AASHTO Transportation GHG Calculator User Documentation

This document is designed to guide users through the process of predicting Greenhouse Gas output at their DOT. The spreadsheet tool is intended to help state DOTs identify what they can do to impact their GHG output.

Introduction: What the Spreadsheet Does

This spreadsheet predicts GHG based on fuel consumption. Fuel consumption is assumed to vary based on fleet fuel efficiency, EV adoption, and miles traveled. Miles traveled change based on the specified growth rate and mode shift (between autos, carpooling and other modes). The default data in the spreadsheet all come from public data sources, comments on the input cells provide a reference on where data was found. Default data can be overridden by the user for precise calculations.

This guide is broken down into three sections for each page of the GHG Spreadsheet. Each page has associated steps to help with understanding of the tool.

- Using the Summary page of the spreadsheet
    - **Step 1.** Edit Baseline Data
    - **Step 2.** Edit Other Parameters
    - **Step 3.** Edit Journey to Work Data
    - **Step 4.** Edit Fuel Consumption Data by Vehicle Type Data
    - **Step 5.** View Result outputs
- Using the Sensitivity page of the spreadsheet
    - **Step 1.** Step 1: Editing "Test Value"
    - **Step 2.** Results and Graph Output
- Using the Trends page of the spreadsheet
    - **Step 1.** Selecting "State" Data
    - **Step 2.** Step 2: Selecting Data Series

GHG Prediction Spreadsheet: Summary Page

This page of the GHG spreadsheet calculates state-level transportation GHG emissions in a baseline year and future year. Baseline data is provided but can be manually overridden if more exact/recent information exists for a state. The baseline and future GHG measurements are used across the spreadsheet pages.

Summary **Step 1: Editing "Baseline Data"**

Navigate to the "Summary" worksheet tab using the bottom navigation bar. Scroll up to the "Baseline Data" Section.

Select your state from the dropdown menu at cell F8 to populate selected data items. After you choose your state, baseline data (VMT, NHS VMT, Gasoline Consumption, and Special Fuel Consumption) automatically fill with the 2019 FHWA's Highway Statistics for the selected state.

Input override data as desired in the blue-shaded cells in the "Override" column (Column F).

Summary **Step 2: Editing "Other Parameters" Data**

Scroll to the "Other Parameters" section of the "Summary" page, located directly underneath the "Baseline Data." These parameters are populated with national defaults. View the source and description for each metric by hovering over the appropriate cell in the "Description" column.

Input override data as desired in the blue-shaded cells in the "Override" column (Column F).

Summary **Step 3: Editing "Journey to Work" Data**

Scroll to the "Journey to Work" section of the "Summary" page, located directly underneath the "Other Parameters." The default parameters are populated based on the selected state (Step 1), from Journey to Work data by state estimates for 2012-2016 from the ACS.

Input override data as desired in the blue-shaded cells in the "Baseline" column (Column F).

Input the projected values or goals as desired in the blue-shaded cells in the "Future" column (Column G).

Summary **Step 4: Editing "Future Consumption Data by Vehicle Type"**

Scroll to the "Future Consumption Data by Vehicle Type" section of the "Summary" page, located directly underneath the "Journey to Work Data." These parameters are populated with national defaults. View the source and description for each metric by hovering over the appropriate cell in the "Description" column.

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DRAFT AASHTO State-Level Transportation GHG Calculator
Inputs and Summary Results

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Baseline Data

Description	Default	Override				Notes
State		Arizona				
VMT (millions)	70,281					
NHS VMT (millions)	32,975					
Gasoline Consumption (000 gallons)	2,831,627					
Special Fuels Consumption (000 gallons)	946,619					

Other Parameters

Description	Default	Override				Notes
Analysis Period (years)	4					
Annual VMT Growth	1.06%					
Vehicle Occupancy, Carpools	2.3					
Gasoline CO2 Content (kg/gallon)	8.10					
Special Fuels CO2 Content (kg/gallon)	10.19					
Percent of VMT, Autos	89.6%					
Percent of VMT, Single Unit Trucks and Buses	4.4%					
Percent of VMT, Combo Trucks	5.4%					
Percent of VMT, Motorcycles	0.6%					
Percent of Auto VMT for Work Trips	19.0%					

