



COMMONWEALTH of VIRGINIA  
*Office of the*  
SECRETARY of TRANSPORTATION

## VTrans Long-term Risk & Opportunity Register

Northern Virginia Transportation Authority:  
Regional Jurisdiction and Agency Coordinating Committee (RJACC)

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Virginia Office of Intermodal Planning and Investment

September 23, 2021



## TODAY'S PRESENTATION: PURPOSE

- Present Draft Policy:  
Development and Monitoring of VTrans Long-term Risk & Opportunity Register
- Review one Megatrend

# COMPONENTS OF VTRANS

1  
CTB's Vision, Guiding Principles, Goals and Objectives

2  
VTrans Mid-term Needs: Identification and Prioritization

3  
VTrans Long-term Risk & Opportunity Register

4  
Strategic Actions (Recommendations)

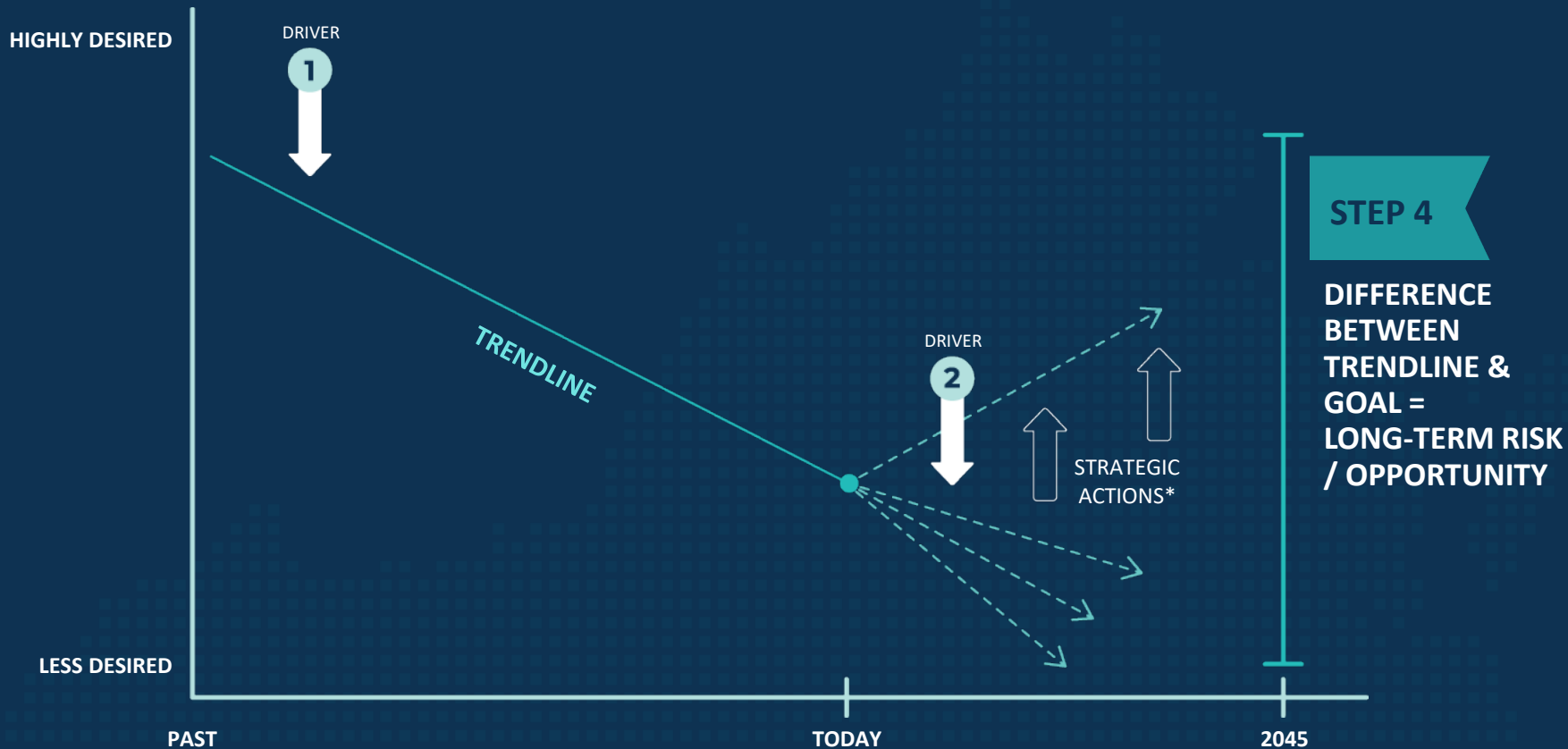


JAN 2020

JAN 2020  
MARCH 2021

BY THE END OF 2021

# CONTEXT & OVERVIEW: APPROACH



STEP 1 IDENTIFY MEGA- & MACROTRENDS

STEP 2 IDENTIFY SURROGATES FOR CTB GOALS

STEP 3 ESTIMATE IMPACTS OF MACROTRENDS ON SURROGATES

STEP 4 DEVELOP VTRANS LONG-TERM RISK  
& OPPORTUNITY REGISTER

STEP 5 TRACK MACROTRENDS FOR ANNUAL REPORTING

# IDENTIFY MEGA- & MACROTRENDS: CLIMATE CHANGE MACROTRENDS

CLIMATE CHANGE MACROTRENDS	SUMMARY OF KNOWN IMPACTS <sup>3</sup>
<ul style="list-style-type: none"> <li>Air Quality<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>Impact on health and quality of life<sup>1</sup></li> </ul>
<ul style="list-style-type: none"> <li>Extreme sea levels<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Traffic (vehicles and rail/transit service) disruptions</li> <li>Damage to transportation infrastructure</li> <li>Impact on structure and pavement life cycles</li> </ul>
<ul style="list-style-type: none"> <li>Tropical cyclones: precipitation<sup>2</sup></li> <li>Tropical cyclones: proportion of intense cyclones<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Traffic (vehicles and rail/transit service) disruptions</li> <li>Damage to transportation infrastructure</li> <li>Impact on structure and pavement life cycles</li> </ul>
