VisionEval Tableau Visualizer User Guide

# Introduction

## Purpose

This user guide provides comprehensive instructions and guidance on how to effectively utilize the Tableau visualizer developed for VisionEval. This guide aims to help users, including VisionEval pooled fund participants, administrators, and data analysts, navigate and interpret the dashboard's features and functionalities. By following this guide, users will learn how to set up the Tableau visualizer with their own VisionEval model data and gain a deeper understanding of visualizer navigation.

## Dashboard Overview

The Tableau dashboard for VisionEval is designed as a versatile template that can be utilized for various VisionEval scenarios, as long as the underlying data schema remains the same. It provides a standardized framework for visualizing and analyzing transportation-related data and policy scenarios.

*Please note the intent of this dashboard is to compare measure values across selected scenarios. The Dashboard is optimized to compare across a maximum of 15 scenarios.*

This template dashboard offers a user-friendly interface with interactive features that enable users to explore and interpret the impacts of different policy scenarios on greenhouse gas (GHG) emissions, VMT, and many other variables. The dashboard's modular design and flexibility allow for easy customization and modification, making it adaptable to specific needs with minimal adjustments.

The dashboard's visualizations, charts, and maps provide insights into key aspects of transportation analysis, such as vehicle and fuel types, household information, and localized policy variables. Users can select specific scenarios, apply filters to examine data from different perspectives, and customize views to focus on specific regions or areas of interest. The interactive nature of the dashboard empowers users to interact with the data, uncover patterns, and make informed decisions.

Additionally, the template dashboard's features are easily modifiable, allowing users to tailor the visualizations and functionalities to their specific requirements. Whether it's adjusting data mappings, adding additional visual elements, or incorporating new data sources, the dashboard's flexibility facilitates customization to suit individual needs. More advance Tableau users can implement more substantive changes to the format of the dashboard and included variables.

## VisionEval Framework

VisionEval Tool is an open-source framework originally developed through a partnership between the Federal Highway Administration (FHWA) and the Oregon Department of Transportation (ODOT). VisionEval focuses on simulating travel activity at the household level to analyze the impact of various policy scenarios on greenhouse gas (GHG) emissions. The framework builds on several predecessor tools, including GreenSTEP, ODOT’s Regional Strategic Planning Model (RSPM), and the Rapid Policy Analysis Tool (RPAT) developed by the American Association of State Highway and Transportation Officials (AASHTO).

The VisionEval Concept Primer further describes how the model can be used:[[1]](#footnote-2)

"Structurally, VisionEval may be described as a “disaggregate demand/aggregate supply” model. That is, it combines rich demographic and socioeconomic detail from a synthetic population with aggregate treatments of travel (multi-modal VMT and congestion without explicit trips, or transport networks). The implication of the “aggregate supply” model is that VisionEval cannot be used to evaluate performance of specific projects or corridors…

What VisionEval can do, and even makes especially simple, is to evaluate large numbers of scenarios and explore how combinations of alternative future conditions might affect performance measures.”

More information on VisionEval can be found on the project website.[[2]](#footnote-3) This remainder of this user guide is oriented for existing users of the VisionEval Regional Strategic Planning Model (VE-RSPM) model system.[[3]](#footnote-4)

# Getting Started

To begin using the VisionEval Tableau dashboard, follow the steps outlined below. As a quick guide to supplement this user guide, reference the Tableau Workspace [reference guide](https://help.tableau.com/current/pro/desktop/en-us/environment_workspace.htm). Additionally, a glossary of helpful Tableau terms is provided in *Appendix I*.

System Requirements

Before proceeding, ensure that your system meets the following requirements:

* A computer with either Tableau Desktop ([download here](https://www.tableau.com/products/desktop/download)) or Tableau Reader ([download here](https://www.tableau.com/products/reader)) installed
* Internet connectivity for accessing the dashboard and related resources

## Accessing the Visualizer

To simply explore the Tableau visualizer with the included sample data, follow these steps:

1. Download the Tableau workbook (.twbx file extension) provided for the visualizer.
2. If you already have Tableau Desktop installed, you can open the .twbx file directly in Tableau Desktop. Once you have opened the .twbx file in Tableau Desktop, save it as a new .twb (Tableau Workbook) file before making any modifications.
3. Alternatively, if you don't have Tableau Desktop, it is recommended to download and install Tableau Reader, which is a free application. Tableau Reader provides an optimized user interface and functionality for viewing and interacting with Tableau workbooks.
4. Open Tableau Reader and use the application's file navigation to locate and open the downloaded .twbx file. Once you’ve opened the .twbx file in Tableau Reader, it will default to only show the worksheets and dashboards that were not hidden when the workbook was packaged. The main purpose of Tableau Reader is to allow non-Tableau users the ability to view and interact with dashboard contents.

