MAY 15 2025 I DENVER
RESILIENCE SUMMIT

WHERE SCIENCE MEETS DESIGN

Integrating Locally Relevant Climate Projections Into Planning

Welcome! Please find seating in your Climatic Region

Front of Room

Arid/Desert

Humid/Hot

Coastal

Temperate

Mountain

Northern/Cold

SESSION OVERVIEW

This panel was convened around a shared commitment to advancing climate literacy in planning and design.

Today we will cover:

- What do we know and what can we do about it?
- Approaches from a policy, infrastructure, and portfolio scale
- Approaches at a campus and site scale
- Audience engagement exploring regional action

Please use the note cards on your table to write any questions for the speakers. Raise your hand to pass them to the front.

▮▮▮

SETTING THE STAGE

Ashley Muse, Muse Consulting

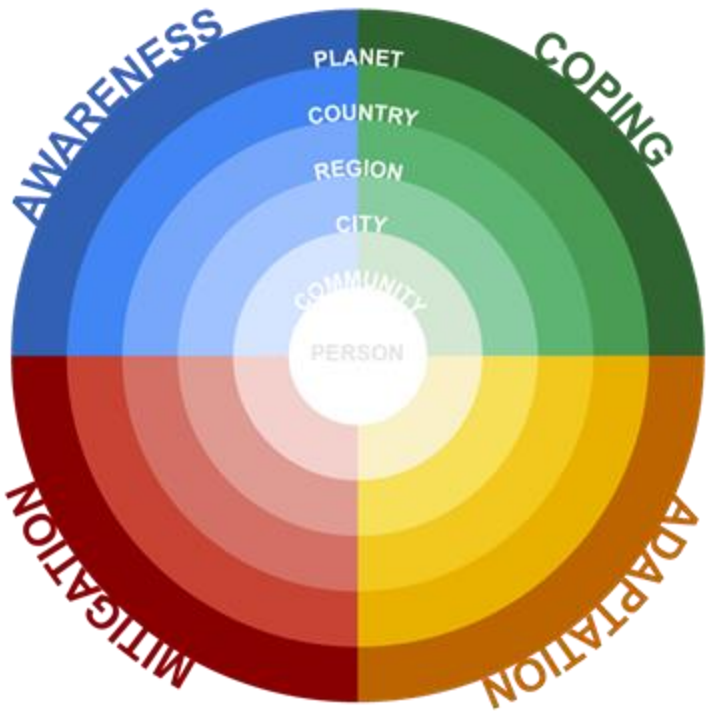
APPROACHING RESILIENCE

Awareness: Engage stakeholders and establish ongoing assessments to raise understanding of climate and other hazards, laying the groundwork for informed decision-making.

Coping: Provide immediate resources and strategies to individuals and organizations to manage current exposures and sensitivities to climate risks.

Impact Mitigation: Reduce near- and mid-term impacts of escalating hazards by intercepting risks through targeted interventions based on present vulnerabilities.

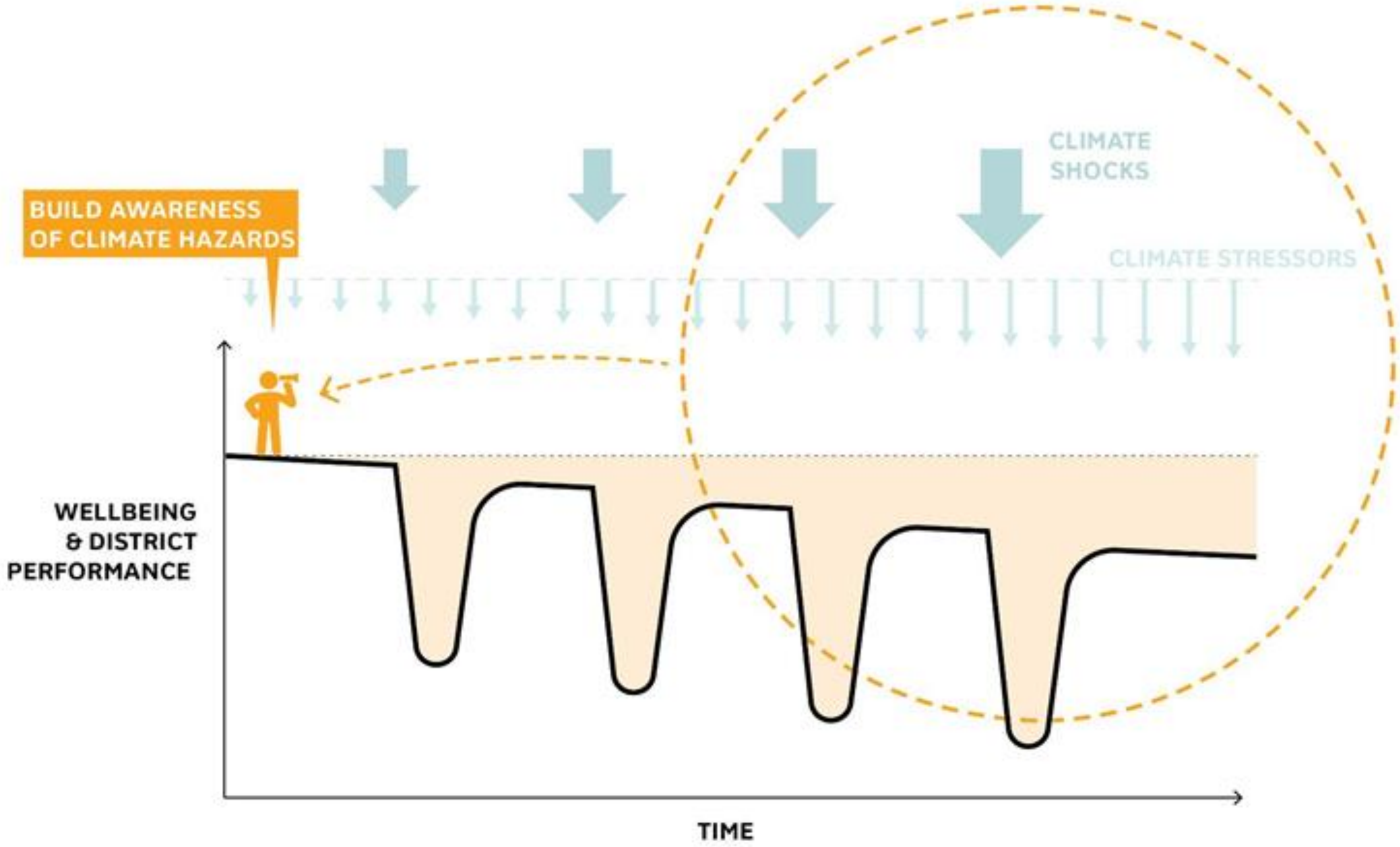
Adaptation: Adjust built environments and infrastructure, behaviors, policies, and financial systems to prepare for and respond to evolving climate threats through long-term adaptation pathways.