<ul style="list-style-type: none"> <li>Heavy precipitation events<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Traffic (vehicles and rail/transit service) disruptions</li> <li>Damage to transportation infrastructure due to landslides and washouts</li> <li>Impact on structure and pavement life cycles</li> </ul>
<ul style="list-style-type: none"> <li>Warm/hot extremes<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Reduced visibility due to wildfires caused by extreme temperatures</li> <li>Limits to construction activities (due to heat waves)</li> <li>Damage to transportation infrastructure</li> <li>Impact on structure and pavement life cycles</li> <li>Impact on rail infrastructure life cycle</li> <li>Impact on vehicle longevity (vehicles last for shorter periods)</li> </ul>
<ul style="list-style-type: none"> <li>Cold extremes<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Impact on structure and pavement life cycles</li> <li>Impact on vehicle longevity (vehicles last for shorter periods)</li> </ul>
<ul style="list-style-type: none"> <li>Agricultural, ecological droughts<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Impacts on health and quality of life</li> </ul>
<ul style="list-style-type: none"> <li>Compound events<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Combination of the items above</li> </ul>
<ul style="list-style-type: none"> <li>Marine heatwaves<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>Impacts of vessels and sea lanes</li> </ul>

<sup>1</sup>Centers for Disease Control and Prevention; <sup>2</sup>United Nation's Intergovernmental Panel on Climate Change, Sixth Assessment; <sup>3</sup>United States Environmental Protection Agency

# IDENTIFY MEGA- & MACROTRENDS

MEGATREND

**IMPACT OF CLIMATE  
CHANGE /  
GREENHOUSE GAS  
EMISSIONS**

MACROTREND



Increase in  
Flooding Risk

- Sea-level Rise
- Storm Surge
- Inland/Riverine Flooding

# IDENTIFY MEGA- & MACROTRENDS

MEGATREND

**IMPACT OF CLIMATE  
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MACROTREND



Increase in  
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**TECHNOLOGICAL  
ADVANCEMENTS**



