMUG –Tennessee Modeling User Group

Presented By-
Golnaz Sarram
Planning Specialist @ Forecasting Office
October 12, 2022

Introduction

❑ Model Purpose

- ✓Increasing the accuracy of future-year land use **forecasts**, helps long-range transportation planning.
- ✓Assessing cumulative and **indirect** effects of transportation projects.
- ✓Evaluating **economic** effects of various state and regional policies.
- ✓Evaluating the land use **changes** because of rapid changes in travel behavior

❑ Model Structure

- ✓Enhanced gravity-based approach
- ✓Operational at TAZ level
- ✓Forecasts demographic and Socio-economic with 5-year intervals
- ✓Using two years data sets (base and lag year) for calibration
- ✓Forecasting land use conditions and house conditions
  - Incorporates, job opportunities, population, house conditions, residential, commercial, industrial, agricultural, and vacant lands in zones.

Validation – Accuracy Rate

❑ FDOT (2011) measured their model accuracy in replicating the land use changes. Employed an ANN model to validate the accuracy of the MNL model.

✓Based on their goodness of fit results, maximum accuracy is 74%

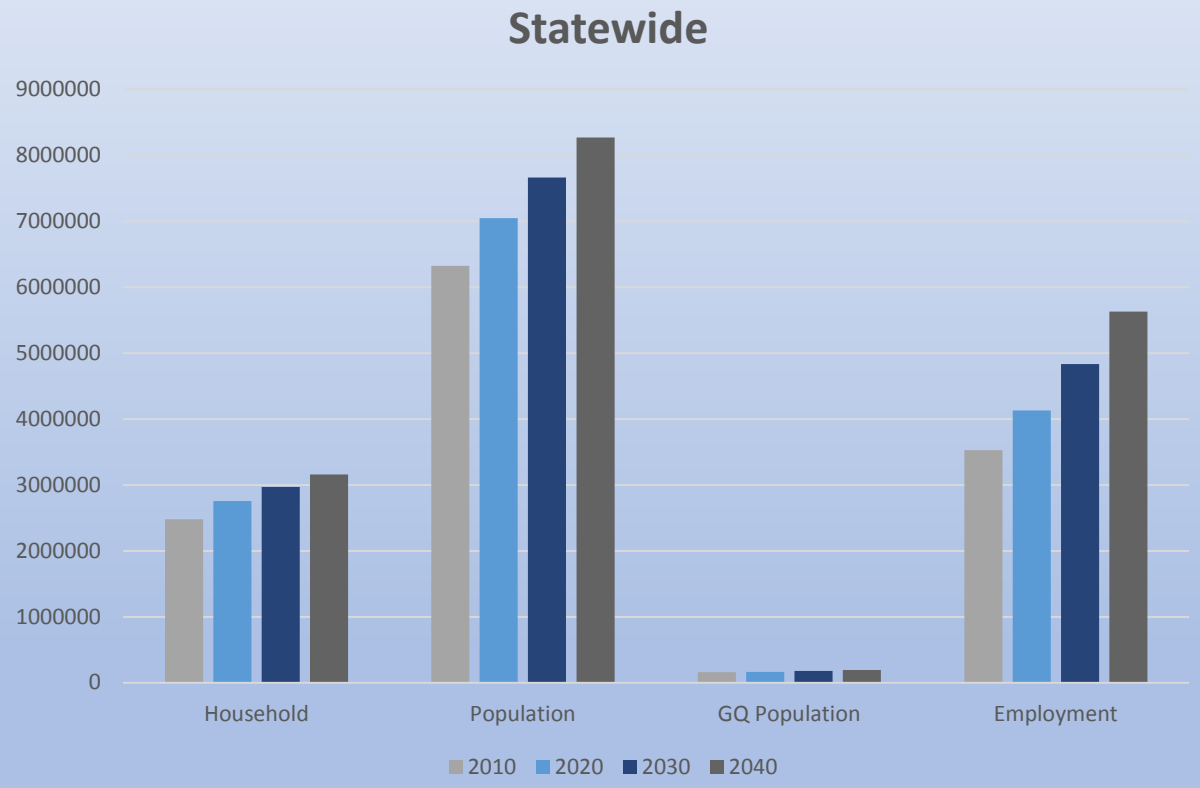
❑ ODOT (1999) used the TRANUS package and the global increments of exogenous production as input and compared the results to target values.

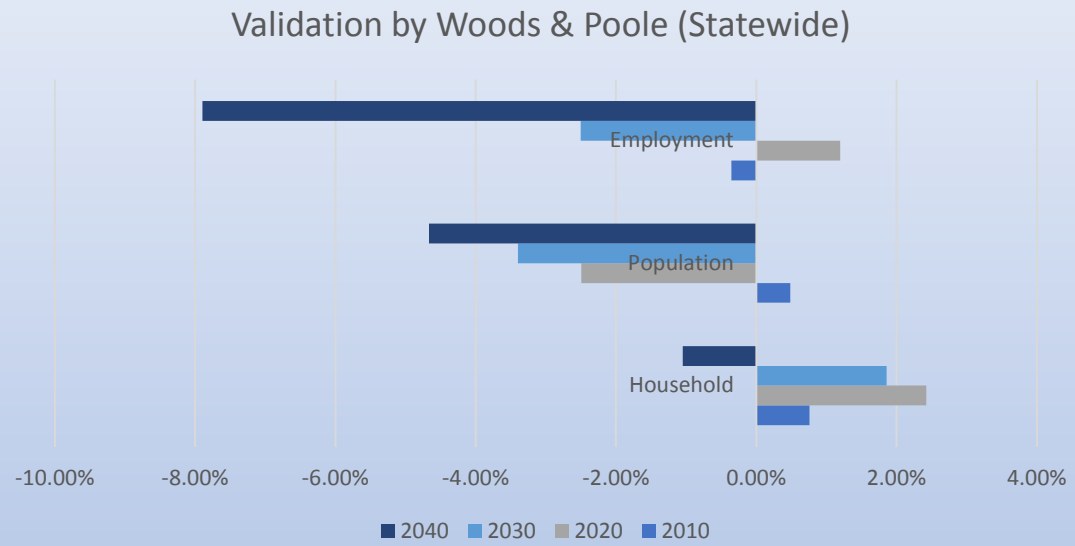
✓Primary criteria for evaluation of the model were:

