

Preparing for Climate Change

Maryland State Highway Administration



Maryland Climate Action Plan

- Maryland Climate Action Plan
 - Required by Governor's Executive Order (January 2007) - Released August 2008
 - Eight Strategies related to Transportation & Land Use assigned to MDOT as lead agency, evaluated in multi-modal working groups
 - Requires SHA to develop a Climate Action Plan to address potential impacts to SHA assets
 - Annual progress reports are presented to Governor O'Malley every November



MD SHA Activities

- Initiated a Climate Change Program in 2009
- Established a Climate Adaptation Team (CAT)
- Drafted a Broad Strategic Plan for Climate Change
- Developed a GIS tool to identify infrastructure (SHA/MdTA) vulnerable to varying intensities of sea-level rise
- Developing a Climate Action Plan, to include a vulnerable infrastructure assessment, for implementation by September 2011



Preparing for Climate Change

- Mitigation - measures to reduce greenhouse gas emissions
 - Highway System Efficiency
 - Reduced Fuel & Energy Use
- Adaptation - Natural or man-made adjustments or actions to accommodate or reduce the adverse consequences of climate change
 - Protect, Strengthen, Elevate or move critical infrastructure
 - Abandon & Disinvest
 - Enhance Redundancy



MITIGATION



Highway System Efficiency

What does this really mean?

Better mobility equals better air quality

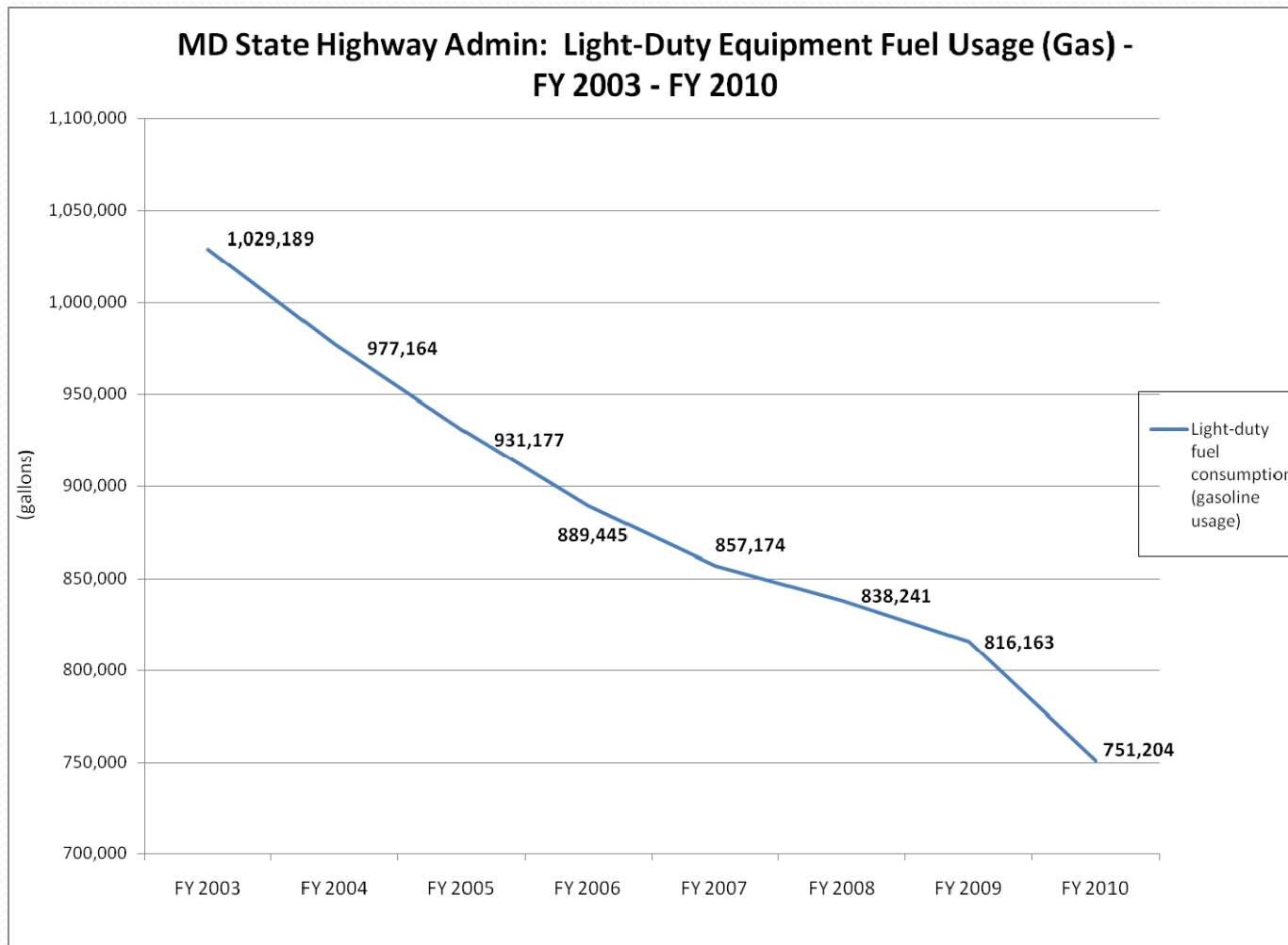
- Focusing on keeping cars moving (TSM/TDM)
- ITS and managed lane strategies
- Moving people
- Mode shifts
- Restructuring capacity (lane widths)
- Recurring congestion vs. non-recurring