Adoption of  
Highly  
Autonomous  
Vehicles



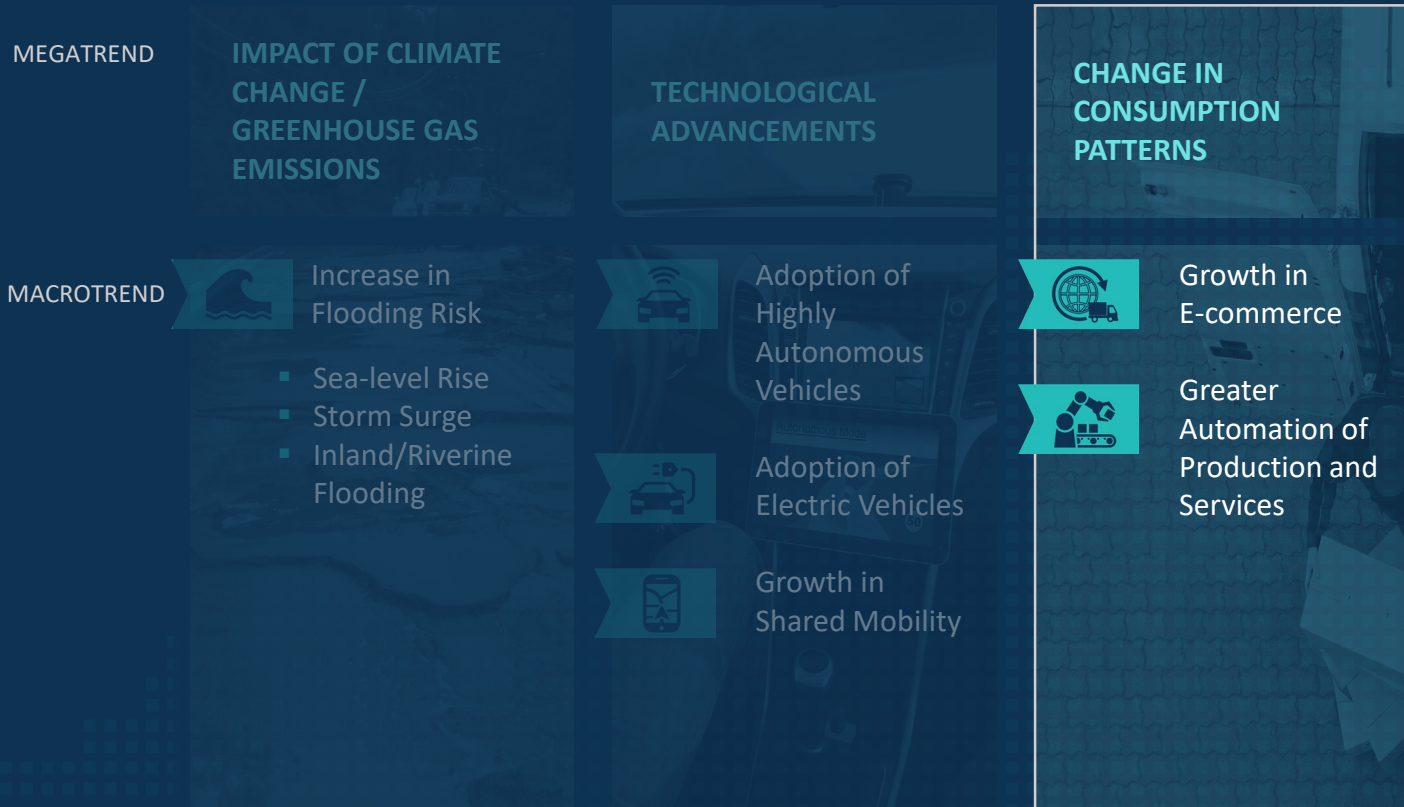
Adoption of  
Electric Vehicles



Growth in  
Shared Mobility



# IDENTIFY MEGA- & MACROTRENDS



# IDENTIFY MEGA- & MACROTRENDS

MEGATREND

IMPACT OF CLIMATE  
CHANGE /  
GREENHOUSE GAS  
EMISSIONS

TECHNOLOGICAL  
ADVANCEMENTS

CHANGE IN  
CONSUMPTION  
PATTERNS

SOCIO-DEMOGRAPHIC /  
EMPLOYMENT  
CHANGES

MACROTREND



Increase in  
Flooding Risk

- Sea-level Rise
- Storm Surge
- Inland/Riverine Flooding



Adoption of  
Highly  
Autonomous  
Vehicles



Adoption of  
Electric Vehicles



Growth in  
Shared Mobility



Growth in E-  
commerce



Greater  
Automation of  
Production and  
Services



Increase in  
Workplace  
Flexibility



Growth of  
Professional  
Service Industry



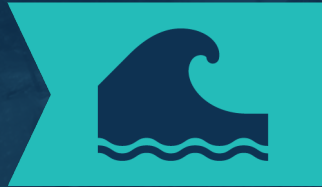
Growth of the  
65+ Cohort



Population and  
Employment  
Shift

## MEGATREND 1:

## IMPACT OF CLIMATE CHANGE / GREENHOUSE GAS EMISSIONS



### MACROTREND 1:

Increase in Flooding Risk due to

- Sea-level Rise
- Storm Surge
- Inland/Riverine Flooding

# IDENTIFY MEGA- & MACROTRENDS: RELATED WORK

Since the initiation of the VTrans work in 2018, there have been several related state-led efforts.

## VIMS Study

Coastal Virginia Transportation  
Infrastructure Inundation Study and  
Virginia Dept of Transportation (VDOT)  
At-Risk Infrastructure Report  
from VIMS & VDOT

## Enhancement to Precipitation Estimates

from the Office of the Governor,  
Secretary of Natural Resources, Special  
Assistant to the Governor for Coastal  
Adaptation and Protection, Department  
of Environmental Quality,  
Commonwealth Center for Recurrent  
Flooding Resiliency (CCRFR), & VDOT

## Virginia Coastal Resilience Master Plan

from Office of the Governor, Secretary of  
Natural Resources, Special Assistant to  
the Governor for Coastal Adaptation and  
Protection, & DCR

## Other State Efforts

- ▶ Joint Subcommittee on Coastal Flooding, Report
- ▶ Commonwealth Center for Recurrent Flooding Resiliency
- ▶ Joint Commission on Technology and Science – Coastal Areas: Study on Economic Consequences of Weather-Related Events

# IDENTIFY SURROGATES FOR CTB GOALS


	GOALS	SURROGATES FOR CTB GOALS
	Economic Competitiveness and Prosperity	Vehicle Miles Traveled (VMT)
	Accessible and Connected Places	Switch to Shared Mobility
	Safety for All Users	Number of Crashes Involving Fatalities and Serious Injuries
	Proactive System Management	Roadways At Risk from Flooding
	Healthy Communities & Sustainable Transportation Communities	Tailpipe Emissions

# ESTIMATE IMPACTS OF TRENDS ON SURROGATES FOR GOALS

For each hazard, three scenarios or estimates of impacts have been developed to account for uncertainties.