Graphic by: Climate Adaptation Partners and HGA

APPROACHING RESILIENCE

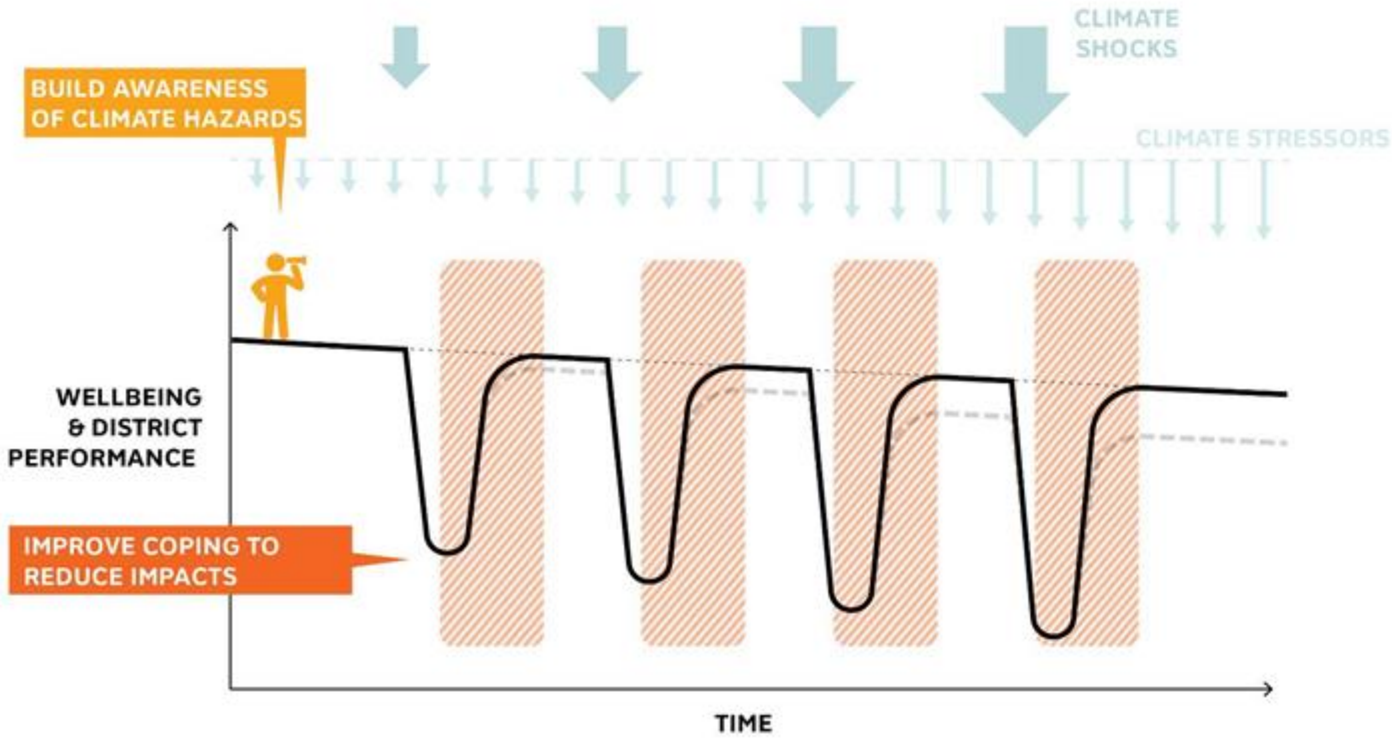
Building Awareness



Graphic by: SCAPE

APPROACHING RESILIENCE

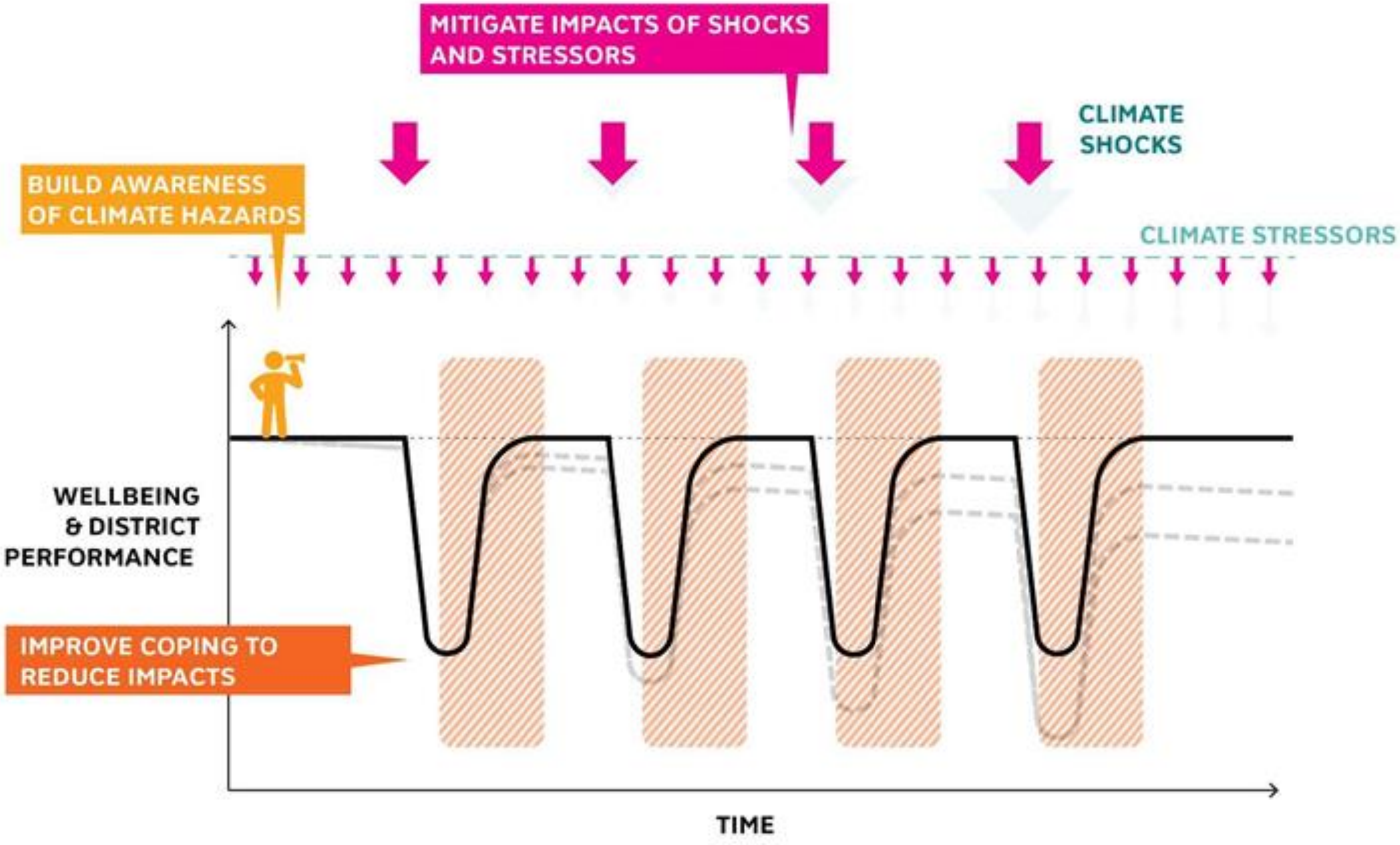
Improving Coping Capacities



Graphic by: SCAPE

APPROACHING RESILIENCE

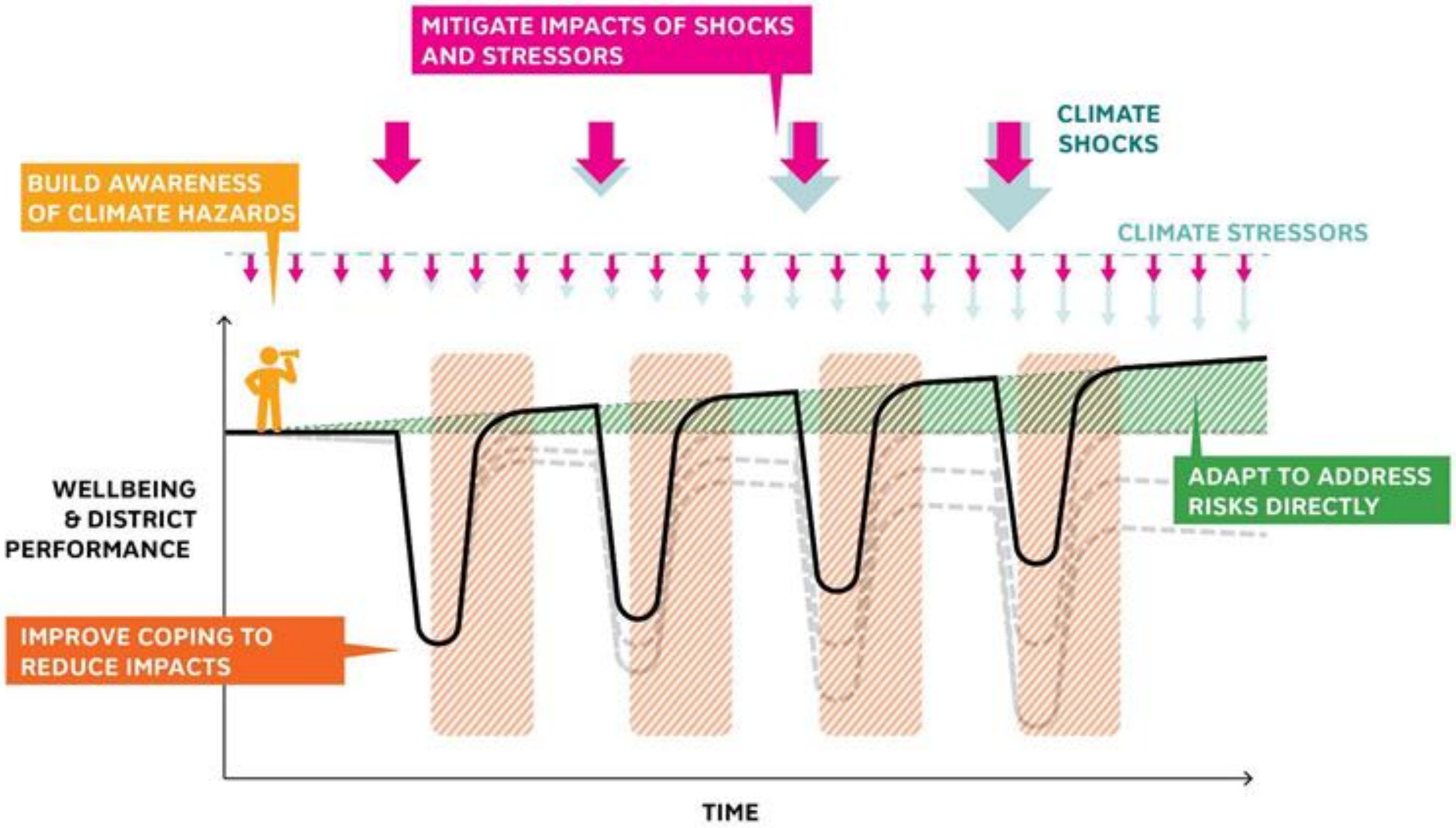
Mitigating Impacts



Graphic by: SCAPE

APPROACHING RESILIENCE

Adapting to Risks



Graphic by: SCAPE

RISK ASSESSMENT

Guiding Principles

ALL HAZARDS
Acute shocks / chronic stressors that threaten the investment. Hazard intensity,, probability & impact.

↓

RISK ASSESSMENT
Assess risk from hazards based on exposure, sensitivity, and adaptive capacity of assets and nested scales.

↑

ASSETS & REGIONAL SYSTEMS
Physical, social, and infrastructure

Consider "All Hazards"	Taking an **inclusive, all-hazards approach** as a baseline for risk assessment. Not all hazards are uniformly addressed, but decisions should be intentional.
Evaluate Compound and Cascading Consequences	Considering **cascading and compound consequences** of co-occurring hazards.
Understand Implications of Nested Scales	Understanding the **interactions and implications** of the resilience work being planned at the local, state, and federal scales and supporting that work with mutually supportive strategies.
Accommodate for Variation in Risk	Understanding the **range of risk**: through time, through spatial impacts, and in the context of outside dependencies.

ALL HAZARDS APPROACH

Bay Area Example

Climate Trends

- **Rising Temperature**
- **Sea Level Rise**
- **Changes in Precipitation**

Climate Hazards

Primary Hazards
Climate trends perpetuate these primary hazards in the Bay Area

- Extreme Heat
- Drought
- Energy insecurity
- Wildfire

FLOODING
- Flooding, coastal
- Flooding, extreme rain
- Groundwater rising
- Saltwater intrusion

Secondary Hazards
Hazards that may affect the region, but are not as broadly relevant

- Pests
- Wind
- Subsidence
- Groundwater overdraft
- Coastal fog diminishment

Other Hazards
Not covered in the scope of this risk assessment; addressed by others in the org

- Dam / Levee Failure
- Economic Disruption
- Security Risks
- Tsunami
- Earthquake
- Disease Vectors
- Landslide
- Social Stressors

Graphic by: HGA

ALL HAZARDS APPROACH

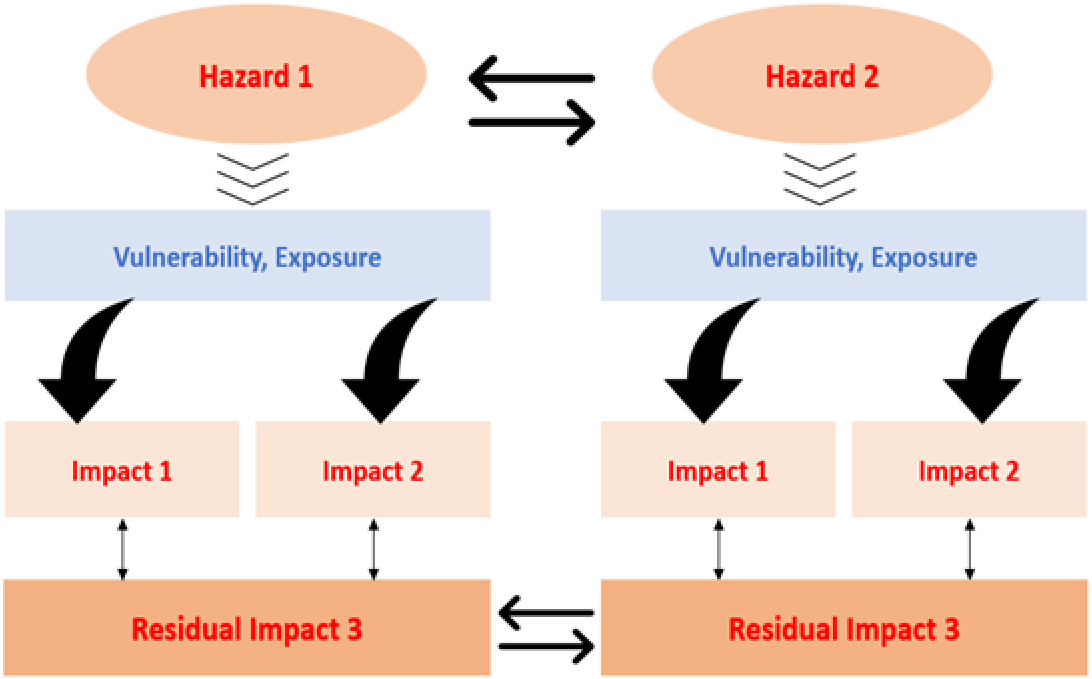
Consider the range of likely impacts

Human	Human physical and mental health may be negatively affected. Health impacts may lead to a reduction in productivity, increases in remote work, and more employee sick days.
Program	Indoor and outdoor programming may be paused indefinitely or need to be relocated to new spaces. Programs may also have less capacity, less efficiency, and less participation.
Operations	District and building operations may be paused indefinitely or have less efficiency and capacity.
Physical Assets	Buildings and infrastructure may have mild to severe damage. Materials and systems may have shorter lifespans and/or worse performance.