## Upload Custom Data

To use the Tableau visualizer with your own VisionEval data, follow the steps below. Note that uploading custom extracts and modifying measure charts can only be done using Tableau Desktop.

1. Use the VisionEval query process to extract the VisionEval model run data into the appropriate format for the Tableau dashboard (see *Appendix II* for more information on this step).
   1. If customizing scenario names as part of this process, note that Tableau limits string fields to 255 characters.
2. Open the default .twbx file in Tableau Desktop and save it as a new .twb file.
3. Before replacing the existing query extract data source in Tableau, make sure your custom extract exactly matches the existing data schema in *Appendix III.* If your custom extract is missing a field, the pre-configured sheets and dashboards in Tableau will not load.
4. Once you confirm that your custom extract matches the default data schema, navigate to the “Data Source” tab at the bottom left of the Tableau screen.[[4]](#footnote-5) On the left panel you will see a section titled “Connections” with two existing connections: (1) subzone\_template (shapefile) - existing shapefile geography that relates to the existing query, and (2) query\_extract\_template (csv) - existing query extract. Remove the connections within the data source window by right clicking on the box and clicking “Remove”. See the image below for reference.

A screenshot of a computer

Description automatically generated

1. Within the “Connections” section in the left panel, right click on both the query extract and shapefile connections and click remove. See the image below for reference.

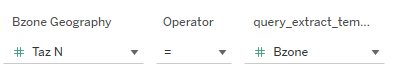
A computer screen shot of a computer error

Description automatically generated

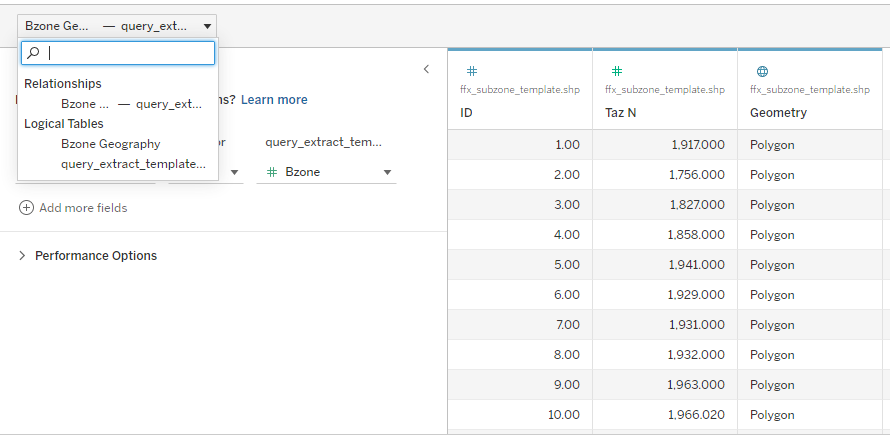
1. Within the “Connections” section in the left panel, click “Add” and select “Spatial File” from the options. Navigate to the location of your shapefile and select it.
2. Within the “Connections” section in the left panel, click “Add” and select “More…” from the options. Navigate to the location of your query extract csv and select it.
3. Drag the shapefile connection into the data source window followed by the query extract connection.
4. Once both of your connections have been updated, you will need to refresh the union between them. Select the line between the two data sources in the right pane:



1. In the bottom panel, relate the two connections by referencing the related Bzone fields:



1. A snapshot of your related data will appear in the table next to the relationship editor. Toggle between the shapefile table and extract table using the dropdown menu above the relationship editor:



1. Navigate to one of the dashboard tabs (e.g., Bzone VMT Income Dashboard, Bzone Trips Dashboard) to confirm your edited connections and relationships were successful. *Note that if there are missing charts or blanks on a dashboard, this indicates that the specific measure was not included in your custom extract. Also, creating a new connection may append a “1” to field names. Field names can be edited within the data source tab or within Dashboard containers. See the Navigating the Tableau Visualizer section for a list of default measures included in the template.*

## Customizing Geographies

Customizing the Azone or Marea of Bzones will require pre-processing of the query extract data within GIS. If you have an Azone or Marea shapefile or Esri feature class, you will need to associate the Bzones with the respective shapefiles and populate the Azone and Marea fields in the query extract to match. For a specific workflow, follow these steps:

1. Upload Bzone and Azone shapefile or Esri feature class to desired desktop GIS software.
2. Compute a Spatial Join or Intersect that joins the Azone that Bzones are contained within to the Bzone shapefile or Esri feature class.
3. Extract the Bzone shapefile or Esri feature class to an excel table.
4. Use VLookup or Index Match in excel to overwrite the Azone field in the query extract based on the Bzone ID.

