Climate Change Vulnerability
Transportation Assessment

Old Colony Planning Council
What does this presentation cover?
OCPC Climate Change Vulnerability Transportation Assessment Funded by the Old Colony Unified Planning Work Program

1. Study Purpose
2. What is Climate Change
3. Federal Response
4. State Response
5. OCPC and Local Response to Climate Change
1. Study Purpose –
   ❖ Identify the Impacts of Climate Change on the transportation system
   ❖ Assess the vulnerability of the system
   ❖ Develop strategies for management and mitigation
   ❖ Coordinate with federal and state directives and initiatives
1. Study Purpose

- Builds on previous OCPC and Local Study
  - OCPC Climate Change Roadway Drainage and Runoff Study 2011
  - OCPC Climate Change Transportation Impact Study 2010
  - Hazard Mitigation and Municipal Vulnerability Preparedness Plans (Local studies)
1. Study Purpose

- Public outreach, stakeholder input and feedback (state, federal, local, watershed associations Jones River, Taunton River)
- Examining/identify the root causes of climate change
- Map potential negative impacts in the region compared to the existing transportation system
- Identify potential strategies to reduce climate change impacts
Weather and Climate

Weather – Short-term, day-to-day state of atmospheric changes variation in minutes to weeks

❖ Temperature, humidity, precipitation, cloudiness, visibility, and wind

Climate – Climate is the weather of a place averaged over a period of time, often 30 years

2. What is Climate Change?
2. What is Climate Change?

An increase in global temperatures and extreme weather events as a result of increased levels of **greenhouse gases and atmospheric pollution** (in particular, carbon pollution)
3. Federal Directives and Initiatives
EO 13653 (2013) "Preparing the US for the Impacts of Climate Change"

“The federal government must build on progress and pursue new strategies to improve the Nation's preparedness and resilience.”

Agencies should promote:

- Engaged and strong partnerships and information sharing at all levels of government
- Risk-informed decision making and the tools to facilitate it
- Adaptive learning, in which experiences serve as opportunities to inform and adjust future actions
- Support state and local governments in preparedness planning and resiliency
3. Federal Directives and Initiatives

FHWA - “Transportation Systems Management and Operations and Maintenance Programs (TSMO) need to adapt to Climate Change”

❖ Assess Vulnerability
❖ Document Existing Capabilities
❖ Collect and Integrate Data on Past Performance
  ➢ Loss of alternative routes
  ➢ Loss of situational awareness (due to power/communication)
  ➢ Inability to evacuate/shelter-in-place.
  ➢ Loss of service life (due to faster deterioration, etc.)
  ➢ Increased safety risk
  ➢ Loss of economic productivity
  ➢ Reduced mobility
4. State Response to Climate Change

- **2008**: Global Warming Solutions Act
- **2011**: Climate Change Adaptation Report
- **2013**: Clean Energy and Climate Plan for 2020
- **2015**: State Hazard Mitigation Plan
- **2016**: Municipal Vulnerability Preparedness Program
- **2017**: State Hazard Mitigation and Climate Adaptation Plan
4. State Response to Climate Change

MASSACHUSETTS GLOBAL WARMING SOLUTIONS ACT (GWSA) – Enacted 2008

Requires the (EOEEA), in consultation with other state agencies and the public, to set economy-wide greenhouse gas (GHG) emission reduction goals

- Reduce between 10 percent and 25 percent below statewide 1990 GHG emission levels by 2020
- Reduce to at least 80 percent below statewide 1990 GHG emission levels by 2050.
- September 2016 Governor Baker signed EO 569 establishing statewide GHG emissions limits for 2030 and 2040 to promulgate regulations to ensure compliance with the 2020 emissions limit
- Dec 2020 the Secretary of the EOEEA set GHG limit 45% below the 1990 level for the year 2030
4. State Response to Climate Change
Achieving GWSA Reduction Goals

❖ Establish regulations requiring reporting of GHG emissions by the Commonwealth's largest sources by January 1, 2009 providing data about the types and levels of GHG