Highway System Efficiency

CHART Air Quality Data

Summary of CHART Benefits (2006-2009)					
Reduction due to CHART		2006	2007	2008	2009
Delay (Million Vehicle-hours)	Truck	2.456	2.66	2.09	1.68
	Car	35.09	33.32	29.57	30.75
Total Delay (Million Vehicle-hours)		37.54	35.98	31.66	32.43
Fuel Consumption (Million Gallons)		6.34	6.07	6.39	6.23
Emission (Tons)	HC	490.72	470.41	413.87	424.00
	CO	5,511.54	5,283.47	4,648.42	4,762.25
	NO	235.02	225.29	198.21	203.07
	CO ₂	N/A	N/A	58,977.67	57,098.97

SHA Light-Duty Fuel Usage





ADAPTATION



Predicted Climate Changes

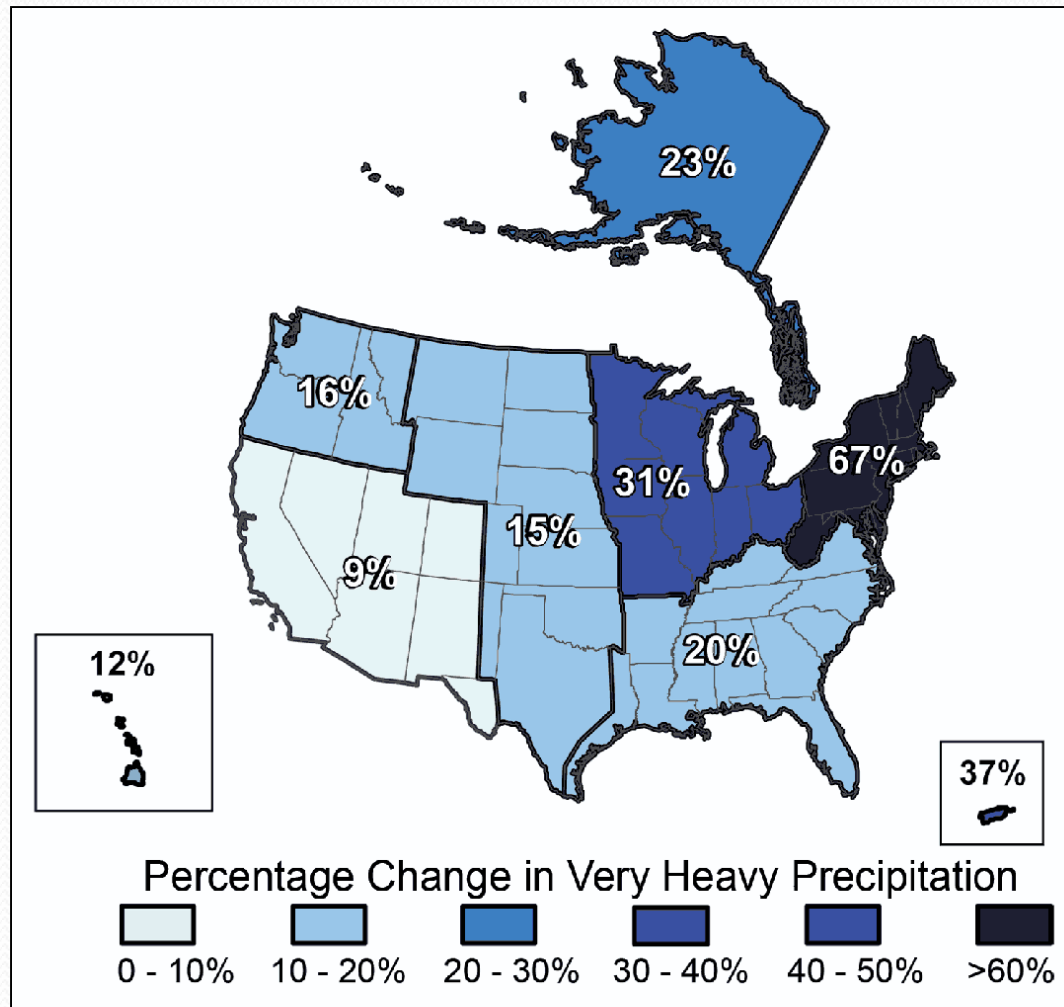
A 2100 Snapshot

- Temperature: +2 degrees F
- Annual Precipitation: -10% to +20%
- More Frequent and Intense Storms
- Stronger Hurricanes
- Sea Level Rise: 3-4 feet (1 to 1.5 meters)
- Spring Runoff: Higher
- Summer Runoff: Lower

Increases in Very Heavy Precipitation

Precipitation

1958-2007





Climate Action Plan

SHA with MdTA will develop a Climate Action Plan and assess infrastructure vulnerable to sea-level rise

- Develop Inventory of Assets, Analyze, & Prioritize
- Gather Climate Information
- Assess the Risk to Assets using predicted impacts from Climate Change
- Develop Strategies to address impacts



