COMMONWEALTH of VIRGINIA
Office of the
SECRETARY of TRANSPORTATION

VTrans Update – Needs Assessment & Vulnerability Assessment

2019 VAPDC/VAMPO Training Conference

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Discussion Items

- Performance measures for Mid-Term Needs identification
- Vulnerability Assessment

Mid-Term Needs Assessment | Travel Markets Review

- **Corridors of Statewide Significance (CoSS)** [Code of Virginia § 33.2-353]
  - Serve inter-regional travel
- **Regional Networks** [Code of Virginia in in § 33.2-353]
  - Serve commuters, intra-regional, and local travel
- **Urban Development Areas (UDA)** [Code of Virginia § 33.2-353 and § 15.2-2223.1]
  - Designated by local governments
  - Intended to promote walkable development and traditional neighborhood design

Corridors of Statewide Significance*

- Coastal Corridor
- Crescent Corridor
- East-West Corridor
- Eastern Shore Corridor
- Heartland Corridor
- North Carolina to West Virginia Corridor
- North-South Corridor
- Northern Virginia Corridor
- Seminole Corridor
- Southside Corridor
- Washington to North Carolina Corridor
- Western Mountain Corridor

*Thin lines of same color represent Corridor Component Facilities

- Airports
- Ports
- Rail Network

Travel Markets:

Corridors of Statewide Significance serve inter-regional travel.

VTRANS | VIRGINIA'S TRANSPORTATION PLAN

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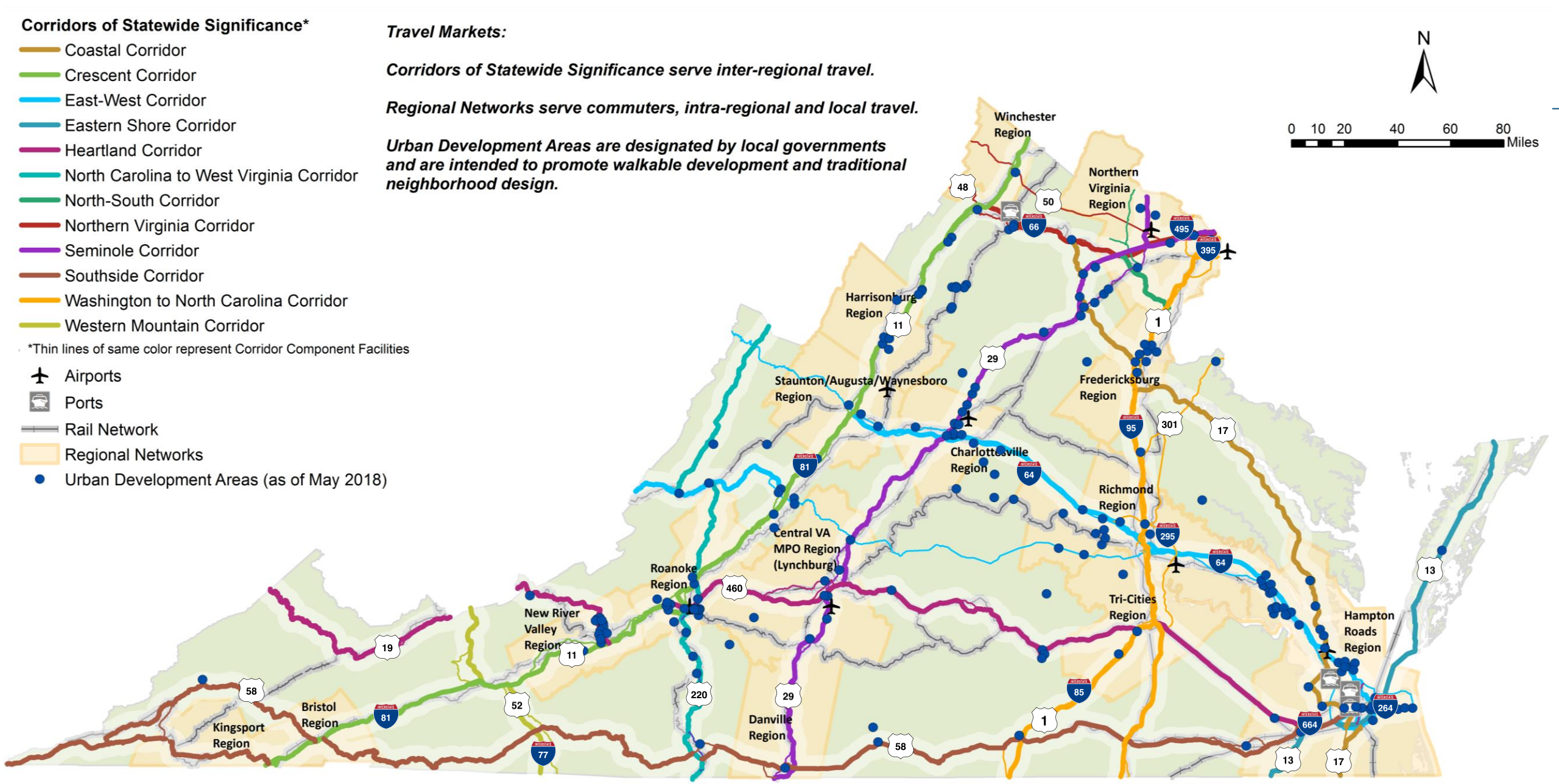
- Airports
- Ports
- Rail Network
- Regional Networks
- Urban Development Areas (as of May 2018)

Travel Markets:

Corridors of Statewide Significance serve inter-regional travel.