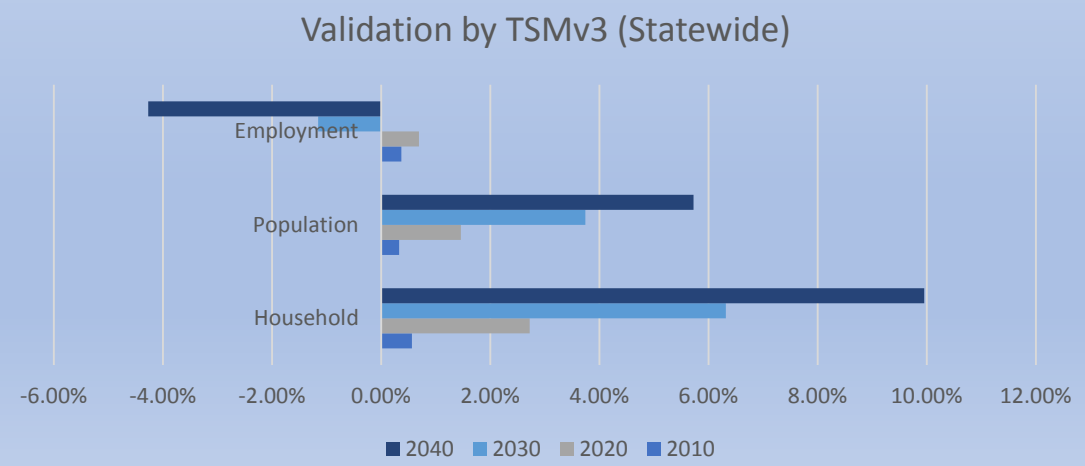
- Matching target passenger trips by sub-state area within +/- 20%
- Matching the expected change in passenger trips by sub-state area within +/- 20%
- Matching 1995 truck and auto average weekday counts along major intercity corridors within +/- 20%
- Matching the 1990 to 1995 change in truck and auto average weekday counts along major intercity corridors within +/- 20%

❑ The ongoing research in this area are still challenged by the **interconnectedness** of the land use model features, and the model accuracies are below 80%.

Demographics Crosstabulations - TSTM3 and WP







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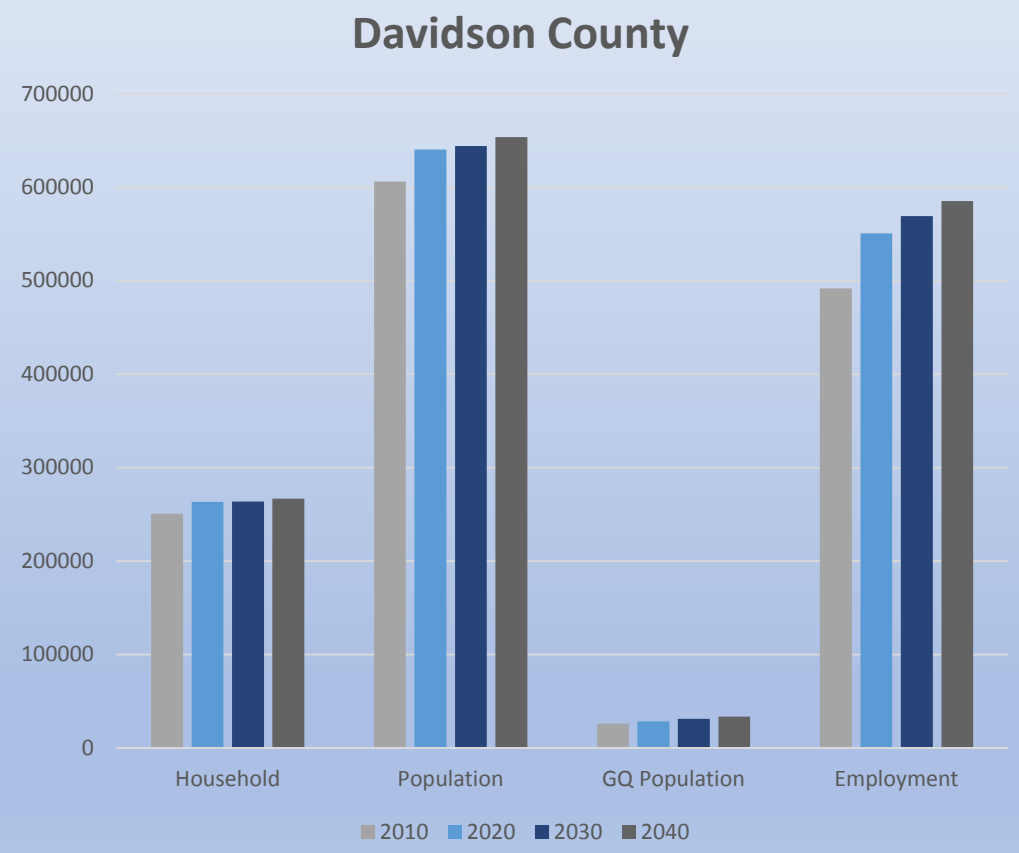