Journey to Work Data

Description	Default	Baseline	Future
Percent of Work Trips Driving Alone	76.67%		
Percent of Work Trips Carpooling	10.95%		

Fuel Consumption Data by Vehicle Type

Description	Default				Baseline				Future			
	Autos	Single Unit Trucks	Combo Trucks	Motorcycles	Autos	Light Trucks/Buses	Combo Trucks	Motorcycles	Autos	Light Trucks/Buses	Combo Trucks	Motorcycles
Fuel Efficiency, Non-EV (mpg)	22.8	7.5	6.0	44.0								
EV Percent of Fleet	1%	0%	0%	0%								
Percent of Non-EVs Using Gasoline	98%	28%	13%	100%								

Results

Description	Baseline	Future
Total GHG (metric tons)	32,582,226	33,985,834
Total, NHS GHG (metric tons)	15,287,080	15,945,631

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Input override data as desired in the blue-shaded cells in the "Baseline" section (Cells I46:L50).

Input the projected values or goals as desired in the blue-shaded cells in the "Future" column (Cells M46:P50).

Summary **Step 5: Results**

Scroll to the "Results" section of the "Summary" page, located directly underneath the "Future Consumption Data by Vehicle Type."


This table will output calculations based on the inputs in earlier sections.

GHG Prediction Spreadsheet: Sensitivity Page

This page of the GHG spreadsheet graphs is used to test the sensitivity of the calculation of GHG emissions to changes in selected key parameters. This sheet reproduces the Baseline and Future results from the previous "Summary" page, and allows alternative parameter values to be added as a "Test" future result. The Baseline, Future, and Test results are graphed so it is possible to see how a change in a selected variable will affect overall emissions.

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Sensitivity **Step 1: Editing "Test Value"**

Navigate to the "Sensitivity" worksheet tab using the bottom navigation bar.
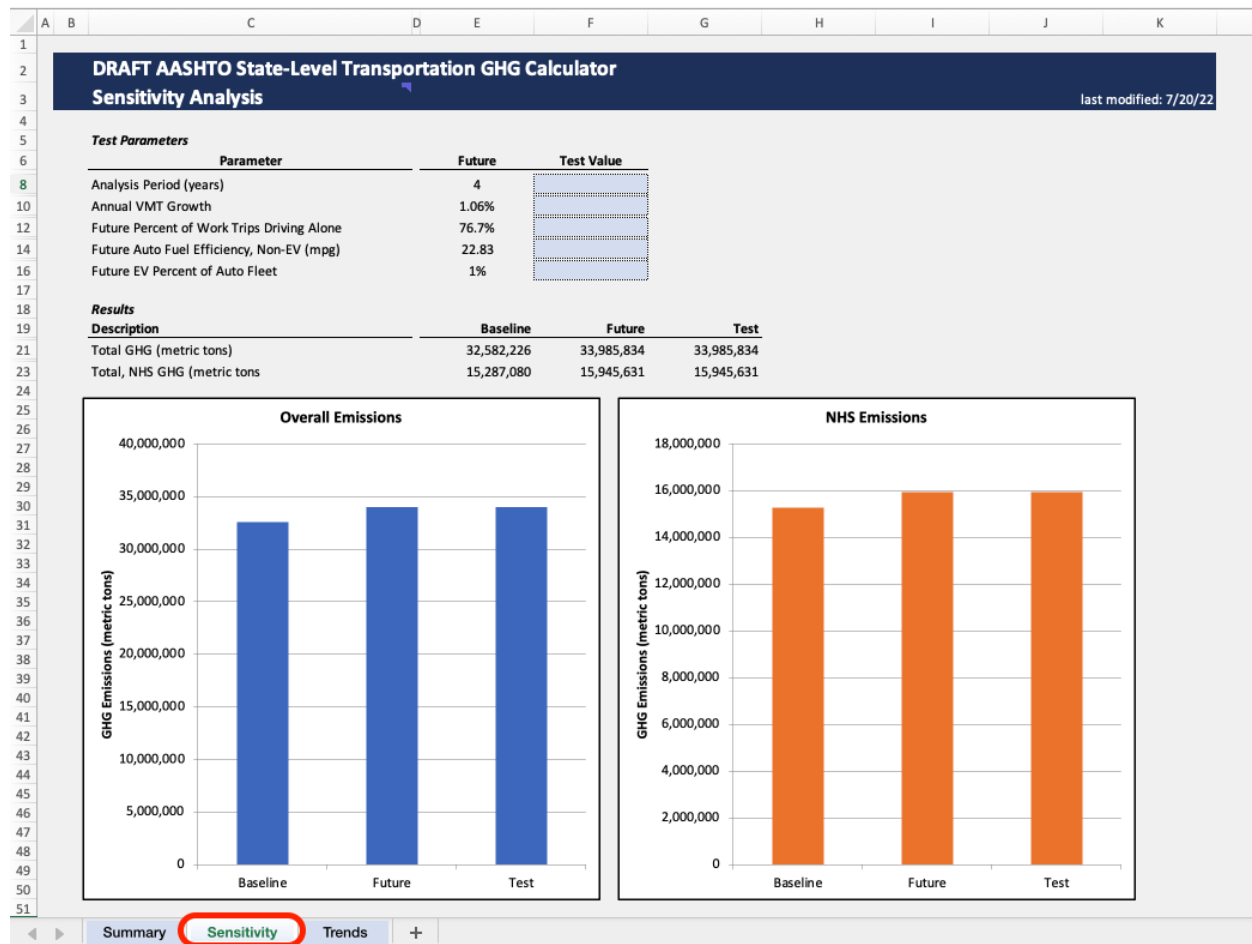
To use this sheet first review the assumptions regarding "Baseline" and "Future" year calculations in the Summary tab. The results from that tab are reproduced here.