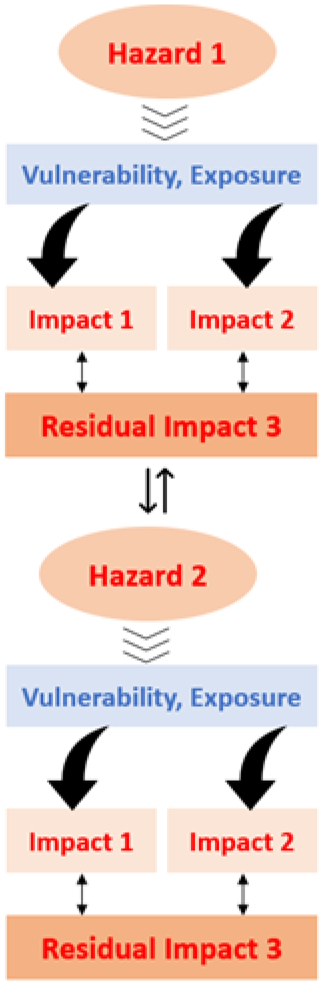
ALL HAZARDS APPROACH

Disasters multiply and cascade risks

Compounding Hazards: A second hazard that can interact with the first, causing multiplicatively destructive consequences.

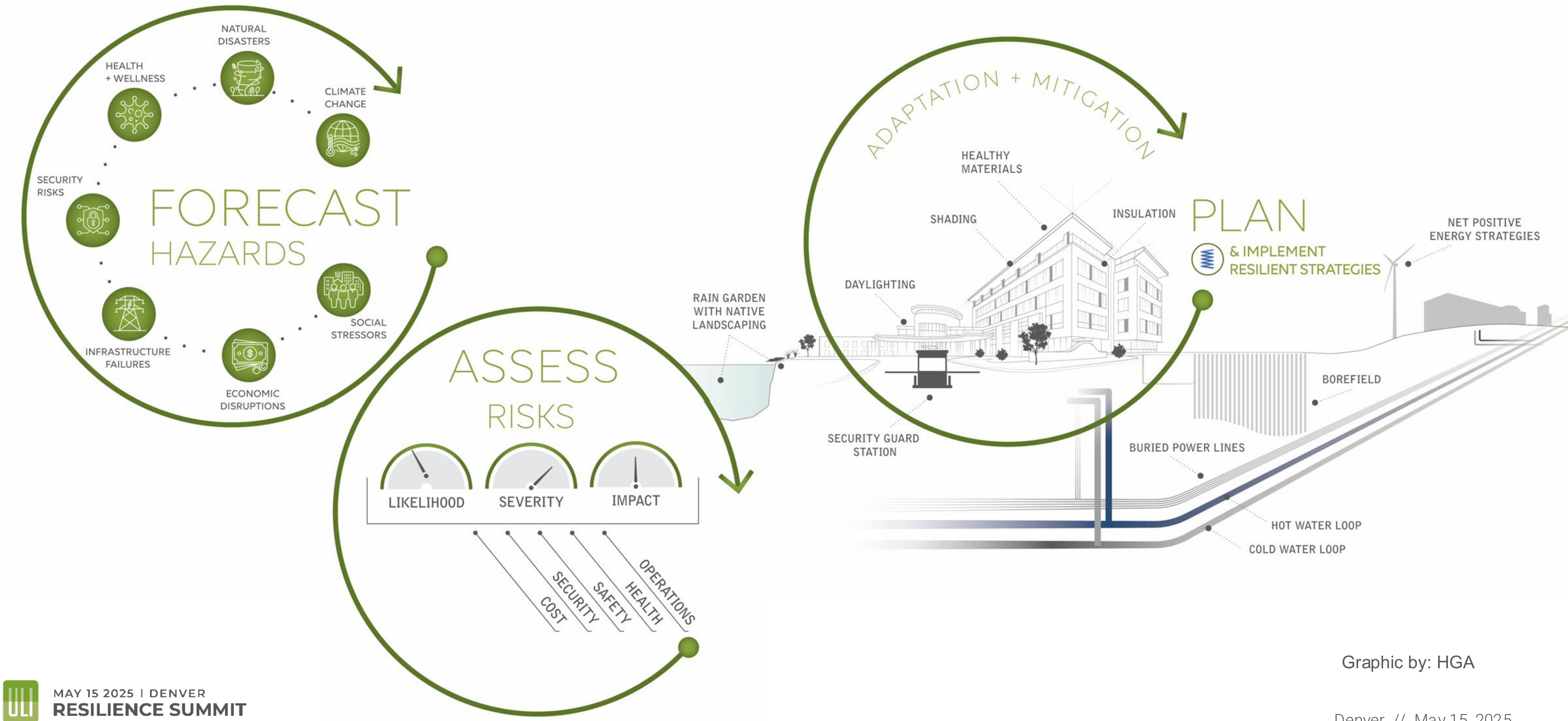


Cascading Hazards: A secondary effect of a primary hazard, tending to increase in progression over time and generate unexpected secondary events of strong impact. These are often at least as serious as the original event and contribute significantly to the overall duration of events.



Graphics by: UNDRR

PLANNING FOR RESILIENCE



Graphic by: HGA

CLIMATE INFORMED DESIGN

Amanda Farris, Associate Director

University of Minnesota Climate Adaptation Partnership

APPROACHES FROM A POLICY, INFRASTRUCTURE, & PORTFOLIO SCALE

Richard Graves, Director, Center for Sustainable Building Research

and College of Design, University of Minnesota

In the 2023 Legislative session, a bill was passed to conduct research examining how projections of future weather trends may exacerbate climate conditions, including but not limited to drought, elevated temperatures, and flooding that:

(1) can be integrated into the design and evaluation of buildings constructed by the state of Minnesota and local units of government, in order to:

(i) reduce energy costs by deploying cost-effective energy efficiency measures, innovative construction materials and techniques, and renewable energy sources; and

(ii) prevent and minimize damage to buildings caused by extreme weather conditions, including but not limited to increased frequency of intense precipitation events and tornadoes, flooding, and elevated temperatures; and

(2) may weaken the ability of natural systems to mitigate the conditions to the point where human intervention in the form of building or redesigning the scale and operation of infrastructure is required to address those conditions in order to:

(i) maintain and increase the amount and quality of food and wood production;

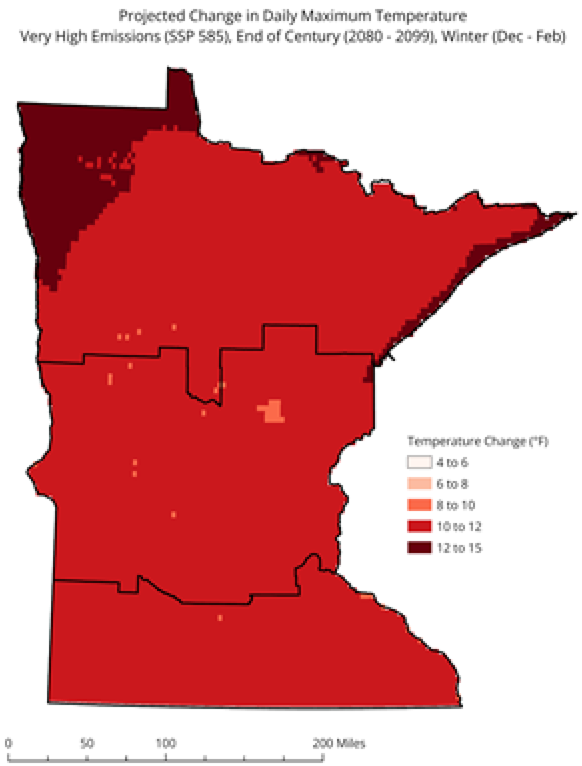
(ii) reduce fire risk on forested land;

(iii) maintain and enhance water quality; and

(iv) maintain and enhance natural habitats.