Regional Networks serve commuters, intra-regional and local travel.

Urban Development Areas are designated by local governments and are intended to promote walkable development and traditional neighborhood design.



Mid-Term Needs vs. Long-Term Needs

Mid-Term Needs	Long-Term Needs
7 - 10 year time horizon	10 + year time horizon
Performance measures with current data to determine	Performance measures through scenario analysis with forecast data to determine
Used as screening criteria for SMART SCALE	Used to inform policy, planning and project recommendations to prepare for 10+ years out
Action requested by December 2019	Expect to request action in 2020 or 2021

Mid-Term Needs Approach:

- Validate and build upon needs identified in VTrans2040 (travel markets)
- Tie measures to VTrans Goals and Objectives
- Introduce new/improved data sources and new measures in line with federal performance reporting requirements
- Coordinate with regional and local stakeholders to update needs

TRAVEL MARKETS & MID-TERM NEEDS ANALYSIS

	CoSS	Regional Networks	UDA	Safety (Statewide)
Starting Point	Full Analysis of CoSS	VTrans2040 RN needs	VTrans2040 UDA needs	Full analysis of PSI locations
How will measures be used?	Identification of new needs	Validate of previously identified needs and identification of new needs	Needs must support UDA legislative requirements (§ 15.2-2223.1)	Identification of new needs
Stakeholder engagement required	Review and comment on identified needs	Regional workshops for needs identification with MPOs, PDCs, and localities	Survey/Needs questionnaire with localities	Review and comment on identified needs

SCHEDULE AND OPPORTUNITIES FOR FEEDBACK

Date	VTrans Task	Public and Agency Feedback
May-early June	Presentations to MPO's	Feedback from MPO staff and localities Confirm activity centers Confirm UDAs
Late May	Webinar - same as presentation to MPOs	Feedback from PDCs without MPOs; localities that are not represented on MPO boards
Early June	Webinar on UDA methodology and Instructions to Localities	Localities with UDAs to fill-out a survey
June 18th	Presentation to CTB	Opportunity for public and agencies to comment
July-early August	Workshop at MPO's Webinar	Feedback from MPO staff and localities

TRENDS ANALYSIS: VTRANS VULNERABILITY ASSESSMENT

VTRANS VULNERABILITY ASSESSMENT (BACKGROUND)

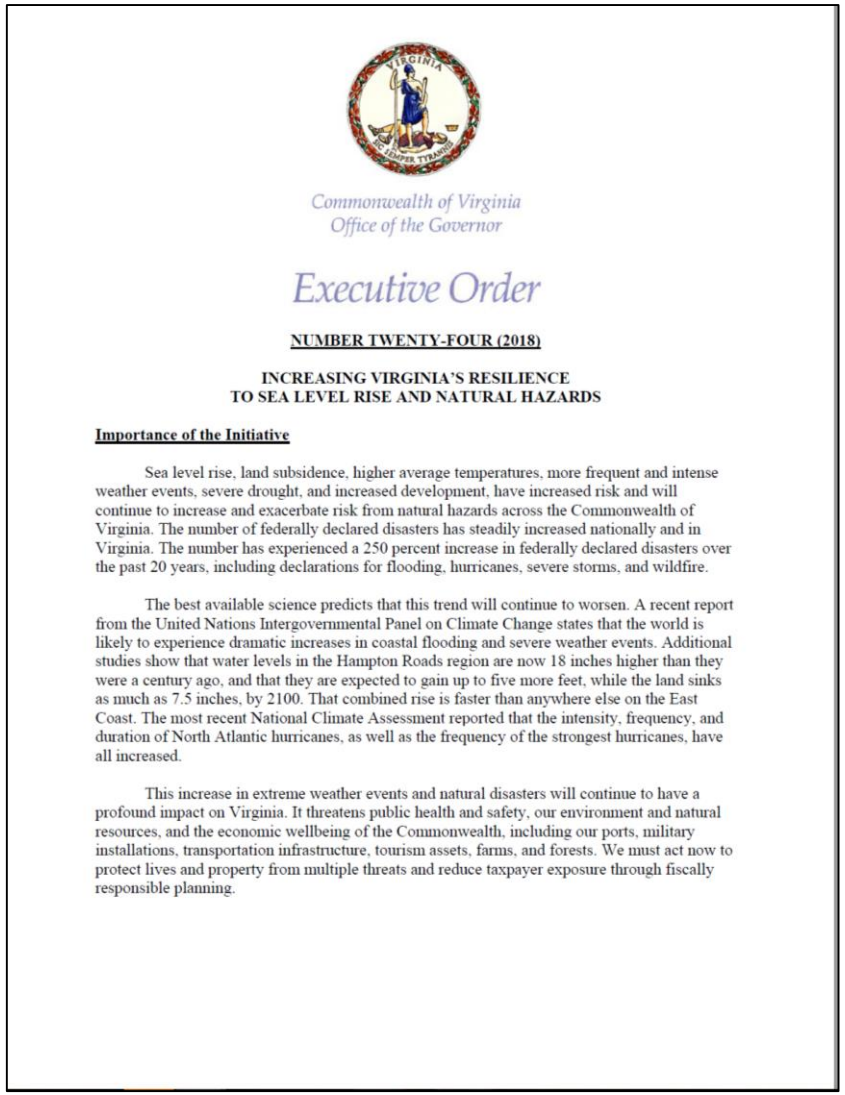
- Objective:
  - Conduct a screening-level analysis of the vulnerability of Virginia's transportation system to current and future flood hazards.
  - Understand the magnitude of needs required to preserve a resilient and reliable transportation system.
- Hazards:
  - Sea level rise, storm surge, inland/riverine flooding
- Modes:
  - Primary focus: major highways, bridges on major highways
  - Secondary focus: rail, transit, ports, airports, etc.

