

October 2023

Equity and Environmental Justice Mapping Tools User Guide

Importance and Background

The role of transportation is to connect people to each other, to enable goods and commerce to flow from one place to another, and to create opportunities for individuals to meet their daily needs and achieve their greatest desires.

Unfortunately, the benefits of transportation are experienced differently across Vermont. Age, income, ability, language, race, and ethnicity are predictors of different outcomes for health, safety, and social well-being as well as resiliency in the face of climate change and economic uncertainty. These and other factors predict safety on our roads, the quality of the air we breathe, and travel costs and time required to meet our basic transportation needs. Equity will be reached when these factors are no longer predictors in life outcomes and when outcomes for all Vermonters are improved.

One of central objectives of Vermont's Transportation Equity Framework (TEF) is to equip AOT and RPC staff with tools and data to improve practices for identifying underserved communities. The tools below can be a starting point for screening projects through an equity lens. Many of the tools have similar data to present, but each offers a different interface and presentation style, allowing users to select tools that will be most helpful and relevant to a specific project or process. While each tool comes with certain limitations, by using them in combination with one another, AOT and RPC staff can obtain a more comprehensive picture of the challenges facing underserved populations in Vermont. That said, gathering more robust data and local community insights remains a high priority goal as noted in Vermont's TEF.

Using Census Data at the Vermont Scale

Many of the tools in this guide utilize American Community Survey (ACS) or other U.S. Census Bureau data. It is important to note that estimates from census data sources in a state like Vermont with a small population, can have higher margins of error. For example, estimates for particular groups (such as a specific ethnic group) can have high margins of error which should be kept in mind when assessing the accuracy of lower population estimates. Census data is provided at various common geographies including Census Tracts, Census Block Groups, and Counties. Census Tracts generally accumulate geographic areas containing around 4,000 people per Tract. Note that for a state like Vermont, tracts can include two or more municipalities. Another common geography used is the Census Block Group. A Census Block Group is a statistical subdivision of a Census Tract. Block Groups usually contain between 600 and 3,000 people. At each of these geographic levels, it is important to remember that these types of data only offer a snapshot into the lived experiences of Vermonters. The estimates and assumptions that are necessary for this type of data collection and publication must be considered when drawing conclusions.

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Acronym List

Acronym	Definition
ACS	American Community Survey
AHS	Vermont Agency of Human Services
AOT	Vermont Agency of Transportation
CEJST	Climate and Economic Justice Screening Tool
CEQ	Council on Environmental Quality
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
ETC	Equitable Transportation Community
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FTA	Federal Transit Administration
GIS	Geospatial/Geographic Information System
MPO	Metropolitan Planning Organization
NEPA	National Environmental Policy Act
RPC	Regional Planning Commission
STEAP	Screening Tool for Equity Analysis of Projects
SVI	Social Vulnerability Index
TEF	Transportation Equity Framework
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation

VTEDI
VTEPT

Vermont Environmental Disparity Index
Vermont Transportation Equity Planning Tool

Vermont Specific Tools

Vermont Transportation Equity Planning Tool (VTEPT)

Overview:

- The Vermont Transportation Equity Planning Tool (VTEPT) was created as part of the data and mapping component of the Transportation Equity Framework (TEF) for Vermont.
- This tool serves as a dynamic mapping tool for AOT use that is consistent with Title VI plan requirements for FTA, FHWA, FMCSA and other potential future planning and project development purposes.

Data and Tool Information:

- American Community Survey (ACS) 5-year (2016-2020) estimates.
- Tool created by AOT Mapping Unit.
- Data provided at the census tract level with some metrics shown at the county level.

Strengths and Features:

- Provides users with the ability to view data regarding race and ethnicity, linguistic isolation, foreign born populations, and poverty spatially down to the census tract level throughout Vermont.
- Public transit routes overlaid to help draw conclusions about accessibility while keeping other metrics in mind.
- The GIS format enables compatibility with other state GIS tools.

Limitations:

- See the Background section of this guide for a description of the limitations of ACS and other census data.

Tool Link: [Vermont Transportation Equity Planning \(arcgis.com\)](https://arcgis.com)

Contact: For more information, please contact Isaac Kaplan (isaac.kaplan@vermont.gov), AOT Systems Planning Coordinator.

Example Use-Case: Transit Analysis in Addison County

1. Users can identify areas of concentrated poverty visually by activating the “residents in poverty” layer and looking at the darker shaped areas (see Figure 1).
2. By clicking on the tract of interest (see Figure 2) users can see that it has a poverty rate of approximately 7.6% while Addison County has a poverty rate of 5.18%. Socioeconomic challenges seem to be concentrated at higher levels in this area. In addition, public transit routes (shown in purple) seem to bypass these communities. Taking this information into account can help inform where to prioritize transit projects in this county to better serve its underserved populations.

