Introduction to the Climate Resilience Design Standards Tool

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Resilient MA

Climate Change Clearinghouse for the Commonwealth

WHY

Resilient MA Action Team (RMAT)

Responsible for the **State Hazard Mitigation and Climate Adaptation Plan (SHMCAP)** implementation, monitoring, and maintenance, with representatives from each Secretariat and key state agencies.

100+
agency actions

Integration of climate resilience into capital planning is a 2018 SHMCAP Priority Action

- Incorporating climate change vulnerability, resilience and adaptation standards into **budgeting, coordination, capital planning**
- **Review and update design standards** using MA climate change projections that will support best management and construction practices
- Incorporate climate vulnerability, resilience, and adaptation standards into **capital planning for new projects**

WHY

Climate Resilience Design Standards Tool
Resilient MA Action Team

Tool Reporting Workflow

Version 1.1 – updated April 25, 2022

Project GOALS:

- Make preliminary climate resilience analysis **more broadly accessible**
- **Inform "climate smart"** capital planning and procurement
- **Provide recommendations based on consistent use** of state's climate data
- **Provide a unified planning and design support tool that state agencies** can use for grant applications and project evaluation processes
- **Provide consistent information to municipalities** hosted on **ResilientMa.org**

WHO

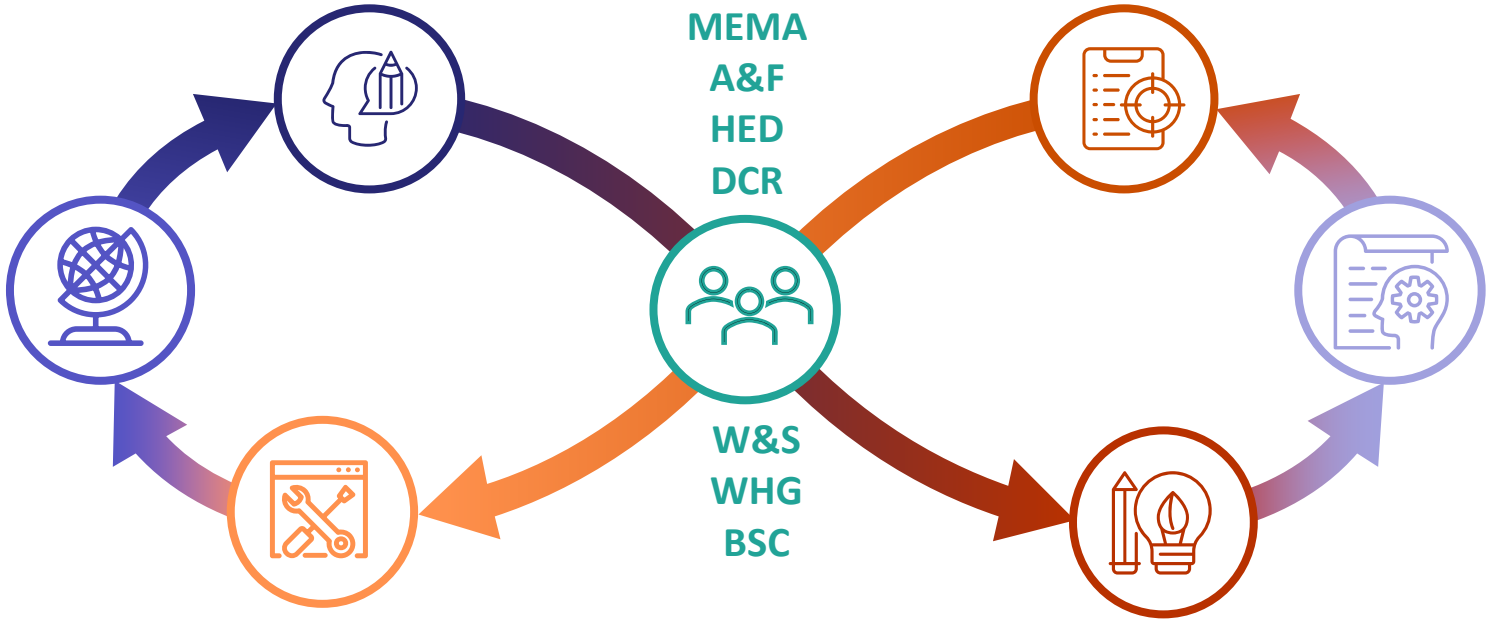
2.5-Year History of Iterative Stakeholder Engagement