If Azone or Mareas need to be reassociated after data is loaded into Tableau, make sure the Tableau Workbook is closed before modifying the query extract. Since the Tableau Workbook uses a live data source, any saved changes made to either the shapefile or query extract will be reflected within the Dashboards.

## Create Custom Charts and Dashboards

Each dashboard is comprised of individual charts, also known as sheets. If you’d like to modify an existing worksheet within a dashboard, follow these steps:

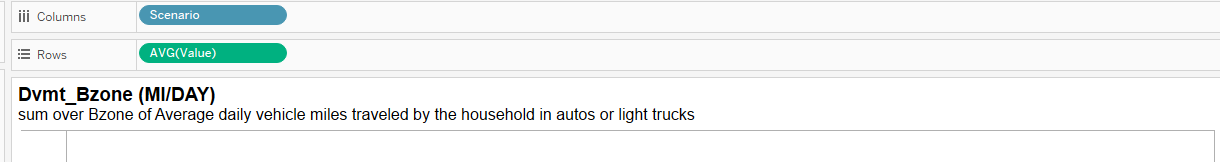
1. Right click on the dashboard containing a worksheet you’d like to modify and select “Unhide All Sheets”. All worksheets contained within that dashboard appear in the bottom panel:



1. Click on the worksheet you’d like to modify in the bottom panel. Use [the Tableau Workspace refence guide](https://help.tableau.com/current/pro/desktop/en-us/environment_workspace.htm) to orient you within the worksheet workspace. From here, you can change bin colors, update typography, edit aliases, and much more.

If you’d like to create a new worksheet within a dashboard, follow these steps:

1. On the bottom panel, select the first plus sign. Hover over it and it will say “New Worksheet”.
2. A blank worksheet will appear. Drag a dimension into the columns row and a measure into the rows row at the top. For more information on dimensions and measures, please see this [reference guide](https://help.tableau.com/current/pro/desktop/en-us/datafields_typesandroles.htm#:~:text=Dimensions%20contain%20qualitative%20values%20(such,values%20that%20you%20can%20measure.).



1. Once you’ve dragged your dimensions and measures to the columns and rows, a bar chart will appear in the main panel.
2. To customize the chart further, please see this [reference guide](https://help.tableau.com/current/pro/desktop/en-us/buildexamples_bar.htm) on how to customize a bar chart.

To change the symbology of the maps on the Bzone Dashboards, follow these steps:

1. Navigate to the Dashboard containing the map you’d like to change or update, click within the map container, click on the downward arrow on the right side of the map and click “Go to Sheet”.
2. Once you are on the map sheet, drag either a dimension or measure to the “Color” box in the Marks card. This will update the symbology of each polygon based on the value assigned.
3. To modify the color schema, click on “Color” in the Marks card.

## Troubleshooting and Support

For additional guidance and troubleshooting assistance, please refer to the following links and resources:

* [Tableau Help](https://www.tableau.com/support/help?_gl=1%2A1crppjy%2A_ga%2AR0ExLjIuR0ExLjEuR0ExLjIuR0ExLjIuR0ExLjIuR0ExLjIuR0ExLjIuR0ExLjIuMjA2NzMxMTQwNy4xNjYzMDgxNjY0%2A_ga_8YLN0SNXVS%2ATmVlZHMgR1RNIENvbmZpZ3VyYXRpb24uMjQuMS4xNjg2OTgzMjgyLjAuMC4w&_ga=2.69465040.1779635450.1686976977-GA1.2.GA1.1.GA1.2.GA1.2.GA1.2.GA1.2.GA1.2.GA1.2.2067311407.1663081664)
* [Tableau Community](https://community.tableau.com/s/)

# Navigating the Tableau Visualizer

The Tableau visualizer consists of four dashboards, each offering valuable insights into different aspects of VisionEval. Each dashboard and its key features are described below.