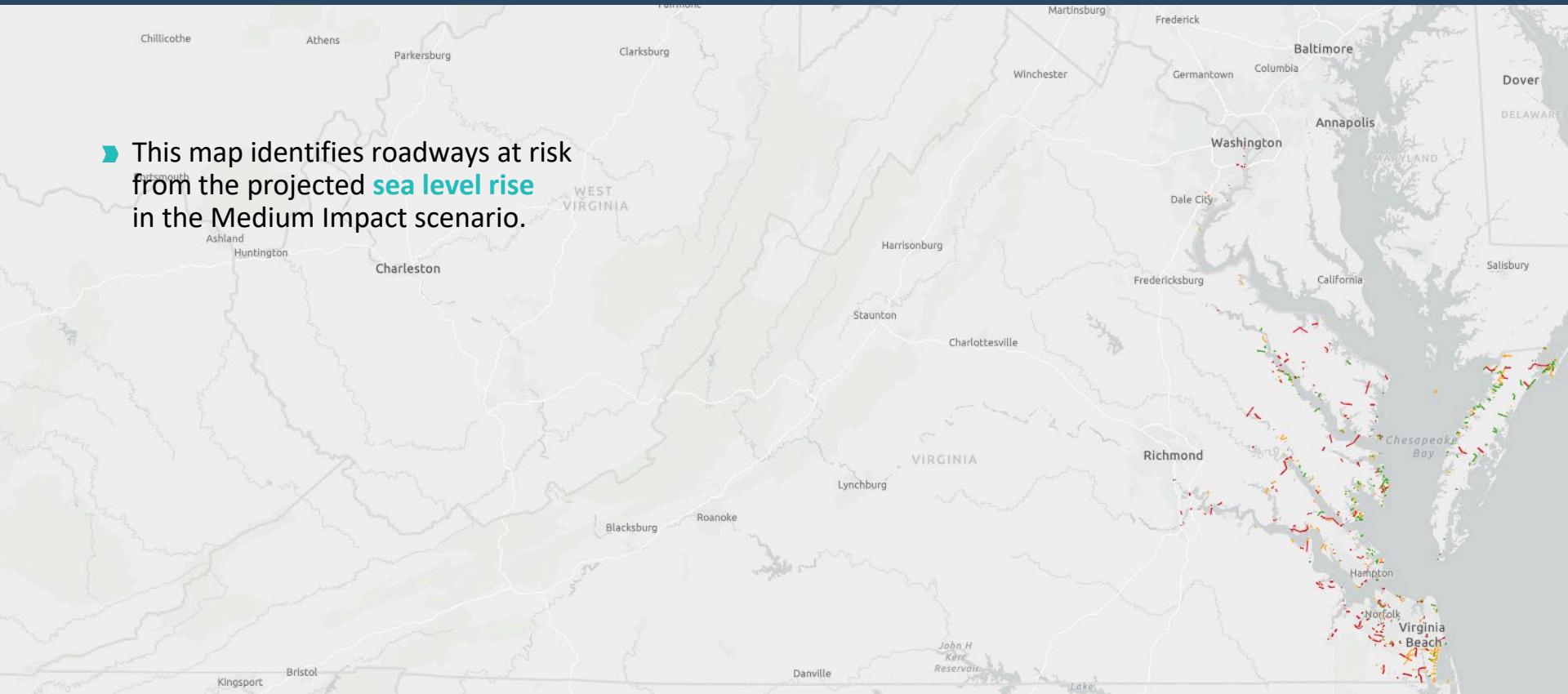
## SCENARIOS BY IMPACT

HAZARD	LOW	MEDIUM	HIGH
<b>SEA LEVEL RISE</b>	<ul style="list-style-type: none"> <li>Intermediate sea level rise scenario (Year 2040)</li> </ul>	<ul style="list-style-type: none"> <li>Intermediate-high sea level rise scenario (Year 2040)</li> </ul>	<ul style="list-style-type: none"> <li>Extreme sea level rise scenario (Year 2040)</li> </ul>
<b>STORM SURGE</b>	<ul style="list-style-type: none"> <li>Category 2 hurricane storm surge</li> </ul>	<ul style="list-style-type: none"> <li>Category 3 hurricane storm surge</li> </ul>	<ul style="list-style-type: none"> <li>Category 4 hurricane storm surge</li> </ul>
<b>INLAND/RIVERINE FLOODING</b>	<ul style="list-style-type: none"> <li>100-year flood zone AND</li> <li>Historical weather-related damages or closures</li> </ul>	<ul style="list-style-type: none"> <li>500-year flood zone AND</li> <li>Historical weather-related damages or closures</li> </ul>	<ul style="list-style-type: none"> <li>500-year flood zone with a buffer AND</li> <li>Historical weather-related damages or closures</li> </ul>


  
 INCREASING IMPACT

# ESTIMATE IMPACTS OF TRENDS ON SURROGATES FOR GOALS

► This map identifies roadways at risk from the projected **sea level rise** in the Medium Impact scenario.