Consequences of Climate Change

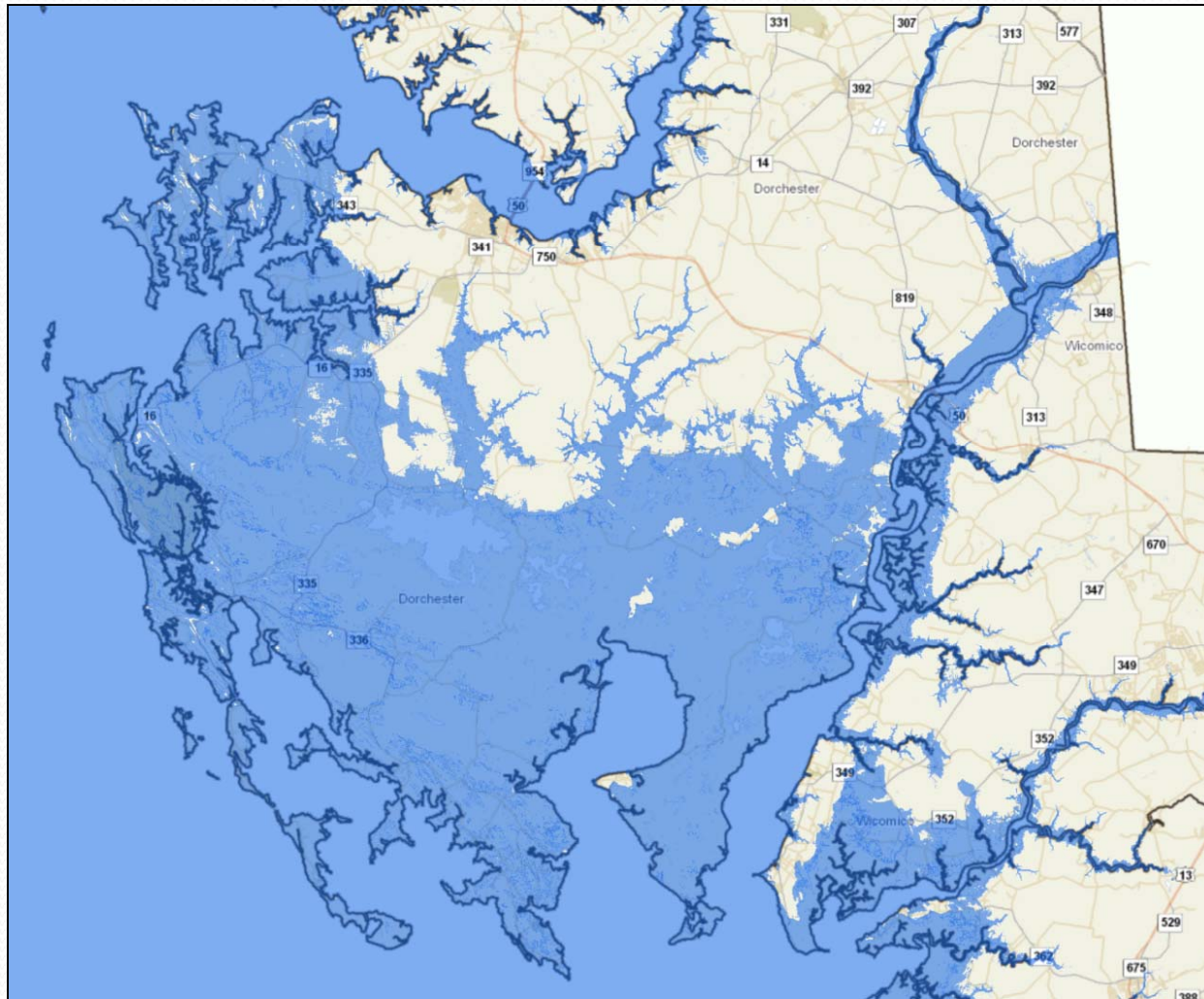
Highway Systems & Engineering must Adapt for :

- Pavement rutting & buckling
- Increased precipitation (spring rain storms & winter snow)
- More frequent and costly evacuations
- Scouring of bridge foundations & failure of bridge decks
- Flooding, Increased 100-Year storm frequency (every 20 years), Power Loss, Traffic Disruptions
- Sea-level Rise Inundation of Coastal areas