Figure 1: Addison County Poverty Data

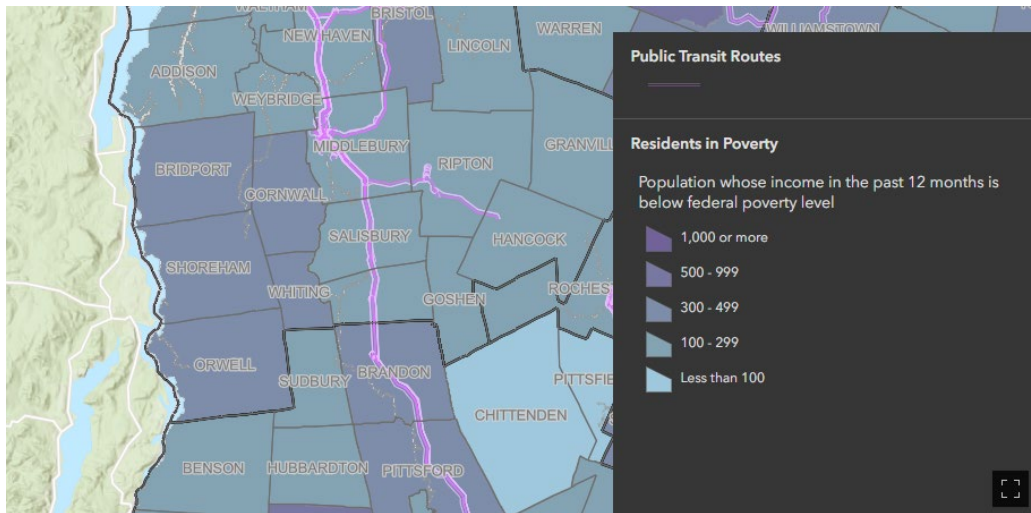
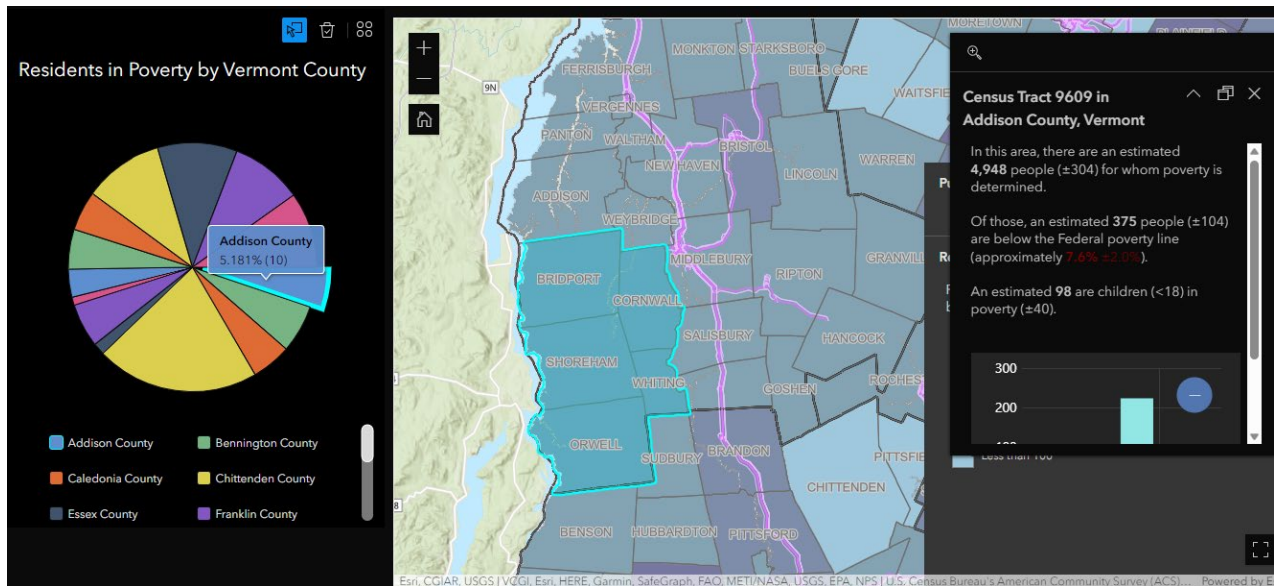


Figure 2: Zooming in on a Census Tract with High Poverty Rates



Vermont Social Vulnerability Index (SVI)

Overview:

- Using 2016-2020 American Community Survey data, this mapping tool shows the number of vulnerability measures above the 90th percentile for Vermont census tracts.
- To be assigned a vulnerability flag, census tracts must be in the 90th percentile for the vulnerability measure. The SVI exhibits the sum of all flags for each census tract.
- There are a total of 16 measures in the SVI.
- Users can examine Vermont’s SVI broadly or in more detail by specifying one of three SVI themes (Socioeconomic, Demographic, Transportation/Housing).

Data and Tool Information:

- American Community Survey (ACS) 5-Year 2016-2020 estimates.
- Tool created by the Vermont Department of Health
- Metrics are provided at the census tract level.

Strengths and Features:

- Compiles a wide range of indicators to assess social vulnerability throughout the state.
- Equity indicators include income and poverty percentages, education levels, and demographic data.
- Geographic representation of the SVI measures allows users to see visually where pockets of inequity are most concentrated in Vermont.

Limitations:

- See the Background section of this guide for a description of the limitations of ACS and other census data.

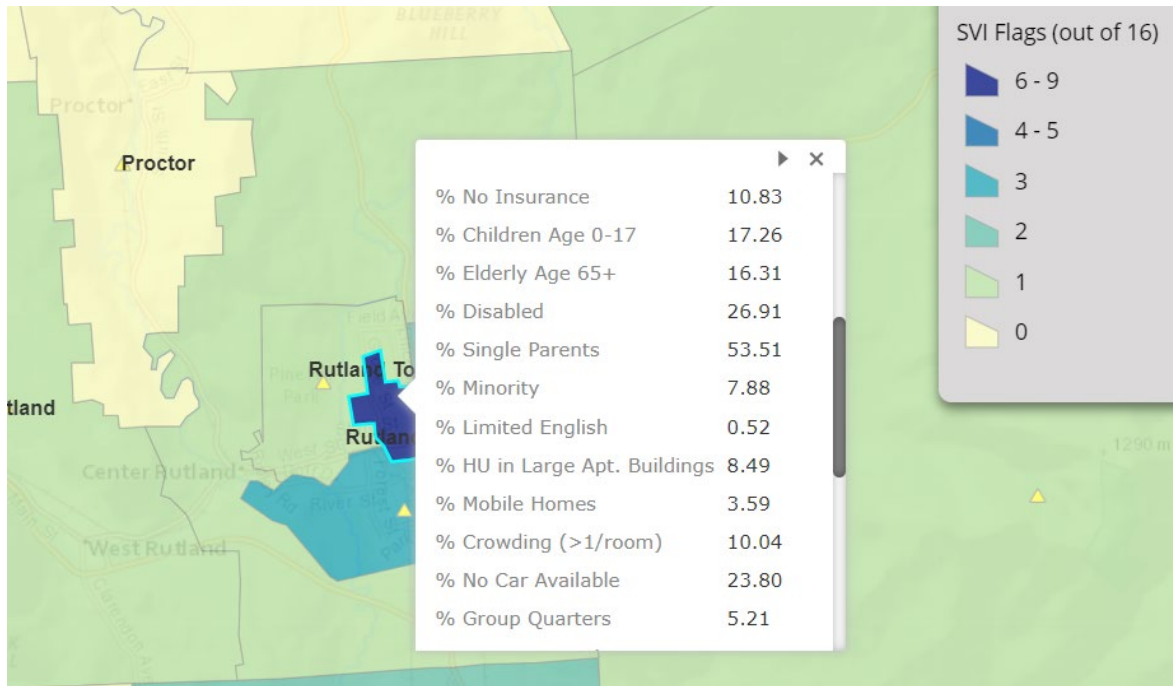
Tool Link: [Vermont Social Vulnerability Index \(SVI\) \(arcgis.com\)](https://arcgis.com)

Contact: For more information, contact AHS-VDHGIS@Vermont.gov

Example Use-Case: Planning for Safer Multimodal Transit Usage in Rutland County

1. Several tracts in Rutland County score high on the SVI relative to other parts of the state (see the blue shaded areas in Figure 3).
2. By clicking on a particularly vulnerable tract (see Figure 3), users can scroll through ACS data for the tract. Users might notice that in the selected tract, almost a quarter of the population (23.8%) have no car available.
3. Keeping this and other metrics in mind, RPCs and VTTrans can target new projects like the Route 7 road diet that create safer bike lanes and enable people to use alternate transit modes more safely in the community. These projects help to make opportunities and services more accessible to everyone.