VTRANS VULNERABILITY ASSESSMENT (BACKGROUND)

- Executive Order Number 24 (2018): Increasing Virginia's Resilience to Sea Level Rise and Natural Hazards

- "This increase in extreme weather events and natural disasters will continue to have a profound impact on Virginia. It threatens public health and safety, our environment and natural resources, and the economic wellbeing of the Commonwealth, including our ports, military installations, transportation infrastructure, tourism assets, farms, and forests."

- "The Chief Resilience Officer shall work collaboratively within state government and with assistance from regional, state, and national experts and stakeholders, to issue, within 180 days from issuance of this Order, a regional or statewide sea level rise projection……In creating this standard, the Chief Resilience Officer shall consult with: the Secretary of Administration, the Secretary of Commerce and Trade, the Secretary of Finance, the Secretary of Transportation, and the Virginia Institute of Marine Science."



Commonwealth of Virginia
Office of the Governor

Executive Order

NUMBER TWENTY-FOUR (2018)

INCREASING VIRGINIA'S RESILIENCE
TO SEA LEVEL RISE AND NATURAL HAZARDS

Importance of the Initiative

Sea level rise, land subsidence, higher average temperatures, more frequent and intense weather events, severe drought, and increased development, have increased risk and will continue to increase and exacerbate risk from natural hazards across the Commonwealth of Virginia. The number of federally declared disasters has steadily increased nationally and in Virginia. The number has experienced a 250 percent increase in federally declared disasters over the past 20 years, including declarations for flooding, hurricanes, severe storms, and wildfire.

The best available science predicts that this trend will continue to worsen. A recent report from the United Nations Intergovernmental Panel on Climate Change states that the world is likely to experience dramatic increases in coastal flooding and severe weather events. Additional studies show that water levels in the Hampton Roads region are now 18 inches higher than they were a century ago, and that they are expected to gain up to five more feet, while the land sinks as much as 7.5 inches, by 2100. That combined rise is faster than anywhere else on the East Coast. The most recent National Climate Assessment reported that the intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest hurricanes, have all increased.

This increase in extreme weather events and natural disasters will continue to have a profound impact on Virginia. It threatens public health and safety, our environment and natural resources, and the economic wellbeing of the Commonwealth, including our ports, military installations, transportation infrastructure, tourism assets, farms, and forests. We must act now to protect lives and property from multiple threats and reduce taxpayer exposure through fiscally responsible planning.