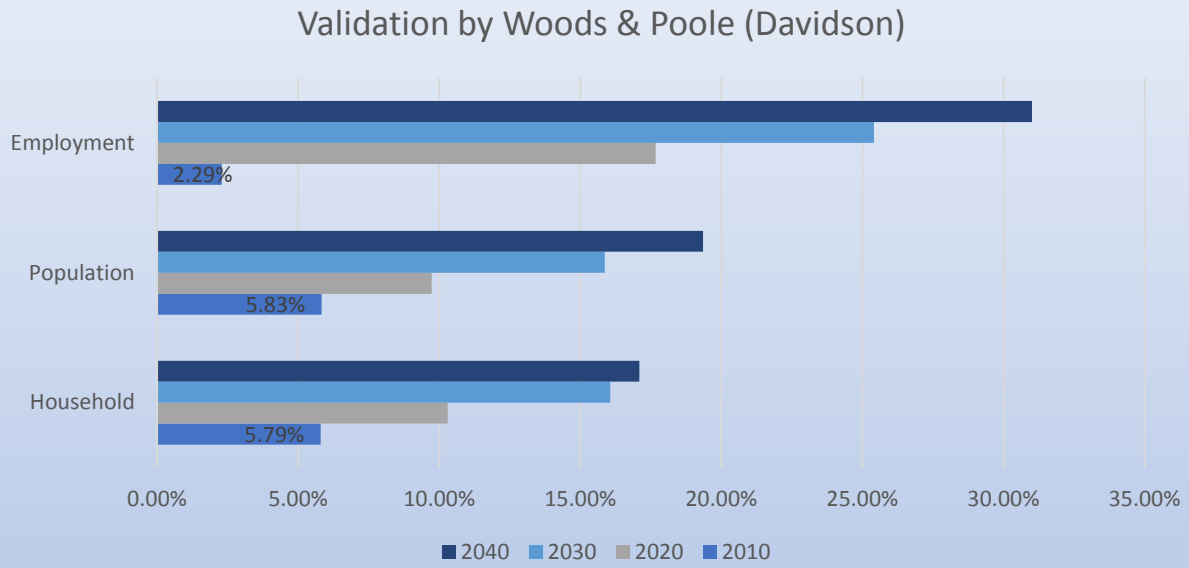

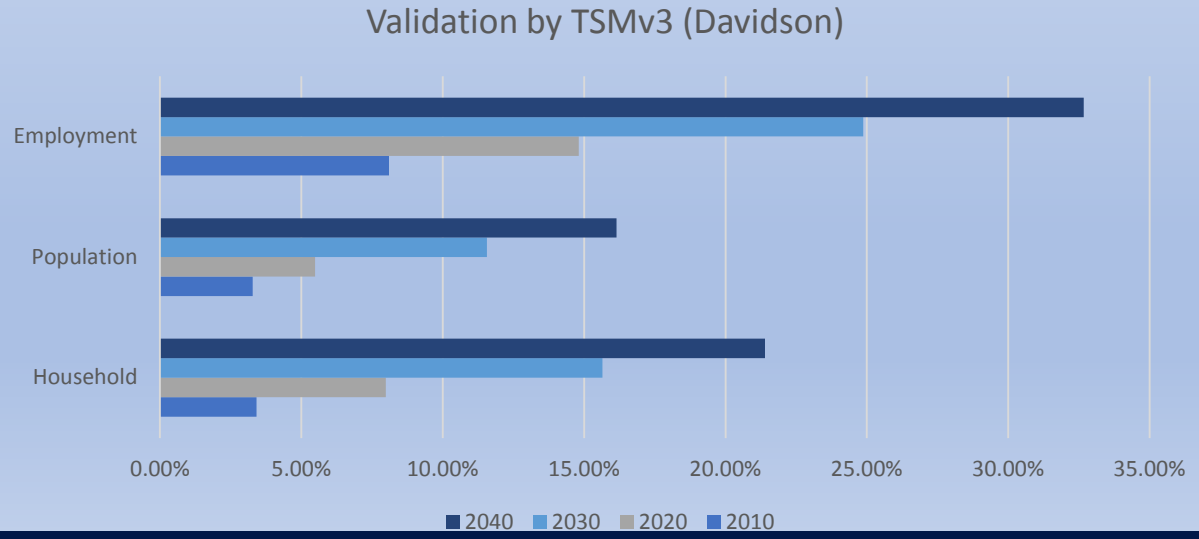

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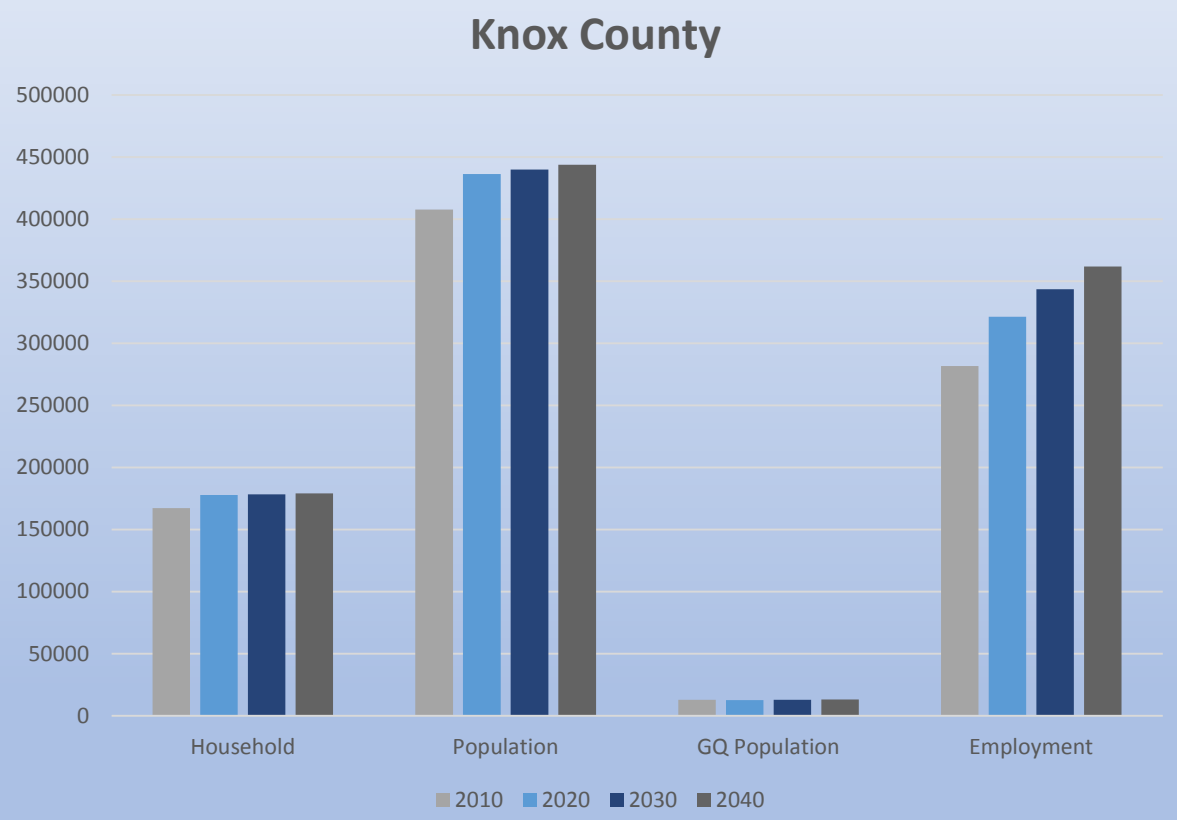