Scroll up to the "Test Parameters" section of the "Summary" page. Enter alternative parameter values as desired in the blue-shaded cells in the "Test Value" column (Column F). The test values entered are used to produce an alternative calculation of future year GHG emissions.

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Sensitivity Analysis

Test Parameters

Parameter	Future	Test Value
Analysis Period (years)	4	
Annual VMT Growth	1.06%	
Future Percent of Work Trips Driving Alone	76.7%	
Future Auto Fuel Efficiency, Non-EV (mpg)	22.83	
Future EV Percent of Auto Fleet	1%	

Summary   **Sensitivity**   Trends   +

Sensitivity **Step 2: Results and Graph Output**

Scroll to the "Results" section of the "Summary" page, located directly underneath the "Future Consumption Data by Vehicle Type." The results labeled "Test" are an alternative calculation of future year GHG emissions made using the test values entered. The total emissions for the "Test" values can be compared to the total emissions for the "Baseline" and "Future" sets of values.
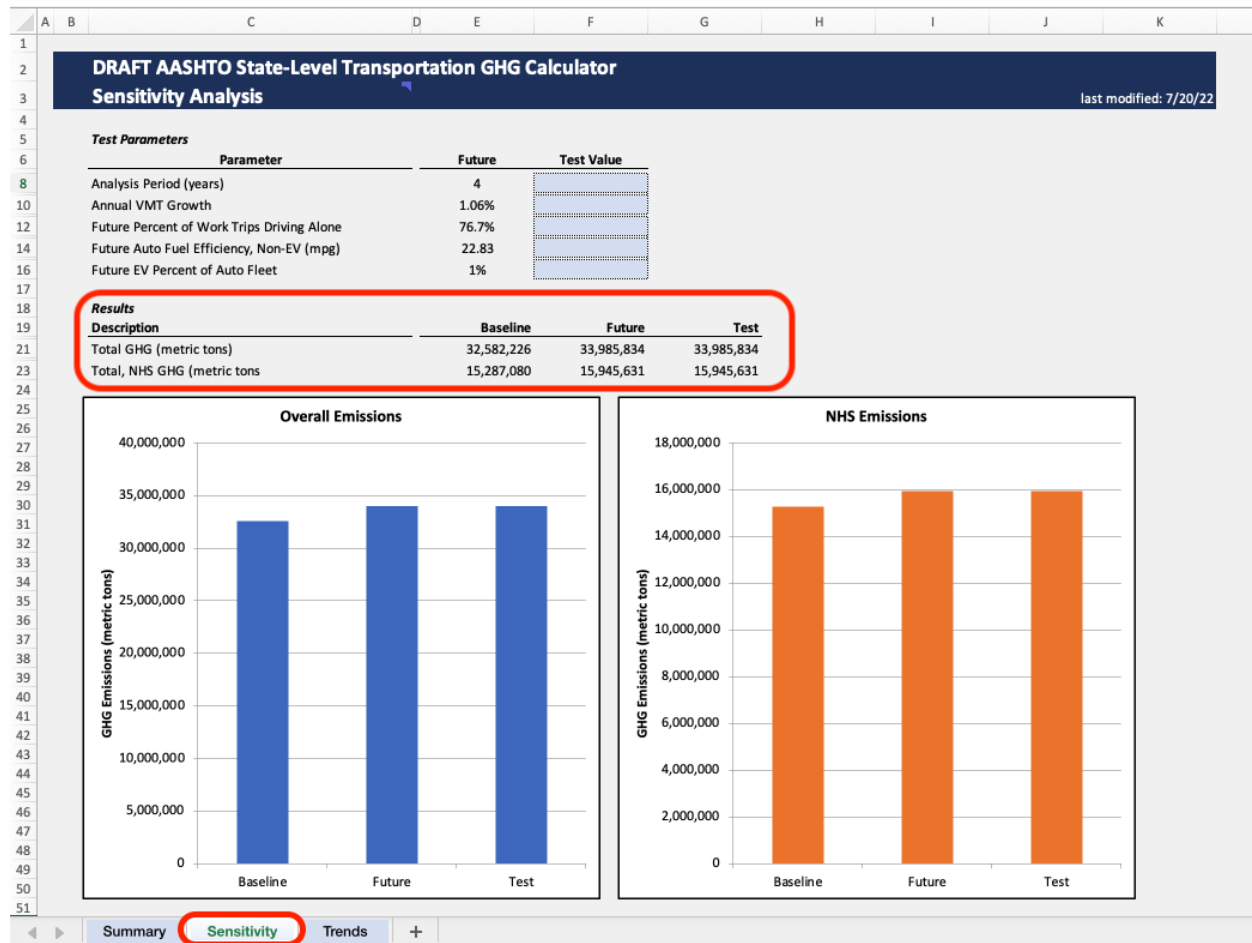
Examine the graphs produced at the bottom of the "Sensitivity" page, which display the data shown in the "Results" table above. These graphs allow you to visually compare the overall emissions for the "Baseline," "Future," and "Test" values. By going back to the "Test Value" input (Step 1), it is possible to try different values in each parameter to see how the total emissions will change. This can help determine which parameters may be important to your DOT. Graphs for Overall Emissions and NHS Emissions are shown.
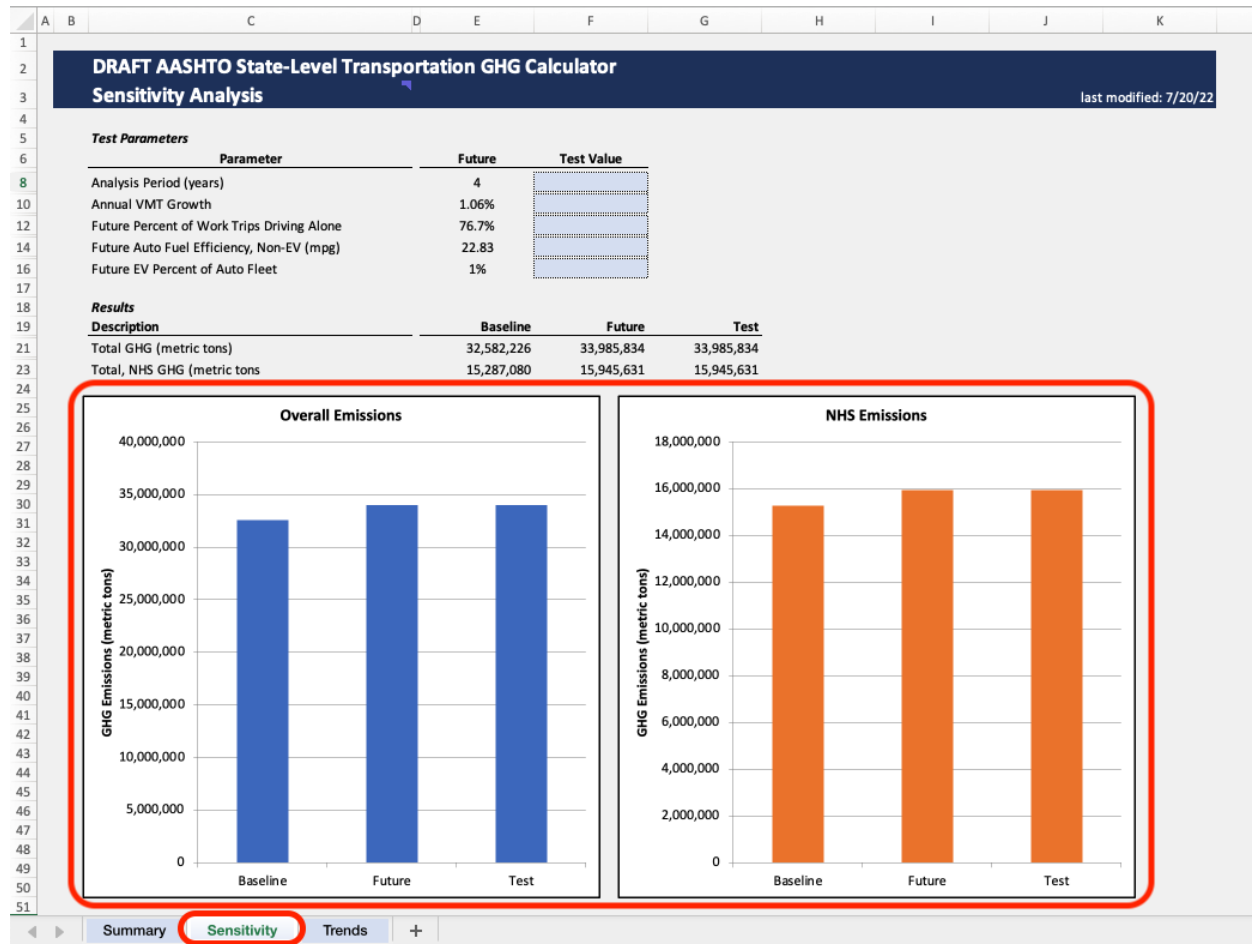
GHG Prediction Spreadsheet: Trends Page