RMAT & PROJECT MANAGEMENT TEAM

Over 30 climate change coordinators and State Agency representatives

CAPITAL PLANNING WORKING GROUP

20+ State Agency and A&F representatives focused on integrating resilience into capital planning



2020 PUBLIC COMMENT & 2021 BETA TOOL LAUNCH

Beta Tool Used for FY22 MVP and Massworks Grants

256 Responses to Public Feedback Survey and 13 Focus Groups

ASSETS WORKING GROUPS & PILOT TESTING BETA TOOL

60+ State Agency representatives organized by buildings/facilities, infrastructure, and natural resources asset working groups

TECHNICAL ADVISORY GROUP

50+ consultants, academics, municipalities, regional planning organizations, non-profit agencies, and federal agencies

SCIENTIFIC WORKING GROUP

20+ leading climate academics, researchers, and others working on local, regional, and country-wide climate science studies

WHAT

WHAT DO YOU NEED TO USE THE TOOL?

- Access to internet, a computer, and a valid email address
- A project with physical assets and the following preliminary information:

  - ❑ Name of the project
  - ❑ Project location and approximate extent of project limits
  - ❑ General details, including estimated capital costs and contact information
  - ❑ Planned or possible ecosystem service benefits through the project, if any
  - ❑ Past climate exposure, if any, for example history of flooding
  - ❑ Criticality of the asset (time, scope and severity)
  - ❑ Asset Information

PRIMARY ASSET TYPES:

INFRASTRUCTURE

BUILDING/FACILITY

NATURAL RESOURCES

WHAT

PRIMARY TOOL OUTPUTS:

- Preliminary Climate Exposure and Risk Ratings
- Recommended Climate Resilience Design Standards

Additional supporting guidance:

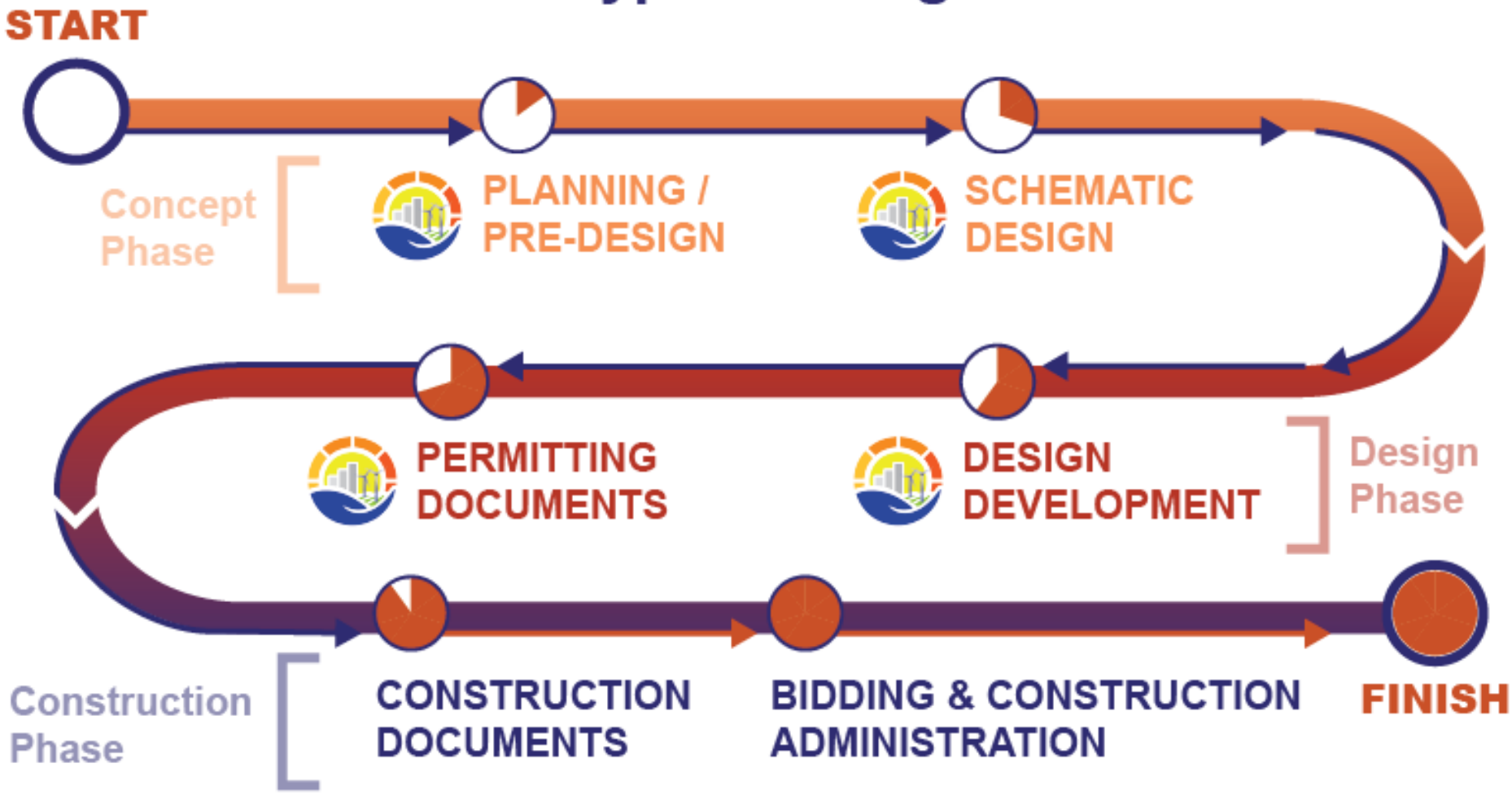
- Site Suitability Considerations
- Regional Coordination Considerations
- Flexible Adaptive Pathways Considerations