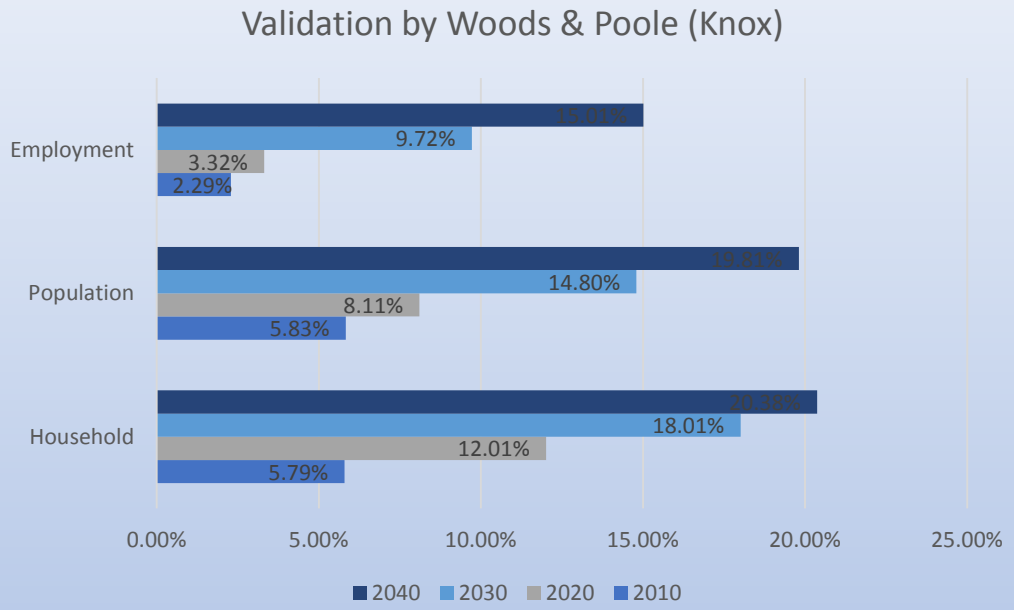

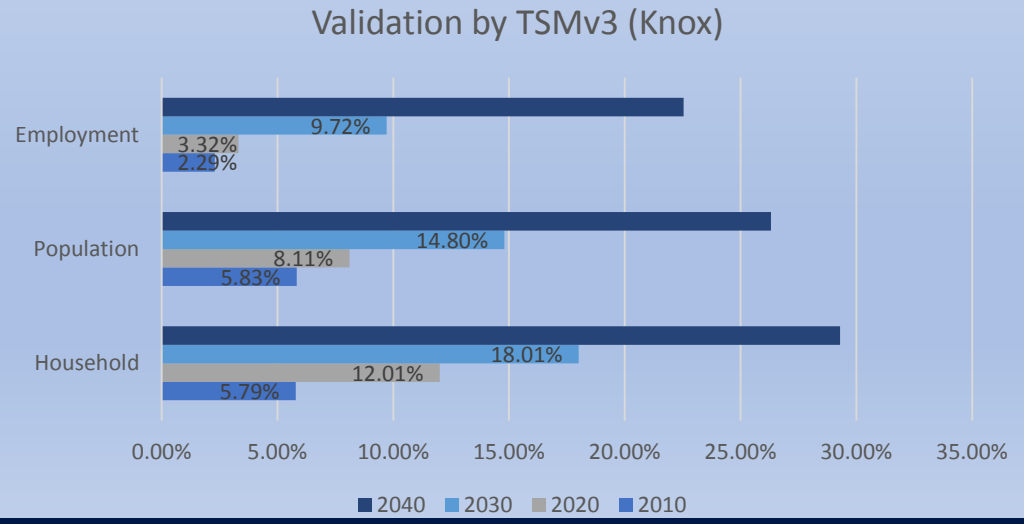

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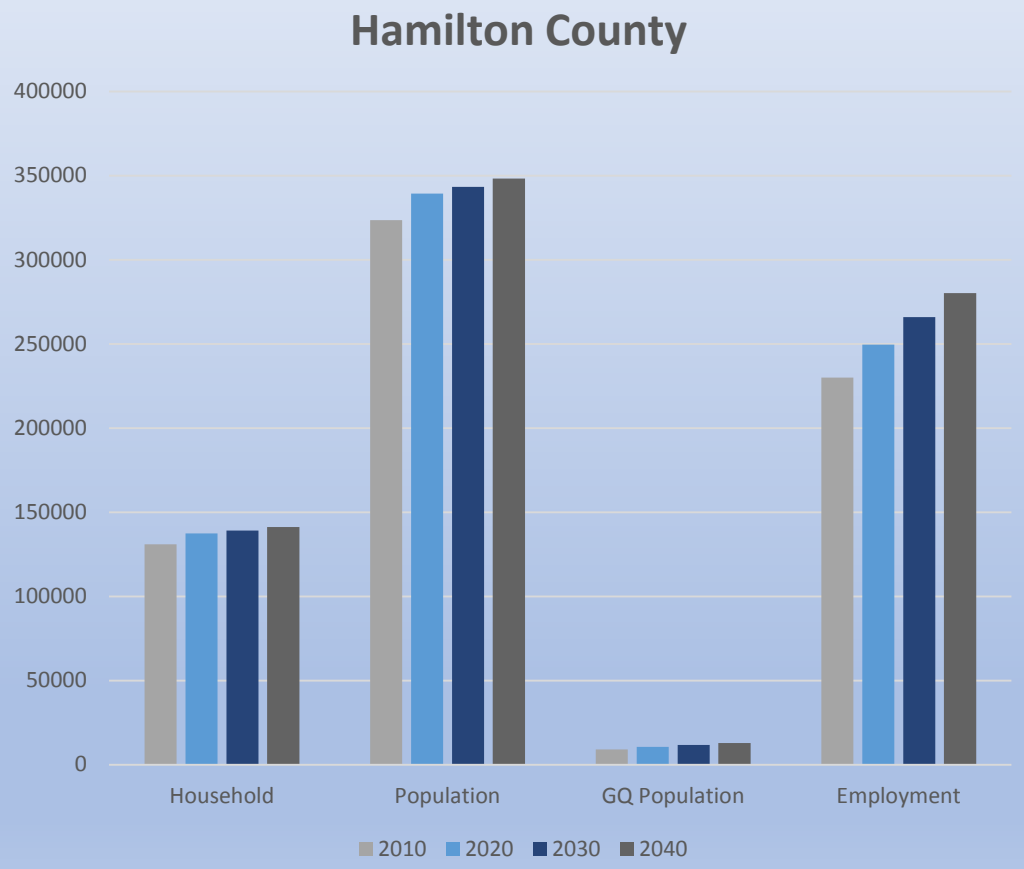

