

Needs Prioritization Methodology

1. Introduction

This methodology documentation outlines the process for prioritizing various transportation needs throughout the Roanoke Valley region. Included is the overall process for completing the prioritization and an overview of the needs criteria and individual metrics within each criteria.

Currently, the described process and associated files only represent the quantitative / geospatial performance. Other considerations will be applied to these quantitative results, such as alignment with regional goals, geographic equity, comparison to VTrans mid-term needs, and other factors. All results serve as a tool to inform priority need decisions but should not be treated as a definitive or absolute list or ranking.

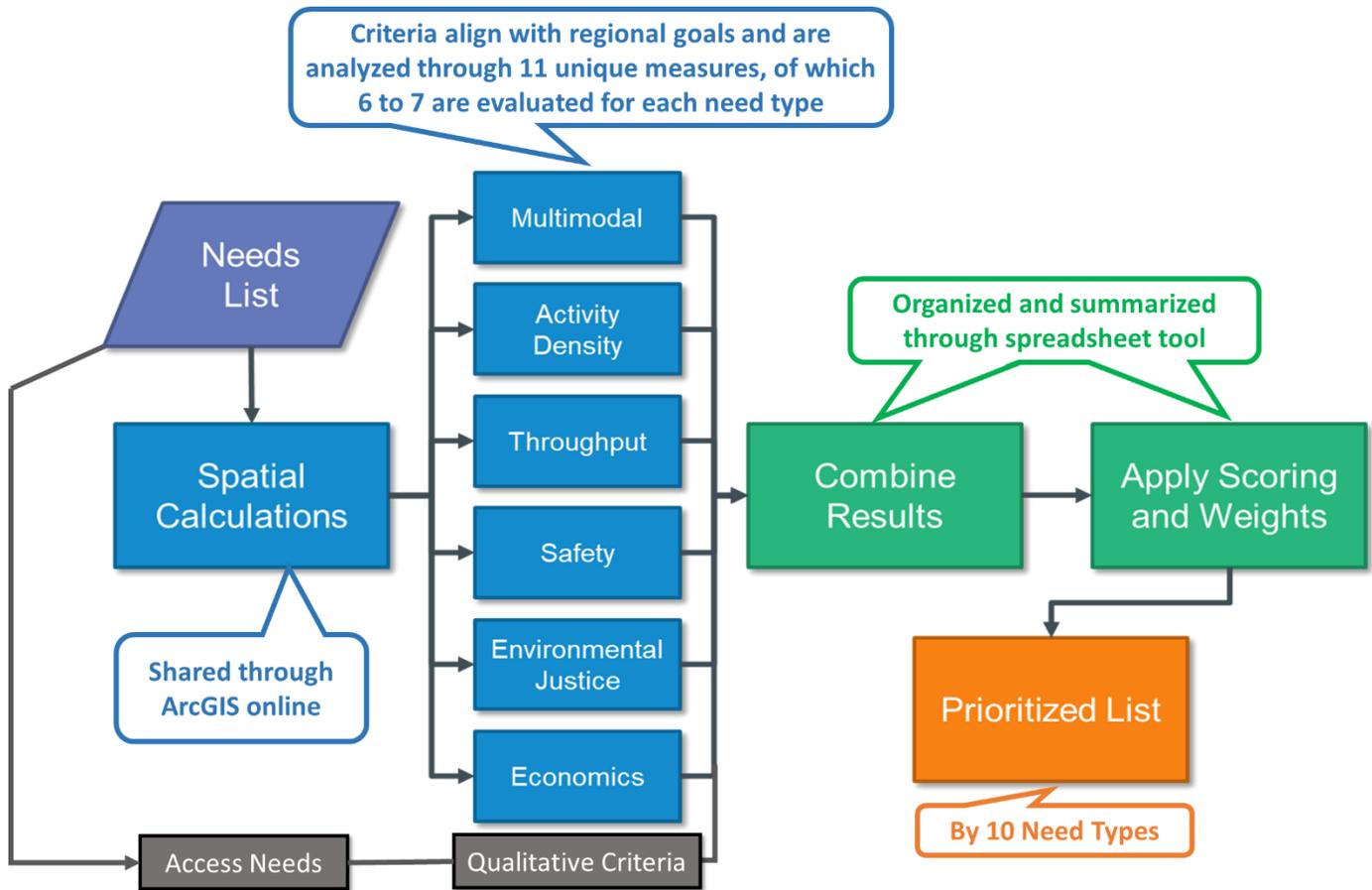
2. Methodology Overview

The overall process for scoring and prioritizing the list of transportation needs involves a few steps. A generalized flowchart of this process is shown in **Figure 1**.

- **Needs List:** First, a comprehensive needs list is cleaned and organized. This includes placing the identified need in the correct geospatial location, removing any duplicates, and assigning each need to one of seven categories: **Automobile Safety, Pedestrian Safety, Bicycle Safety, Transit Safety, Congestion, System Management (Non-Transit), System Management (Transit)**.
Note: Access Needs were considered separately and are discussed in detail on page 8.
- **Spatial Calculations:** After the needs list is organized, the needs list is then spatial analyzed, calculating whether the need applies to a series of six criteria: **Multimodal, Activity Density, Throughput, Safety, Environmental Justice, Economics**. See **Section 3** for more information on each criterion and **Table 2** for a full list of the criteria and associated metrics.
- **Combine Results:** All the criteria results are then combined in Excel. Users can define more specific thresholds and conditions for each criteria (e.g., what constitutes a need being located in a multimodal center).
