DRAFT Resiliency and Durability Pilot Study Methodology

Objective: Analyze vulnerability of regional transportation assets to expected natural hazards.

Vulnerability assessment steps:

1. Scope of the Study (to be discussed at 5/22 kickoff)
2. Obtain Asset Data (to be discussed at 5/22 kickoff)
3. Obtain Climate Data (to be discussed at 5/22 kickoff)
4. Assess Vulnerability (to be discussed at 5/22 kickoff)
5. Identify Adaption Options
6. Incorporate Assessment Results in Future Planning
7. Monitor and Revisit (outside the scope of study)

Scope of the Study

The first step in the vulnerability assessment is establishing a clear study scope, which includes selecting and characterizing important transportation assets in the region and identifying key climate variables that could impact those critical assets (please review the methodology flowchart on the last page).

SELECTING TRANSPORTATION ASSETS

Selecting relevant assets for the study makes it more manageable while providing opportunities for in depth analysis. Therefore, this study confines the vulnerability assessment to Freeways, Major Arterials, and Bridges. The study then groups these assets into critical and less critical assets based on Criticality analysis. Criticality of transportation assets is measured based on both quantitative data and qualitative information from stakeholders. This pilot study uses the desk review approach to rank assets based on a broad range of criteria that capture use and accessibility of roadways and bridges. Criteria for evaluating an asset include average daily traffic, average daily truck traffic, access to employment/medical facilities, access to ports, and role in emergency management. Once the critical assets are identified then they are verified by local experts and stakeholders. Assets that are known to be vulnerable to natural hazards based on historic data can also be included in the criticality assessment. Both critical and non-critical assets will be considered for the vulnerability assessment.

IDENTIFYING KEY CLIMATE VARIABLES

Based on the historic data, the climate variables that are considered important for this regional study include

1. Storm Surge
2. Flooding
3. Sea-Level Rise
4. Temperature (needs further discussion)

The information provided by the local hazard mitigation plans is also utilized to identify the types of weather events and thresholds that cause impacts on transportation system/assets.

Obtaining Asset Data

Network data collected from TxDOT and H-GAC

Obtaining Climate Data

Historic and future climate data will be collected from NOAA, USGS, USACE and other research agencies. Regional data based on past natural disasters will also be considered for the analysis.

Processing LiDAR Data

H-GAC's LiDAR data will be used to get Digital Elevation Model (DEM) data to better estimate roadway and bridge flooding.

Assessing Vulnerability

Geographic Model: Use historic and future climate data to map areas vulnerable to natural hazards.

Hazus Model: FEMA's Hazus Flood Model along the DEM data will be used to assess both riverine and coastal flooding and estimate potential damages to the critical transportation assets.

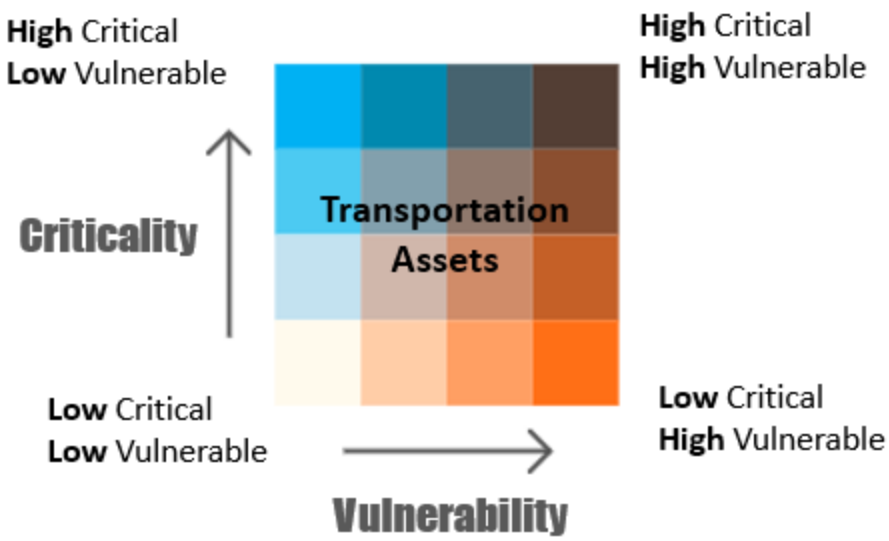
VAST Tool: The Vulnerability Assessment Scoring Tool (VAST) is an Excel-macro based application developed by the FHWA to provide a structured process for assessing climate-related vulnerabilities. VAST requires four input components: critical transportation assets, climate exposure, sensitivity indicators and adaptive capacity indicators. Climate exposure indicates whether and to which degree a certain transportation asset will experience or affected by a given climate stressor. In this project, selected climate stressors are flooding (increased precipitation), sea level rise and storm surge. Sensitivity indicators suggest whether and to which degree a specific transportation asset might be damaged by a given climate exposure. Adaptive capacity indicators describe the ability of the transportation system to cope with the consequences of damage or disruption to the specific transportation asset.

Note: Risk and economic impact analyses will be incorporated into the vulnerability assessment once the VAST analysis is complete.