University of Minnesota
Driven to Discover®

VERY HIGH EMISSIONS: SSP585 (END) DAILY MAX TEMP



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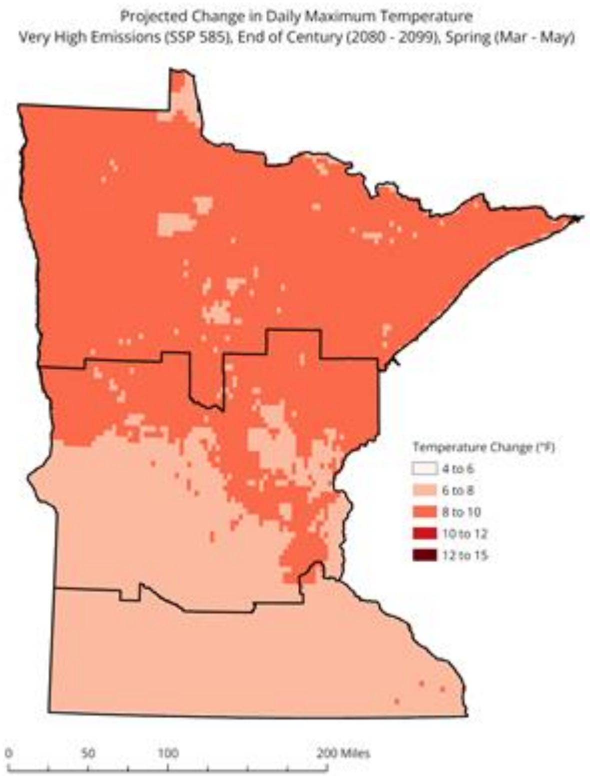
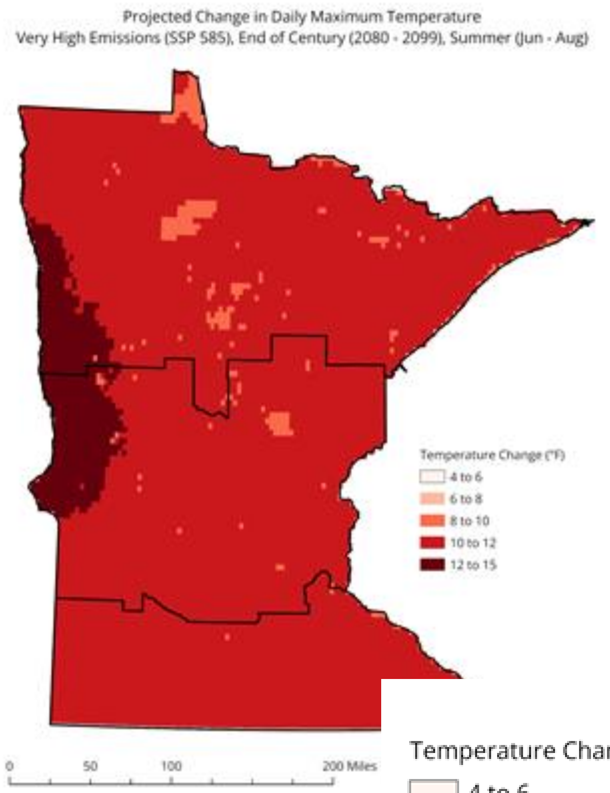
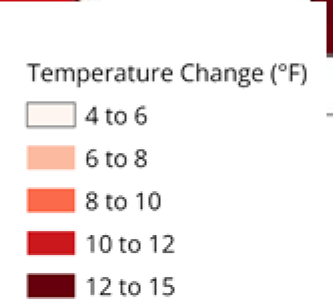
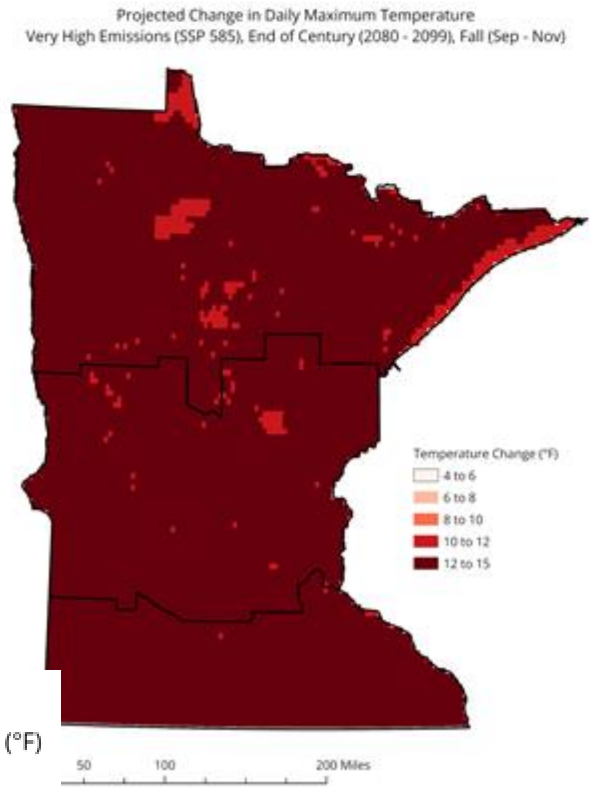


Spring



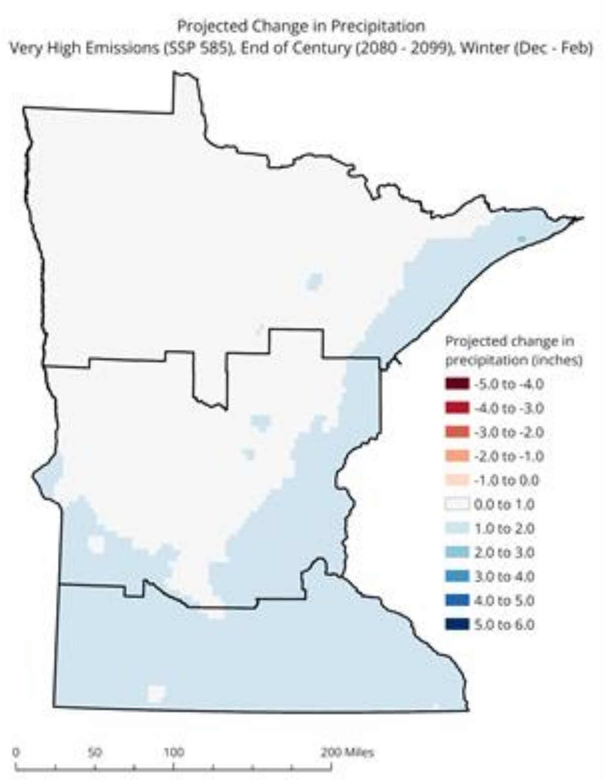
Summer



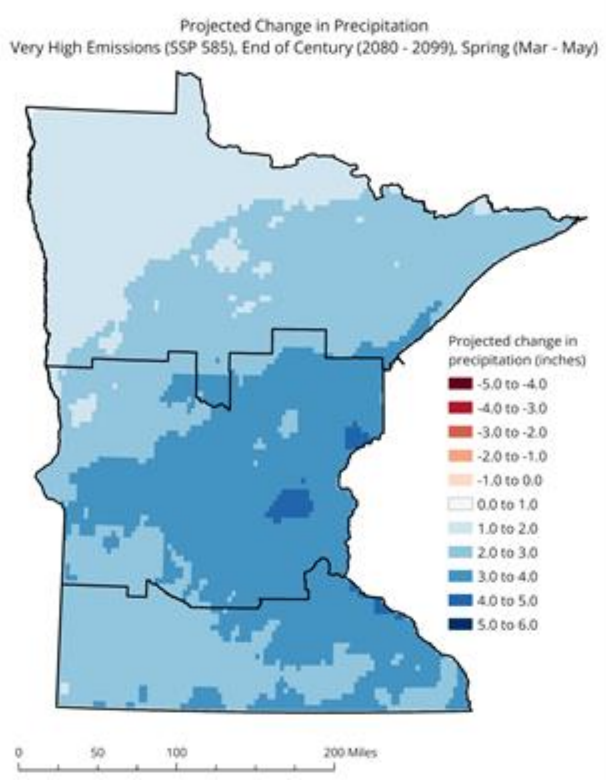


Fall

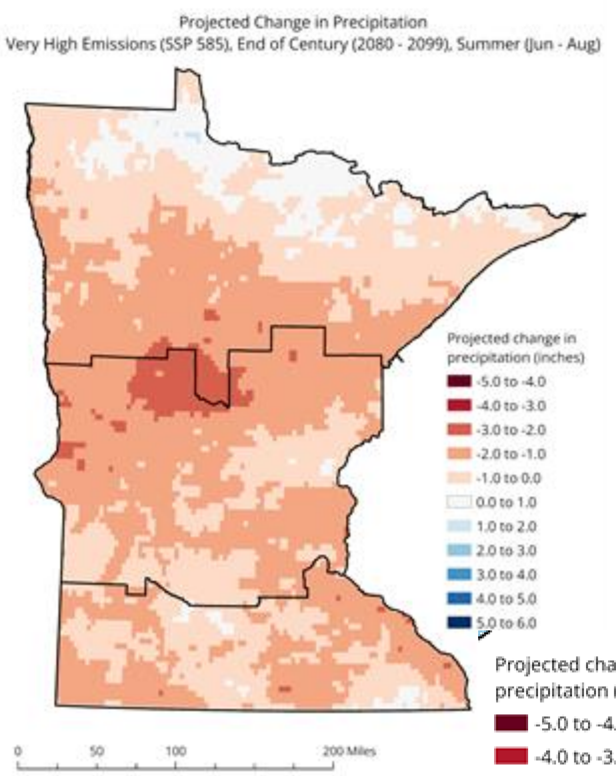
VERY HIGH EMISSIONS: SSP585 (END) PRECIPITATION



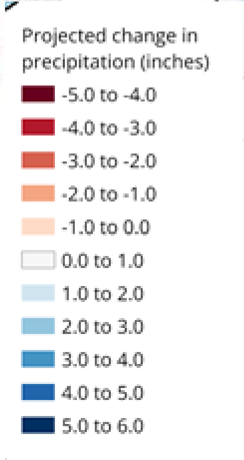
Winter

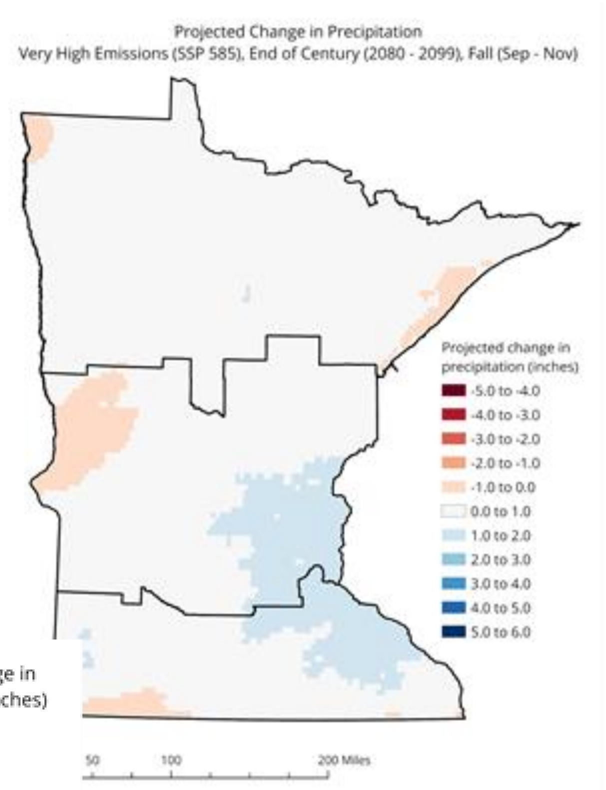


Spring



Summer





Fall

Analyzing infrastructure as a complex social, ecological, and technological system can reveal overlooked climate actions.