- **Apply Scoring and Weights:** Scoring and weights are then applied. Weighting varies depending on the needs category, with some metrics receiving 0 to 25 points. An overview of the weighting by need type / metric is shown in **Table 1**.
- **Prioritized List:** The scoring and weighting creates the final prioritized needs list. This displays the total points received for each individual need by its associated needs type. Scores can receive a maximum of 100 points.

The criteria align with the seven goals developed for the Roanoke Valley Transportation Plan by considering related metrics associated with different goals across every need type. However, every need, and its ultimate solutions, are not intended to address every goal as indicated in **Table 1**.

Figure 1 Overall Needs Prioritization Process



Roanoke Valley Transportation Plan

Table 1 Scoring Weighting by Need Type

Alignment with Plan Goals	3, 6		3, 6		2, 3, 5, 6		1, 5, 7		4, 7		3, 6, 7	
	Multimodal		Activity Density		Throughput		Safety		Environmental Justice		Economics	
Need Type	Centers	District	2019	2045	Priority Corridor	VMT Change	VTrans Needs (PSI)	PSAP	Equity Emphasis Areas	Development Priority Locations	Urban Development Areas	
Automobile Safety			5	5		22	53		5	5	5	
Pedestrian Safety	6	6		13				51	10	7	7	
Bicycle Safety	6	6		13				51	10	7	7	
Transit Safety	6	6		13				51	10	7	7	
Congestion			17.5	17.5		17.5			12.5	17.5	17.5	
System Management (Non-Transit)			15	15	15	15.5			12.5	13.5	13.5	
System Management (Transit)	11	11		21.5		20			12.5	12	12	
Access Criteria	Population Affected				Severity				Environmental Justice			
Transit and Non-transit	5				5				2			

Roanoke Valley Transportation Plan Goals:

1. Provide a safe and secure transportation system
2. Enable reliable mobility
3. Ensure convenient and affordable access to destinations
4. Foster environmental sustainability
5. Maintain and operate an efficient and resilient transportation system
6. Support economic vitality
7. Promote equitable transportation investments

