

Criticality Assessment Methodology

The criticality assessment is the first component of the Resiliency and Durability Project's analysis. Using the criticality assessment, critical transportation assets are identified for use in the VAST analysis. Vulnerability rankings of selected critical transportation assets will be assessed in later stages using the VAST, HAZUS, and other applicable tools. In the Resiliency and Durability Project, two types of transportation assets, roads and bridges, will be assessed.

Asset criticality is assessed using three categories of indicators:

1. **Socioeconomic importance:** assessed by considering how each transportation asset contributes to the regional economy and social functioning.
2. **Usage and operational importance:** assessed by considering the volume of traffic that each transportation asset experiences.
3. **Health and safety importance:** assessed by considering how each transportation asset contributes to the regional emergency response system.

The scoring process is stratified by the functional classes of the assets: freeways and non-freeway major roads (including principal arterials, minor arterials and collectors).

Final criticality scores are calculated by weighted-summarizing scores of all indicators. Freeway assets with top 20% of final scores will be considered critical. Non-freeway assets with top 5% of final scores will be considered critical.

Detailed scoring approach for all indicators are shown below:

Category	Indicator	Description	Score	Criteria	
Socioeconomic Importance (Weight: 30%; standardized to a full score of 10)	Linkage to airport	Measures to which degree does a specific road segment provide linkage to the airport. Only two commercial airports (IAH, HOU) are selected.	4	For freeways: if traffic-free drive time to the nearest airport less than 8 mins	For major roads: if traffic-free drive time to the nearest airport less than 9 mins
			3	For freeways: if traffic-free drive time to the nearest airport between 8 to 10 mins	For major roads: if traffic-free drive time to the nearest airport between 9 to 11 mins
			2	For freeways: if traffic-free drive time to the nearest airport between 10 to 13 mins	For major roads: if traffic-free drive time to the nearest airport between 11 to 14 mins
			1	For freeways: if traffic-free drive time to the nearest airport between 13 and 18 mins	For major roads: if traffic-free drive time to the nearest airport between 14 to 22 mins
			0	For freeways: if traffic-free drive time to the nearest airport more than 18 mins	For major roads: if traffic-free drive time to the nearest airport more than 22 mins
	Linkage to port	Measures to which degree does a specific road segment provide linkage to the port facility.	4	For freeways: if traffic-free drive time to the nearest port less than 5 mins	For major roads: if traffic-free drive time to the nearest port less than 4 mins
			3	For freeways: if traffic-free drive time to the nearest port between 5 to 6 mins	For major roads: if traffic-free drive time to the nearest port between 4 to 6 mins
			2	For freeways: if traffic-free drive time to the nearest port between 6 to 9 mins	For major roads: if traffic-free drive time to the nearest port between 6 to 10 mins
			1	For freeways: if traffic-free drive time to the nearest port between 9 to 15 mins	For major roads: if traffic-free drive time to the nearest port between 10 to 19 mins
			0	For freeways: if traffic-free drive time to the nearest port more than 15 mins	For major roads: if traffic-free drive time to the nearest port more than 19 mins

Category	Indicator	Description	Score	Criteria
	Access to activity population	Measures to which degree does a specific road segment support the routine social and economic activities in this region. The assessment is made by calculating the combined residential population and employment that could be accessed within 15 mins drive in a traffic-free setting.	4	For freeways: if the road segment serves more than 30% of the region's population and employment within 15-minute drive For major roads: if the road segment serves more than 30% of the region's population and employment within 15-minute drive
			2	For freeways: if the road segment serves 25% to 30% of the region's population and employment within 15-minute drive For major roads: if the road segment serves 25% to 30% of the region's population and employment within 15-minute drive
			0	For freeways: if the road segment serves less than 25% of the region's population and employment within 15-minute drive For major roads: if the road segment serves less than 25% of the region's population and employment within 15-minute drive
Usage & Operational (Weight: 50%)	Annually averaged daily traffic (AADT)	Annually averaged daily traffic of all vehicles on a specific road segment.	4	if AADT among the top 5 %
			3	if AADT among top 5-10%
			2	if AADT among top 10-25%
			1	if AADT among top 25-50%
			0	if AADT below median
	Annually averaged daily truck traffic (AADT-Truck)	Annually averaged daily traffic of trucks on a specific road segment.	4	if AADT-Truck among the top 5 %
			3	if AADT-Truck among top 5-10%
			2	if AADT-Truck among top 10-25%
			1	if AADT-Truck among top 25-50%
			0	if AADT-Truck below median
	Transit Ridership (50% weight on	Measures how important transit routes on a specific road segment.	4	if transit index >8
			3	if transit index between 6 and 8
2			if transit index between 4 and 6	

Category	Indicator	Description	Score	Criteria		
	transit ridership within the category)	Transit index measures job accessed within 30 mins transit ride.	1	if transit index between 2 and 4		
			0	if transit index <2		
Health& Safety Importance (Weight: 20%; standardized to a full score of 10)	Linkage to hospital	Measures to which degree does a specific road segment provide linkage to hospitals. Urgent care centers, EMS centers are not considered hospitals.	4	For freeways: if travel time to the nearest hospital less than 1 min	For major roads: if travel time to the nearest hospital less than 1 min	
			3	For freeways: if travel time to the nearest hospital between 1 to 2 mins	For major roads: if travel time to the nearest hospital between 1 to 2 mins	
			2	For freeways: if travel time to the nearest hospital between 2 to 3 mins	For major roads: if travel time to the nearest hospital between 2 to 3 mins	
			1	For freeways: if travel time to the nearest hospital between 3 to 5 mins	For major roads: if travel time to the nearest hospital between 3 to 5 mins	
			0	For freeways: if travel time to the nearest hospital more than 5 mins	For major roads: if travel time to the nearest hospital more than 5 mins	
	Linkage to FEMA emergency centers	Measures to which degree does a specific road segment provide linkage to FEMA emergency centers. Designated shelters are not considered emergency centers.	4	For freeways: if travel time to the nearest emergency center less than 3 mins	For major roads: if travel time to the nearest emergency center less than 2 mins	
			3	For freeways: if travel time to the nearest emergency center between 3 to 4 mins	For major roads: if travel time to the nearest emergency center between 2 to 3 mins	
			2	For freeways: if travel time to the nearest emergency center between 4 to 5 mins	For major roads: if travel time to the nearest emergency center between 3 to 5 mins	
			1	For freeways: if travel time to the nearest emergency center between 5 to 7 mins	For major roads: if travel time to the nearest emergency center between 5 to 8 mins	
			0	For freeways: if travel time to the nearest emergency center more than 7 mins	For major roads: if travel time to the nearest emergency center more than 8 mins	
				2	if a designated evacuation route	

Category	Indicator	Description	Score	Criteria
	Evacuation Route	Whether or not a specific road segment is a designated evacuation route.	0	if not a designated evacuation route
	Access to vulnerable population	Measures to which degree does a specific road segment provide access to socially and economically challenged communities, which are prone to disproportionately high risk in states of emergency.	2	if vulnerability index of the nearest census block group is greater than 90
			1	if vulnerability index of the nearest census block group is between 75 and 90
			0	if vulnerability index of the nearest census block group is smaller than 75