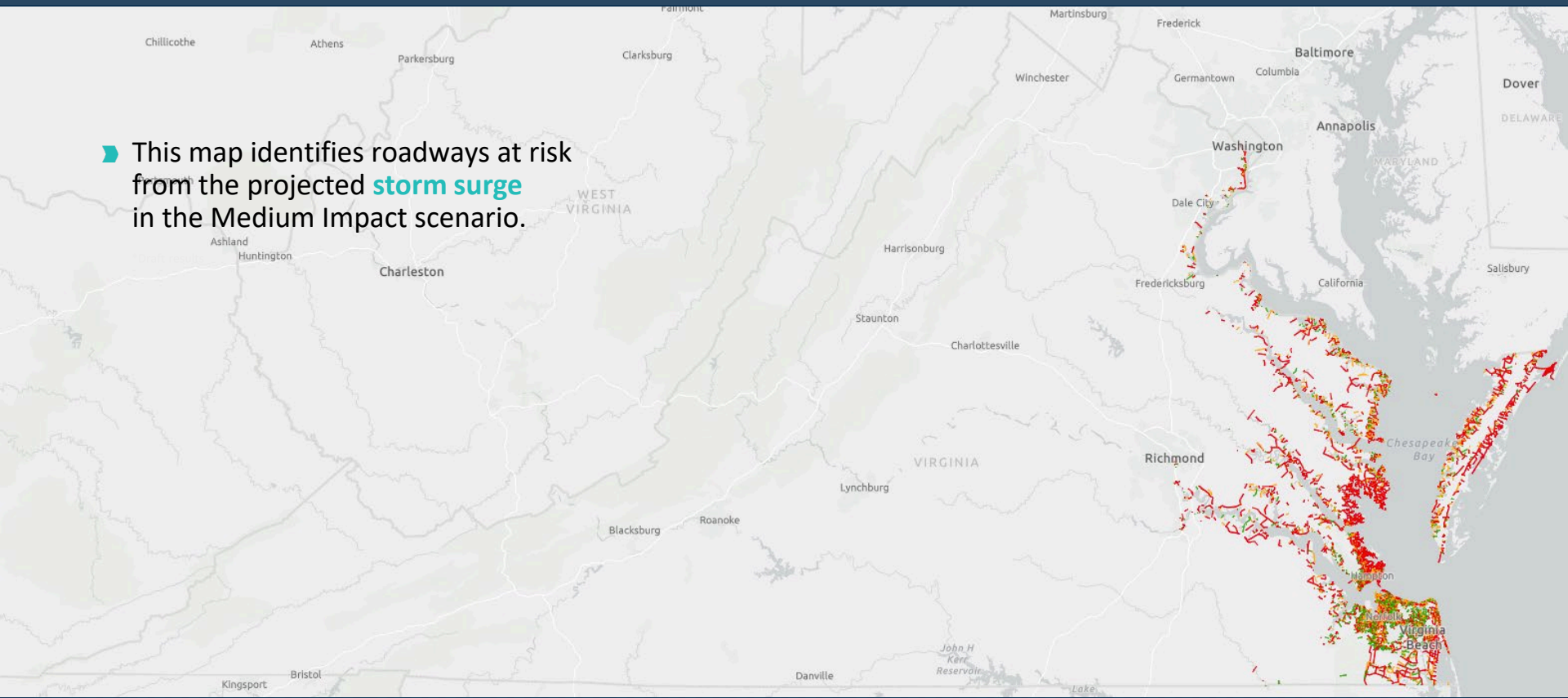
High

Med

Low

# ESTIMATE IMPACTS OF TRENDS ON SURROGATES FOR GOALS