Tool Versioning

- Beta release in April 2021
- Version 1.0 in February 2022
- Version 1.1 in April 2022
- *Planned version 1.2 in June 2022*

WHEN & WHERE

Typical Design Process



Where the Tool is recommended for benefit to users. Concept Phase is where most beneficial.

NOTE: *The Tool can be used or updated any time during the design process. If projects are submitted through the Tool, users can create a clone of a submitted project to update as needed.*

SWITCH TO BROWSER FOR DEMO

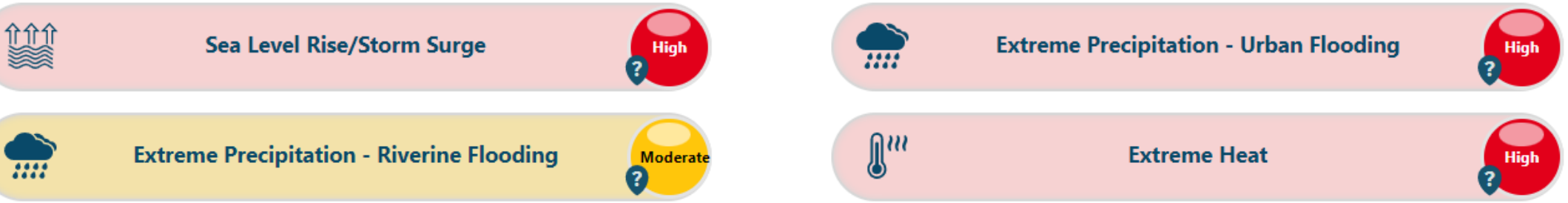
WHAT


Project Status: Scored - Not Submitted
Delete Project
START HERE
LOCATE PROJECT
PROJECT INPUTS
PROJECT OUTPUT
VIEW REPORT
SUBMIT PROJECT
Project Located
Inputs Complete
Overall Project Scores Output
The Ecosystem Service Benefits Score and Preliminary Climate Exposure Ratings presented below are assigned to the overall project, while the Preliminary Climate Risk Ratings and Climate Resilience Design Standards are asset-specific. The Scores and Standards are based on the questions previously answered and the location of the overall project. This information can be used to think critically about site suitability, regional resilience efforts, and adaptive site design for long-term climate resilience.
Environmental Justice
In Massachusetts, an Environmental Justice (EJ) neighborhood (census block group) is defined as meeting one or more criteria linked to the size of a census block group's minority populations, median household income, and language isolation. EJ neighborhoods typically include climate vulnerable populations, who may have lower adaptive capacity or higher exposure and sensitivity to
Does this project fall within mapped Environmental Justice neighborhoods?
Yes
Ecosystem Benefits
The purpose of this output is to provide an overall indication of the Ecosystem Service Benefits (ESB) provided by a project, through protection of natural resources and implementation of nature-based solutions. Natural systems and ecosystem services provide great economic value and social benefit, often untapped in non-resilient projects. Nature-based solutions may cost less than
Ecosystem Benefits Scores
Moderate