3. Need Prioritization Criteria

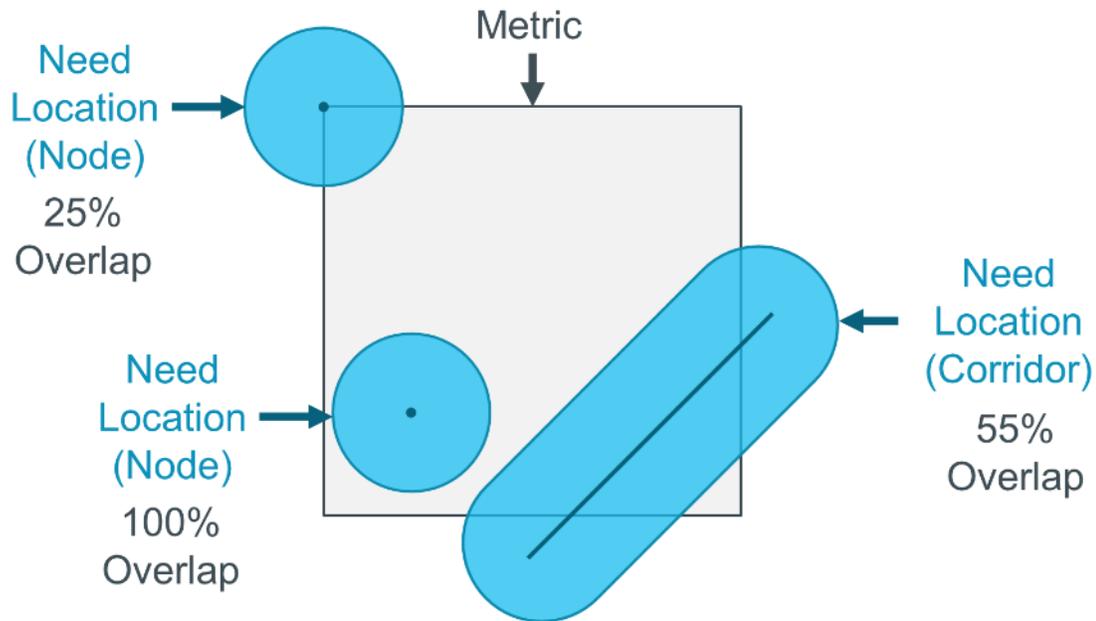
Needs are assessed within the following criteria categories, comprised of individual metrics (**Table 2**). This section provides an overview of each individual criteria and metric, including definition, sources, and how it is calculated for the analysis.

Table 2 Needs Criteria, Metrics, and Rationale

Needs Criteria	Needs Metrics	Criteria Rationale
Multimodal	Multimodal Centers	Places importance on needs that support access and mobility in designated multimodal areas within the region
	Multimodal Districts	
Activity Density	2019 Activity Density	Places importance on needs that address population and employment centers within the region today and in the future
	2045 Activity Density	
Throughput	Priority Corridor	Places importance on needs within congested corridors identified in the Congestion Management Process and high travel-growth corridors
	VMT Change	
Safety	VTrans Safety Needs (based on Potential for Safety Improvement (PSI))	Places importance on needs in areas with observed high crash frequency and severity for both vehicles and non-motorized users
	Pedestrian Safety Action Plan (PSAP) Priority Needs	
Environmental Justice	Equity Emphasis Areas	Places importance on needs supporting communities in designated equity emphasis areas
Economics	Development Priority Locations	Places importance on needs adjacent to economic development priority locations and serving designated urban development areas
	Urban Development Areas	
Transit and Non-transit Access	Population Affected	Places importance on needs by relative number of people impacted by lack of access and how significant the inability to access the destination is to daily life particularly for EJ populations.
	Severity	
	Environmental Justice	

For all metrics, a 1/8th mile buffer was applied to each individual need to represent the catchment area. The only exception are needs covering a specific area, such as a neighborhood. In these cases, the area was left as-is. Many of the metrics used a proportional overlap to estimate whether the metric impacted each individual need. An example of this process is shown in **Figure 2**, where the grey box is the metric, and the blue shapes are individual needs. This was also completed the opposite way to account for metrics impacting a smaller area. For example, if a needs corridor fully extends from A to C but the metric only extends from A to B. All metrics, besides Activity Density and VMT, assumed a metric impacts a need if it overlaps by at least 50 percent.