❖ Establish 1990 as a baseline assessment of statewide GHG emissions used to measure goal progress (1990 is the base year of the Kyoto Protocol)

❖ Develop a projection of the statewide GHG emissions for 2020 (a "business as usual" scenario as if no government action is implemented for reductions)

❖ Establish target emission reductions for 2020, and a plan for achieving them. The GWSA requires that these must be established by January 1, 2011

❖ Analyze strategies via advisory committee and make recommendations for adapting to climate change, the committee reports to the Legislature by December 31, 2009

❖ EOEEA established two advisory committees to provide input on the implementation of the GWSA
  ➢ The Climate Protection and Green Economy Advisory Committee to advise the Executive Office of Energy and Environmental Affairs on measures to reduce greenhouse gas emissions in accordance with the GWSA
  ➢ The Climate Change Adaptation Advisory Committee to study and make recommendations on strategies for adapting to climate change
4. State Response to Climate Change
Achieving GWSA Reduction Goals

❖ Section 7(a) The secretary, in consultation with the executive office of administration and finance, may consider the use of market-based compliance mechanisms to address climate change concerns.

❖ Section 7(c) The executive office and the department may work with the participating regional greenhouse gas initiative states and other interested states and Canadian Provinces to develop a plan to expand market-based compliance mechanisms such as the regional greenhouse gas initiative to other sources and sectors necessary or desirable to facilitate the achievement of the greenhouse gas emissions limits.
4. State Response to Climate Change
The Transportation and Climate Initiative (TCI)

❖ Cap-and-trade” system, a cap is set on the total amount of carbon dioxide that can be released from vehicles using transportation fuels (lowered as time goes on).

❖ Transportation fuel suppliers must then buy allowances for every ton of carbon dioxide their fuel will produce, the total number of allowances is limited, based on the cap.

❖ An auction is held in which fuel suppliers can bid to buy allowances, the price of those allowances depends on the market allowances can be traded.

❖ States get money from the sale of the allowances and would be required to invest that money into projects that reduce carbon emissions from transportation.
4. State Response to Climate Change
The Transportation and Climate Initiative (TCI)

- Expected to incentivize development of fuel-efficient technologies and incentivize people to use less pollution emitting fuel and it will raise money for state investments in new technologies, such as electric buses.

- Twelve northeast and mid-Atlantic states plus Washington, D.C., are involved in the discussions: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and Virginia.

- MOU has been signed by Massachusetts, Washington DC, and Rhode Island each of the others will decide whether to sign the MOU and participate in the regional program.
4. State Response to Climate Change

MASSACHUSETTS GLOBAL WARMING SOLUTIONS ACT (GWSA)

- Updated legislation combined House and Senate bill (The Legislature will refile Senate Bill No. 2995, and the Governor work to improve the bill to reach agreement)
  - Senate Bill 2500 Interim 5 year targets with plans to achieve, regulations, public hearings, and certificates of compliance within 18 months of end of year
    - 2030: not less than 50% below 1990 level
    - 2040: not than 75% below 1990 level
  - House Bill 4933 -Plan updated every five years requirement for legislative recommendations
    - 2030: not less than 50% below 1990 level
    - 2040: not than 75% below 1990 level
5. OCPC and Local Response

OCPC Climate Change Roadway Drainage and Runoff Study 2011

❖ Watersheds in the OCPC Region
❖ Impervious area in the region
❖ Storm water mapping for each community
❖ The affects of March 2010 storm event
❖ Regional drainage analysis and areas of concern
❖ Storm water regulation reviewed
❖ Strategies to mitigate storm water impacts
  ➢ Low Impact Development (LID) practices
5. OCPC and Local Response
OCPC Climate Change Roadway Drainage and Runoff Study 2011