*Note: Measure bar charts use the average value of the respective measure. If one Bzone is selected on the map, the value for each scenario will be the distinct value for that specific Bzone. If multiple Bzones are selected, the measure values will be an average of all selected Bzones. If no Bzones are selected on the map, the measure values will be for an average Bzone of the entire Region. Percent changes across scenarios (percentages within data label parenthesis) compare scenarios to the base year value.*

### Bzone VMT Income Dashboard

The Bzone VMT Income dashboard provides a comprehensive view of vehicle miles traveled (VMT) and household income across different Bzones. This dashboard includes the following components:

* **Legend and Quick Info:** Located on the top left, this section provides a legend explaining how the data is summarized in the dashboard.
* **Interactive Map:** Below the legend section, there is an interactive map displaying the Bzones in the project. By clicking or unclicking specific zones, the charts on the right side of the dashboard will dynamically update to reflect the selected zones (by default, the charts provide Marea-level summaries).
* **Dropdown Filters:** Dropdown filters that allow users to change the following parameters are located in the top-right of the dashboard: Region, Marea, Bzone, Scenario, and Year. The available options in these dropdowns depend on the specific VisionEval data loaded.
* **Bar Charts:** The right side of the dashboard features three bar charts, each representing a different scenario. The bars are color-coded to indicate the scenario category: red for baseline, orange for future year, and light blue for other scenarios.[[5]](#footnote-6) A label on top of each bar displays the percentage change compared to the baseline scenario value. The bar charts depict the following metrics:
  + Average daily vehicle miles traveled by households in autos or light trucks
  + Total annual household income
  + Annual household vehicle ownership cost savings in dollars, including depreciation, finance, insurance, and taxes

### Bzone Trips Dashboard

The Bzone Trips dashboard focuses on analyzing various types of trips taken by household members in different Bzones. Its components include:

* **Legend and Quick Info**: Similar to the previous dashboard, this section provides a legend and quick information about data summarization on the top left.
* **Interactive Map:** The map allows you to select specific Bzones, influencing the charts on the right-hand side.
* **Dropdown Filters:** The top right corner contains dropdown filters to modify the Region, Marea, Bzone, Scenario, and Year parameters.
* **Bar Charts:** The right side of the dashboard presents four bar charts, each corresponding to a different scenario. The bars are color-coded based on the scenario category: red for baseline, orange for future year, and light blue for other scenarios. Additionally, each bar displays the percentage change compared to the baseline scenario value. The bar charts depict the following metrics:
  + Average number of vehicle trips per day by household members
  + Average number of public transit trips per year by household members
  + Average number of bicycle trips per year by household members
  + Average number of walk trips per year by household members

### Bzone Energy and Emissions Dashboard

The Bzone Energy and Emissions Dashboard provides insights into energy and emissions-related metrics in different Bzones. This dashboard includes:

* **Legend and Quick Info**: Located on the top left, this section displays a legend and quick information about the data summarized in the dashboard.
* **Interactive Map:** Similar to the previous dashboards, an interactive map is displayed on the left, allowing you to select specific Bzones.
* **Dropdown Filters:** The top right corner contains dropdown filters to modify the Region, Marea, Bzone, Scenario, and Year parameters.
* **Bar Charts:** The right side of the dashboard features three bar charts, representing different scenarios. The bars are color-coded to reflect the scenario category: red for baseline, orange for future year, and light blue for other scenarios. Each bar includes the percentage change compared to the base year value. The bar charts showcase the following metrics:
  + Gasoline equivalent gallons consumed per day by household vehicle travel
  + Kilowatt hours consumed per day by household vehicle travel
  + Grams of carbon dioxide equivalents produced per day by household vehicle travel

### Marea Dashboard

The Marea Dashboard provides insights into several priorityVisionEval metrics for Mareas. This dashboard does not contain a map and is designed to compare VisionEval metrics at an Marea level. Users may wish to adapt the dashboard to compare, for example, model inputs and outputs across scenario. By default, this dashboard includes:

* **Legend and Quick Info**: Located on the top left, this section offers a legend and quick information about the data summarized in the dashboard.
* **Dropdown Filters:** The top right corner contains dropdown filters to modify the Region, Marea, Bzone, Scenario, and Year parameters.
* **Bar Charts:** The dashboard contains bar charts related to Marea VMT. The bars are color-coded to reflect the scenario category: red for baseline, orange for future year, and light blue for other scenarios. Each bar includes the percentage change compared to the baseline scenario value. The bar charts showcase the following metrics:
  + Commercial service daily vehicle miles traveled associated with Marea urbanized household activity
  + Commercial service daily vehicle miles traveled associated with Marea town household activity
  + Average daily vehicle miles traveled by all household in the Marea
  + Average daily vehicle miles traveled in autos or light trucks by households residing in the urbanized portion of the Marea
  + Average daily vehicle miles traveled in autos or light trucks by households residing in the town portion of the Marea
  + Average daily vehicle miles traveled in autos or light trucks by households residing in the rural portion of the Marea