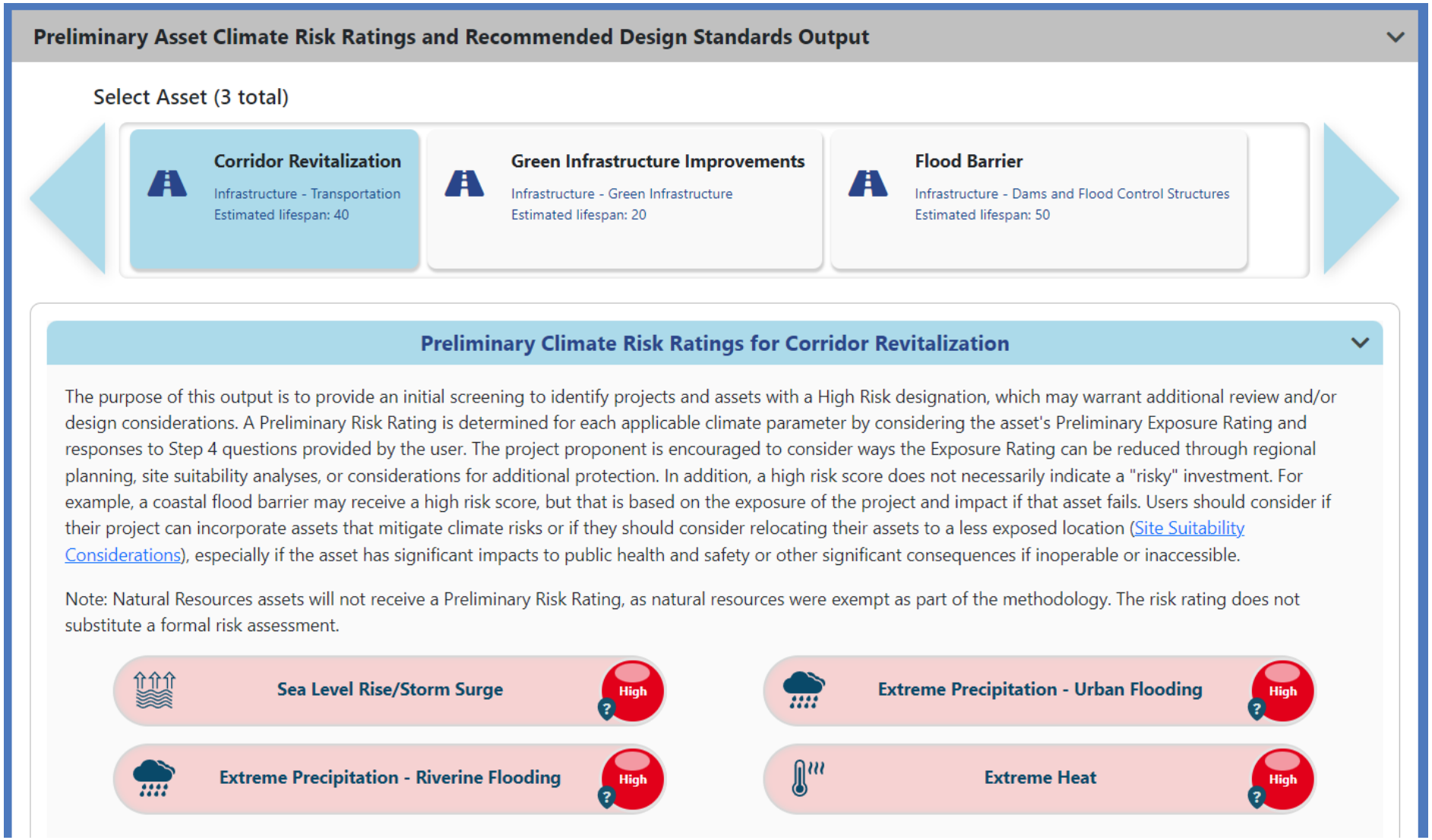
WHAT

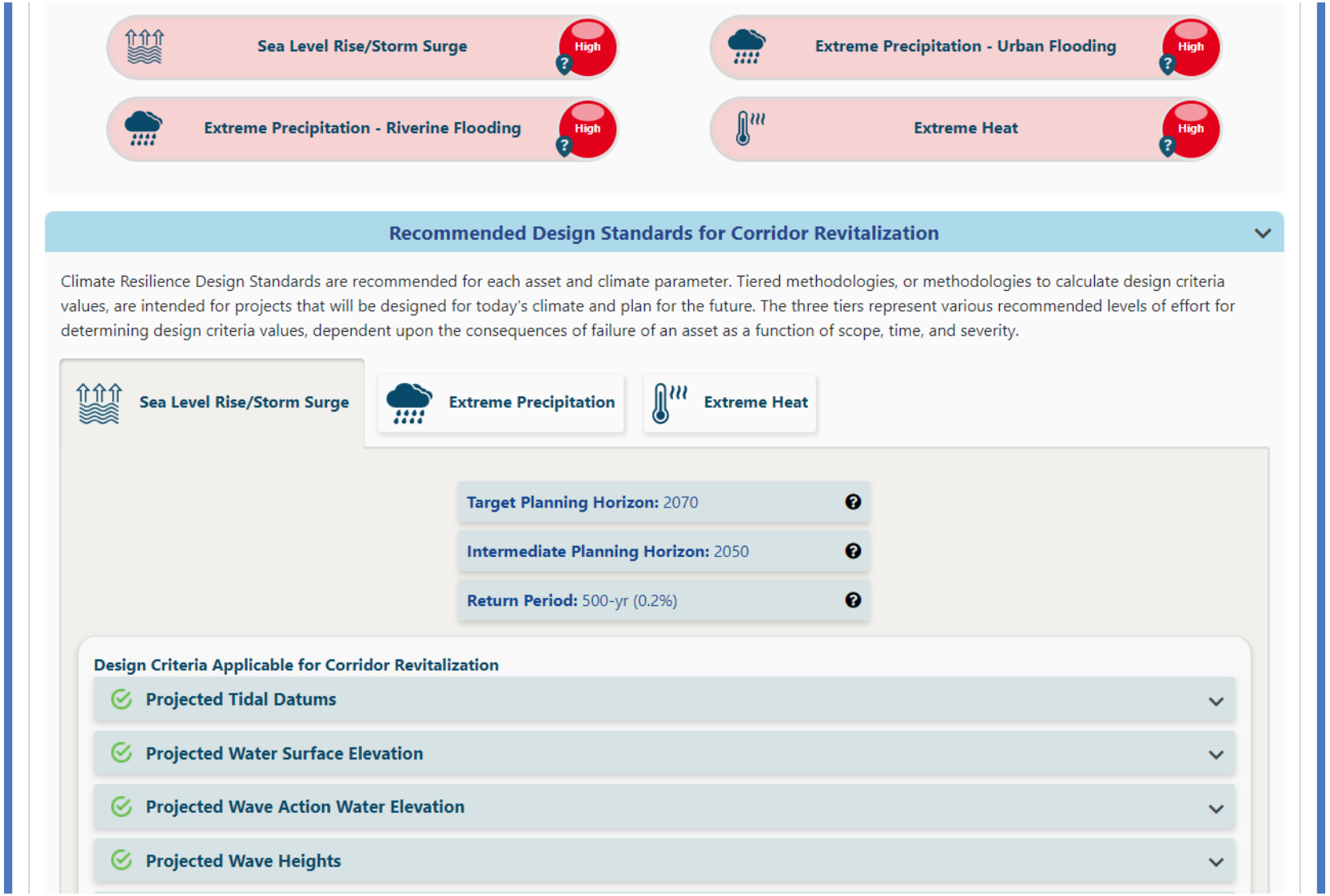
Preliminary Climate Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. Click on the question mark to identify why your project location is receiving the exposure rating.