Watersheds in the OCPC region

The affects of storm event March 2010, Bridge Street top and Bridge Street today 2020 below, Bridgewater
Traditional drainage uses large stormwater management systems to process stormwater, LID uses a diverse set of water controls designed to simulate the natural hydrologic cycle and reduce the total amount of runoff, distribute and discharge it to more locations, provide better natural pollution controls, and conceal the functionality with aesthetically pleasing design.
5. OCPC and Local Response
OCPC Climate Change
Transportation Impact Study
2010

Impacts
❖ Flooding
➢ Taunton River, Bridgewater Titicut Street March 2010
➢ Hollingsworth Pond, MBTA Passenger Rail Braintree, 2010
➢ Norwood Airport flooded March 2010
➢ March 2010, multiple roads in OCPC communities 15 inches in two weeks
➢ Storm water and drainage
➢ Dams

❖ Sea Level Rise
➢ White Horse Beach, Plymouth
➢ Coastal landowners and the tourism industry impacts

❖ Extreme Weather Impacts

❖ Air Quality and Health Impacts
➢ Increase ground-level ozone causing air quality alerts
➢ Health issues among the elderly and young children
Recommended Improvements

➢ Improve local storm drainage by create drainage channels to detention ponds, clean trash/debris in swales on roads blocking water flow, increase safe flood storage by using potential multi-use retention basins
➢ Repair dams suitable for safe flood storage
➢ Reduce fallen tree risk with selective trimming and infill planting
➢ Continue creating / expanding fire breaks upwind of critical facilities
➢ Repairing/modifying seawalls for minimum erosion
➢ Local regulation - enforce current flood hazard zoning and adoption of storm water treatment and retention provisions
➢ Develop and/or update local stormwater and floodplain management plans.
➢ Integrate transit, bicycle, and pedestrian infrastructure into developments and promote Transit Oriented Development and Smart Growth principals (revise zoning promoting mixed-use/integrated development)
➢ Use porous asphalt and LID to manage stormwater
➢ Consider track elevation for rail
Massachusetts Municipal Vulnerability Preparedness grant program (MVP) provides funding for municipalities for the planning process for climate change resiliency, communities who complete the MVP program are certified and eligible for the MVP Action Grant funding:

- Identify climate related hazards
- Understand how communities may be impacted by climate change
- Identify existing and future climate vulnerabilities and strengths
- Identify opportunities to take action to reduce risk and build resilience
- Implement priority actions identified through the planning process
- 15 of OCPC communities have completed or are in the process of completing an MVP plan, three have received an Action Grant.
## 5. OCPC and Local Response Municipal Vulnerability Preparedness