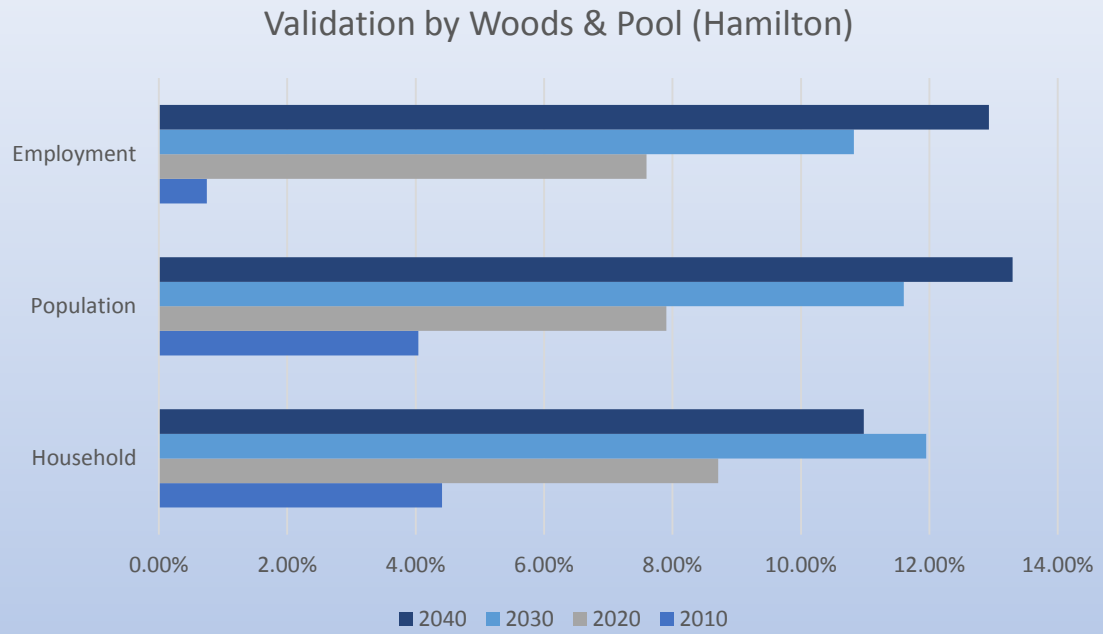

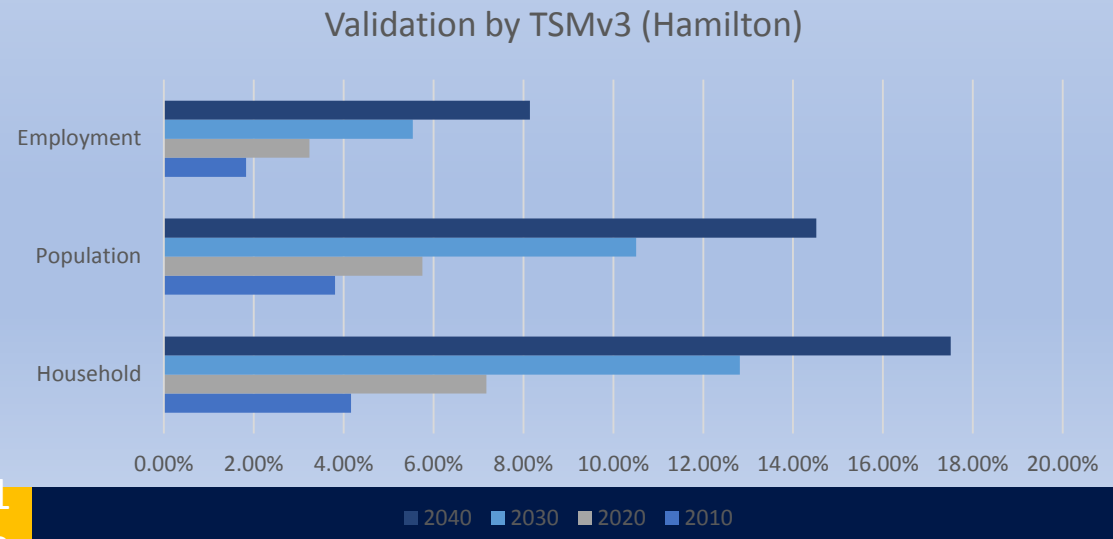

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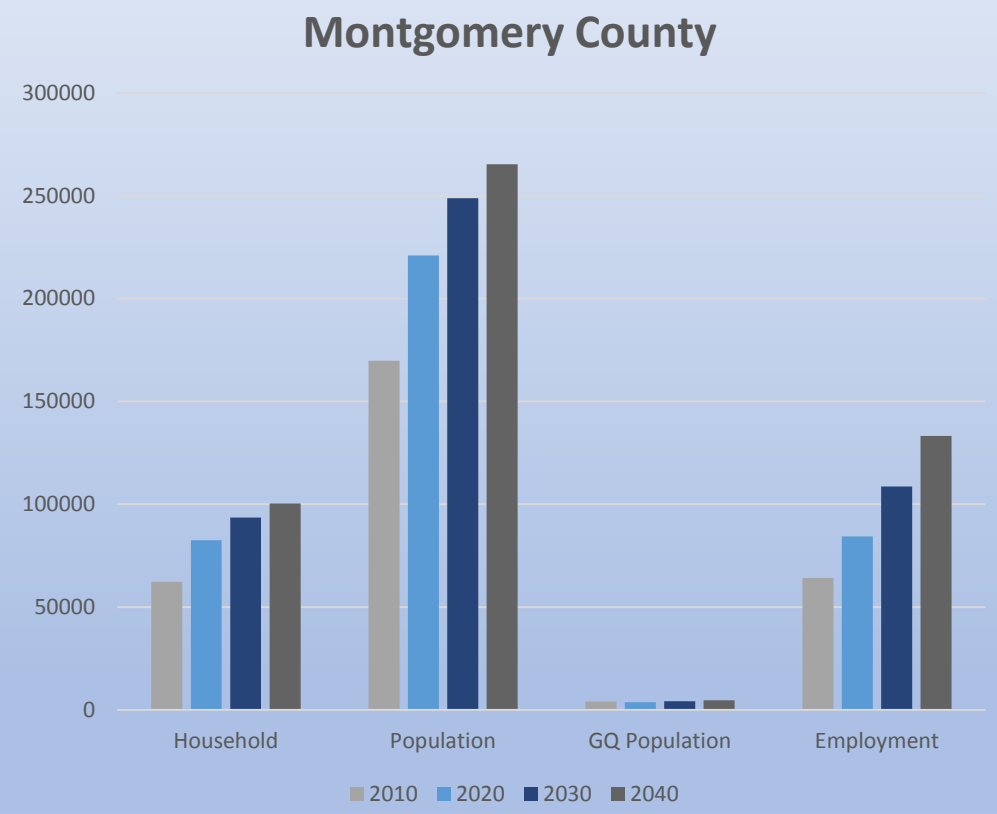

