Prioritizing Resilience in MPO Funding Decisions

Judy Day

Boston Region Metropolitan Planning Organization (MPO)
Background on the Boston Region MPO
Boston Region MPO
Boston Region - Hazards of Concern

August 2022 Heat Wave (WHDH 7News Boston)

Sunny day flooding along Neponset River Greenway in Dorchester, Feb 2024

Flooding in Boston during Hurricane Sandy 2012 (NorthEndWaterfront.com)

Flooding in Arlington after heavy rains in Summer 2023 (CBS News)
Boston Region - Hazards of Concern

- Inland flooding: 94%
- Extreme temperatures: 88%
- Severe winter storms: 73%
- Drought: 69%
- Other severe weather: 62%
- Coastal flooding: 31%
- Wildfire: 12%
- Hurricanes/Tropical storms: 12%
- Ecological changes: 9%
- Coastal erosion: 4%
- Tornadoes: 3%
BRMPO’s Climate Resilience Program
Evaluation/Prioritization Process

Transit Modernization Project Scorecard
For project funding through the Transportation Improvement Program

Transportation Equity
Goal: Ensure that all people receive comparable benefits from, and are not disproportionately burdened by, MPO investments, regardless of race, color, national origin, age, income, ability, or sex.

An equity multiplier is applied to criteria that the MPO has identified through public outreach and data analysis as critical transportation needs or where there exist disparities that negatively impact equity populations. These criteria are evaluated by a check mark on the right side of the scorecard. Each project’s multiplier is based on the percent of the population or the project area that benefits to each of the MPO’s six core populations or the project area relative to their region wide averages. The higher the share of equity populations in the project area, the higher the multiplier.

To calculate a final Transportation Equity score, a project’s raw equity multiplier is scaled to 20 points and then added to the base score out of 80 possible points as shown at the bottom of this scorecard.

Safety
Goal: Transportation by all modes will be safe.

Criteria
- Project addresses a documented safety issue
- Project improves pedestrian network and ADA accessibility

Point Value: 4
Equity Multiplier: 6 possible points

System Preservation and Modernization
Goal: Maintain and modernize the transportation system and plan for its resiliency.

Criteria
- Project incorporates resiliency elements into its design
- Project improves pedestrian network and ADA accessibility

Point Value: 7
Equity Multiplier: 1 possible point

Capacity Management and Mobility
Goal: Use existing facility capacity more efficiently and increase transportation options.

Criteria
- Project reduces transit passenger delay
- Project reduces GHG emissions

Point Value: 6
Equity Multiplier: 2 possible points

Clean Air and Sustainable Communities
Goal: Create an environmentally friendly transportation system.

Criteria
- Project reduces GHG emissions

Point Value: 6
Equity Multiplier: 1 possible point

Economic Vitality
Goal: Ensure our transportation network provides a strong foundation for economic vitality.

Criteria
- Project serves areas targeted for future development
- Project improves existing employment and population centers

Point Value: 3
Equity Multiplier: 2 possible points

Complete Street Project Scorecard
For project funding through the Transportation Improvement Program

Transportation Equity
Goal: Ensure that all people receive comparable benefits from, and are not disproportionately burdened by, MPO investments, regardless of race, color, national origin, age, income, ability, or sex.

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Safety
Goal: Transportation by all modes will be safe.

Criteria
- Project addresses severe-crash location
- Project addresses high-crash location

Point Value: 3
Equity Multiplier: 3 possible points

System Preservation and Modernization
Goal: Maintain and modernize the transportation system and plan for its resiliency.

Criteria
- Project incorporates resiliency elements into its design
- Project improves pedestrian network and ADA accessibility

Point Value: 5
Equity Multiplier: 2 possible points

Capacity Management and Mobility
Goal: Use existing facility capacity more efficiently and increase transportation options.