Figure 3: Social Vulnerability Indicators



Vermont Environmental Disparity Index (VTEDI)

Overview:

- This map-based tool displays an environmental disparity index (VTEDI) for Vermont based on exposure to environmental hazards and population characteristics (including underlying health risk factors and social vulnerability).
- This index is a combination of environmental exposure and population characteristics.

Data and Tool Information:

- This tool draws from a variety of national and state data sources including the VT Department of Health, VT Agency of National Resources, EPA, FEMA, and USDA.
- This tool was constructed by the Decolonial Science, Democracy & Just Futures Lab at the University of Vermont.
- Metrics are provided at the census tract level.

Strengths and Features:

- Used to help identify communities that are most susceptible to environmental hazards and most vulnerable to the modifying effect of socio-economic factors.

Limitations:

- Due to the range of data sources (with varying abilities to represent small population rural areas), the metrics are susceptible to higher margins of error.

Tool Link: [Vermont Environmental Disparity Index \(VTEDI\) \(arcgis.com\)](https://arcgis.com)

Contact: If you have any questions about this map, please contact Qing Ren (tsing0619@gmail.com) or Bindu Panikkar (bindu.panikkar@uvm.edu) at the Rubenstein School of Environment and Natural Resources of UVM.

Example Use-Case: July 2023 Flood Impact Assessment

1. Montpelier and Barre were two of the areas hit the hardest by the flooding in July 2023.
2. The VTEDI tool illustrates where populations in the state are at higher risk by combing socioeconomic factors with environmental risk information (see Figure 4).
3. As displayed in Figure 4, Montpelier and Barre appear to be relatively high impact and high exposure areas on the map using these indices.
4. Clicking on the Barre City tract (see Figure 5), users can see metrics such as the 1% Annual Flood Zone which is a score of 86.8/100.
5. Examining measures like these in combination with one another in the context of the July flooding events, AOT staff can advocate for further flood mitigation and other environmental planning considerations and projects in high-risk regions like Barre-Montpelier.

Figure 4: VT Environmental Disparity Index Data

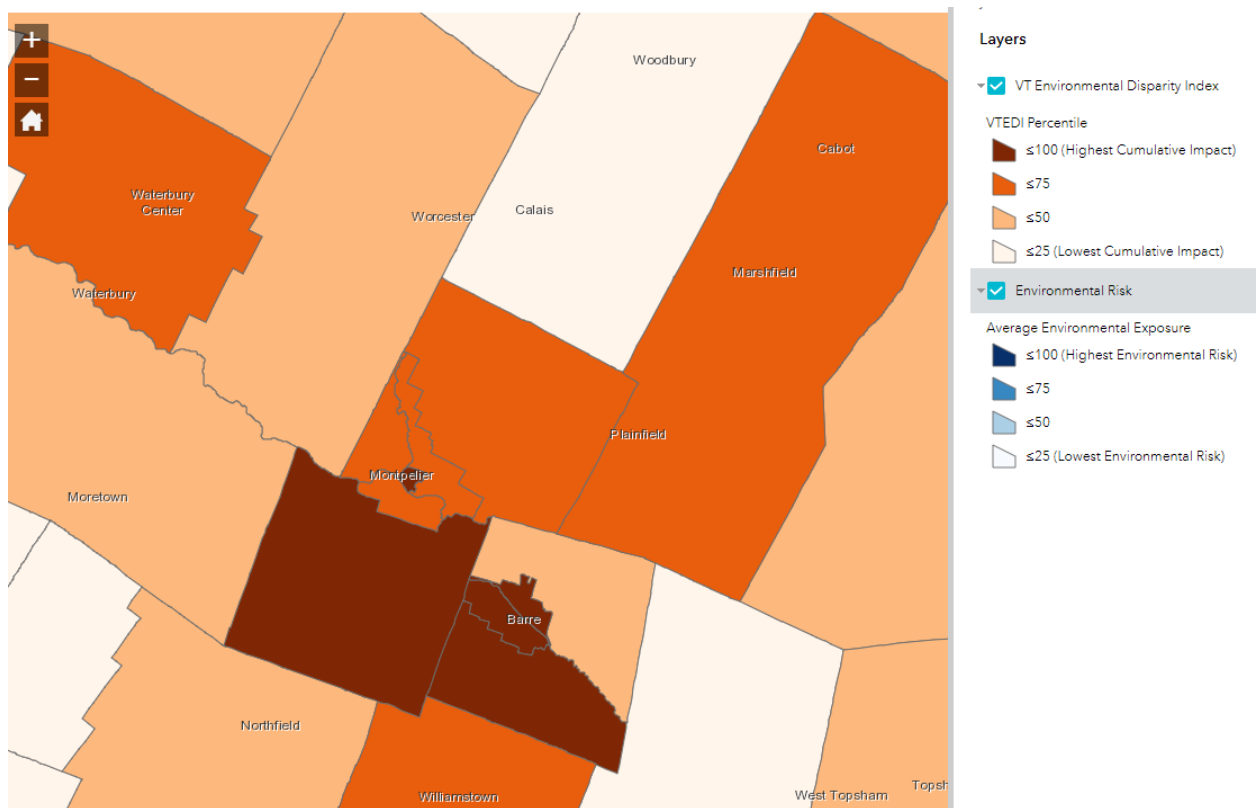
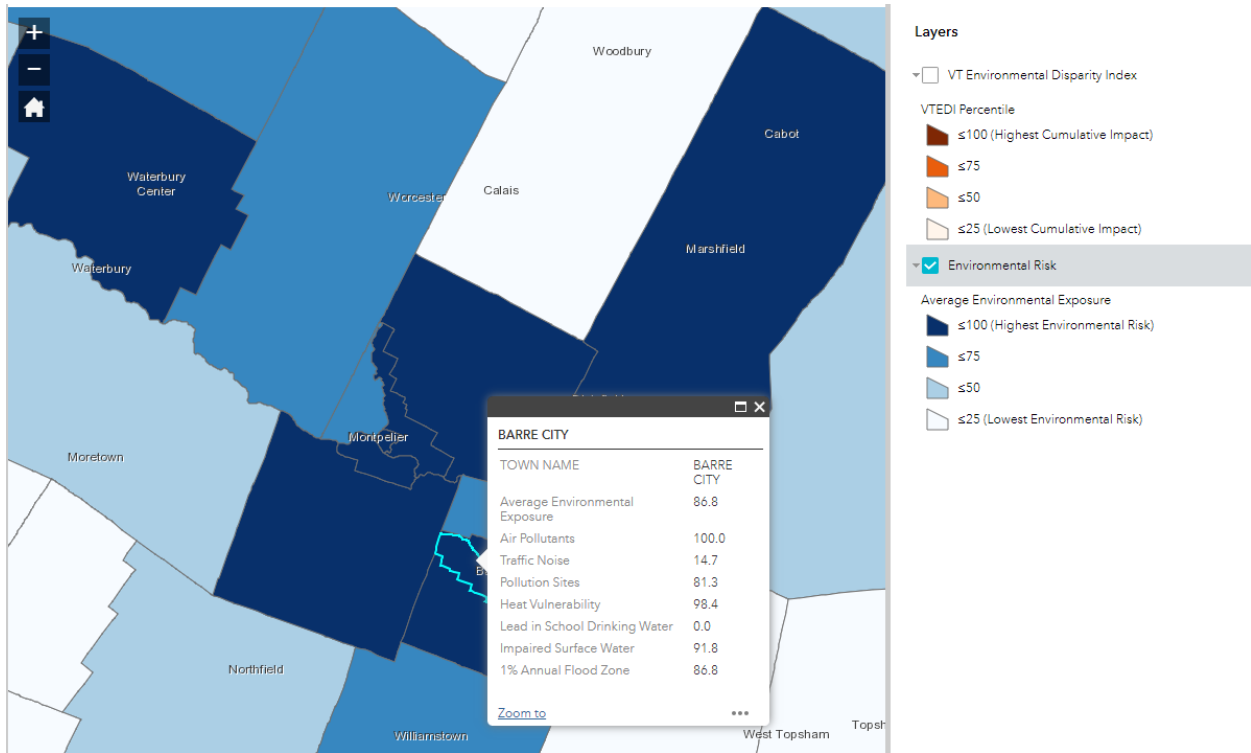