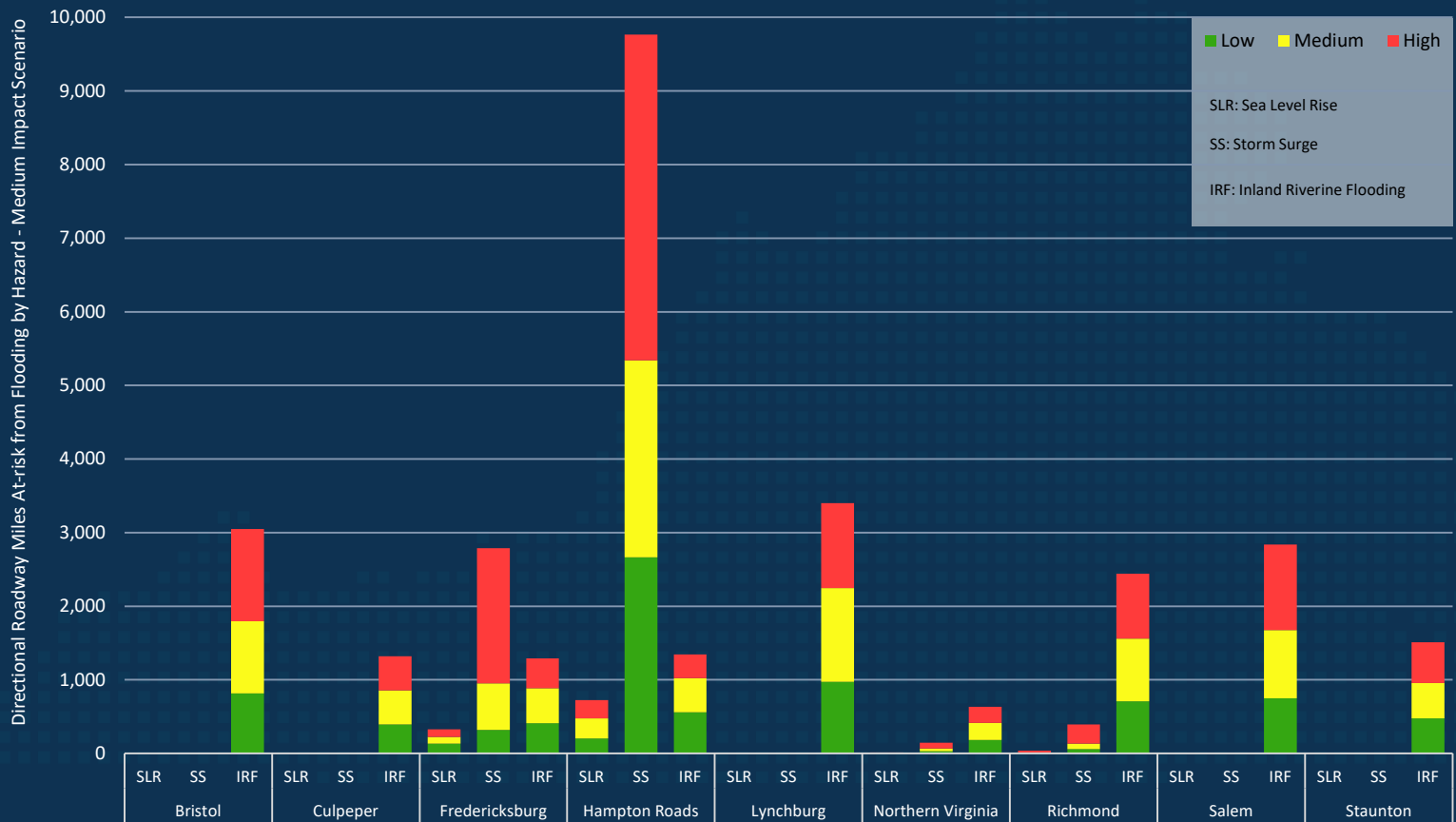
► This map identifies roadways at risk from the projected **storm surge** in the Medium Impact scenario.