Criteria
- Project reduces transit passenger delay
- Project reduces GHG emissions

Point Value: 6
Equity Multiplier: 2 possible points

Clean Air and Sustainable Communities
Goal: Create an environmentally friendly transportation system.

Criteria
- Project reduces CO2 emissions

Point Value: 3
Equity Multiplier: 1 possible point

Economic Vitality
Goal: Ensure our transportation network provides a strong foundation for economic vitality.

Criteria
- Project serves areas targeted for future development

Point Value: 3
Equity Multiplier: 1 possible point
Past Resilience Projects Lagged Behind

**Ipswich: Argilla Roadway Reconstruction and Adaptation (Crane Estate to Crane Beach) (612738)**

- **Proponent:** Ipswich
- **Request:** $5,500,000
- **Score:** 35.1
- **Status:** PRC–Approved (5/12/2022)
- **Description:**
  - Roadway reconstruction and elevation for coastal flooding adaptation
  - Expanded culverts and addition of new drainage systems
  - Stabilized and widened road shoulders for safer access and reduced erosion
New Resilience Goal (as of 2023)

RESILIENCY

Provide transportation that supports sustainable environments and enables people to respond and adapt to climate change and other changing conditions.

- Prioritize investments to make the region’s roadway and transit infrastructure more resilient and responsive to current and future climate hazards, particularly within areas vulnerable to increased heat and precipitation, extreme storms, winter weather, and sea level rise.

- Prioritize resiliency investments in disadvantaged communities and in areas that bear disproportionate climate and environmental burdens.

- Prioritize investments in transportation resiliency that improve emergency access and protect evacuation routes.

- Prioritize investments that include nature-based strategies such as low-impact design, pavement reduction, and landscape buffers to reduce runoff and negative impacts to water resources, open space, and environmentally sensitive areas.
TIP Criteria Workshop
TIP Criteria Workshop

What type of organization do you represent?

- Advocacy or community organization: 6
- Municipality: 2
- State or regional agency: 9
- Other: 3

In a word or two, what are your organization's resilience goals? What motivates you to achieve them?

- nature-based solutions
- climate resilience
- social resilience
- equitable
table conservation
- meeting human needs
- community led
- protecting ecosystems
- co-benefits
equity
- community participation
TIP Criteria Workshop

What are the most important factors to consider when designing projects for resilience?
49 responses

What additional sources or reference material might be useful for scoring potential projects?
25 responses

How might we measure the potential impact of resilience improvements?
38 responses

What might qualify as "above and beyond" for a resilience project?
30 responses
Response Themes

Factors to Consider
- Data standard
- Purpose
- Design
- Community engagement

Data Sources
- Hazard data
- Criteria examples
- Resources

Evaluating Impact
- Risk reduction
- Stormwater
- Land cover
- Community engagement

Above and Beyond
- Environmental justice
- Co-benefits
- Design
- Community engagement
## Factors to Consider

### Data Standard
- forward-looking, long-term, accurate climate data (i.e. better than FEMA)
- Incorporating the latest climate data from the state’s Climate Change Clearinghouse
- Use of MCFRM rather than NOAA SLR
- Ensuring materials and design are matched with climate projections

### Purpose
- Risk reduction as a main factor, not afterthought
- Identify and prioritize projects that impact human resiliency to climate catastrophes, i.e. emergency access routes, evacuation routes for coastal flooding.

### Design
- Projects provide co-benefits that uplift EJ communities
- Prioritizing vegetated features with co-benefits over hard surface (even porous) and/or subsurface features
- Plans for stormwater management- both volume and water quality
- Maximizing use of nature-based solutions over grey infrastructure

### Community Engagement
- Strong and authentic community engagement.
- Community-driven solutions
- Community participation and access
- Community-led with authentic community input

- Processing and inclusion of neighborhood culture and addressing community needs
## Factors to Consider

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**Factors to Consider**
# Data Sources