<table>
<thead>
<tr>
<th>Municipality</th>
<th>MVP Planning Grant</th>
<th>Local Hazard Mitigation Plan</th>
<th>MVP Action Grants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abington+</td>
<td>✓ 2020 Comprehensive Environmental</td>
<td>No, and not with MVP; wants to do regional BRIC application (Liz Shea)</td>
<td></td>
</tr>
<tr>
<td>Avon</td>
<td>In progress 2020 Weston &amp; Sampson</td>
<td>In progress through MVP</td>
<td></td>
</tr>
<tr>
<td>Bridgewater</td>
<td>✓ FY17/18 In progress OCPC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brockton</td>
<td>✓ FY17/18 OCPC involved</td>
<td>In progress; not with MVP. Funded by General Fund and awarded to STC.</td>
<td>2019: Integrated Water Infrastructure Vulnerability Assessment and Economic Development Plan for Climate Resiliency $312,615</td>
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<tr>
<td>Duxbury*</td>
<td>✓ FY17/18 ✓ Completed 2018 MAPC</td>
<td></td>
<td>2019: Climate Change Flood Vulnerability Assessment/Adaptation Planning $131,712</td>
</tr>
<tr>
<td>East Bridgewater</td>
<td>In progress 2020 Vendor unknown</td>
<td>No, and not with MVP; wants to do regional BRIC application (John Haines)</td>
<td></td>
</tr>
<tr>
<td>Easton+</td>
<td>✓ 2019</td>
<td>No, and not with MVP; wants to do regional BRIC application (Stephanie Danielson)</td>
<td>2020: Wetland Restoration- Removal of Abandoned Structures $177,620</td>
</tr>
<tr>
<td>Halifax</td>
<td>In progress 2020 $15,000 OCPC</td>
<td>In progress through MVP</td>
<td></td>
</tr>
<tr>
<td>Hanover*</td>
<td>Has not applied, but has expressed interest to State</td>
<td>No, and not part of OCPC Regional Plan; their HMP expires 2021</td>
<td></td>
</tr>
<tr>
<td>Hanson</td>
<td>In progress FY19 $27,000 OCPC</td>
<td>In progress through MVP</td>
<td></td>
</tr>
<tr>
<td>Kingston</td>
<td>✓ 2018 Horsley Witten Group</td>
<td>No, and not with MVP; Joanne checking with Mary Guiney</td>
<td></td>
</tr>
<tr>
<td>Pembroke*</td>
<td>In progress 2020, extended 2021 Woodard &amp; Curran</td>
<td>In progress through MVP</td>
<td></td>
</tr>
<tr>
<td>Plymouth</td>
<td>✓ 2020 MAPC with OCPC support</td>
<td>In progress Horsley Witten Group</td>
<td></td>
</tr>
<tr>
<td>Plympton</td>
<td>In progress 2020 Woods Hole</td>
<td>In progress through MVP</td>
<td></td>
</tr>
<tr>
<td>Stoughton*</td>
<td>In progress 2020 Vendor unknown</td>
<td>No, not part of MVP; wants to do regional BRIC application (Craig Horsfall)</td>
<td></td>
</tr>
<tr>
<td>West Bridgewater</td>
<td>Has not applied, but has expressed interest to State</td>
<td>No, not part of MVP. Joanne checking with David Gagne.</td>
<td></td>
</tr>
<tr>
<td>Whitman</td>
<td>In progress 2020 $? OCPC hopefully</td>
<td>In progress through MVP</td>
<td></td>
</tr>
</tbody>
</table>
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

ABINGTON Community Resilience Building Workshop
Summary of Findings 2020

❖ Top Recommendations

1. Repair Central Street Bridge - located at the inlet of the Shumatuscacant River to Island Grove Pond (significant hazard due to flooding and damage from high peak flows during strong storms)

2. Repair Island Grove Pond Dam - located at the southern end of the pond at Centre Ave. (Rt. 123)
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

AVON DRAFT Hazard Mitigation Plan and Municipal Vulnerability Preparedness Plan

❖ Top Recommendations

1. Create a drainage map for the town to identify areas in need of new or additional drainage infrastructure
2. Extend culvert from West Trout Brook to the Avon Library lot to mitigate periodic flooding - High Priority
3. Enhance drainage in the Brentwood Avenue subdivision to alleviate flooding concerns – High Priority
4. Continue to clear brooks and streams throughout town to allow for the free flow of water and to mitigate the threat of flooding
5. Develop and implement a local flood mitigation dam management program
6. Clean and maintain the stormwater detention pond at the intersection of Bodwell Street and Murphy Drive
7. Upgrade the surface drainage infrastructure on Bodwell Street and Kiddie Drive
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

BRIDGEWATER Municipal Vulnerability Preparedness Plan

❖ Top Recommendations

1. Obtain Effective hydraulic computer models from FEMA and develop Town-wide Hydrologic and Hydraulic (H&H) models based on UMass climate change (CC) projections for the 2050’s and

2. Develop a Culvert and Bridge Improvement Master Plan
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

BROCKTON Community Resilience Building Workshop Summary of Findings

1. Develop an integrated all-waters approach to increase flood resiliency City-wide

2. Study of the City’s dams how they work together effectively for flood storage or where dam removals may be warranted

3. There is a need for a systematic, detailed inventory that catalogs the size and condition of culverts and bridges City-wide