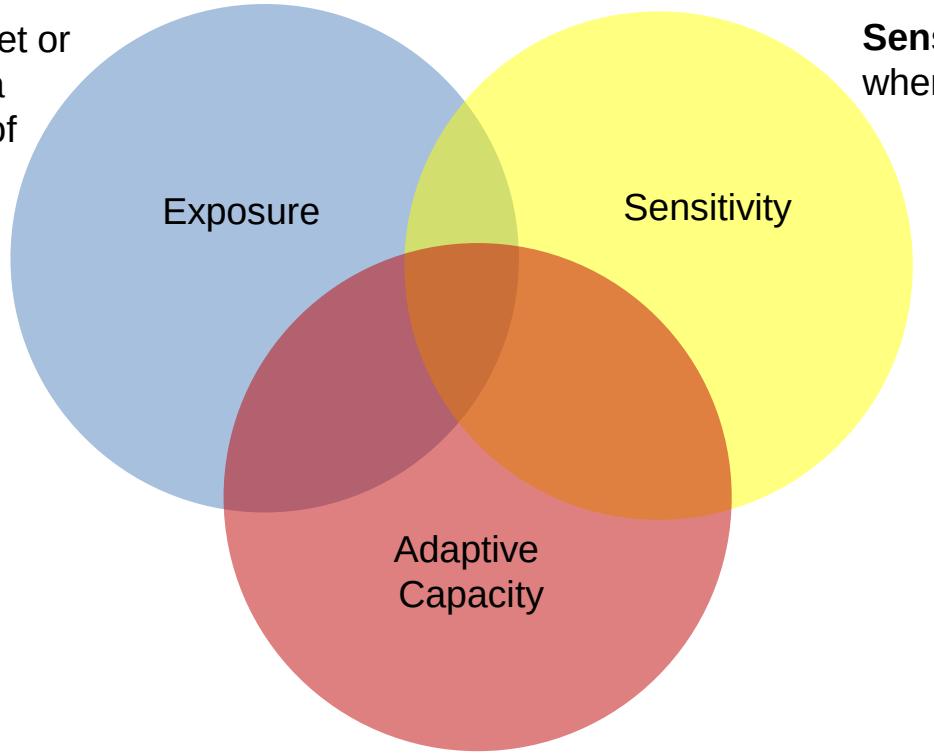
VTrans Vulnerability Assessment

- **Define Vulnerability & Resilience**
  - Important to establish a common nomenclature and foundational definitions of these terms.
  - No standard definition for resilience in the transportation or infrastructure context. However, the definitions used are fundamentally similar across the literature.
    - Definition of Resiliency in *FHWA Order 5520 (2014): Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events* - Resilience or resiliency is the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.
  - OIPI is completing a review of existing definitions of vulnerability & resilience to inform recommended definitions for VTrans.

VTRANS VULNERABILITY ASSESSMENT

- Vulnerability (FHWA): A function of an asset or systems exposure, sensitivity and adaptive capacity.

Exposure: whether the asset or system is located in an area experiencing direct effects of climate variables.



Sensitivity: how the asset or system fares when exposed to a climate variable.

Adaptive capacity: the system's ability to adjust to or cope with existing climate variability or future climate impacts.

Vulnerability Assessment (Definition of Resilience)

Examples of existing definitions of resilience

Agency	Definition
Hampton Roads Planning District Commission	The ability to recovery quickly with minimal lasting damage from an event
Minnesota DOT	Reducing vulnerability and ensuring redundancy and reliability to meet essential travel needs
Wisconsin DOT	A resilient transportation system is able to quickly respond to unexpected conditions and return to its usual operational state
USGCRP	A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment
Colorado DOT	Resiliency incorporates extreme weather, economic adversity, emergency management, and security
Rockingham Planning Commission (Exeter, NH)	Capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment
Arkansas DOT	The ability to reduce the possibility of failure, adapt and recover from a disruptive event and/or gradual external changes over time. It also implies transformation, so not only is the infrastructure service able to survive or recover but it can adapt to a changing environment in which it operates
Delaware DOT	Encompass[ing] the ability to withstand and recover from an incident in order to provide critical transportation services during the incident and through the recovery process
Caltrans	*Resilient transportation facilities*: Transportation facilities that are designed and operated to reduce the likelihood of disruption or damage due to changing weather conditions.

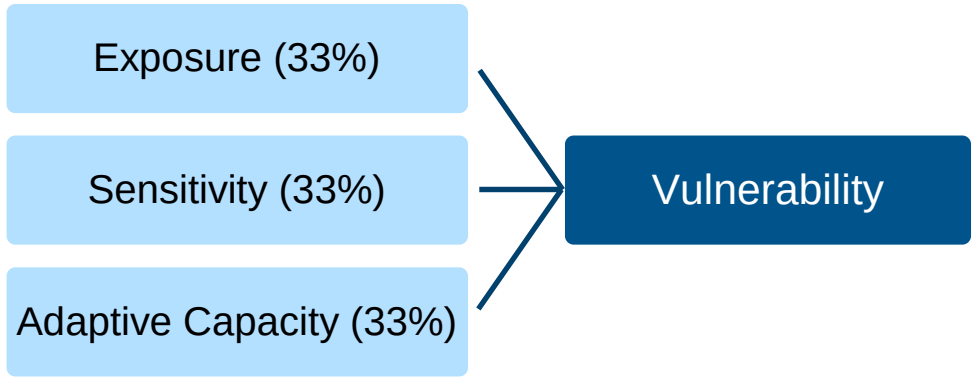
VTRANS VULNERABILITY ASSESSMENT (LITERATURE REVIEW)

- Objective:
  - Ensure consistency in the methodology and data used with other assessments.
  - Build upon the findings of past studies:
    - Multi-state and statewide assessments
      - Commonwealth of Virginia Hazard Mitigation Plan
      - Recurrent Flooding Study for Tidewater Virginia
      - Virginia and the Surging Sea: A vulnerability assessment with projections for sea level rise and coastal flood risk
      - Climate Change Vulnerabilities in the Coastal Mid-Atlantic Region
    - Local assessments
      - Numerous Hampton Roads studies on sea level rise *(HRPDC)*
      - Eastern Shore of Virginia Transportation Infrastructure Inundation Vulnerability Assessment *(Accomack-Northampton PDC)*

VTRANS VULNERABILITY ASSESSMENT (METHOD)