## Hazard Data
- Watershed wide flood models
- MCFRM Level 1 and Level 2
- RMAT Tool exposure data (SLR, precipitation)

## Criteria Examples
- SITES or similar scoring for non-building projects
- LEED building guidance
- Envision Sustainable & Resilient Framework/Criteria

## Resources
- Native plants lists
- EQUITY GUIDE for Green Stormwater Infrastructure Practitioners
- MAPC’s Climate Resilient Land Use Strategies Toolkit
- SWMM software for green infrastructure guidance
- MS4 Permit Materials / MassDEP tools
- Examples of successful projects, esp. for novel ideas
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- Cooling resources added
- Number of people with reduced risk
- Time to recovery after a flooding event

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## Above and Beyond

### Environmental Justice
- Located in an EJ community
- Prioritize projects in EJ communities and/or regional benefits
- Project benefits EJ communities (access to green space, open space, workforce)

### Co-Benefits
- Tackling multiple environmental concerns (e.g., emissions reductions, lowering flood risk, air quality improvements)
- Projects that address multiple modes of transportation (road, bike, bus, rail)

### Design
- Going above the requirement for infiltration
- Projects that are a form of resilience themselves:

### Community Engagement
- Community led or identified
- Projects that do community outreach in such a way that helps make the community feel more engaged, connected, and prepared
- Community education and outreach
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Updated Resilience Criteria
New Criteria

- Is expected to have a positive impact on adjacent areas
- Reduces the risk of extreme heat
- Reduces the risk of flooding
- Improves stormwater infrastructure beyond minimum standard
- Is expected to provide environmental co-benefits
- Demonstrates regional coordination
- Addresses needs identified in town’s climate plans
- Plans for maintenance and future climate conditions
- Reduces risk along evacuation routes or to critical facilities
- Implies a meaningful community engagement process
- Provides educational material
- Proponents have used a self-assessment tool
- Is located in an area exposed to extreme heat and does not address heat
- Is located in a flood zone and does not address flooding
- Is expected to have a positive impact on adjacent areas
- Reduces the risk of extreme heat
- Reduces the risk of flooding
- Improves stormwater infrastructure beyond minimum standard
- Is expected to provide environmental co-benefits
- Demonstrates regional coordination
- Addresses needs identified in town’s climate plans
- Plans for maintenance and future climate conditions
- Reduces risk along evacuation routes or to critical facilities
- Implies a meaningful community engagement process
- Provides educational material
- Proponents have used a self-assessment tool
- Equity multiplier
Resilience Guidance for Planners
Guidance StoryMap

Climate Resilience Guidance for Planners

Boston Region Metropolitan Planning Organization
October 16, 2023
Summarized Climate Impacts

Heavy Precipitation
The average annual amount of precipitation in Massachusetts between 1971 and 2001 was 47 inches. This is projected to increase by one to six inches by 2050, resulting in up to 54 inches of rain per year. Individual rainfall events are expected to become more variable, severe, and punctuated by periods of drought.

Extreme Heat
Inland parts of Massachusetts may experience up to 25 days over 90°F annually by 2050, compared to just five days historically. More coastal parts of the state won’t experience as drastic a change in extreme heat days, although this might be offset by the urban heat island effect in the more developed parts of the Boston area. Changes in humidity are also expected to amplify extreme heat impacts.
Regional Examples

**Wellesley Park Path**

Wellesley Office Park Walking Path is a trail along the Charles River that has been retrofitted with permeable pavement that minimizes runoff and flooding by allowing rainwater to drain through the surface. Lead designer Trevor Smith describes the trail’s design, saying, “We installed two inches of the paving material on a base of six inches of three-quarter-inch crushed gravel. The brown color selected for the project harmonizes the paved path with the natural landscape.”

**Milford Town Park**

The Milford Municipal Vulnerability Preparedness (MMVP) program and an act-on-grant provided funding for green infrastructure at Milford Town Park. This project includes rain gardens and rain infiltration systems that direct the natural water cycle to prevent stormwater runoff from polluting the Charles River. The adaptation strategies used in this project were chosen based on suggestions from the MassMVP subcommittee notification.