Figure 5: Environmental Risk Indicator Scores



Federally Developed Tools

EPA EJScreen Tool

Overview:

- An environmental justice (EJ) mapping and screening tool based on nationally consistent data and an approach that combines environmental and demographic indicators in maps and reports.

Data and Tool Information:

- Federal sources including Census data.
- Tool compiled by the Environmental Protection Agency (EPA)
- Metrics are provided for census block groups.
- Users can add a shapefile.

Strengths and Features:

- The EJScreen tool provides users with a large selection of map layers that display EJ variables and the percentile rank for those variables for a location of interest.
- Multiple layers can be activated at the same time, allowing users to develop a clearer picture of the interaction of multiple factors.

Limitations:

- See the Background section of this guide for a description of the limitations of ACS and other census data.

Tool Link: [EPA EJScreen Tool](#)

Contact: For access to the tool User Guide, click the “help” option in the top right corner (guide also linked [here](#)). For additional information, please contact Isaac Kaplan (isaac.kaplan@vermont.gov), AOT Systems Planning Coordinator.

Example Use-Case: Examining Service Gaps in the Northeast Kingdom

1. By activating the “critical service gaps” layer (displayed in Figure 6), users can see where gaps in services like broadband are most concentrated (note: the data is not always extensive for Vermont despite the presence of true gaps and needs)
2. By clicking on a specific block group in the Northeast Kingdom, users can see how that block group compares to others in the state across a wide range of metrics.
3. By clicking “generate report,” users can get a printout of measures for the block group of interest. See figure 7 below for an example of some of the charts and summary data generated.
4. Users can see that a high percentage of members in this community have lower incomes (48% low income), which is one of the main barriers to accessing other services including reliable broadband.