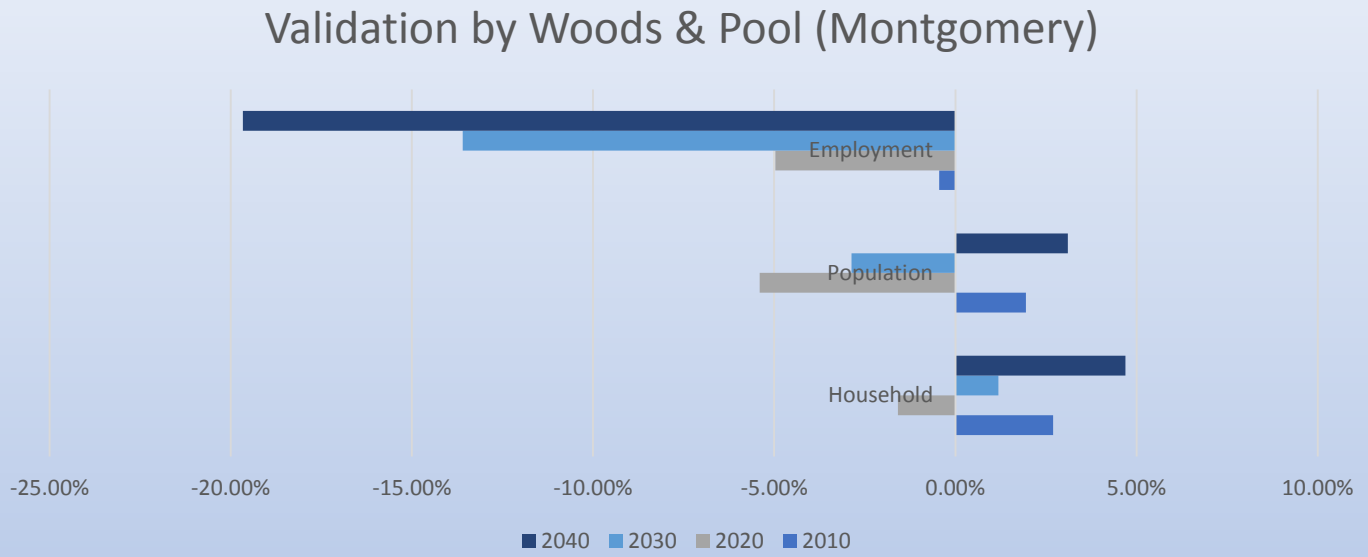

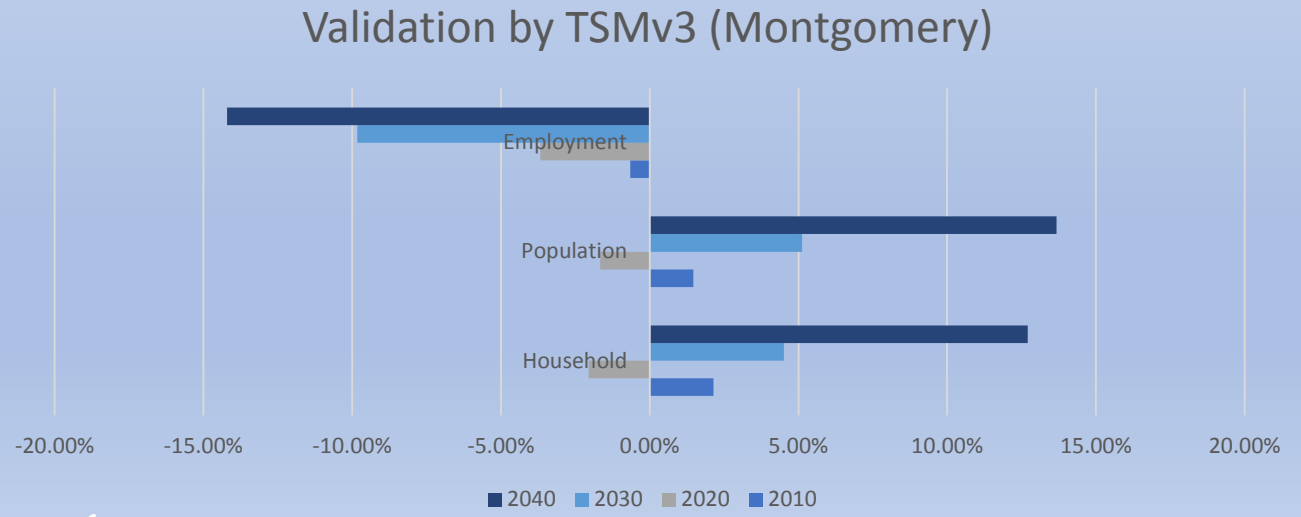

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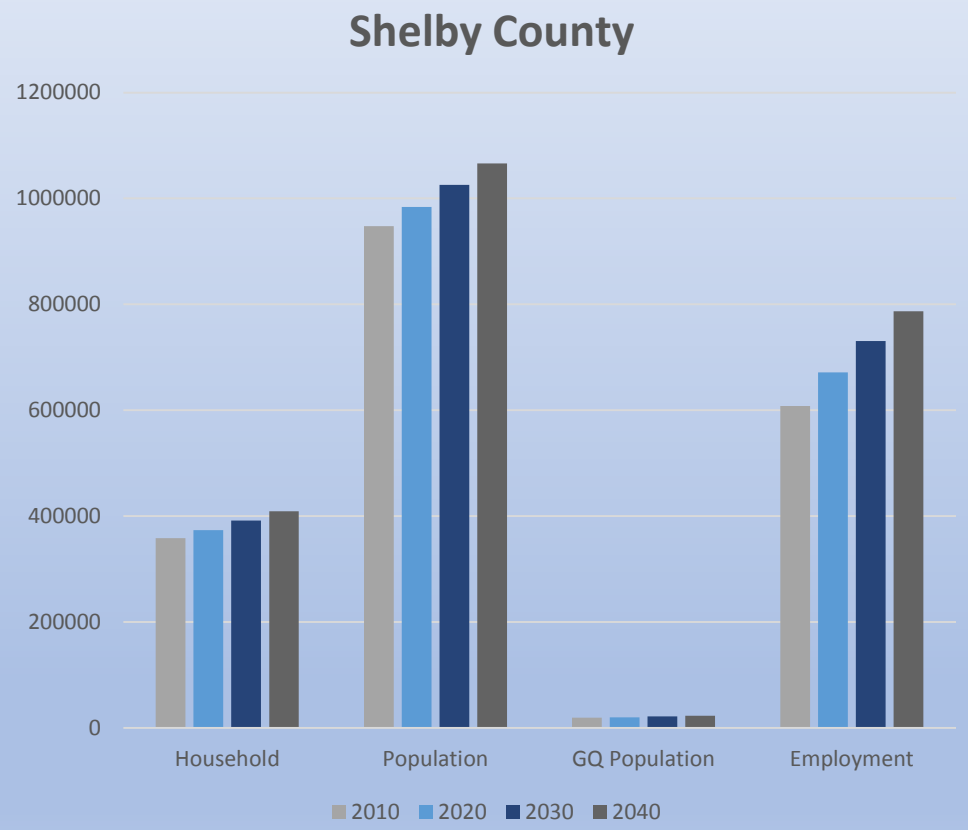