This page of the GHG spreadsheet is used to view trends in metrics related to GHG emissions. Data shown here were obtained from FHWA's Highway Statistics for 2011 to 2020. The calculation of GHG emissions is made based on reported fuel data using the parameters shown in the Summary tab. Graph 1 and Graph 2 are independent from one another, and can show two data series for a state.

Trends **Step 1: Selecting "State" Data**

Navigate to the "Trends" worksheet tab using the bottom navigation bar.

Select the desired state from the dropdown menu at (Cell D/E7 for Graph 1, Cell N/O7 for Graph 2) to populate selected data items. After you choose your state, data series for that state will automatically fill.
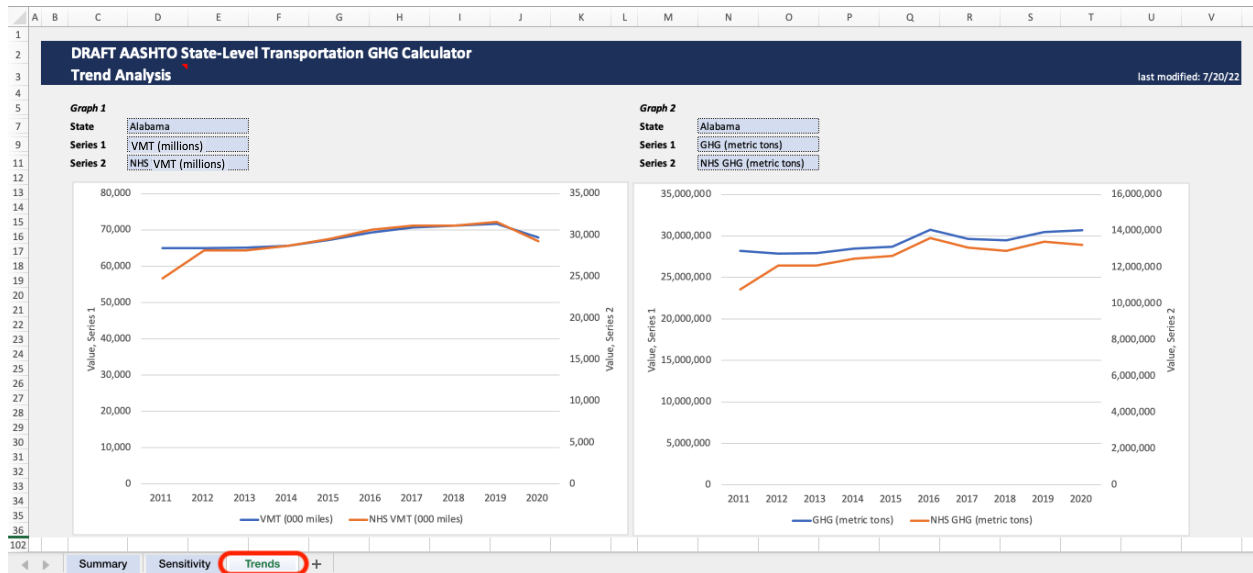
Trends **Step 2: Selecting Data Series**