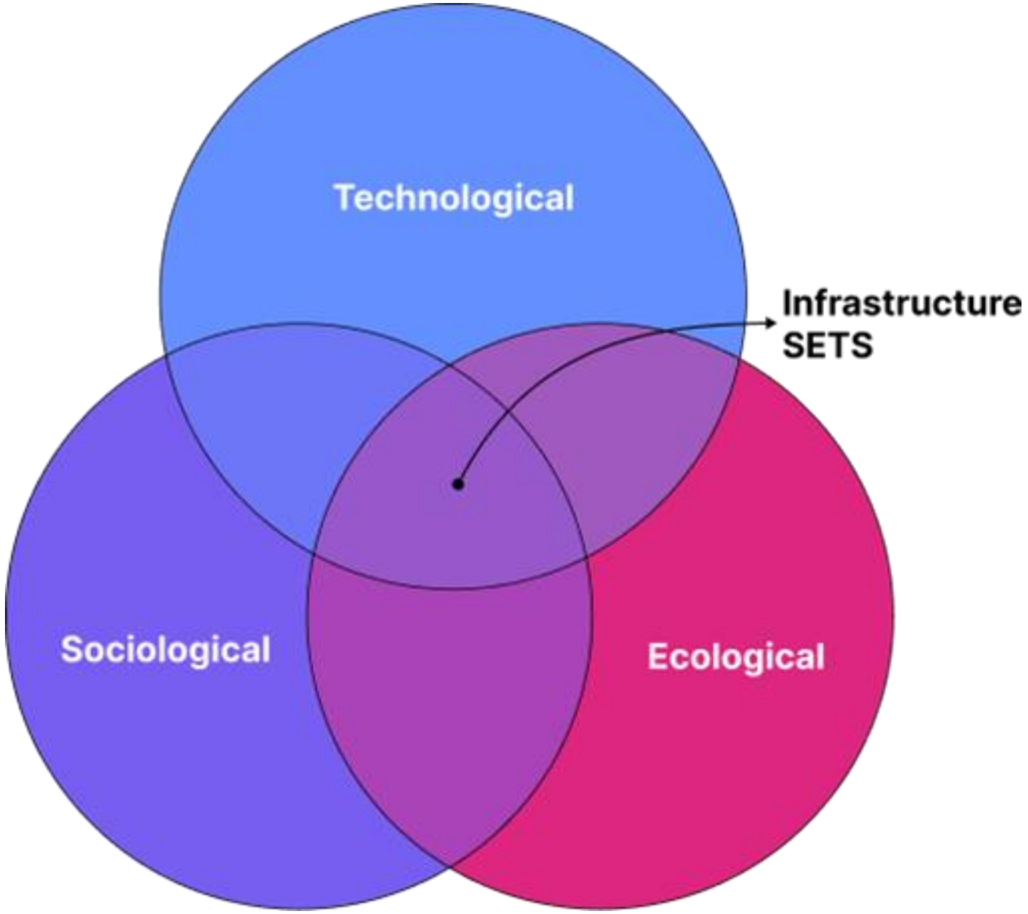
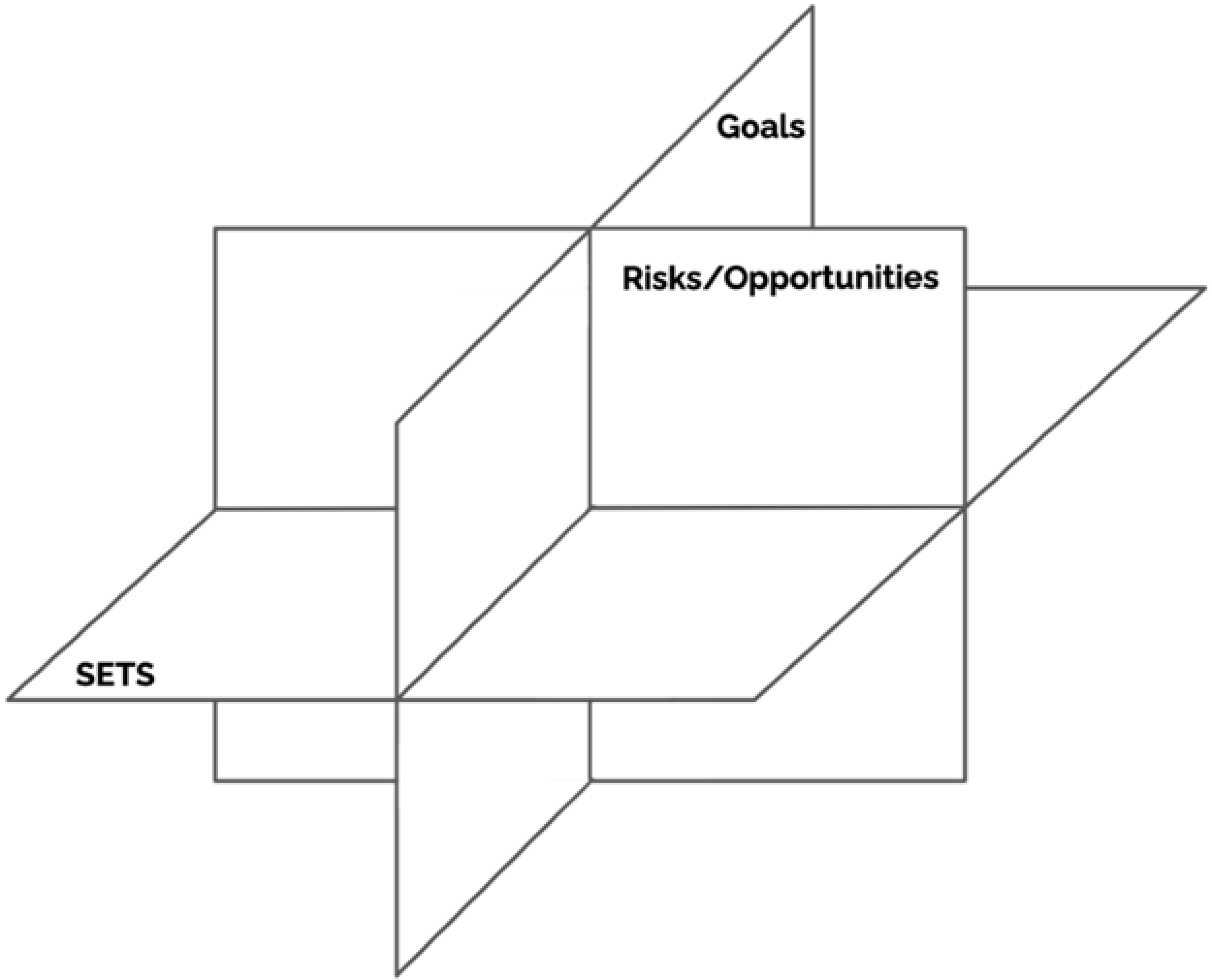


FIG. 1 INFRASTRUCTURE SETS MAP

- Anticipates complex and interconnected risks to infrastructure systems and the policies that guide their design and use.
- Captures the benefits, trade offs, and opportunities of decisions through integrated infrastructure planning.
- Models the capacity of policy responses to meet current infrastructure goals while ensuring resilient policy capacity to the range of potential climate futures.

MAP the relationship of the infrastructure SETS, goals, and risk



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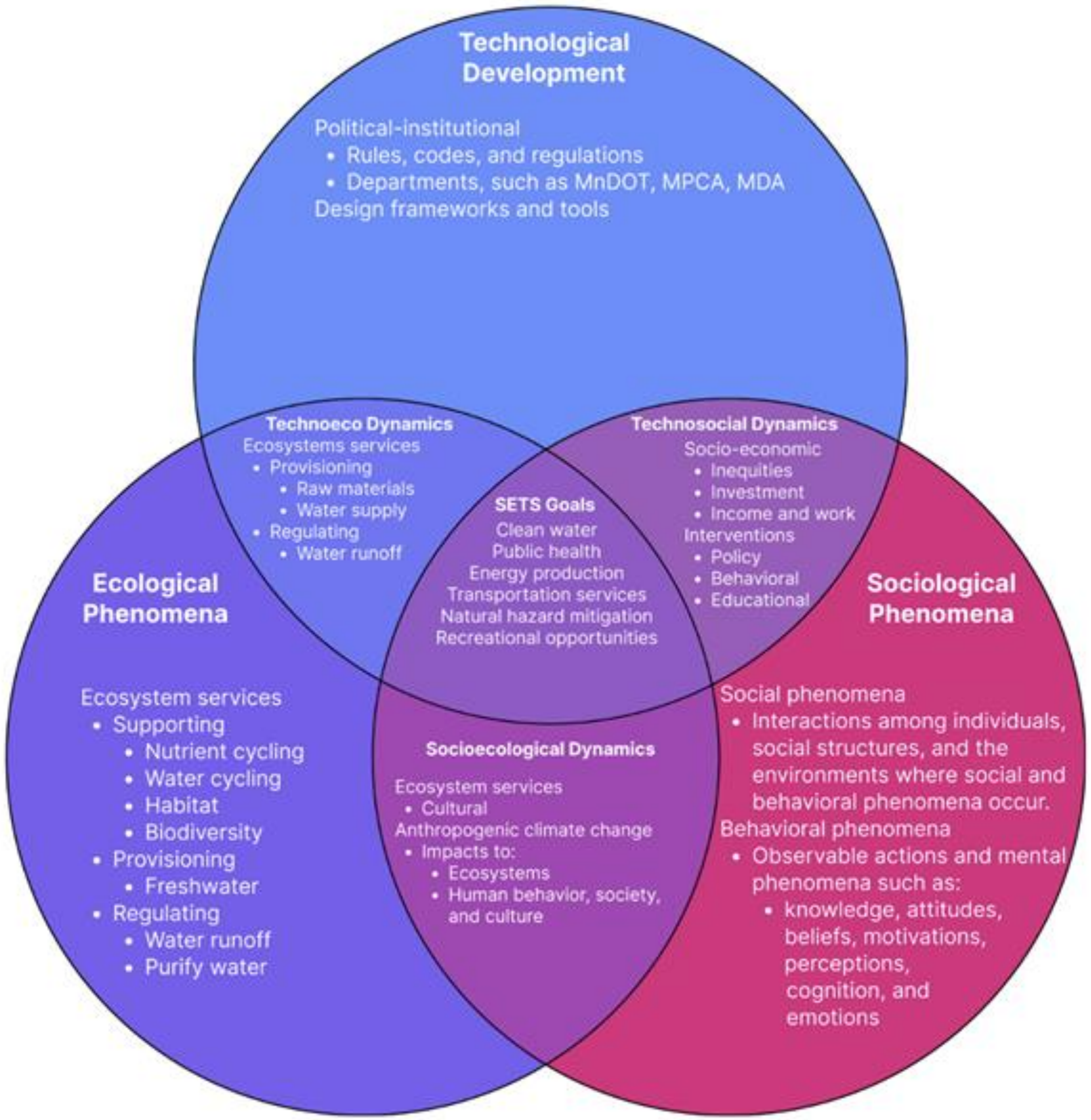