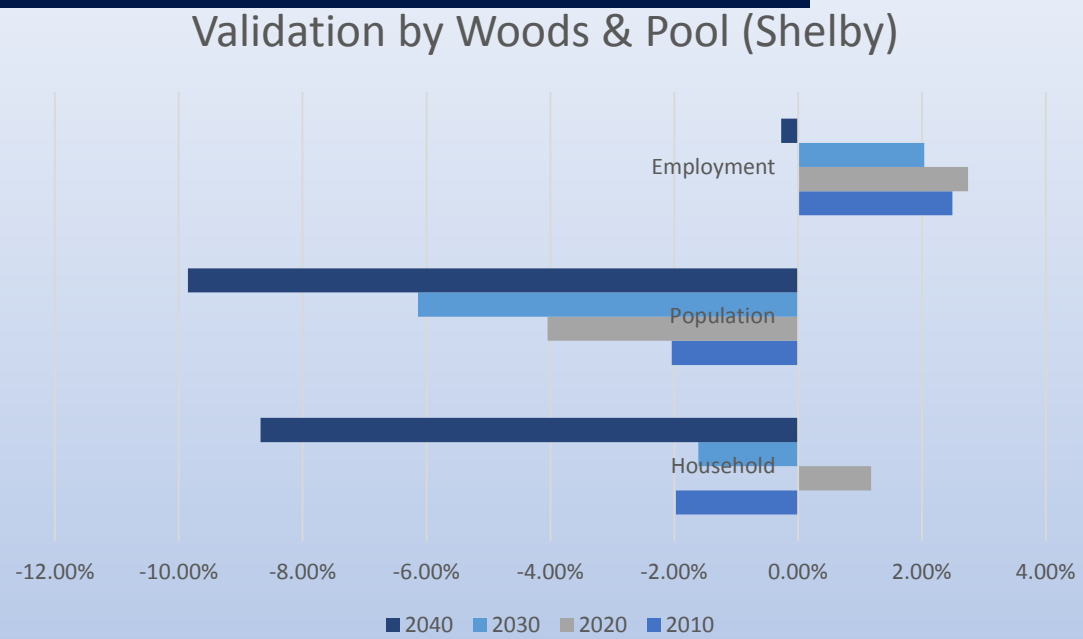

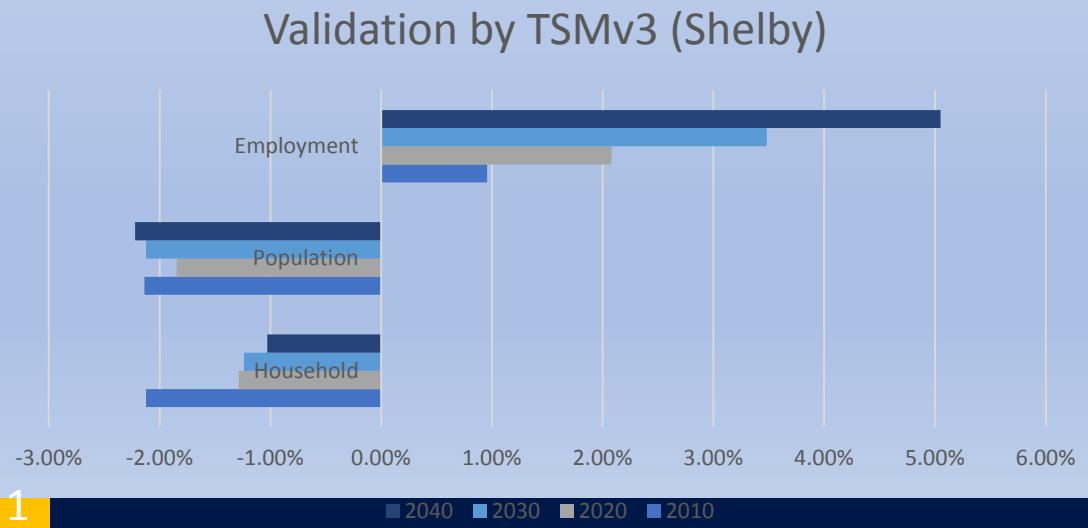

Overall

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- ❑ The replication and validation tests are showing acceptable variations (<20%)
  - ✓A need for the **model sensitivity tests,** as currently restricted to fit the employment constraints
  - ✓Consideration of the **changes in employment** pattern after the **2020 pandemic**

- ❑ From TNMUG workshop, MPOs provided valuable feedbacks that TDOT encouraged consideration. Questions such as:
  - ✓How each **sector employments** are being projected?
  - ✓The play between the counties, through considering the **attractiveness scenarios** (as **Allocation models** may not consider)
  - ✓Deciding on the **right scale** for the model and how TN **interacts** with other states
    - Dealing with people moving to Nashville from **out of state** (consideration of immigration, retirements, etc.)
  - ✓Maybe seeking for a **national economic model**
  - ✓**Adopting the model** to the **pandemic** situation and remote working (Like **policy changes**)
  - ✓Adding the **zoning data** (if available statewide) to the **parcel data** and changing the land consumption model constraints

Other Requested Revisions

Some geographic level complications as:

- ✓ Needed more geographic fields, COUNTYID or FIPs code, MPO, and STATEID, in the forecasting output

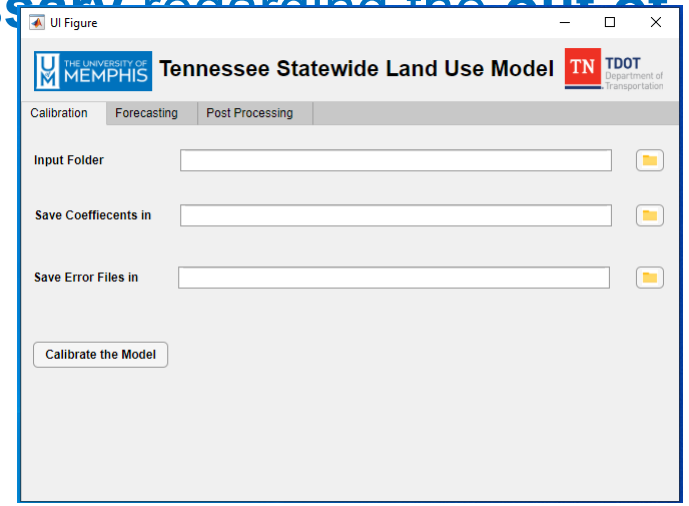
❑ Some **additional** 4000 level TAZs used in the land use model, compared to the TSM3

- Not able to identify as there were no STATEID provided along with TAZs.

❑ While some 6000 level TAZs were missing in the land use model, compared to TSM3 (representing the outsider states)

❑ Elaboration on the methodology and the reason additional TAZs from the surrounding states were selected

- Adding the **missed match states** in the model **may be necessary regarding the out of state migration** into the state



Next Steps:

❑Currently working on the **application of LSUM** in TSMv3:

- ✓ Running the **default scenarios** of TSM3 using the LSUM outputs as
- ✓ Finding the formulas for the rest of the variables

Contact Information

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County Profile Tool Update

TNMUG –Tennessee Modeling User Group

Presented By-
Chris McPhilamy
Long Range Planning Division
October 12, 2022

County Profile Tool (CPT)

- Goal – Put County level transportation and demographic data in the hands of the public in an easily accessible and understandable way.
- It will include over 80 tables of all publicly collected data sources that are kept updated live from their origin.
  - Commodities
  - Trade
  - General Demographics
  - Freight Flows
  - Energy Use
  - EV
  - TDOT Project data
  - More…

County Profile Tool (CPT)

- Uses – Primarily meant to be a informational and research tool able to answer simple questions about transportation across the State.
- Could potentially be used for Long Range Plans, Model Update data sources.
- Will have an interactive table function where you can build your own data from the 30 plus options.
- Launch will be Late 2022

Demo Screens

County	GDP - $K	GDP - Year	# of Private Air Transportation Employees	# of Private Air Transpo
Anderson County	$5,218,192	2020	2,835	December 2021
Bedford County	$2,062,513	2020	2,835	December 2021
Benton County	$377,573	2020	2,835	December 2021
Bledsoe County	$215,606	2020	2,835	December 2021
Blount County	$5,875,298	2020	2,835	December 2021
Bradley County	$4,618,111	2020	2,835	December 2021
Campbell County	$1,034,314	2020	2,835	December 2021
Cannon County	$276,050	2020	2,835	December 2021
Carroll County	$609,812	2020	2,835	December 2021
Carter County	$1,096,528	2020	2,835	December 2021
Cheatham County	$1,223,010	2020	2,835	December 2021
Chester County	$357,603	2020	2,835	December 2021
Claiborne County	$813,174	2020	2,835	December 2021
Clay County	$171,292	2020	2,835	December 2021
Cocke County	$800,136	2020	2,835	December 2021
Coffee Cour				
Crockett Co				
Cumberland				
Davidson Cc				
Decatur Cou				
DeKalb Cou				
Dickson Cou				
Dyer County				