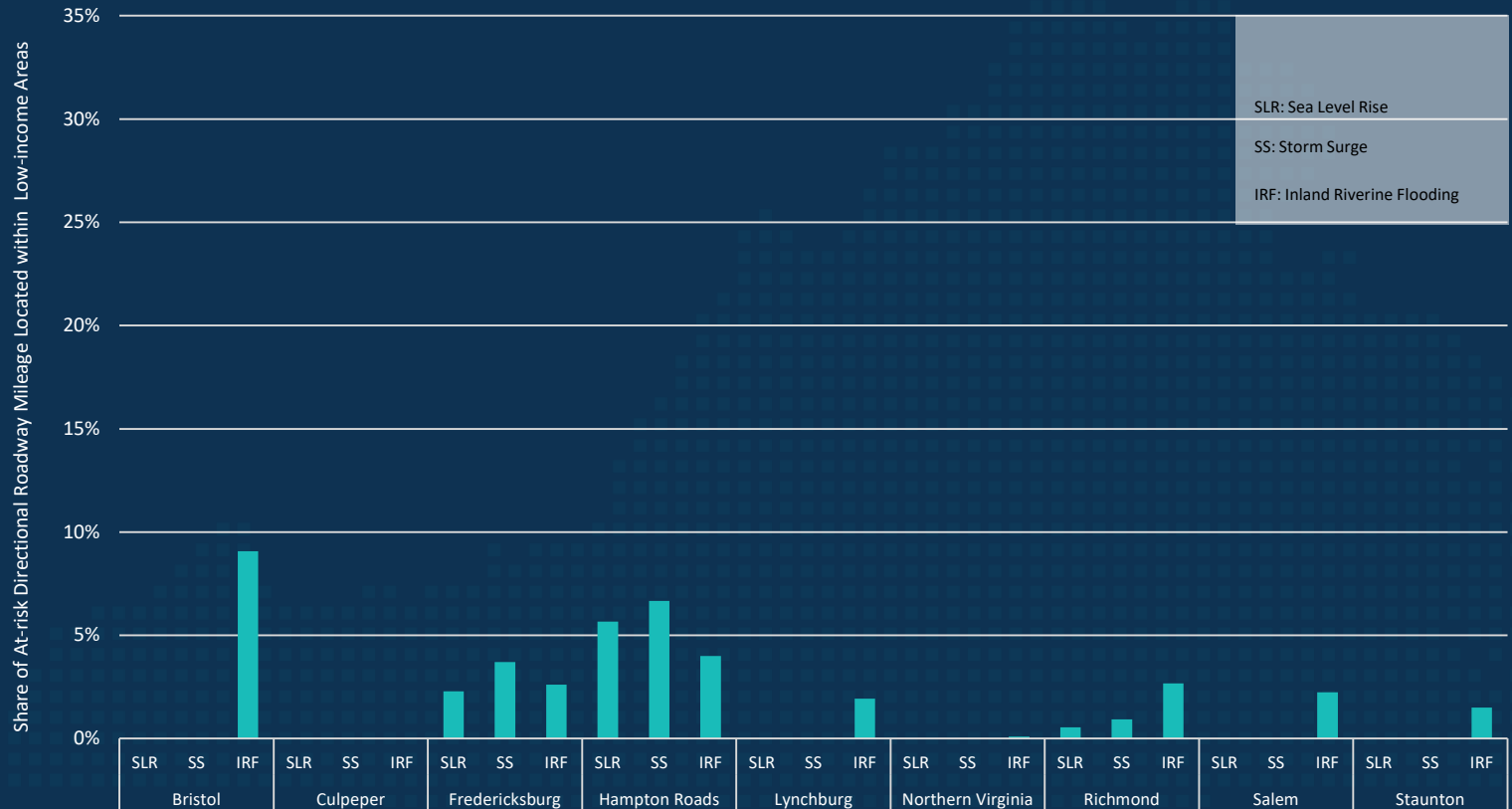
# ESTIMATE IMPACTS OF TRENDS ON SURROGATES FOR GOALS