Figure 6: Critical Service Gaps in the Region

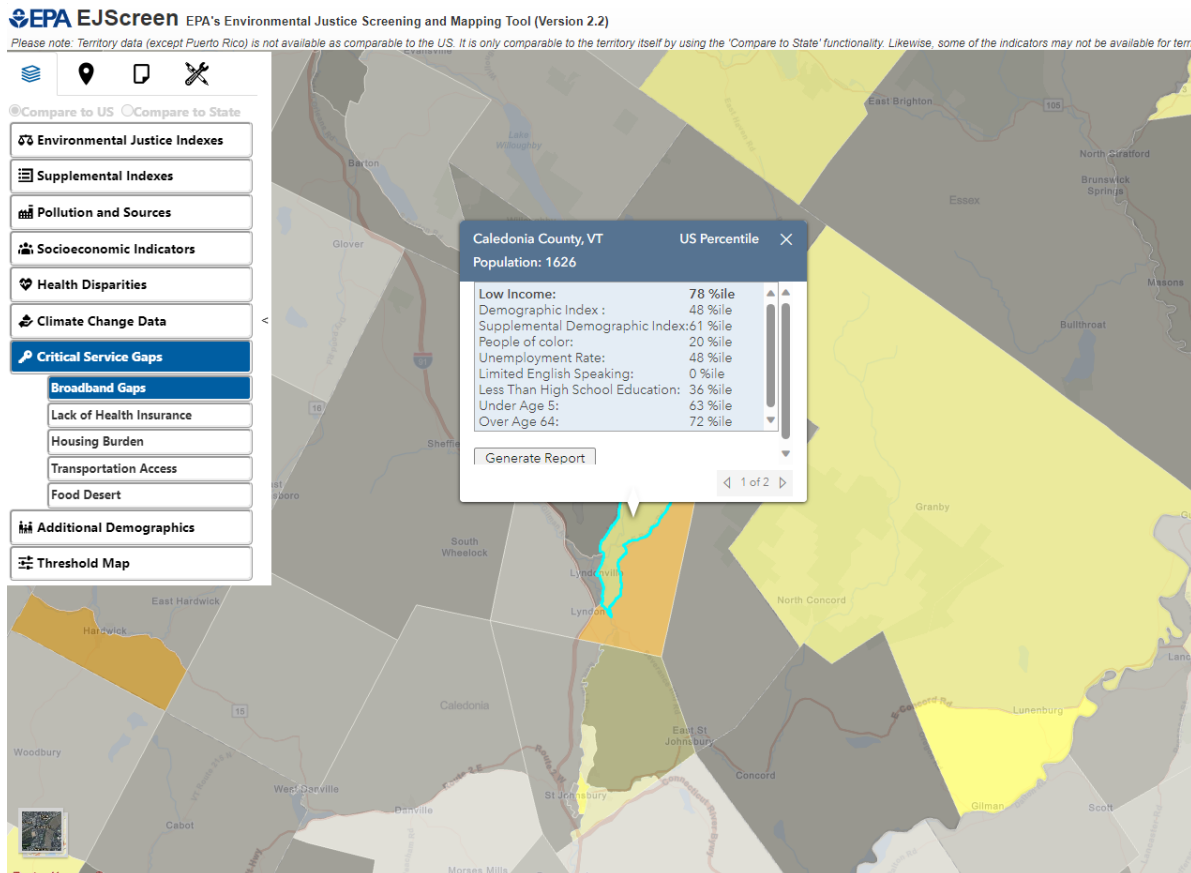
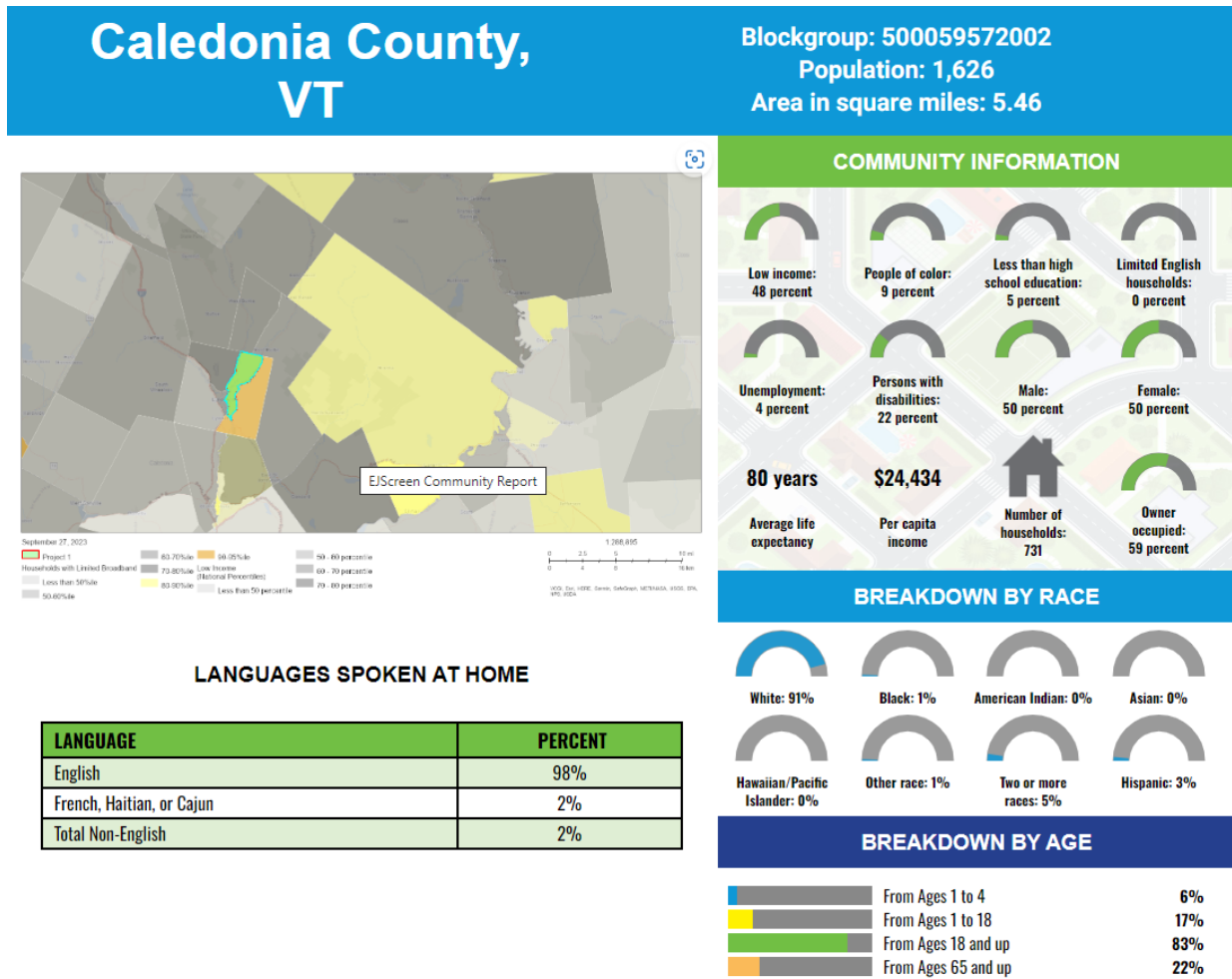


Figure 7: Block Group Data Report



Climate and Economic Justice Screening Tool (CEJST)

Overview:

- This tool was released in support of Executive Order (EO) 14008, Justice40 initiative.
- Communities that are disadvantaged live in census tracts that experience burdens. The tool ranks most of the burdens using percentiles. Percentiles show how much burden each tract experiences when compared to other tracts.
- Thresholds are used to determine if communities in a census tract are disadvantaged. Certain burdens use percentages or a simple yes/no.

Data and Tool Information:

- The tool utilizes many public data sources including the ACS, the National Risk Index, and Climate Risk Data.
- The tool was created by the Council on Environmental Quality (CEQ)
- Metrics are provided for 2010 census tract boundaries.

Strengths and Features:

- Provides users the ability to see the percentile rank of a census tract across a wide range of EJ variables.
- Users can download the data as a shapefile.
- The spreadsheets available for download from the tool list the unique codes for census tracts.

Limitations:

- See the Background section of this guide for a description of the limitations of ACS and other census data.
- Categorization method risks underestimating the number of underserved communities when looking specifically at Vermont.
- National data sources can lose some accuracy on the smaller scale of Vermont.

Tool Link: <https://screeningtool.geoplatform.gov/>

Contact: The best way to contact the Council on Environmental Quality (CEQ) is by filling out [this form](#). Otherwise, email CEQ at: Screeningtool-Support@omb.eop.gov or Isaac Kaplan (AOT Systems Planning Coordinator) at isaac.kaplan@vermont.gov.

Example Use-Case: Identifying Challenges in Windsor County

1. Opening the tool, users can search for Vermont (see Figure 8), or a specific address or zip code. Gray census tracts are those “identified as disadvantaged” using the tool’s threshold methodology (at the VT scale, this threshold doesn’t capture the population very well).
2. Clicking on a disadvantaged tract in central Vermont, users can click on a range of drop downs on the right-hand side of the screen (ranging from Climate Change to Health and Housing) to see the percentile rank of the tract (see Figure 9).
3. Zooming in on the selected tract and clicking the “transportation” drop down list, users can see where the tract stacks up on a variety of transportation related metrics. In addition, the tracts “low income” percentile is displayed.
4. In this tract, users can see that the population ranks in the 66th percentile for households with income less than or equal to twice the federal poverty line. In addition, the tract ranks 53rd for the average of relative cost and time spent on transportation.
5. These identifiers can give planners and other AOT staff a sense of where a tract stacks up compared to others in the state to help with prioritization and identification of project areas.