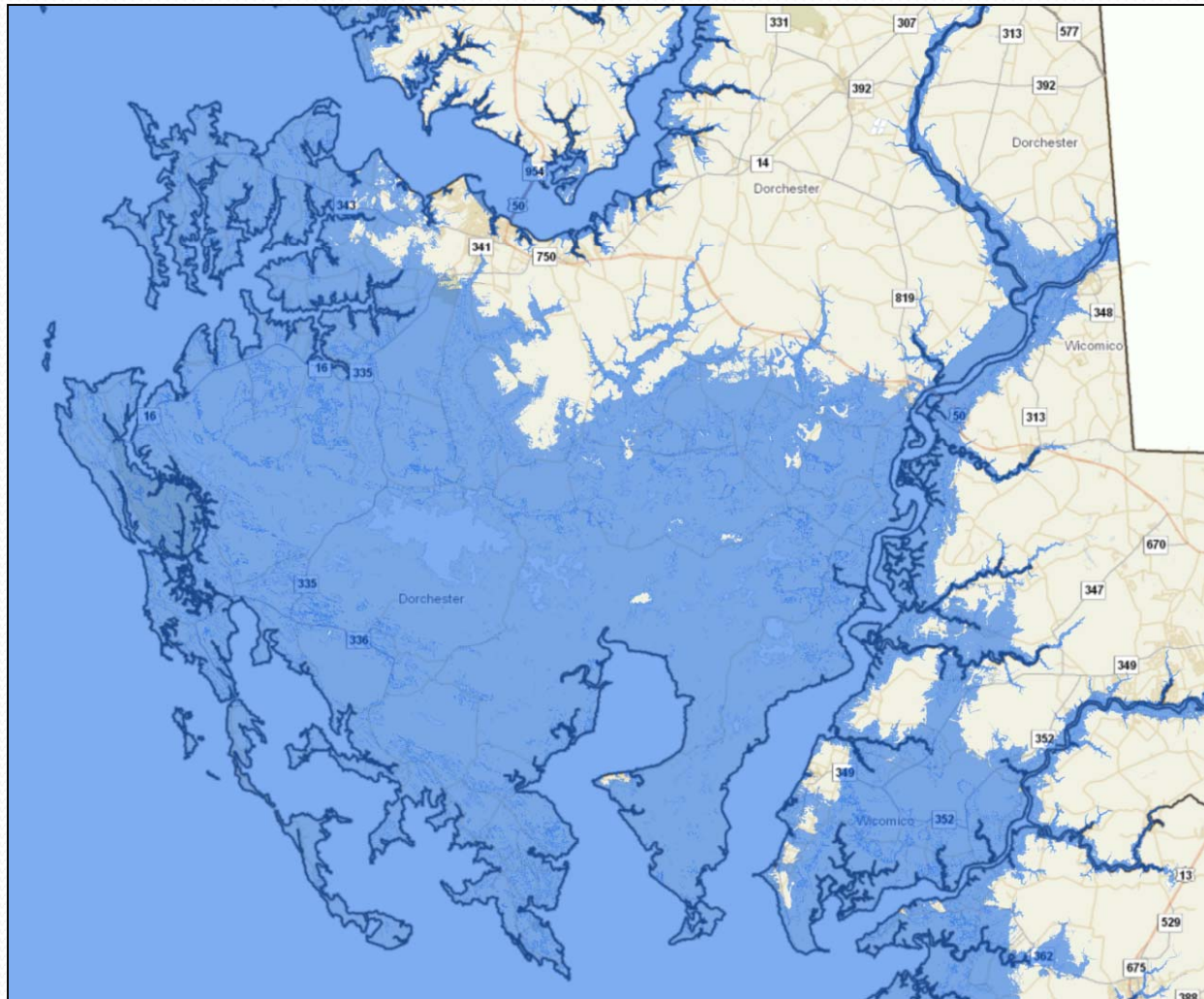
Vulnerable Land in Dorchester County Maryland 2 feet of Sea-Level Rise