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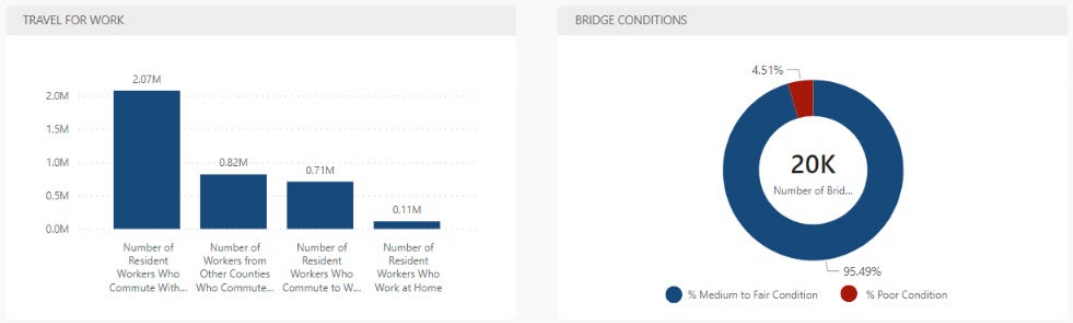
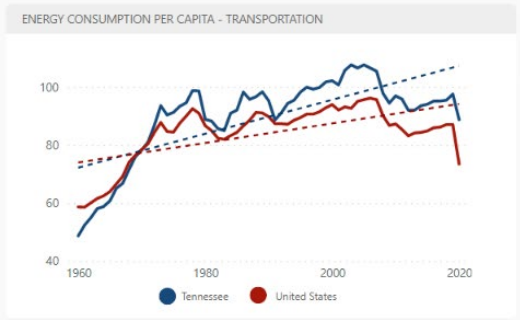
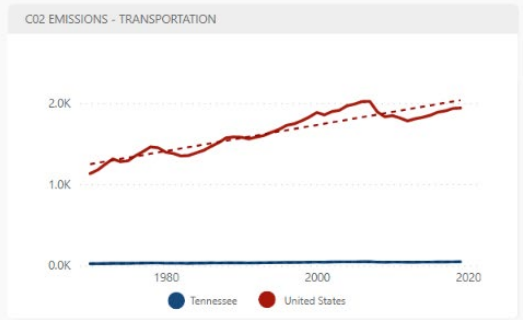
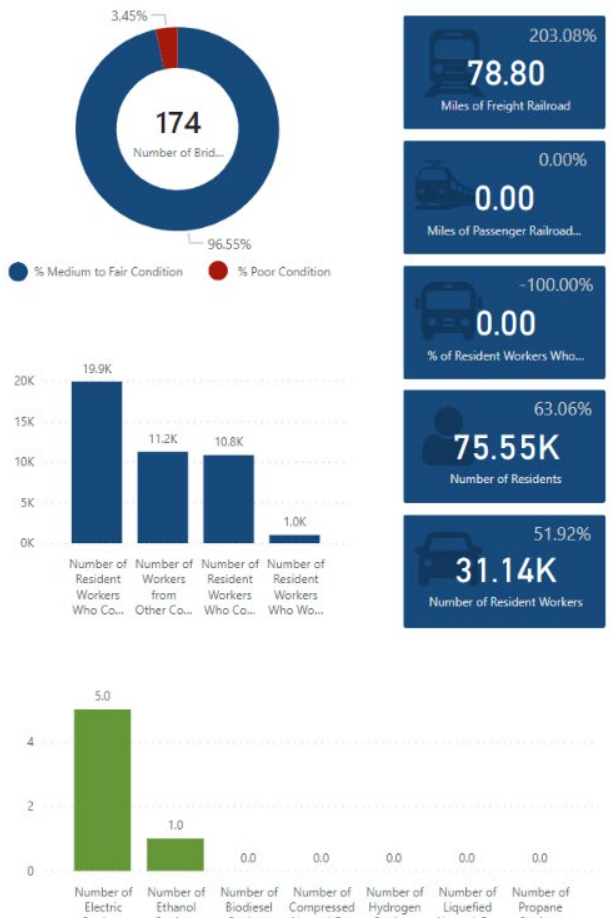






5.91M	-3.33	36.03	86.80	94.40
TN - CY 2020 Enplanements	TN - % Change from 19-20 Enplanements	TN - Median Transportation CO2 Emissions	US - Median Transportation Energy Consu...	TN - Median Transportation Energy Consu...



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Forecasting Office Updates & Model Approval Policy

TNMUG –Tennessee Modeling User Group

Presented By-
Mohammad Molla, PhD
Long Range Planning Division
October 12, 2022

Major Forecasting Office Updates

- TSM V4 Enhancement Summary Reporting and Dashboard
- MPO Model Standardization Phase 2 proposal coming soon for on-call
- Landuse model validation completed and going for second phase
- Mobile Household Travel Survey App is ready to explore and tested the pilot
- National Household travel survey NextGen Add-on progressing.
- TDM Dashboard
- Completed Jackson MPO, Kingsport, and Chattanooga MPO regional model review
- Reviewing Johnson MPO
- Woods and Poole 2020 data available
- Web Updates- https://www.tn.gov/tdot/long-range-planning-

Model Approval Policy Background

- TDOT Model Approval Certification Policy
- Minimum Travel Demand Model Guidelines for the State of Tennessee

Both the docs are available here https://www.tn.gov/tdot/long-range-planning-home/longrange-forecasting/forecasting-projects.html

Background

❑ Responsible Office

- ✓ Forecasting Office, Long Range Planning Division

❑ Purpose

- ✓ Provide a formalized, clearly understood, standardized format process for all Tennessee MPOs
- ✓ Meet FHWA and State requirement
- ✓ promote effective and efficient development
- ✓ Acceptability and professional practices
- ✓ Coordinate the modeling efforts at the MPO level
- ✓ Review and certify the model

❑ Application

- ✓ This procedure will apply to all Tennessee MPOs

Approval Policy

- Prior to initiation of model development, the MPO or their consultant will provide TDOT with an outline of how they intend to develop the model.

- The MPO Model Data will be forwarded to the TDOT Forecasting Office in stages. A stage may encompass a segment or combination of segments after it is completed by the MPO staff or their consultant.

- An example of a model segment would be trip generation. These stages are 1) socioeconomic data and travel survey data, 2) network data, 3) trip generation and trip distribution, 4) mode split where applicable, and 5) trip assignment and travel model performance checks. This allows TDOT to check data and methods for errors and flaws before these problems are forwarded to the next stage and compounded

Approval Policy

- Upon receiving **each stage** of the MPO Traffic Model Data, the TDOT Forecasting Office will review it against these procedures. This review will be completed, and comments returned to the MPOs in a timely manner; within 15 working days, if possible.

- TDOT will review any updates to the existing and future MPO models.

- TDOT will maintain a file of all approved MPO models and have a schedule of when these models are to be updated.

- Any improvements or adjustments made to the official model between major updates should be forwarded to TDOT. These “official” MPO models will be provided by the MPOs and stored in a special file to avoid confusion with any other MPO traffic assignment runs that may be produced from time to time.

Approval Policy

- At a minimum the models to be submitted to TDOT would be the Base Year Calibrated Model, Future on Existing Network, Future on E+C, and Future on Fiscally Constrained Major Route Plan. Intermediate year networks may be required in MPO areas with air quality issues.

- The models should have the date of creation of the model assignment, year the assignment pertains to (existing, intermediate, future), the network the assignment is on (existing, existing + committed, future) and be clearly labeled as to what the assignment pertains to.

Items Review

- ❑ Model Input Data
- ❑ Model Output Data
- ❑ Parameters
- ❑ Process and Methodology
- ❑ Data sources
- ❑ Model Interface
- ❑ Model Script
- ❑ Technical Report
- ❑ Data Dictionary
- ❑ User Guide
- ❑ Step by Step Installation Guide
- ❑ Documentations
- ❑ FHWA and State Requirements

Major Steps

- ❑ Checked for completeness and skimming the docs
- ❑Install the model successfully without any error
- ❑Replicate the base year and cross check everything
- ❑Check the input data, parameters, and data sources
- ❑Review model validation and cross check against FHWA and TDOT
- ❑Document and report findings and fix issues
- ❑Run intermediate and horizon year
- ❑Review and document input, output, parameters for future years
- ❑Review and response usually takes 2-4 cycles

Questions?

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TDOT Long Range Planning Division-Forecasting Office

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- Mohammad Molla, PhD | Forecasting Supervisor
  - Mohammad.Molla@Tn.Gov


Thank
You