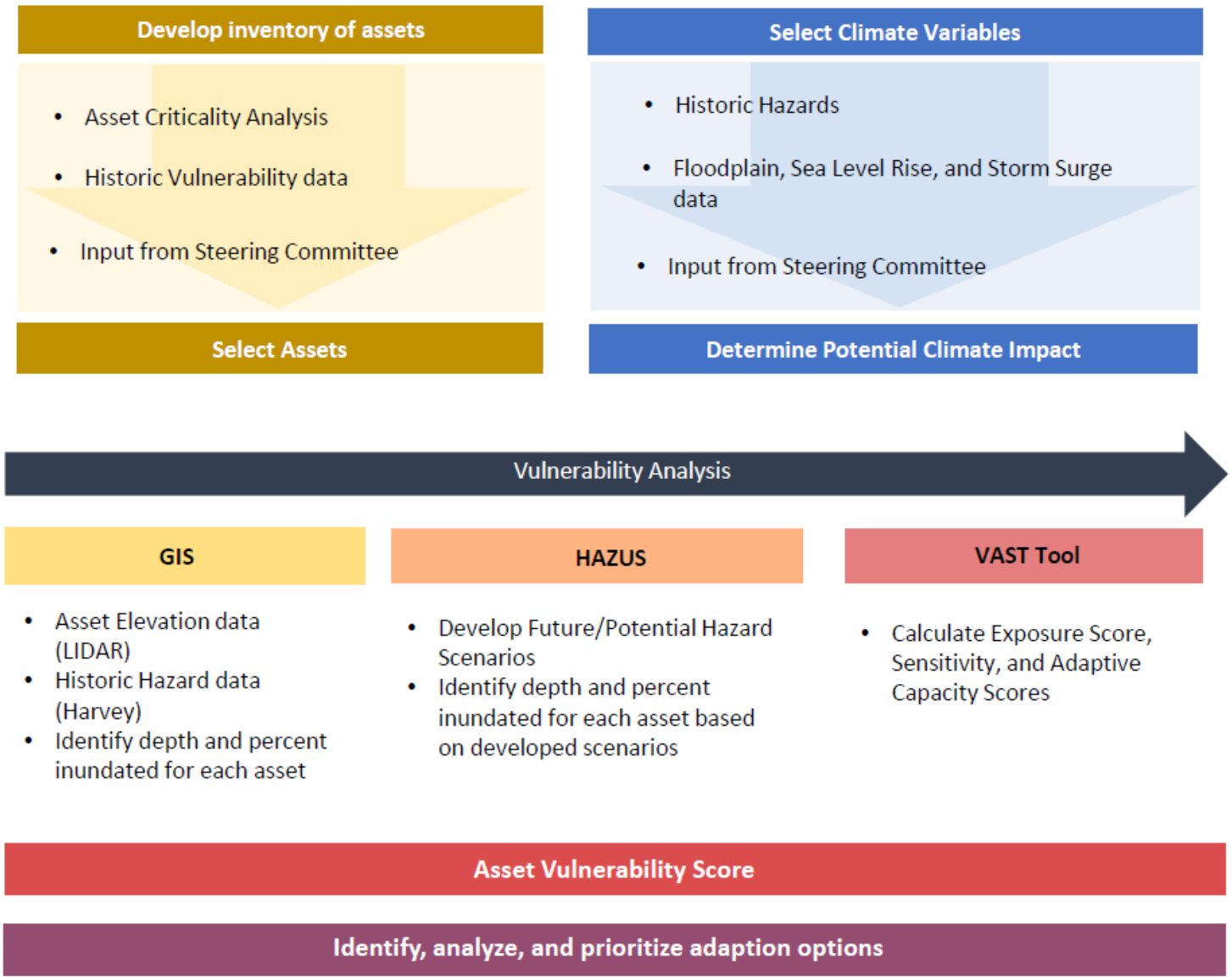
Outcome

Based on the criticality and vulnerability assessment, the study expects to group the transportation assets into

1. Highly Critical-Highly Vulnerable
2. Less Critical-Highly Vulnerable
3. Highly Critical-Less Vulnerable
4. Less Critical- Less Vulnerable



In addition to the above grouping, we expect to have some asset specific scoring index. The outcome from the vulnerability assessment will be shared and discussed with stakeholders. The results from this study will be incorporated in the future transportation and resiliency planning efforts.


Develop inventory of assets
Asset Criticality Analysis
Historic Vulnerability data
Input from Steering Committee
Select Assets
Select Climate Variables
Historic Hazards
Floodplain, Sea Level Rise, and Storm Surge data
Input from Steering Committee
Determine Potential Climate Impact
Vulnerability Analysis
GIS
Asset Elevation data (LIDAR)
Historic Hazard data (Harvey)
Identify depth and percent inundated for each asset
HAZUS
Develop Future/Potential Hazard Scenarios
Identify depth and percent inundated for each asset based on developed scenarios
VAST Tool
Calculate Exposure Score, Sensitivity, and Adaptive Capacity Scores
Asset Vulnerability Score
Identify, analyze, and prioritize adaption options