- For each indicator, we will develop a 4-point scale
  - 1 is less vulnerable
  - 4 is more vulnerable
  - May consider continuous scale for indicators like asset value
- Scores will be weighted and summed to calculate a final vulnerability score between 1 and 4
  - Separate scores will be calculated for each asset and hazard combination

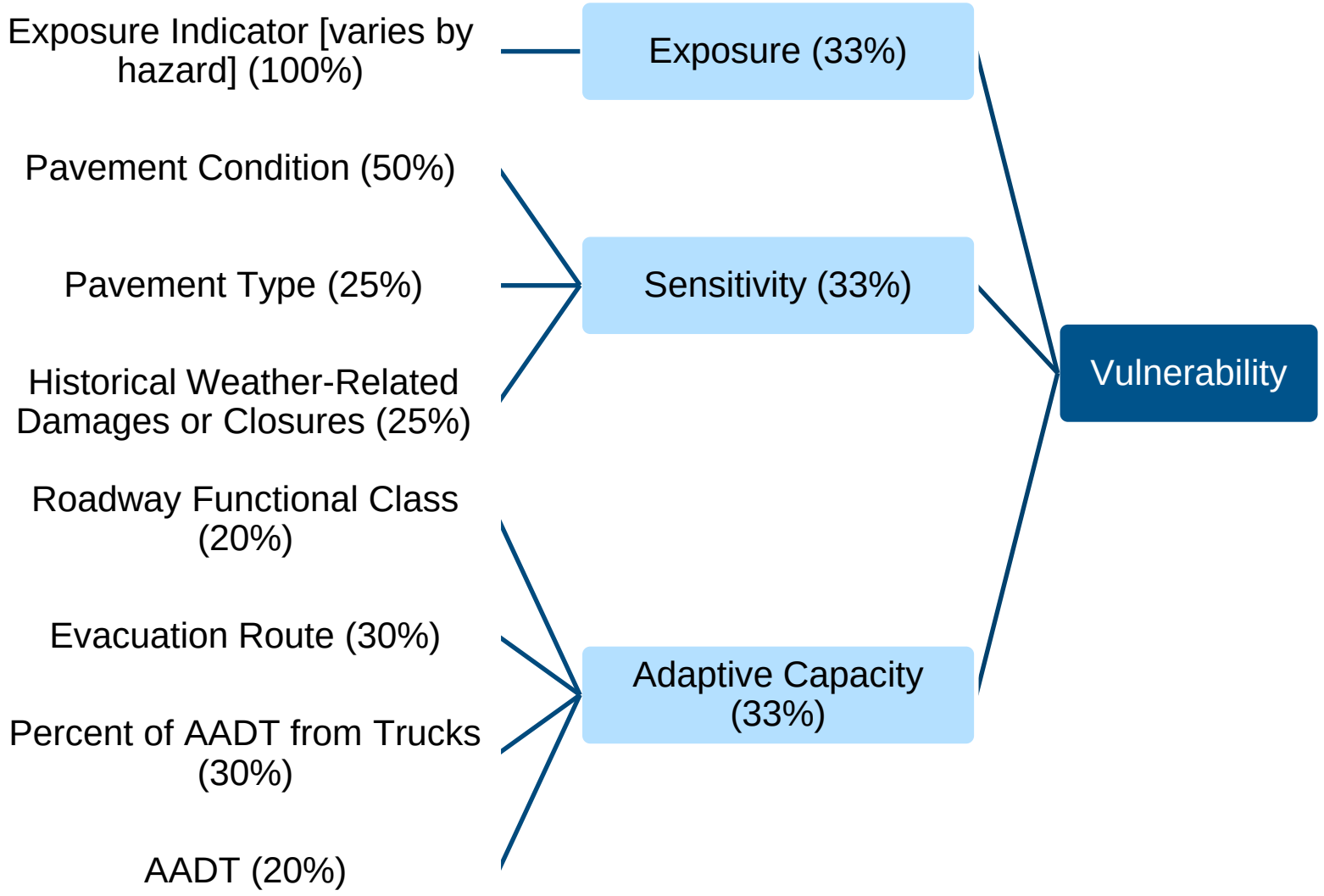
VTRANS VULNERABILITY ASSESSMENT (METHOD - ROADS)



Hazard	Indicator	Bridge	Road
Exposure			
Sea Level Rise	Inundation from Low, Intermediate, and Extreme Sea Level Rise Scenarios	✓	✓
Storm Surge	Inundation from Category 1, 2, 3, and 4 Hurricanes	✓	✓
Inland/ Riverine Flooding	Location Relative to Federal Emergency Management Agency (FEMA) Flood Zone	✓	✓
Sensitivity			
All Hazards	Bridge Age	✓	
	Deck Rating	✓	
	Superstructure Rating	✓	
	Substructure Rating	✓	
	Scour Criticality	✓	
	Historical weather-related damages or closures	✓	✓
	Bridge Underclearance	✓	
	Pavement Condition		✓
	Pavement Type		✓
Adaptive Capacity			
All Hazards	Roadway Functional Class	✓	✓
	Evacuation Route	✓	✓
	Percent of Annual Average Daily Traffic (AADT) from Trucks or Truck AADT	✓	✓
	AADT	✓	✓