# Appendix I: Glossary of Tableau Terms

Table 1: Useful Tableau Terms

|  |  |
| --- | --- |
| **Term** | **Description** |
| Calculated field | A new field that the user creates derived files by using a formula to modify the existing fields in your data source. It is used to make your work simple and easy. |
| Dashboard | A collection of views shown in a single location where you can compare and monitor a variety of data simultaneously. |
| Data source | The underlying data that Tableau Reader is connected to. You can't change the data source in Tableau Reader. |
| Dimension | Dimension is commonly known as a field of categorical data. Dimensions hold discrete data such as members and hierarchies that cannot be aggregated. It also contains characteristic values such as dates, names, and geographical data. The dimensions used to reveal details of your information. |
| Extract | A saved subset of a data source which is used to improve performance and study offline. The users can create an extract by defining limits and filters that contain the data which you want in the extract. |
| Filter | A control on a view that limits the data shown in a view. For example, a filter on Region that only includes the West. |
| Marks | A visual representation of one or more rows in a data source. Mark types can be bar, line, square, and so on. |
| Packaged workbook | A type of workbook created in either Tableau Desktop or Tableau Server. These files contain both the workbook as well as copies of the referenced local file data sources and background images. |
| Pane | The row and columns areas in a view. |
| Repository | A folder located in your My Documents folder that stores workbooks. |
| View | The visual representation of your data in a worksheet or dashboard. |
| Workbook | A collection of one or more worksheets and dashboards. |
| Worksheet | A single view of data. Each worksheet can be connected to a single data source. |

# Appendix II: Data Extraction Tool

## Overview and Importance

## Installing the Data Extraction Tool

## Configuring the Tool

## Running the Data Extraction

## Verifying the Extracted Data

# Appendix III: Data Schema

Table 1: VisionEval Extract Data Schema

|  |  |
| --- | --- |
| **Field** | **Description** |
| Azone (Geography) | The name of the Azone associated with the value, or “NA” if the value was only computed for Marea or Region. |
| Baseline Scenario | Baseline scenario flag. "1" flags the baseline scenario. |
| Baseline Value | The numeric value of the metric for the geography, baseline scenario |
| Bzone (Geography) | The name of the Bzone associated with the value, or “NA” if the value was only computed for Azone, Marea or Region. *This field must align with a field specified in the shapefile that corresponds with your VisionEval Bzones.* |
| Description | Text description of what the metric is reporting |
| Marea (Geography) | The name of the Marea zone associated with the value, or “NA” if the value was computed for the Region. |
| Measure | The name of the metric, suffixed by the geography level at which it was computed (after the underscore) and by the break field if the metric was computed for other subsets of data |
| Priority | TRUE if this is a “priority” field (i.e. one that the query definition said was important for visualization), otherwise “NA” or “FALSE”. Other metrics can be visualized (this field is advisory, not mandatory) |
| Region (Geography) | Always “Region”. If other geography fields (below) are “NA”, the metric Value was only computed for the entire region. Otherwise, aggregating smaller geographies to Region is possible. |
| Scenario | Short name for the scenario in which the metric value was computed |
| Units | Short description of the units in which the metric is reported (this is a manually constructed field; the quasi-automatic query approach expresses the units in terms that VisionEval understands) |
| Value | The numeric value of the metric for the geography, Scenario and Year |
| Year | The year within the scenario for which the metric value was computed |

1. <https://visioneval.org/docs/conceptprimer.html#conceptprimer> [↑](#footnote-ref-2)
2. <https://visioneval.org/> [↑](#footnote-ref-3)
3. The Tableau visualizer is not currently set up for use with VE-State. [↑](#footnote-ref-4)
4. To find out more about the data source page accessed through the data source tab, including a visual displaying the components of this page, please see the following Tableau article: <https://help.tableau.com/current/pro/desktop/en-us/environment_datasource_page.htm> [↑](#footnote-ref-5)
5. The color distinctions used in the visualizer were selected to be accessible for colorblind users. [↑](#footnote-ref-6)