Figure 8: State-Level Observation

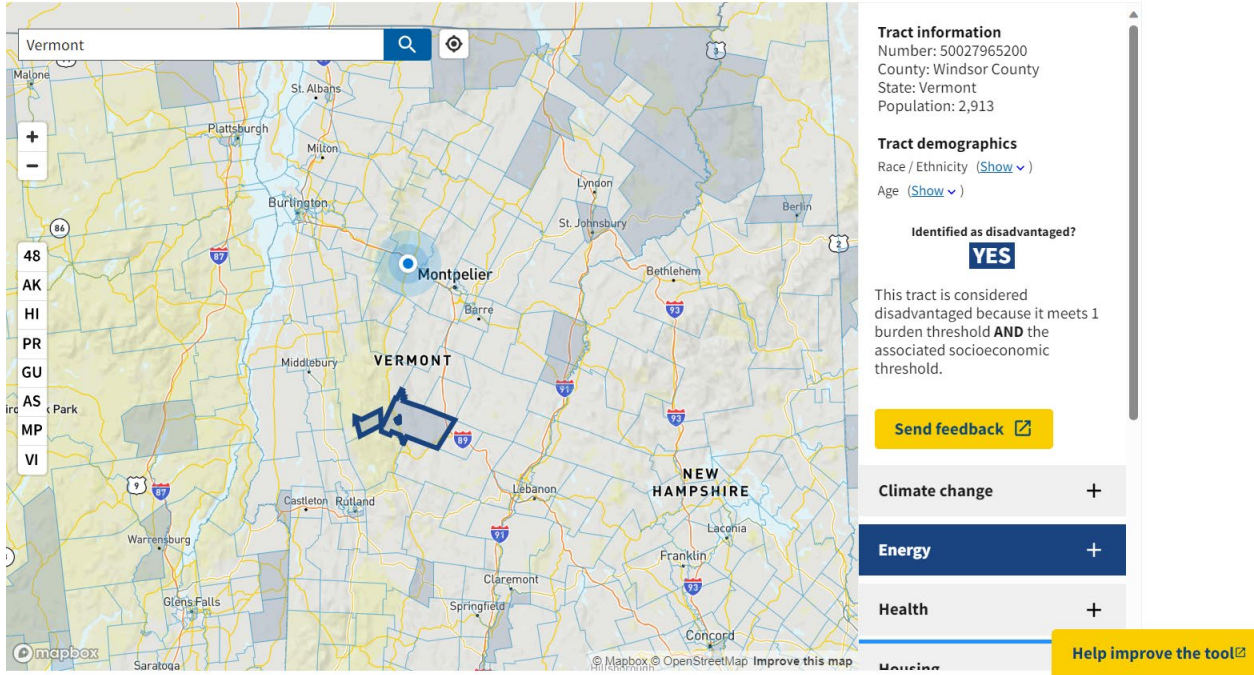
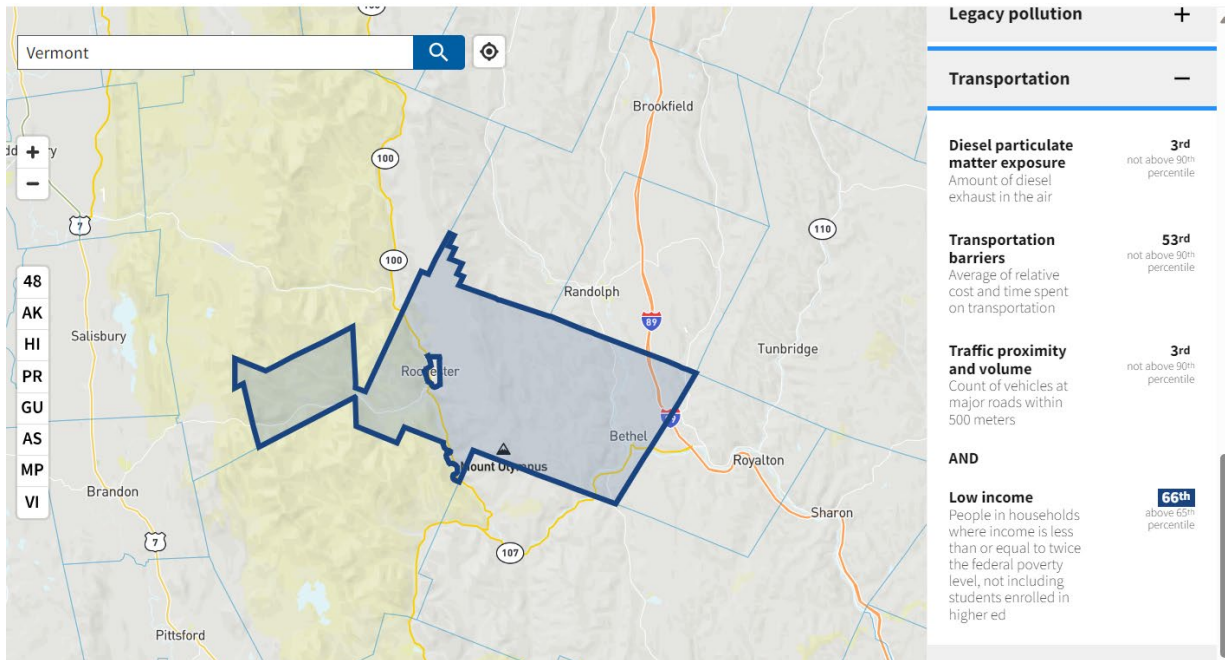


Figure 9: Census Tract Percentile Rankings



FHWA Screening Tool for Equity Analysis of Projects (STEAP)

Overview:

- This tool provides users with the capability to assess the characteristics of communities within a proposed project area.
- Inform users of underserved populations in their study area and can help users determine early ways to avoid or mitigate potential impacts to those populations.

Data and Tool Information:

- American Community Survey (ACS) 5-Year 2016-2020 estimates.
- This tool was created by FHWA.
- Data provided for up to 25 miles of road (or drawn segments)
- Summarizes census tract level data for the areas in the buffer.
- Uses National Highway System road network

Strengths and Features:

- STEAP enables States and MPOs to assess data layers that include demographic and socioeconomic data.
- Users can select specific roadway segments (existing or proposed) of up to 25 miles and specify up to two buffers around the roadway up to three miles in the STEAP interface.
- The tool generates an equity analysis report (in PDF format) for the selected roadway buffer, not by other boundaries such as municipality or census tract.

Limitations:

- See the Background section of this guide for a description of the limitations of ACS and other census data.
- When data is shown as a block group, the data is sometimes estimated from a census tract and may not represent US Census data for block groups.

Tool Link: [STEAP](#)

Contact: For comments, questions, or suggestions about the tool, please contact the HEPGIS Webmaster Sara.Secunda@dot.gov. For more detailed information about methodologies or data sources used for the STEAP tool, please contact the HEPGIS Manager Supin.Yoder@dot.gov.

Example Use-Case: Project Area Screening Bennington to Woodford.