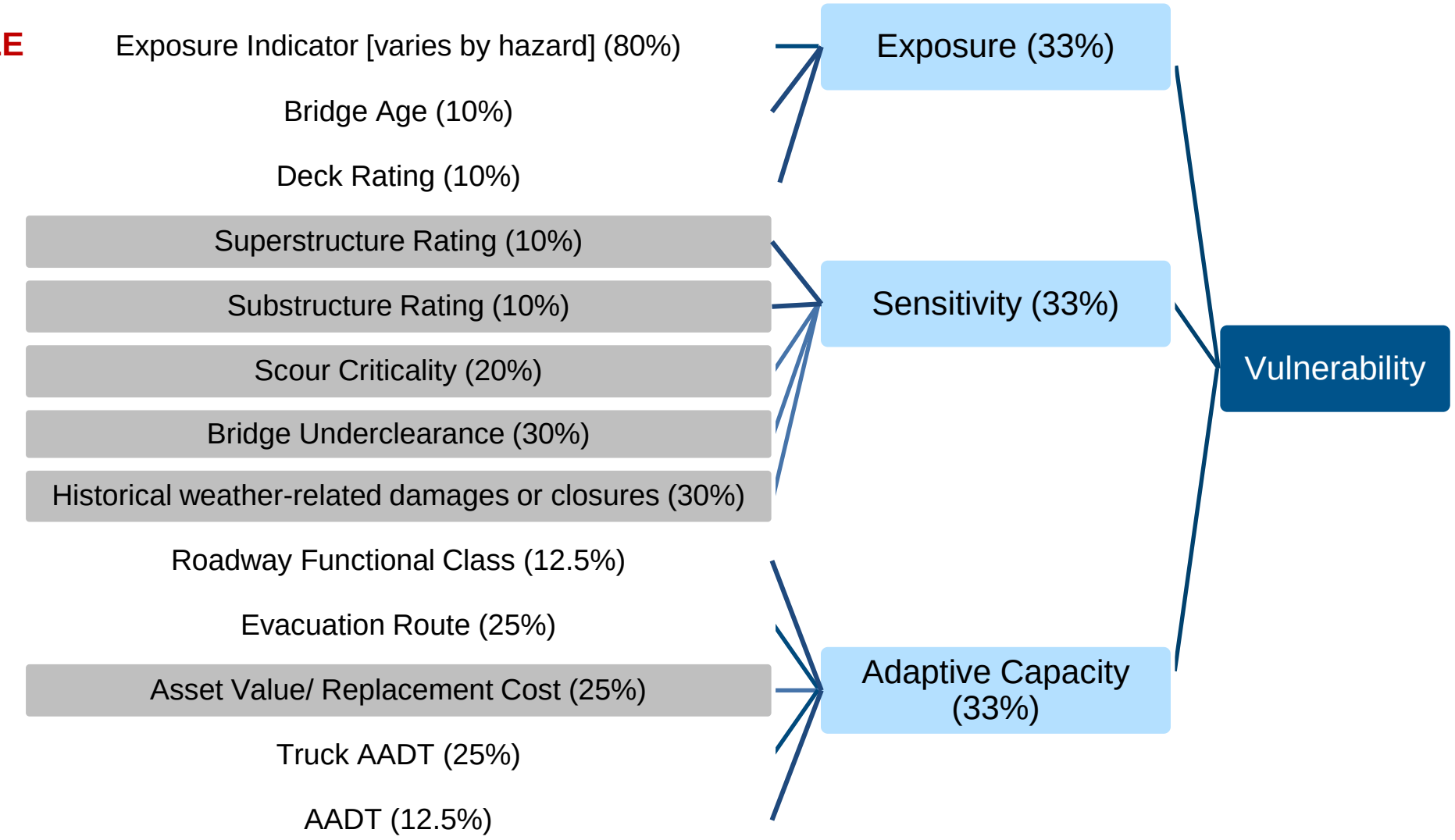
VTRANS VULNERABILITY ASSESSMENT (METHOD - ROADS)

EXAMPLE



VTRANS VULNERABILITY ASSESSMENT (METHOD - BRIDGE)