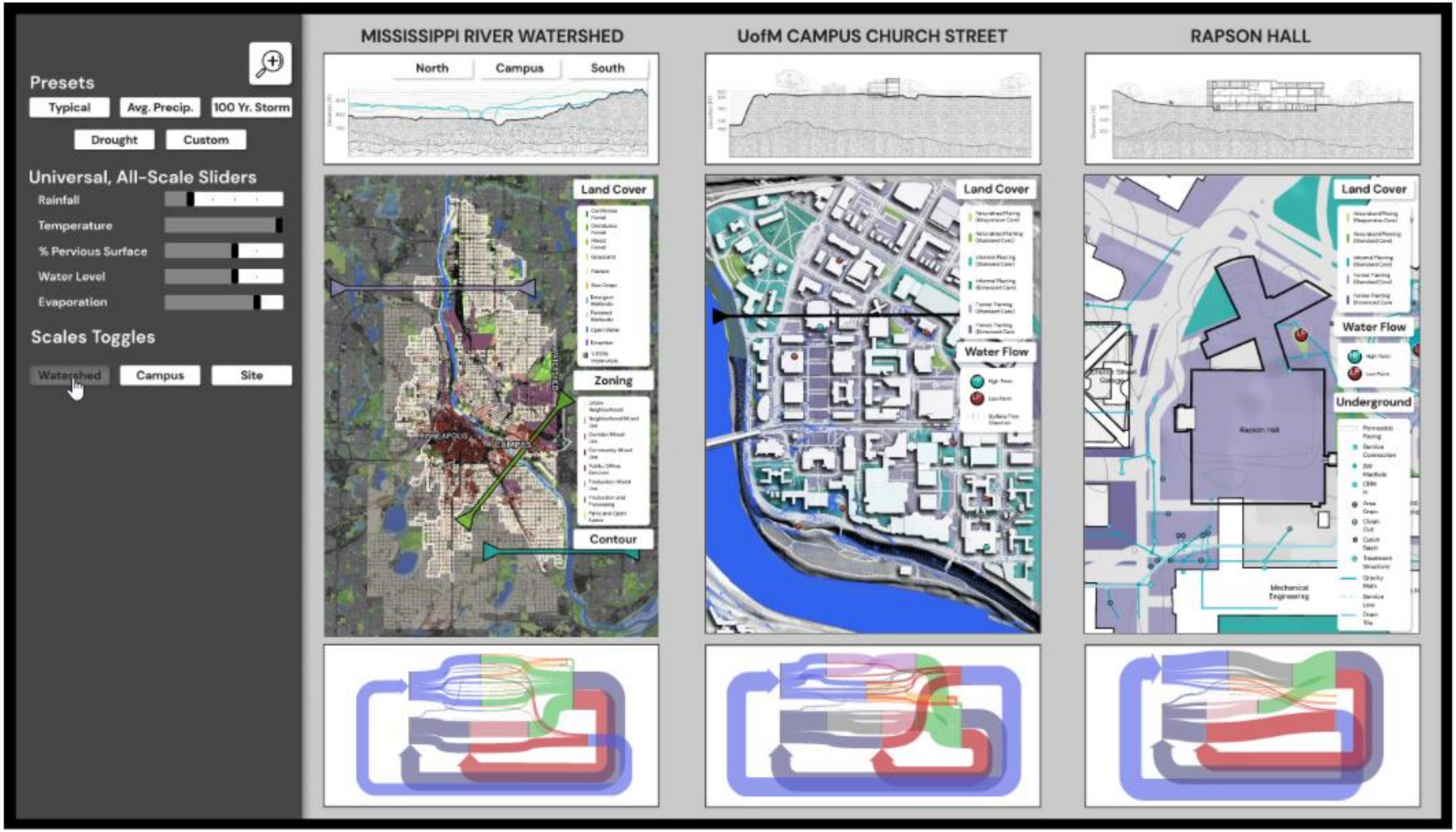
Built environment infrastructure includes all built or intentionally used ecological phenomena that support the design, construction, operations, or, maintenance of built infrastructure.

WATERSHED SCALE ANALYSIS

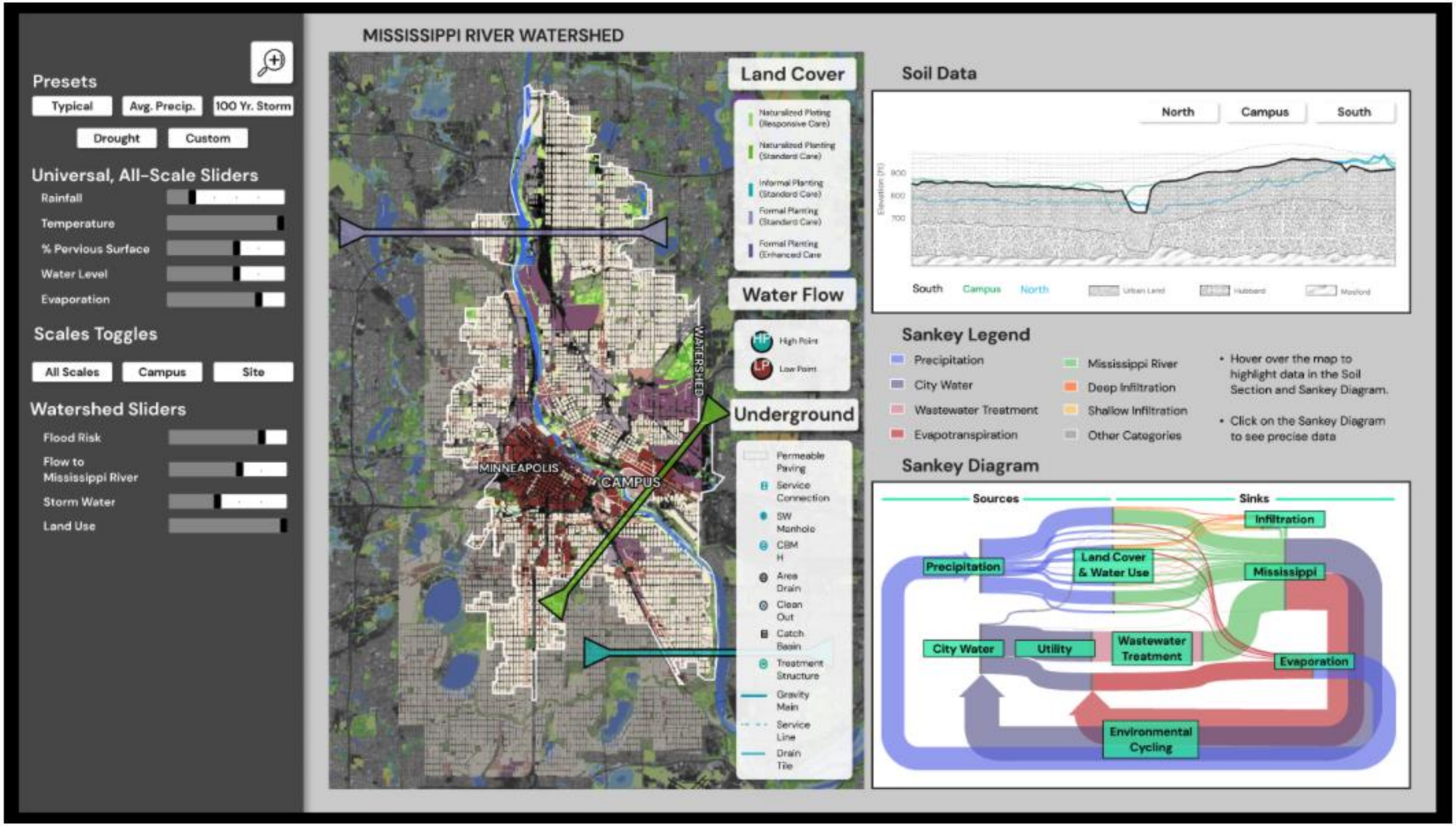
- We want to assess water-based climate change effects at the watershed, subwatershed (huc8), the district scale, and the building/site scale.
- Utilizing the watershed boundary creates more realistic values for the aggregate effects that future weather/water will have because watersheds are contained geologically.
- These watershed scale analysis will hopefully be more useful to watershed managers when identifying priorities for resilient design and policy within their own watershed.

Basins and Major Watersheds in Minnesota

https://minnesotawaterstewards.org/your-watershed



Presets
Typical
Avg. Precip.
100 Yr. Storm
Drought
Custom
Universal, All-Scale Sliders
Rainfall
Temperature
% Pervious Surface
Water Level
Evaporation
Scales Toggles
Watershed
Campus
Site
MISSISSIPPI RIVER WATERSHED
North
Campus
South
Land Cover
Zoning
Contour
UofM CAMPUS CHURCH STREET
Land Cover
Water Flow
RAPSON HALL
Land Cover
Water Flow
Underground
Rapson Hall
Mechanical Engineering



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Scales Toggles
All Scales
Campus
Site
Watershed Sliders
Flood Risk
Flow to Mississippi River
Storm Water
Land Use
MISSISSIPPI RIVER WATERSHED
MINNEAPOLIS
CAMPUS
WATERSHED
Land Cover
Water Flow
High Point
Low Point
Underground
Permeable Paving
Service Connection
SW Manhole
CBM H
Area Drain
Clean Out
Catch Basin
Treatment Structure
Gravity Main
Service Line
Drain Tile
Soil Data
North
Campus
South
South
Campus
North
Sankey Legend
Precipitation
City Water
Wastewater Treatment
Evapotranspiration
Mississippi River
Deep Infiltration
Shallow Infiltration
Other Categories
• Hover over the map to highlight data in the Soil Section and Sankey Diagram.
• Click on the Sankey Diagram to see precise data
Sankey Diagram
Sources
Sinks
Infiltration
Precipitation
Land Cover & Water Use
Mississippi
City Water
Utility
Wastewater Treatment
Evaporation
Environmental Cycling

Annual | 2100 - High Emmissions

SITE #1 University of Minnesota -Twin Cities

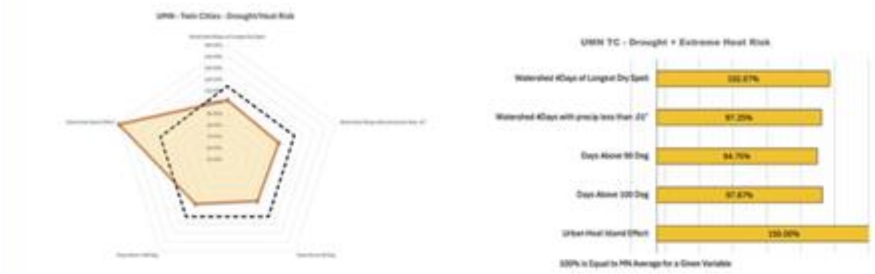
Hydrological Soil Group:..........................A 0% B 0% C 50% D 50%
Elevation:..807ft ASL
GPS Coords:...112985.22 N 125934.22 E
Nearest Waterbody:..................................Mississippi River
Distance to Receiving Waterbody:............0.75 mi
Watershed:..MWMO
Elev. in Watershed:.................................Uplands
Surrounding Land Use:...............................Commercial
Rural/Urban/Natural:................................Urban