Select the desired data series from the dropdown menu. This data series will display on the associated graph.
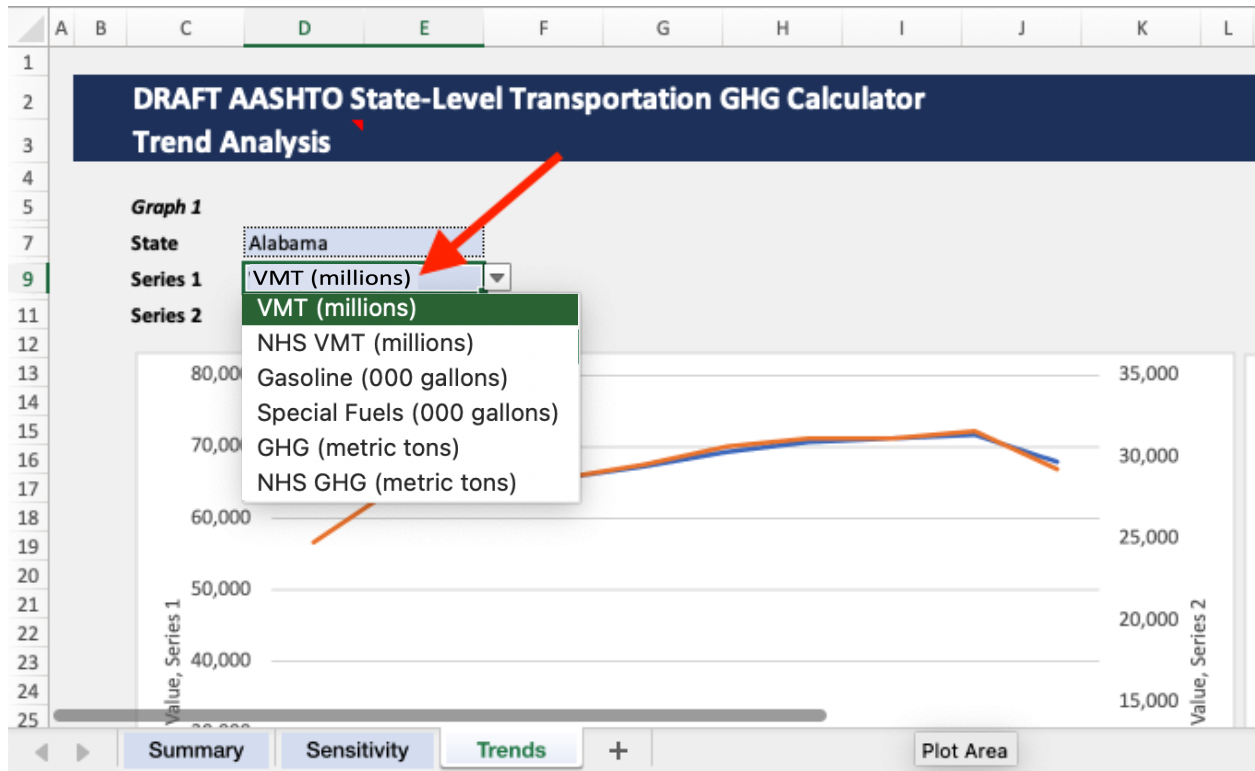
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