Salisbury Plain River regularly floods out Main St Route 28 at K-Mart Plaza (just north of W. Bridgewater line)
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

**DUXBURY Climate Vulnerability Assessment and Action Plan**

The Town has hired a consultant through an MVP implementation grant (to be completed in the spring 2021) for determining the coast line sea level rise impacts to roads, bridges, culverts in 10 year, 50 year horizon. Coordinated with MassDOT.
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

EASTON MVP Community Resilience Building Workshop Summary

Culverts and localized flooding areas of concern included:

➢ Sawmill Pond Rd at Bay Rd around #486, Prospect Road around #80 and #33
➢ Culvert under Route 138 near the mobile home park
➢ Bay Rd near #224 has a confluence of three culverts
➢ Purchase Street at the “Dog Leg” near Easton Country Club
Several culverts in town, including ones at Lake Street and Tussock Brook are in the planning process of being removed or retrofitted to improve flow and reduce flooding.

The town has installed Vortechs® stormwater treatment at several outfalls combining swirl concentration and flow controls into a shallow treatment unit that traps and retains trash, debris, sediment and hydrocarbons from stormwater runoff.
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

PLYMPTON MVP Community Resilience Program

- Inventory of Town-owned culverts; Replace, repair & update culverts; Assess/Identify places for new culverts, Conduct bridge & culvert condition assessment; develop repair and maintenance program
- Conduct dam condition assessment on Town-owned Dams; develop dam repair & maintenance program; Identify potential Easements around Rivers; Develop
- State and Major Roads: Continued maintenance; follow pavement management plan; purchase
5. Local Response to Climate Change - Municipal Vulnerability Preparedness

- Coastal Sea Level Rise

PLYMOUTH Municipal Vulnerability Preparedness Plan

❖ Power Plant

❖ Taylor Ave

❖ Route 3A over the Eel River
Massachusetts Decarbonization Roadmap
The Executive Office of Energy and Environmental Affairs planning process to identify cost-effective and equitable strategies to ensure Massachusetts reduces greenhouse gas emissions by at least 85% by 2050 and achieve net-zero emissions.

Public Engagement – Release of draft reports in January 2021

❖ RoadMap to 2050 (decarbonization plan)
  ➢ www.mass.gov/2050Roadmap

❖ Clean Energy and Climate Plan CECP
  ➢ www.mass.gov/2030 CECP (Public comments accepted on the plan until March, 2021)
System Transformations to 2050

TRANSPORTATION

- Cars, trucks, and buses are emissions-free and mostly electric; zero-carbon fuels like hydrogen help power the rest of the transportation system.
- A healthy public transit system, bike lanes, sidewalks, and transit-oriented development complement vehicle electrification and help to reduce congestion.

BUILDINGS

- High-performance heat pumps provide clean, energy-saving heat and air conditioning for most homes.
- More energy-efficient buildings and electric appliances help reduce monthly energy bills for most families and small businesses.

ENERGY SUPPLY

- Wind and solar power are widely deployed to decarbonize the grid and meet the growing demand for clean electricity.
- A diverse mix of energy resources ensures year-round reliability.
- Improved transmission and distribution systems increase access to a diverse set of low-cost resources and allow offshore wind to help power New England.

NON-ENERGY

- Organic wastes are composted at greater rates; single-use plastics are reduced and recycled, and waste generation overall is minimized.
- Agriculture and industry are managed responsibly to reduce emissions.
- Potent industrial greenhouse gases are replaced by climate-friendly alternatives.

LAND USE

- Forests and other natural and working lands are managed strategically to enhance carbon sequestration while maintaining and building ecosystem health and resiliency.

Massachusetts Decarbonization Roadmap
OCPC Climate Change Vulnerability Transportation Assessment (Completion Date September 2021)

Next Steps
- Public Outreach
  - Public Meeting
  - Local Input
  - Develop Recommendations
- Draft Report to stakeholders for review and comment
- Finalize Report September 2021
Questions/Comments?

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