Figure 2 Proportional Overlap Calculation Example



Multimodal

Multimodal Needs are identified through two metrics:

- **Multimodal Districts**
 - **Description:** Any portion of a city or region with land use characteristics that support multimodal travel, such as higher densities and mixed uses, and where it is relatively easy to make trips without needing a car as gauged by the number of bus routes available, and safe walking or biking paths – either currently or proposed in the future.
 - **Source:** RVARC Staff (Approved by the RVTPO Policy Board in 2015)
- **Multimodal Centers**
 - **Description:** A smaller area of even higher multimodal connectivity and more intense activity, roughly equivalent to a 10-minute walk or a one-mile area.
 - **Source:** RVARC Staff (Approved by the RVTPO Policy Board in 2015)

Methodology: Multimodal Needs use a proportional overlap to estimate whether a need is within a Multimodal District or Center.

Activity Density

Activity Density Needs are identified through two metrics:

- **2019 Activity Density**
 - **Description:** The current activity density in the region. This metric sums the existing population and employment then divides by the area to estimate current activity density.
 - **Source:** Traffic Analysis Zone (TAZ) within the Travel Demand Model (TDM)
- **2045 Activity Density**
 - **Description:** The activity density in the region in 2045. This metric sums the future population and employment then divides by the area to estimate future activity density.
 - **Source:** Traffic Analysis Zone (TAZ) within the Travel Demand Model (TDM)

Methodology: Both 2019 and 2045 Activity Density metrics use a slightly different methodology when compared to other metrics. Instead, a weighted proportional overlap is used, considering not only the overlap area but also the underlying density. Essentially the calculation estimates the area overlap then multiplies by the TAZ's total activity. So, if a TAZ has 120 residents and employees and the need overlaps by 25 percent, this method estimates the need covers 30 residents and employees. This is completed for every TAZ the need intersects with, sums all of the proportional overlapping residents and employees, then divides by the total need area to reach an estimated activity density.

Throughput

Motorized and Non-Motorized Throughput Needs are identified through two metrics:

- **Priority Corridors**
 - **Description:** Identified corridor for congestion management activities, as defined in the 2020 Congestion Management Process. These corridors were identified from the Top 10 Areas of Emphasis and had a Planning Time Index (PTI) greater than three
 - **Source:** RVARC Staff, Traffic Congestion Management Process 2020
- **Vehicle Miles Traveled (VMT) Growth**
 - **Description:** The estimated growth in VMT between 2019 and 2045
 - **Source:** Travel Demand Model (TDM)

Methodology: Priority Corridors use a proportional overlap to estimate whether a need is within a one of the identified priority corridors in the 2020 Congestion Management Process.

VMT Growth was estimated slightly different. Here, the change between 2019 and 2045 VMT was calculated for each segment. All segments were then placed into a percentile, equally distributing the segments with the highest to lowest (or no) estimated growth. A proportional overlap was then completed for each individual need, identifying which percentile overlapped the most. A need was considered along a high-growth VMT corridor if it overlapped with 75th or higher percentile corridors.

Safety

Safety Needs are identified through two metrics:

- **VTrans Safety Needs (PSI)**

- **Description:** Identified segments with the highest Potential for Safety Improvement (PSI), including Corridors of Statewide Significance (CoSS), and non-Corridors of Statewide Significance.
- **Source:** 2019 VTrans Mid-Term Needs for Roadway Safety

- **PSAP Needs**

- **Description:** The top crash clusters and priority corridors (Top 5%) identified through the VDOT Pedestrian Safety Action Plan.
- **Source:** VDOT Pedestrian Safety Action Plan (PSAP) 2.0

Methodology: VTrans Safety and PSAP Needs use a proportional overlap to estimate whether a need is within a one of these identified corridors.