EXAMPLE



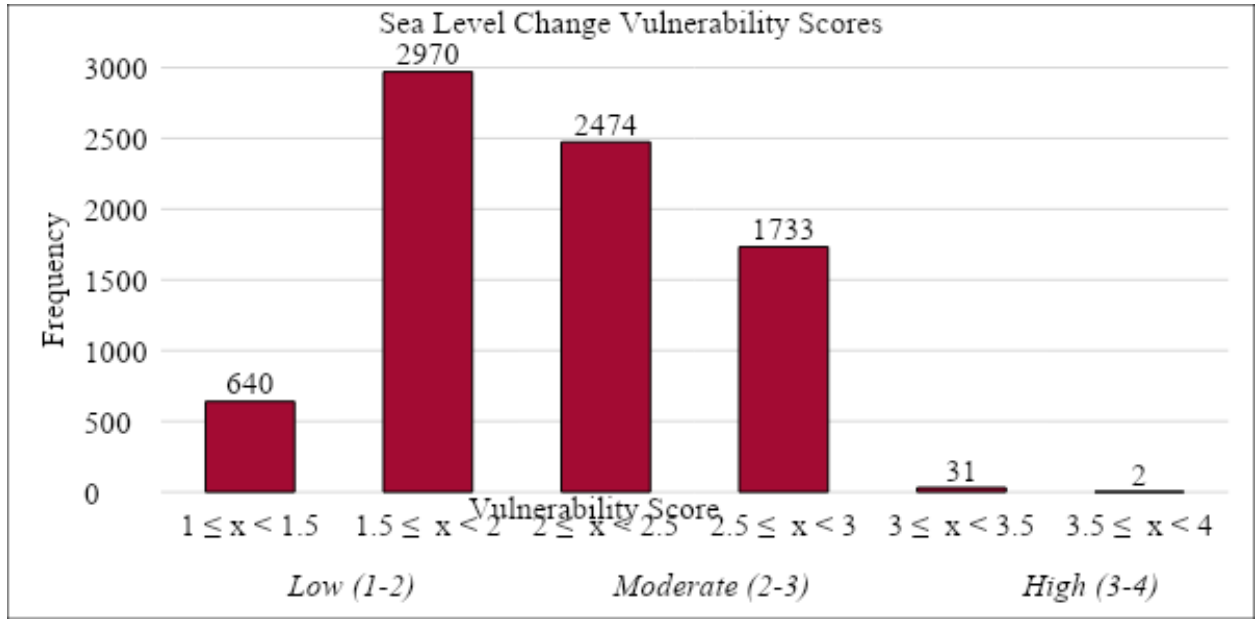
VTRANS VULNERABILITY ASSESSMENT (METHOD – TRANSIT & RAIL)

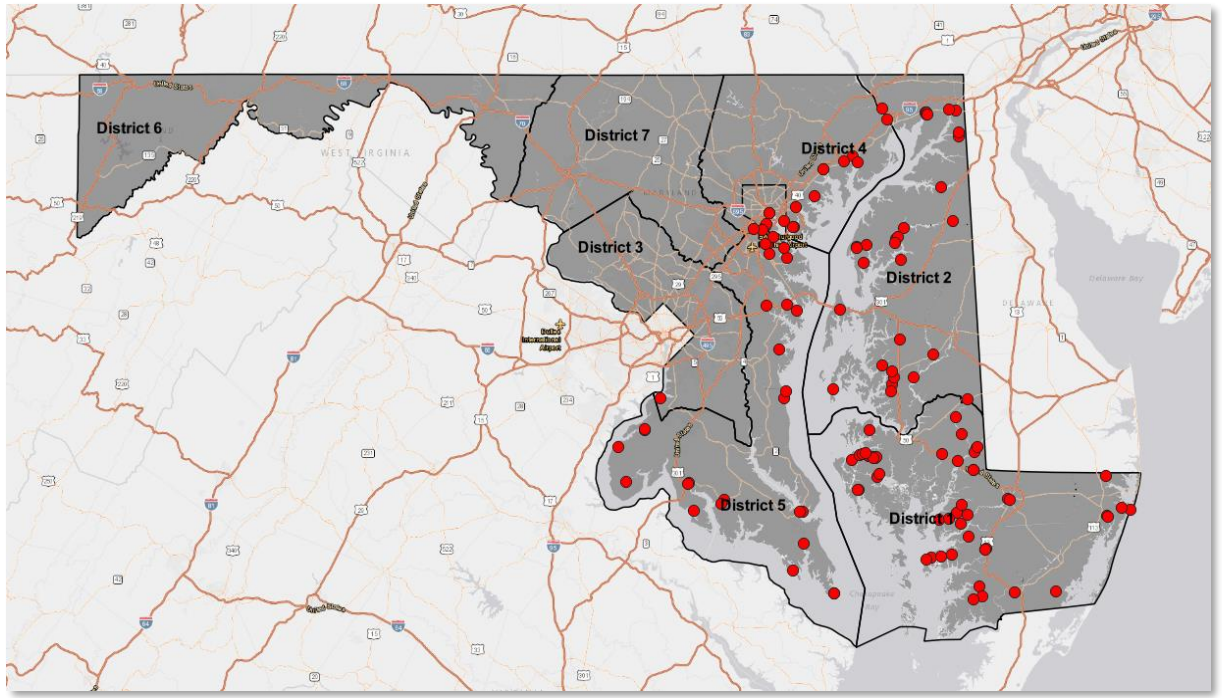
- Qualitative assessment for intermodal and multimodal facilities
  - Passenger rail, freight rail, freight intermodal, ports, transit, park and ride and HOV through a qualitative assessment of vulnerability

- Qualitative assessment of sensitivity and adaptive capacity for each asset type
  - Assessment will include a review of existing relevant studies for Virginia and key information from the FHWA Sensitivity Matrix

VTRANS VULNERABILITY ASSESSMENT (OUTCOMES)