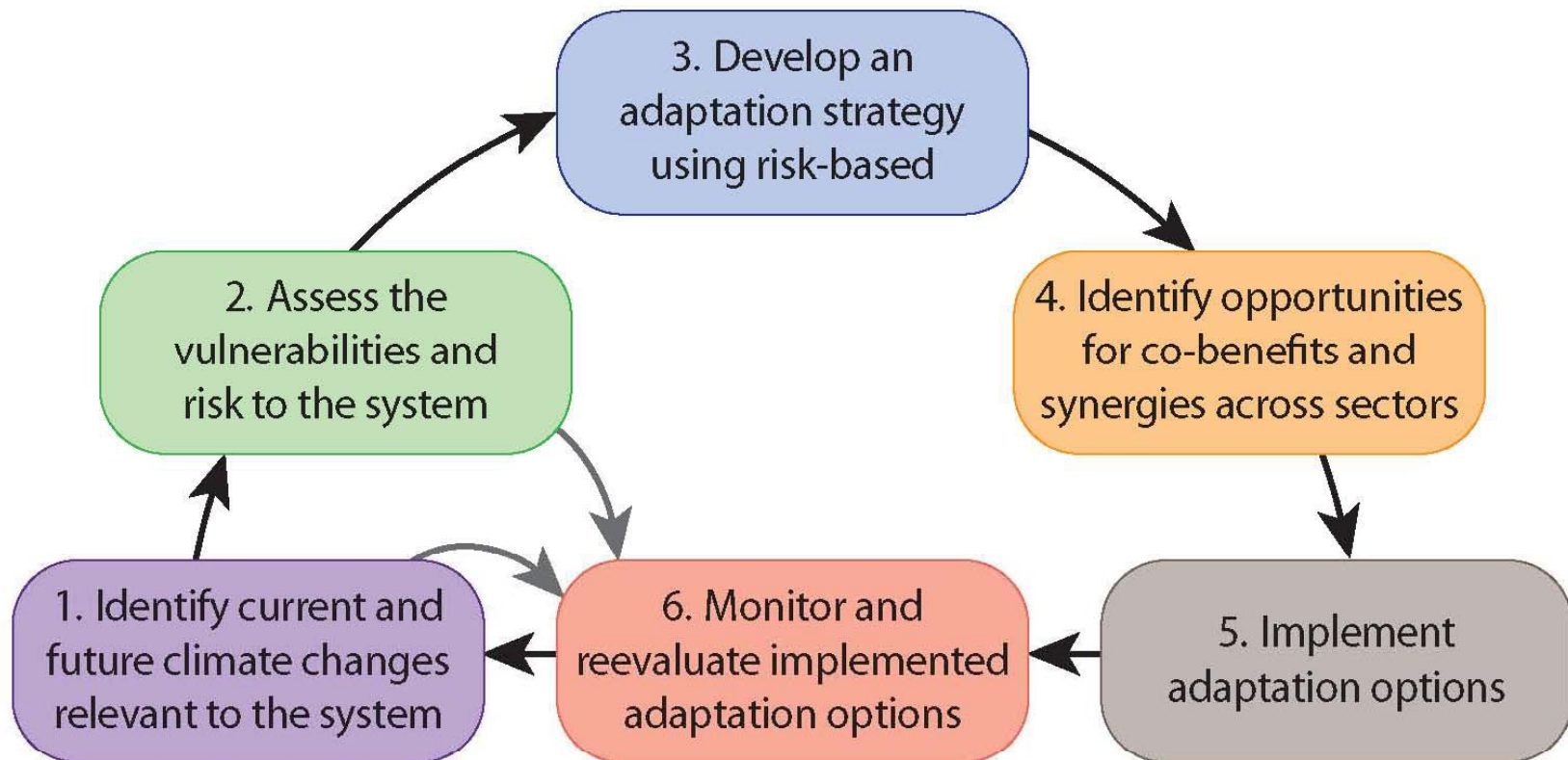
Vulnerable Land in Dorchester County Maryland 5 ft. feet of Sea-Level Rise



Vulnerable Land in Dorchester County Maryland 10 ft. feet of Sea-Level Rise



Adaptation Planning Process





Highway System Vulnerability

- State Maintained Roads requiring further evaluation for impacts due to varying increases in sea-level
 - 2 ft. – 156 miles – 2%
 - 5 ft. – 371 miles – 4.5%
 - 10 ft. – 792 miles – 10%
- Prioritization of assets must consider emergency evacuation planning and system redundancy



SHA Structures Vulnerability

- Planning for Structures with more frequent & severe storms – must consider more than sea-level rise
 - FEMA 100-Year Floodplain indicates 28% of SHA Structures (bridges to culverts) need further impact evaluation
- State Maintained Structures requiring further evaluation for impacts due to varying increases in sea-level
 - 2 ft. – 93 structures – 3.5%
 - 5 ft. – 132 structures – 5%
 - 10 ft. – 196 structures – 7.5%
- Must research & consider new construction and design elements



For More Information

<http://climate.dot.gov/>

<http://climatechange.transportation.org/>

<http://www.globalchange.gov/>

<http://www.fhwa.dot.gov/hep/climate/index.htm>

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