**Bus Shelter on the Massachusetts Bay Transportation Authority (MBTA) Route 42, Bedford VA Hospital—Alwice Station**

The MBTA installed a bus shelter at the Route 42 Bus Stop on Woburn Street near Revere Road as part of the MBTA’s Bus Rapid Shelter Streamlining Project. Bus shelters increase riders and reduce bus stops, creating “circle” routes where bus riders can get on and off without crossing rail lines. In addition to bus shelters, an increase in fare coverage in the surrounding area can significantly increase the amount of long-term riders.
Adaptation Strategies

Nature-Based Adaptation: Bioretention Area/Rain Garden
These are shallow depressions filled with sandy soil topped with a thick layer of mulch and planted with dense vegetation. Stormwater runoff is directed from impervious surfaces such as parking lots and roadways into bioretention areas, where native plants and vegetation filter pollutants and allow treated water to reinfiltate the ground, rather than inundating drainage systems.

Pavement Strategies for Increasing Resilience to Extreme Heat
- New examples of pavement adaptation strategies are included in the 3rd quarter Innovations in Sustainable Pavement Design newsletter.
- Improving high performance asphalt binder properties
- Incorporating resilient mixes in surface layers to improve durability
- Increasing the required rutting resistance for asphalt mixes
- Adding wrinkle mixes with lower curing shrinkage to reduce the coefficient of thermal expansion
- Using lighter, efficient asphalt mixes for the roadway layers using higher service temperatures
- Using micro-surfaced concrete with advanced fiber materials
- Increasing maintenance to continually address the performance of the pavement
- Using innovative pavement designs and noise reduction materials

Structural Adaptation: Berms
Berms are permanent fixed barriers that consist of a raised ridge of land that prevents water seepage and acts as a natural flood barrier for any surrounding infrastructure. This barrier can make flow compete, soil granular or other materials.

Subsurface Stormwater Management Strategies
- Subsurface stormwater management systems can remove pollutants from stormwater runoff but do not control the runoff volume. Managing subsurface runoff requires filtering larger pollutants and debris and can include trash filters to further reduce runoff and pollutant control.
- Deep, long-lasting bioretention systems are designed to remove trash, debris, and canopy runoff. These structures are scalable for residential and commercial areas.

Oil Film Separators are drum chamber storage units designed to remove many particles, floating debris, and hydraulic oils. These are recommended for areas of high potential pollutant loads, like high-traffic areas or parking lots, gas filling stations, and high-quality commercial and restoration areas, and fleet storage areas.

Proprietary separators are custom engineered for specific requirements and may vary in design and cost.

Stormwater Management Improvement: Low Impact Pavement Design
- Low-impact pavement design uses pavement materials that allow water to permeate through the pavement and reinfiltrate rather than run off.
- Stormwater systems consist of permeable, open-textured pervious pavement systems that are designed to infiltrate the ground in a controlled manner.
- Using stabilized aggregate and base materials in areas prone to inclement and thinning the pavement surfaces such as rigid pavements or highly loaded pavements can increase resistance to flooding.

- It is recommended to maintain high traffic, moisture-resistant pavement surfaces and include soil and/or permeable aggregates or materials such as open-graded friction course into surface design to enhance driver safety in rainy conditions.

- Maintaining all of the pre-development vegetation as possible will help lower the impacts of any impervious surfaces.

Stormwater Management Improvement: Water Quality Strategies
- Water quality tools are regularly evaluated and deployed to ensure the quality of all water discharge into the receiving water while maintaining a clear storm runoff water stream.

These strategies, like high-quality pre-treatment, provide a cost-effective and efficient system for removing and reducing stormwater pollutants and improving water quality.