1. Users can search for a location like Bennington or navigate and zoom in on it manually (see Figure 10).
2. Next, users can click to select major road segments, or draw lines manually up to 25 miles (Figure 10).
3. The tool defaults to a buffer zone of 0.5 miles (see Figure 11), which can be customized.

4. After selecting the road segments of interest and clicking “create buffer analysis”, the buffer zone is displayed on the map and a report with buffered-area estimates for a range of ACS variables is generated (see Figure 12).
5. Examining some of the income and housing data for the selected zone, it seems that household incomes are relatively consistent with the town and county averages. However, for the buffer estimates, a slightly higher percentage of households have incomes of \$35k or below. The higher concentration of lower incomes is particularly evident in comparison with the state-level estimate.
6. Using the buffer analysis report, project area populations can be better understood and characterized.

Figure 10: Project Area Selection

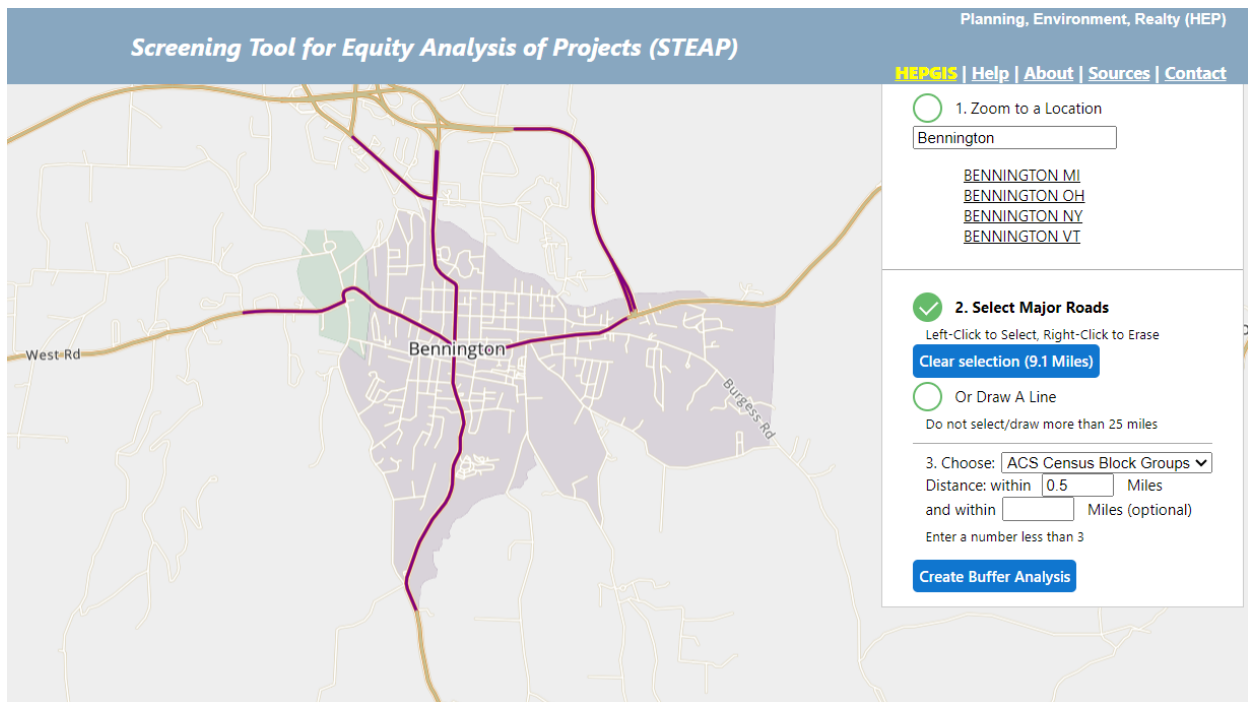


Figure 11: Buffer Zone

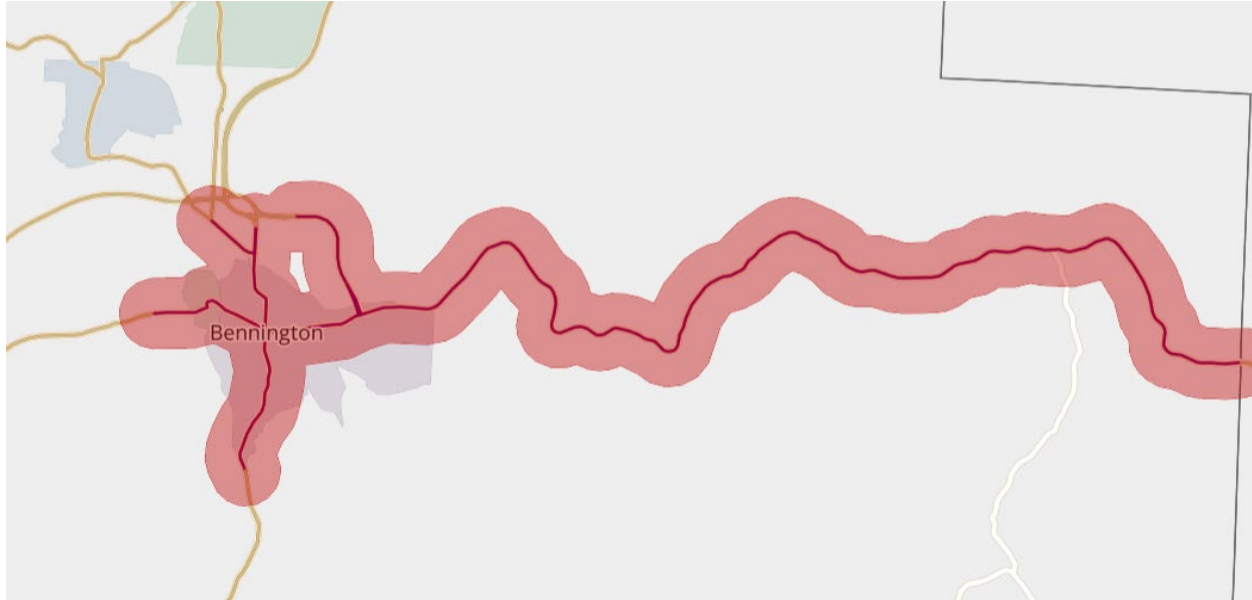


Figure 12: Buffer Analysis Report

	Buffer Estimates	Percent	City/Town Bennington VT	County Bennington VT	State Vermont
In female householder, no spouse/partner present household	351	42%	34%	20%	16%
Households by Household Income					
Household Income Base	2,998	100%	3,704	14,585	262,852
< \$15,000	493	16%	15%	12%	9%
\$15,000 - \$25,000	239	8%	8%	7%	9%
\$25,000 - \$35,000	380	13%	13%	10%	9%
\$35,000 - \$50,000	541	18%	17%	14%	12%
\$50,000 - \$75,000	543	18%	17%	17%	18%
\$75,000 +	801	27%	30%	39%	42%
Selected Monthly Owner Costs as a % of Household Income in the past 12 months (with or without mortgage)					
Total Owner-Occupied Housing Units	1,574	100%	2,106	10,699	187,374
Less than 10.0%	273	17%	20%	18%	15%
10.0 to 14.9%	235	15%	17%	17%	17%
15.0 to 19.9%	173	11%	9%	14%	18%
20.0 to 24.9%	327	21%	20%	14%	15%
25.0 to 29.9%	142	9%	9%	10%	10%
30.0 to 34.9%	109	7%	6%	6%	6%
35.0 to 39.9%	8	1%	1%	3%	4%
40.0 to 49.9%	115	7%	7%	6%	5%