Homeland Security Region: 6

HUC8 Watershed: MWMO

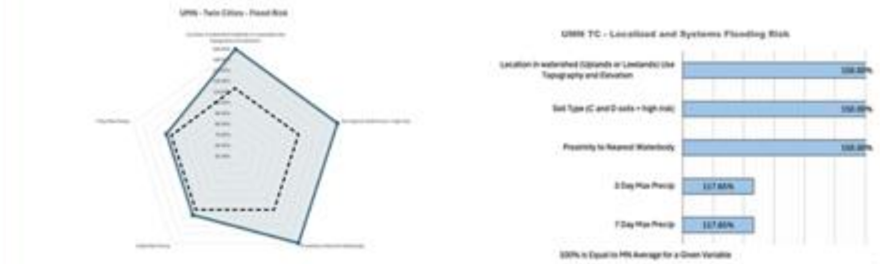
NOAA Climate Region: EC

DROUGHT/HEAT



Low — High
Risk Factor

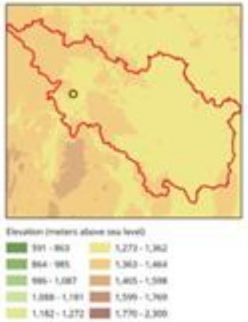
FLOOD/EXCESS PRECIP



Low — High
Risk Factor

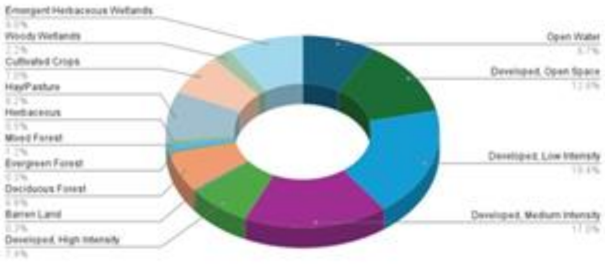
SITE/CONTEXT FACTORS

ELEVATION



WATERBODIES

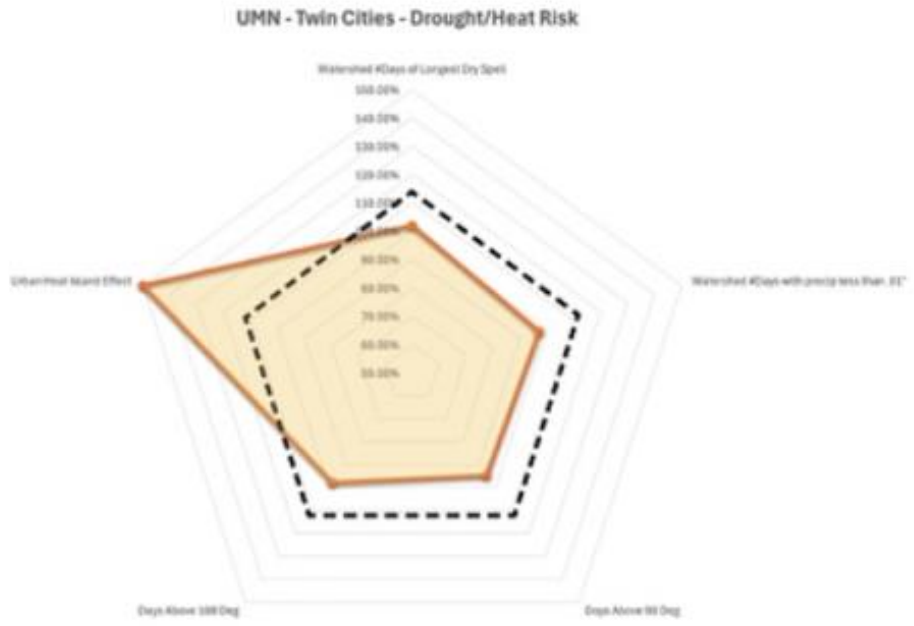
LAND COVER/USE

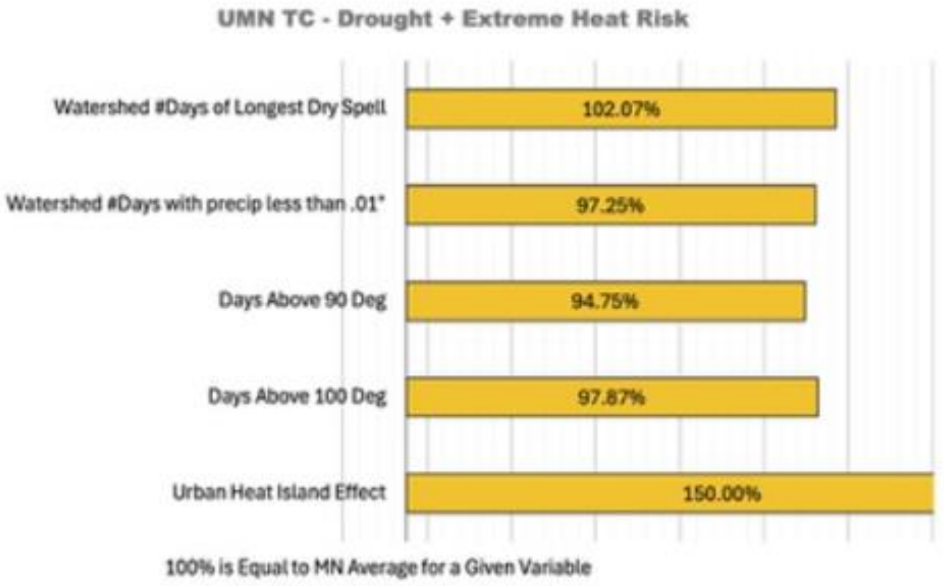


Low — High
Risk Factor

Annual | 2100 - High Emmissions

DROUGHT/HEAT





Low

High

Risk Factor

SITE #1 University of Minnesota -Twin Cities

Hydrological Soil Group:..........................A 0% B 0% C 50% D 50%
Elevation:..807ft ASL
GPS Coords:..112985.22 N 125934.22 E
Nearest Waterbody:...................................Mississippi River
Distance to Receiving Waterbody:...........0.75 mi
Watershed:..MWMO
Elev. in Watershed:.....................................Uplands
Surrounding Land Use:..............................Commercial
Rural/Urban/Natural:..................................Urban

Homeland Security Region: 6

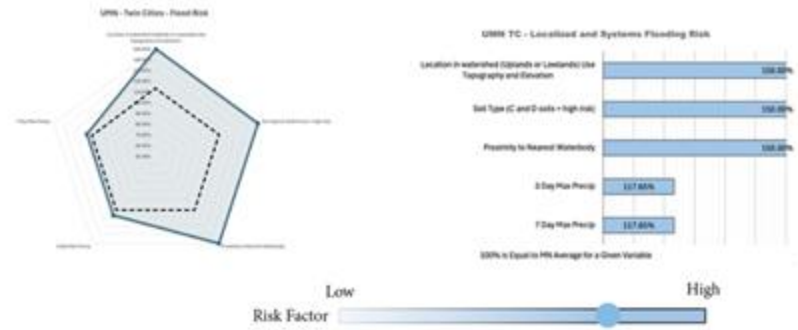
HUC8 Watershed: MWMO

NOAA Climate Region: EC

Annual
2100 - High Emmissions

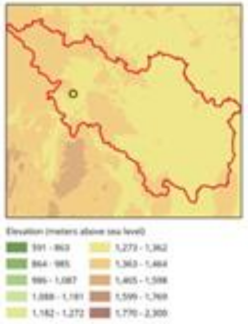
DROUGHT/HEAT

FLOOD/EXCESS PRECIP



SITE/CONTEXT FACTORS

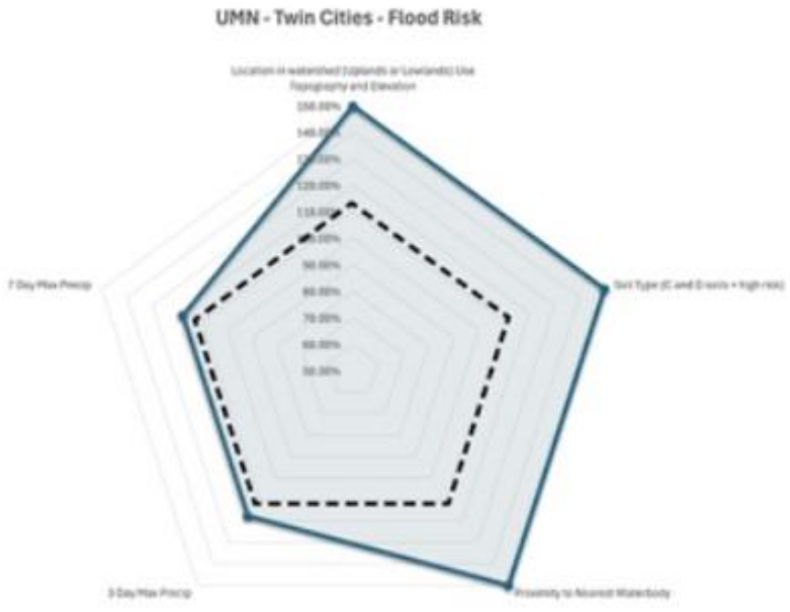
ELEVATION

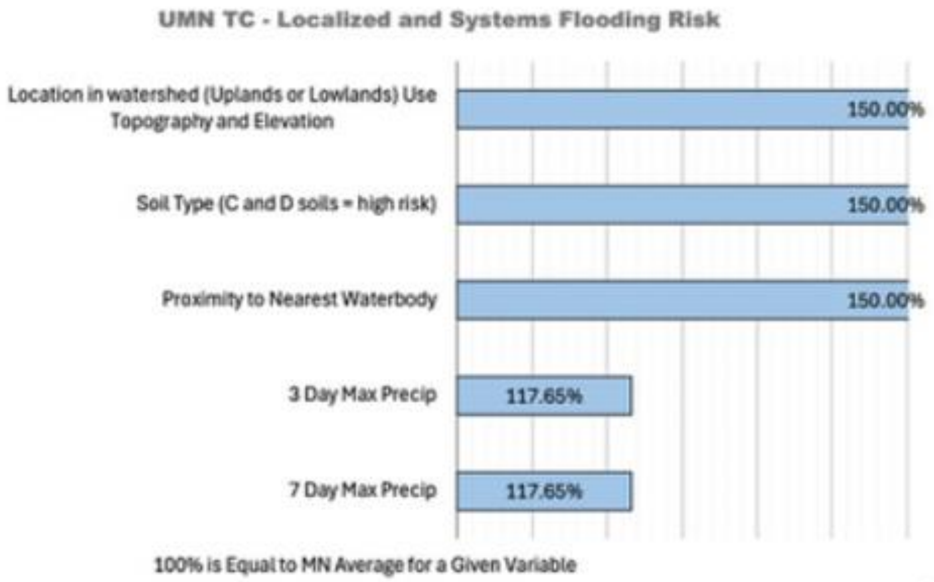


WATERBODIES

LAND COVER/USE

FLOOD/EXCESS PRECIP





Annual 2100 - High Emmissions

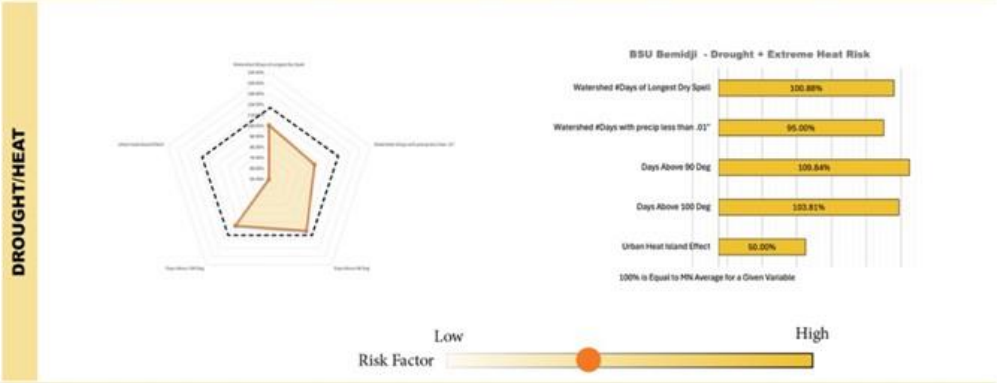
SITE #4 Bemidji State University

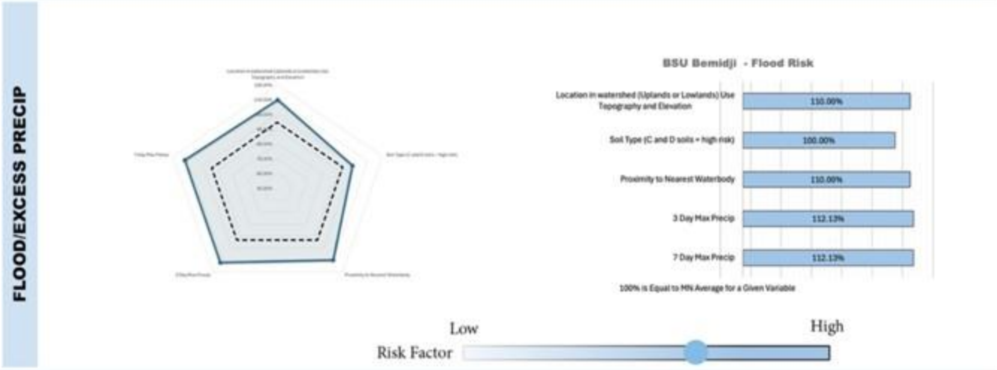
Hydrological Soil Group:..........................A 0% B 0% C 100% D 0%
Elevation:..807ft ASL
GPS Coords:..47.48421478 -94.87145831
Nearest Waterbody:..................................Lake Bemidji
Distance to Receiving Waterbody:...........0.79 mi
Watershed:..Mississippi River Hdwtrs
Elev. in Watershed:...................................Lowlands
Surrounding Land Use:..............................Commercial
Rural/Urban/Natural:..................................Urban