Environmental Justice

Environmental Justice Needs are identified through one metric:

- **Equity Emphasis Areas (EEA)**

- **Description:** Identified areas as defined by the Office of Intermodal Planning and Investment (OIPI) for the purposes of the VTrans mid-term needs identification and prioritization process. Areas are identified based on resident's income, age, race and ethnicity, English proficiency, and disability.
- **Source:** 2019 VTrans Mid-Term Needs and Priority

Methodology: Equity Emphasis Areas use a proportional overlap to estimate whether a need is within a one of these identified areas.

Economics

Economic Needs are identified through two metrics:

- **Development Priority Locations**
 - **Description:** Future development priority locations as identified through the 2021 Regional Study on Transportation Project Prioritization for and Economic Development and Growth
 - **Source:** RVARC Staff, (Study completed in August 2021)
- **Urban Development Areas (UDA)**
 - **Description:** Areas designated by locality that may be sufficient to meet projected residential and commercial growth within the next 10 to 20 years
 - **Source:** VTrans

Methodology: Development Priority Locations and UDA use a proportional overlap to estimate whether a need is within a one of these identified locations.

Access Needs Methodology

It was quickly apparent that the methodology to prioritize other needs wasn't applicable to access needs. For example, transit riders have overwhelmingly cited the Department of Motor Vehicles as a place they need to access but currently cannot. Applying a methodology similar to that described for the other needs yields the Department of Motor Vehicles as a low priority because its location doesn't overlap any of the desired criteria. But it is *because* its location doesn't overlap those criteria that it is so inaccessible. A different method was needed to prioritize access needs.

Transit access needs seemed distinct from non-transit access needs, so access needs were divided into Access (Transit) and Access (Non-transit). Most access needs were location-based, but three systemic access needs were also reviewed: transit frequency, hours of transit, and ADA accessibility. Staff identified what the access need was at each location. If no access need could be discerned, the location was not scored. Motor vehicle access needs were often actually congestion concerns or system management issues, for example, and bicycle and pedestrian needs were often actually safety needs. Motor vehicle access needs were typically regarding resiliency or having more than one way to access a destination.

Staff identified criteria about each location that indicated the number of people affected, the severity of lack of access, and the effect of a lack of access on environmental justice populations (such as poverty, minority, and disability). Staff used these criteria to subjectively assign a score for environmental justice (0-2 points), number of people affected (0-5 points), and severity of the lack of access (0-5 points).

Table 3 Access Needs Criteria and Rationale

Mode	What is here?	Does this affect number of people, the severity of lack of access, or environmental justice?
All modes	Government services	Severity – many government services are essential and available in only one place (i.e., a courthouse), lack of access is high severity
All modes	Essential services	Severity – necessary but may be available in multiple locations (i.e., a grocery store or health clinic), lack of access is moderate severity
All modes	Retail, services	Severity – may not be necessary and may be available in multiple locations, lack of access is low severity Number of people Environmental justice (low wage jobs)
All modes	Recreation	Severity – Access to recreation and outdoor spaces improves quality of life, lack of access is low severity
All modes	Residential density	Number of people
All modes	EJ Index	Environmental justice
All modes	Special residence (assisted living, affordable housing)	Environmental justice
Transit	Bus service	Severity – No existing bus service is high severity, existing bus service without sidewalks is moderate severity, existing bus service without other amenities is low severity
Transit	Bus stop activity	Number of people
Transit	Traffic congestion (Priority corridor for congestion management, corridor of concern for congestion, VTrans congestion need)	Number of people (people driving could use transit, people driving benefit if other drivers switch to transit)
Motor vehicle	Average Annual Daily Traffic	Number of people
Motor vehicle	Alternative routes	Motor vehicle access needs are typically resilience issues, if alternative routes are available the severity is low.

Systemic (non-mappable) access needs were similarly subjectively scored based on the number of people affected, the severity of lack of access, and the effect of lack of access on environmental justice populations.