U.S. DOT Equitable Transportation Community (ETC) Explorer

Overview:

The U.S. DOT Equitable Transportation Community (ETC) Explorer is an interactive web application which uses Census Tracts to explore the cumulative burden communities experience, because of underinvestment in transportation, in the following five components:

- Transportation Insecurity,
- Climate and Disaster Risk Burden,
- Environmental Burden,
- Health Vulnerability, and
- Social Vulnerability.

It is designed to complement the Climate & Economic Justice Screening Tool (CEJST) by providing users deeper insight into the Transportation disadvantage component of CEJST, which will help ensure the benefits of DOT's investments are addressing the transportation related causes of disadvantage.

Data and Tool Information:

- 2020 Census Tracts
- Metadata says it uses 2020 Census data but it is unclear whether it uses a five year average or a single year of data.
- This tool was created by the US Department of Transportation (USDOT)

Strengths and Features:

- The ETC Explorer allows users to look at census tract data to explore socioeconomic and transportation-oriented variables, providing insights into potential gaps and burdens.
- Metrics include estimated times to reach essential services like grocery stores and medical facilities, as well as the percentage of households with no vehicle access.

Limitations:

- See the Background section of this guide for a description of the limitations of ACS and other census data.
- The estimates for metrics such as "distance to a service" can vary in accuracy due to assumptions used to generate estimates.
- "Community Boundaries" uses "Census Places" not municipal boundaries therefore:
 - o Not all municipalities are listed under "Community Selector" particularly not smaller municipalities.
 - o Some labels may not be consistent. For example, "Village of Ludlow" shows the town of Ludlow boundary.

Tool Link: [Equitable Transportation Community \(ETC\) Explorer](#)

Contact: Tool User Guide: [US Department of Transportation Equitable Transportation Community Explorer User Guide](#). Video Tutorial: [USDOT ETC Explorer - YouTube](#). Questions or technical assistance requests can be sent to Justice40@dot.gov.

Example Use-Case: Examining Transportation Disadvantages in the Johnson Census Tract

1. Using the ETC Explorer – State Results tool, users can select Vermont, a specific county, and a community within that county.
2. Selecting the Census Tract containing Johnson Village (see Figure 13), many scores and data points will populate. On the right-hand panels, “Overall Disadvantage Component Scores” are displayed, comparing to other tracts in the state as well as “Climate & Disaster Risk Burden” ranks.
3. Scrolling through the pop-up on the map display (see Figure 14), users can see estimates for a range of transportation, housing, and socioeconomic metrics.
4. Users can see that housing and transportation costs consume a large proportion of household income in the Johnson tract. Grocery store access is on average a 7-minute drive, yet an estimated 10.7% of households in the tract do not own a vehicle.
5. Analysis can also be done using the Transportation Insecurity Analysis Tool (TIAT) which can be navigated to from the same landing page as the ETC Explorer.

Figure 13: Data Dashboard and Census Tract Metrics

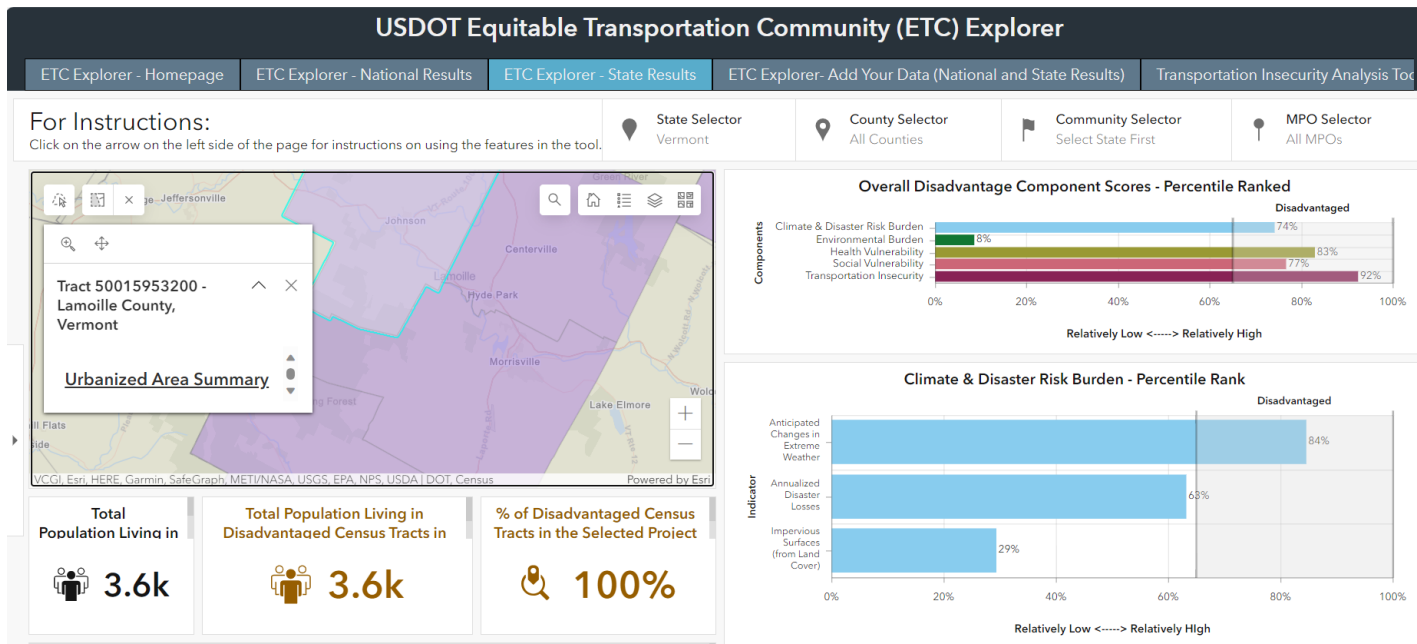


Figure 14: Map Display Census Data