- Maps and spreadsheets/charts of most and least vulnerable assets
  - For example, Maryland DOT State Highway Administration's results are visualized as follows:





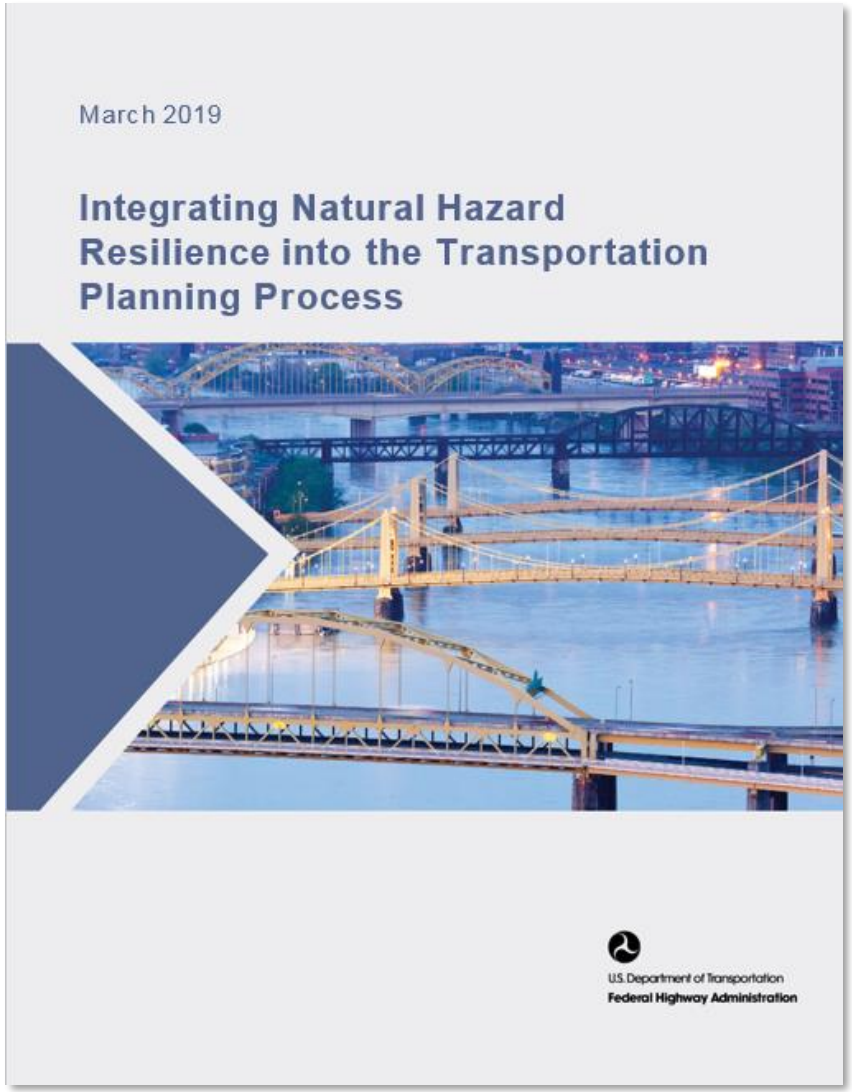
Source: MDOT SHA

VTRANS VULNERABILITY ASSESSMENT (DECISION MAKING)

- **Best practices on refocusing investment decisions to address vulnerability**
  - Literature review and interviews with select DOTs/MPOs
  - Preliminary findings: Hillsborough MPO (FL) developed various investment scenarios to address the vulnerabilities identified in their region.
- **Enhanced Coordination with Virginia Department of Emergency Management**
  - Interviews with VDOT and DRPT managers
  - Interviews with Emergency Management staff
  - Policy recommendations

VTRANS VULNERABILITY ASSESSMENT (DECISION MAKING)

- **Guidance on how to use the vulnerability results in planning and investment decision-making**
  - FHWA report titled: *Integrating Natural Hazard Resilience into the Transportation Planning Process*
  - This report can serve as the starting point for discussions and/or workshops on how to integrate resilience into decision making.



QUESTIONS/DISCUSSION

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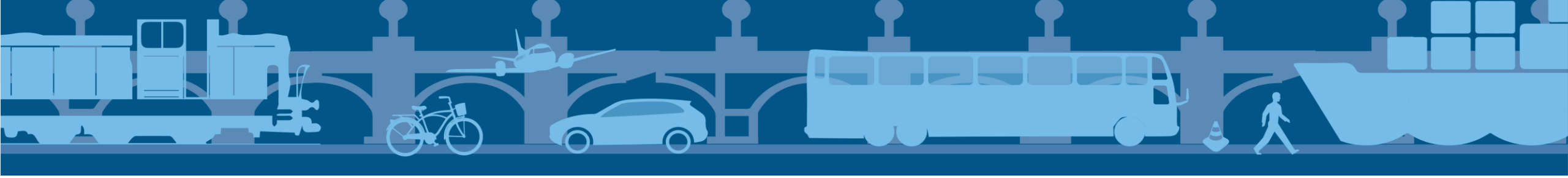

THANK YOU!

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