Dry and wet weather quality tools are selected for the best fit for areas changing to collector bioretention or any front for infiltration, treatment, and storm water applications.
Combining Adaptation Strategies

Common Combinations of Adaptation Strategies: Green Wall + Berm
Green walls can be added alongside berms or vegetated slopes to serve as natural barriers and add to the amount of green space.

Common Combinations of Adaptation Strategies: Sediment Forebay + Wet Basin + Constructed Stormwater Wetland
This combination includes a sediment forebay to dissipate energy and disperse inflow before stormwater is filtered in a wet basin and eventually flows into a constructed stormwater wetland for temporary storage.
Best Practices

Community Engagement: Meaningful community engagement is a vital component of all stages of transportation planning, including identifying needs, siting, design, construction, and evaluation. Inviting both community members and advocacy groups to participate in the transportation planning and improvement process allows for the acknowledgement and incorporation of local needs into project design, provides transparency for major projects and their potential impacts on communities and ecosystems, and provides legitimacy by increasing the likelihood that projects are supported by the public.

Plan for all Seasons: Consider infrastructure’s adaptability and resilience to extreme summer and winter conditions. It is particularly important to consider the durability of natural stormwater infrastructure that will be greatly affected by low temperatures. For example, the depth of soil media used in the planting bed for a vegetated filter strip should extend below the frost line in order to minimize the impacts from freezing during harsh winter conditions.

Diversify Strategies: When implementing a combination of BMPs/adaptations, try to select strategies that provide a diverse range of functions and benefits. Consider the costs and benefits of including additional strategies and try to strike a balance between the needs of your project site and your project’s budget.

Plan Ahead: Adaptation strategies and BMPs incorporated into the initial construction and design of transportation projects are often more effective that retrofits. Taking resilience into account in the beginning stages of a project can maximize efficiency of the adaptation strategy and extend the service life of the asset.

Nature First: Nature-based adaptation strategies are almost always recommended either on their own or combined with structural adaptations because they can reduce vulnerability to climate hazards, provide multiple ecological benefits, and promote valuable ecosystem services. A few examples of these ecosystem benefits include wildlife conservation, habitat connectivity, carbon capture and sequestration, recreational and cultural services, and nutrient cycling.

Online Tools: Tools such as MAPC’s Green Stormwater Infrastructure Siting Tool can help identify suitable sites for nature-based strategies and provide suggestions on new ways to implement green stormwater infrastructure.
Criteria 1
The project reduces the risk of flooding in the project area through climate adaptation and resilience improvements.

+0: The project does not address flooding.
+1: The project reduces flood risk using structural adaptation/gray infrastructure.
+2: The project reduces flood risk using nature-based adaptation/green infrastructure, or a combination of green and gray infrastructure.

How to score points
Determine the project area’s risk of flooding using the flood data on the right or other resources.

Use the climate adaptation strategies section of this guidance or other sources such as Massachusetts Department of
Were we successful?
Ipswich’s Argilla Rd Project

Ipswich: Argilla Road Ecological Tidal Restoration Project

- **Proponent:** Ipswich
- **Request:** $13,200,000
- **Score:** 37.9
- **Status:** PRC-Approved (5/12/2022)

**Description:**
- Comprehensive sea level rise and coastal flood mitigation project for sustained access to open space resources through 2100 flood conditions
- Project scope changed after application last year to include further road elevation and culverts to mitigate runoff risks for sensitive marshes
Were we successful?
Next Steps: Evaluating Performance

- % of total funds allocated to resilience
- $ invested in stormwater improvements
- % of resilience investments made in equity/EJ communities
- # acres green space added
- Mi vulnerable roadways invested in
- # projects with nature-based components
Next Steps:
Emphasis on Engagement
Emphasis on Engagement

What is the role of an MPO in coordinating regionally on environmental issues and with environmental stakeholders?

- Discrete study to…
  - Understand state of the practice among peer agencies
  - Operationalize best practices
  - Make new connections
  - Identify a platform for consistent communication

Advocacy group survey

Municipal survey
Thank you!

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