WHAT


Preliminary Asset Climate Risk Ratings and Recommended Design Standards Output
Select Asset (3 total)
Corridor Revitalization
Infrastructure - Transportation
Estimated lifespan: 40
Green Infrastructure Improvements
Infrastructure - Green Infrastructure
Estimated lifespan: 20
Flood Barrier
Infrastructure - Dams and Flood Control Structures
Estimated lifespan: 50
Preliminary Climate Risk Ratings for Corridor Revitalization
The purpose of this output is to provide an initial screening to identify projects and assets with a High Risk designation, which may warrant additional review and/or design considerations. A Preliminary Risk Rating is determined for each applicable climate parameter by considering the asset's Preliminary Exposure Rating and responses to Step 4 questions provided by the user. The project proponent is encouraged to consider ways the Exposure Rating can be reduced through regional planning, site suitability analyses, or considerations for additional protection. In addition, a high risk score does not necessarily indicate a "risky" investment. For example, a coastal flood barrier may receive a high risk score, but that is based on the exposure of the project and impact if that asset fails. Users should consider if their project can incorporate assets that mitigate climate risks or if they should consider relocating their assets to a less exposed location (Site Suitability Considerations), especially if the asset has significant impacts to public health and safety or other significant consequences if inoperable or inaccessible.
Note: Natural Resources assets will not receive a Preliminary Risk Rating, as natural resources were exempt as part of the methodology. The risk rating does not substitute a formal risk assessment.
Sea Level Rise/Storm Surge
High
Extreme Precipitation - Urban Flooding
High
Extreme Precipitation - Riverine Flooding
High
Extreme Heat
High


Sea Level Rise/Storm Surge
High
Extreme Precipitation - Urban Flooding
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High
Extreme Heat
High
Recommended Design Standards for Corridor Revitalization
Climate Resilience Design Standards are recommended for each asset and climate parameter. Tiered methodologies, or methodologies to calculate design criteria values, are intended for projects that will be designed for today's climate and plan for the future. The three tiers represent various recommended levels of effort for determining design criteria values, dependent upon the consequences of failure of an asset as a function of scope, time, and severity.
Sea Level Rise/Storm Surge
Extreme Precipitation
Extreme Heat
Target Planning Horizon: 2070
Intermediate Planning Horizon: 2050
Return Period: 500-yr (0.2%)
Design Criteria Applicable for Corridor Revitalization
Projected Tidal Datums
Projected Water Surface Elevation
Projected Wave Action Water Elevation
Projected Wave Heights

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Sea Level Rise/Storm Surge | Extreme Precipitation | Extreme Heat

Target Planning Horizon: 2070

Intermediate Planning Horizon: 2050

Return Period: 500-yr (0.2%)

Design Criteria Applicable for Corridor Revitalization

- **Projected Tidal Datums**
- **Projected Water Surface Elevation**

Definition

Projected Water Surface Elevation is the projected elevation for a specific future flood event, considering storm surge, tides, and wave setup.

Projected Water Surface Elevation Values:

The projected modeled elevations may vary across large sites due to variations in the site's physical features (e.g., topography), so the elevations are presented as a maximum, minimum, and area weighted average values in the table below. The area weighted average represents the most typical value corresponding to the projected Water Surface Elevation of the project site.

Asset Name	Recommmended Planning Horizon	Recommmended Return Period	Max (ft - NAVD88)	Min (ft - NAVD88)	Area Weighted Average (ft - NAVD88)
Corridor Revitalization	2050	0.2% (500-Year)	13.3	13.1	13.2

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Sea Level Rise/Storm Surge | Extreme Precipitation | Extreme Heat

Target Planning Horizon: 2070

Return Period: 50-yr (2%)