## Number of Directional Roadway Miles At-risk from Flooding by Hazard



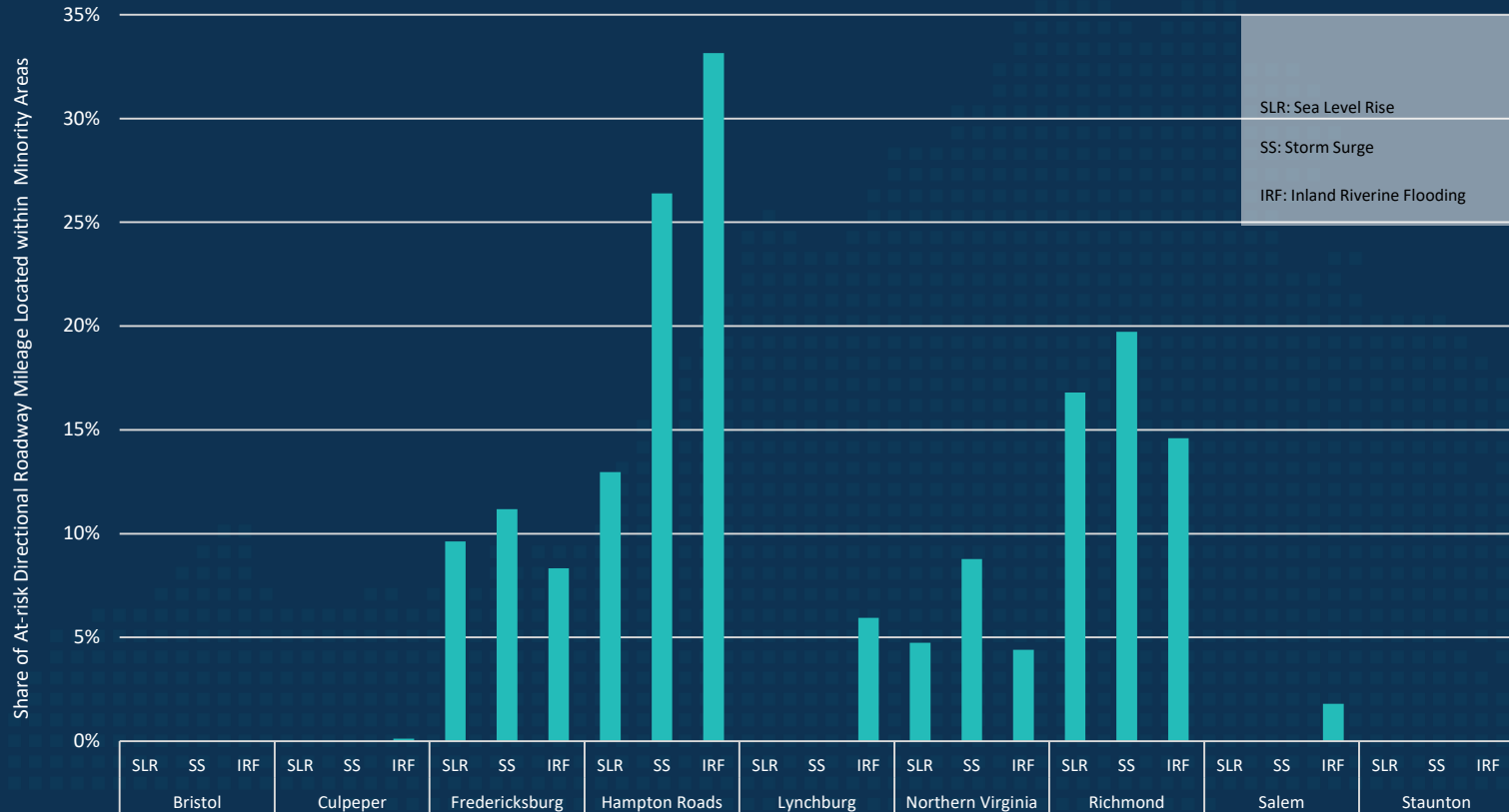
# ESTIMATE IMPACTS OF TRENDS ON SURROGATES FOR GOALS

## Share of At-Risk Roadway Mileage Located in Areas with High Concentration of Low-income Populations



# ESTIMATE IMPACTS OF TRENDS ON SURROGATES FOR GOALS

## Share of At-Risk Roadway Mileage Located in Areas with High Concentration of **Minority Populations**



# DEVELOP VTRANS LONG-TERM RISK & OPPORTUNITY REGISTER

#	Nature	Description of Risk/Opportunity	CTB Goal Addressed					Proximity	Priority
			Goal A	Goal B	Goal C	Goal D	Goal E		
1	Risk	A large number of state's roadways are at risk from flooding					x	Mid-term	
2	Opportunity	Proactively eliminate or mitigate identified flooding risks					x	Mid-term	
3	Risk	Several unknown and unquantified flooding risks might be present					x	Long-term	
4	Risk	Impacts of increased flooding risk are disproportionately higher for certain areas and populations		x			x	Long-term	
5	Opportunity	Increase state's preparedness to address <u>other macrotrends</u> associated with climate patterns megatrend					x	Mid-term	

OIPI will provide annual updates to the Board.

## MACROTREND

## VTRANS TREND TRACKERS



- Number of directional miles at risk from sea level rise
- Number of directional miles at risk from storm surge
- Number of directional miles at risk from inland/riverine flooding



- Market Penetration of Highly Autonomous Vehicles\*
- Attitude and Preferences for Adoption of Highly Autonomous Vehicles\*



- Market Penetration of Electric Vehicles\*
- Attitude and Preferences for Adoption of Electric Vehicles\*








- Access to Shared Mobility Services\*
- Utilization of Shared Mobility Services by Type\*



- Number of Warehouse and Distribution Centers
- Square Footage of Warehouse and Distribution Centers
- Share of E-commerce Sales (Business-to-business, business-to-customers)

# TRACK MACROTRENDS

OIPI will provide annual updates to the Board.

MACROTREND	VTRANS TREND TRACKERS
	<ul style="list-style-type: none"><li>▪ Value output of 3D Printing</li><li>▪ Number of short-range and long-range drone deliveries</li><li>▪ Number of last-mile robotic deliveries</li></ul>
	<ul style="list-style-type: none"><li>▪ Number of Workers with Workplace Flexibility*</li><li>▪ Utilization of Workplace Flexibility*</li></ul>
	<ul style="list-style-type: none"><li>▪ Share of Professional Service Industry</li></ul>
	<ul style="list-style-type: none"><li>▪ Number of Virginias Age 65 or higher</li><li>▪ Share of Age 65+ Cohort</li></ul>
	<ul style="list-style-type: none"><li>▪ VTrans Land Use Vitality Index</li><li>▪ Population</li><li>▪ Employment</li><li>▪ Income</li></ul>

## NEXT STEPS

### In the coming months, OIPI will:

- Gather feedback from CTB members on risks and opportunities.
- Continue outreach and engagement activities. ([Webinar Recording and Material](#); [InteractVTrans Data Explorer](#))
- Present the following at the October CTB Workshop:
  - VTrans Macrotrends #2 through #10
  - Draft list of VTrans Strategic Actions