Design Criteria Applicable for Corridor Revitalization

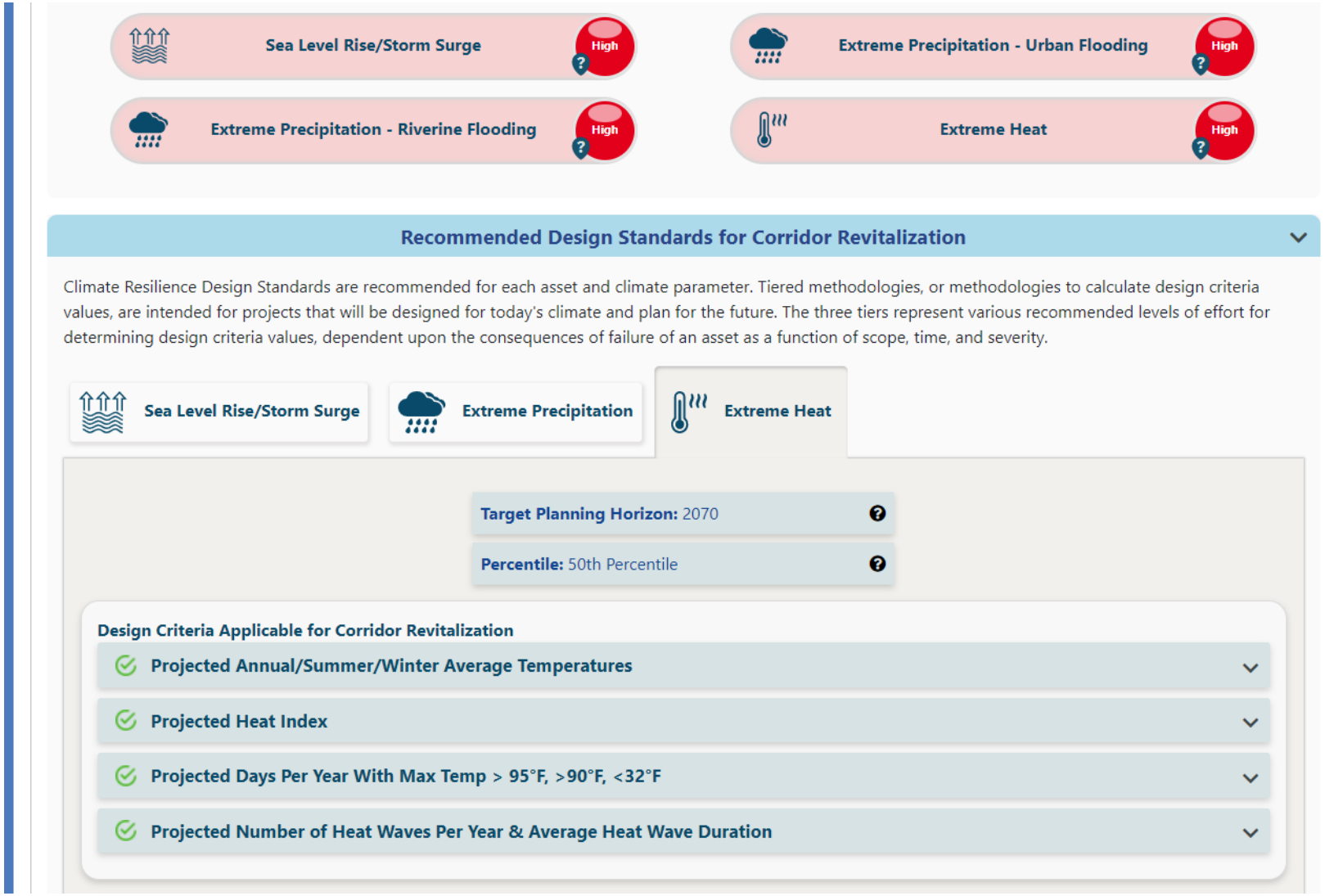
Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms

Definition

Projected Total Precipitation Depth Values and Peak Intensity Methodology

The Tool uses climate projections developed by Cornell University as part of the EEA's Massachusetts Climate and Hydrologic Risk Project. Assets receive a projected value for the 24-hour Total Precipitation Depth associated with a recommended return period (design storm) and planning horizon.

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Corridor Revitalization	2070	50-Year (2%)	9.5	Downloadable Methodology PDF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Sea Level Rise/Storm Surge
Extreme Precipitation
Extreme Heat
Target Planning Horizon: 2070
Percentile: 50th Percentile
Design Criteria Applicable for Corridor Revitalization
Projected Annual/Summer/Winter Average Temperatures
Projected Heat Index
Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F
Projected Number of Heat Waves Per Year & Average Heat Wave Duration