Homeland Security Region: 2

HUC8 Watershed: MR HDWTRS

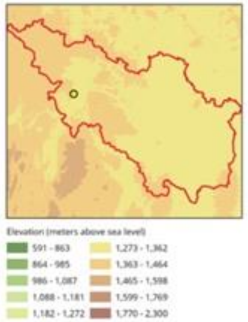
NOAA Climate Region: NC





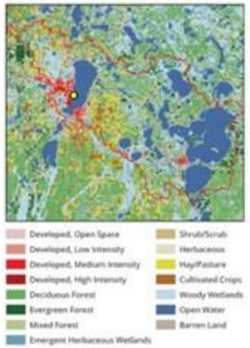
SITE/CONTEXT FACTORS

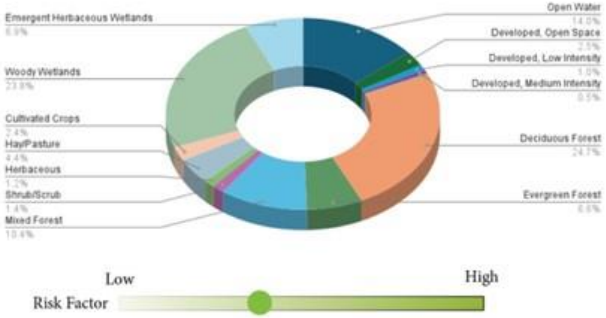
ELEVATION



WATERBODIES

LAND COVER/USE





Annual 2100 - High Emmissions

SITE #3 Mankato State University

Hydrological Soil Group:..........................A 0% B 100% C 0% D 0%
Elevation:..608ft ASL
GPS Coords:...44.14479828 -93.99917371
Nearest Waterbody:.................................Lake Bemidji
Distance to Receiving Waterbody:...........2.35 mi
Watershed:..Minnesota River - Mankato
Elev. in Watershed:.....................................Lowlands
Surrounding Land Use:.............................Commercial
Rural/Urban/Natural:.................................Urban

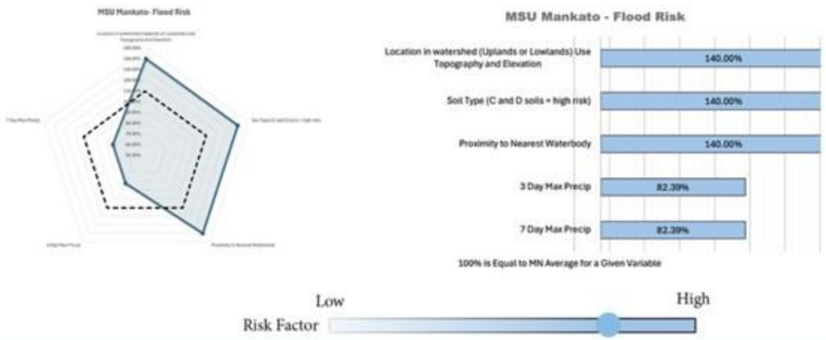
Homeland Security Region: 1

HUC8 Watershed: MN River Mankato

NOAA Climate Region: SC

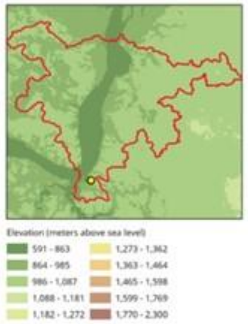
DROUGHT/HEAT

FLOOD/EXCESS PRECIP



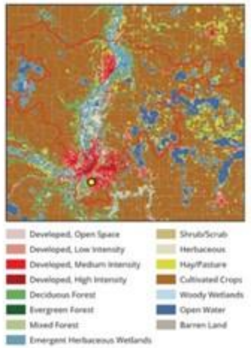
SITE/CONTEXT FACTORS

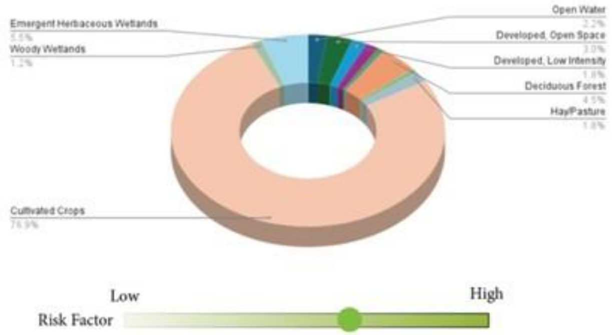
ELEVATION



WATERBODIES

LAND COVER/USE





Annual 2100 - High Emmissions

SITE #8 UMN - Duluth

Hydrological Soil Group:..........................A 0% B 100% C 0% D 0%
Elevation:..906ft ASL
GPS Coords:...46.82038116 -92.08526632
Nearest Waterbody:................................Tisher Creek
Distance to Receiving Waterbody:...........1.6 mi
Watershed:..St Louis River
Elev. in Watershed:...................................Uplands
Surrounding Land Use:............................Developed/Open
Rural/Urban/Natural:................................Urban


Homeland Security Region: 2


HUC8 Watershed: ST. LOUIS RIV

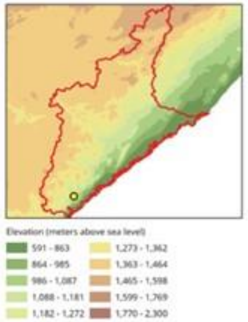

NOAA Climate Region: NE

DROUGHT/HEAT

FLOOD/EXCESS PRECIP

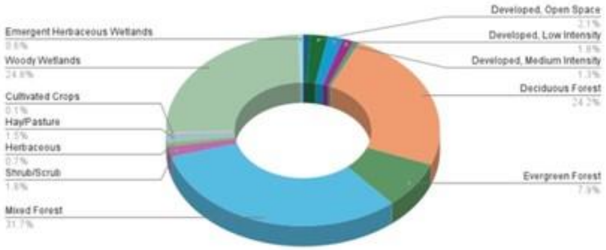
SITE/CONTEXT FACTORS

ELEVATION



WATERBODIES

LAND COVER/USE



BUILDING ENERGY DESIGN SCENARIOS

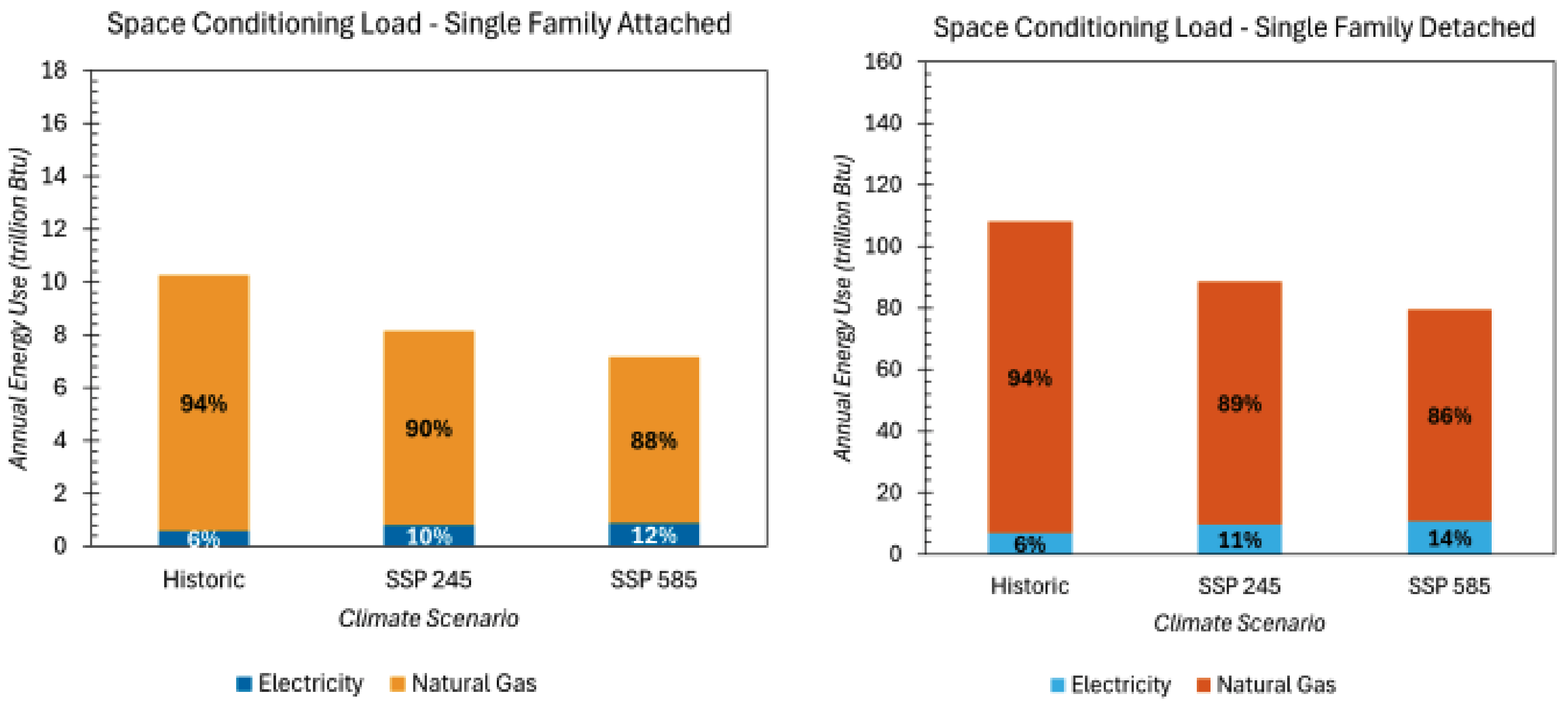


Figure 5.1: Modeled annual space conditioning loads by energy source for single family attached and single family detached homes in the Metro Area.

BUILDING ENERGY DESIGN SCENARIOS

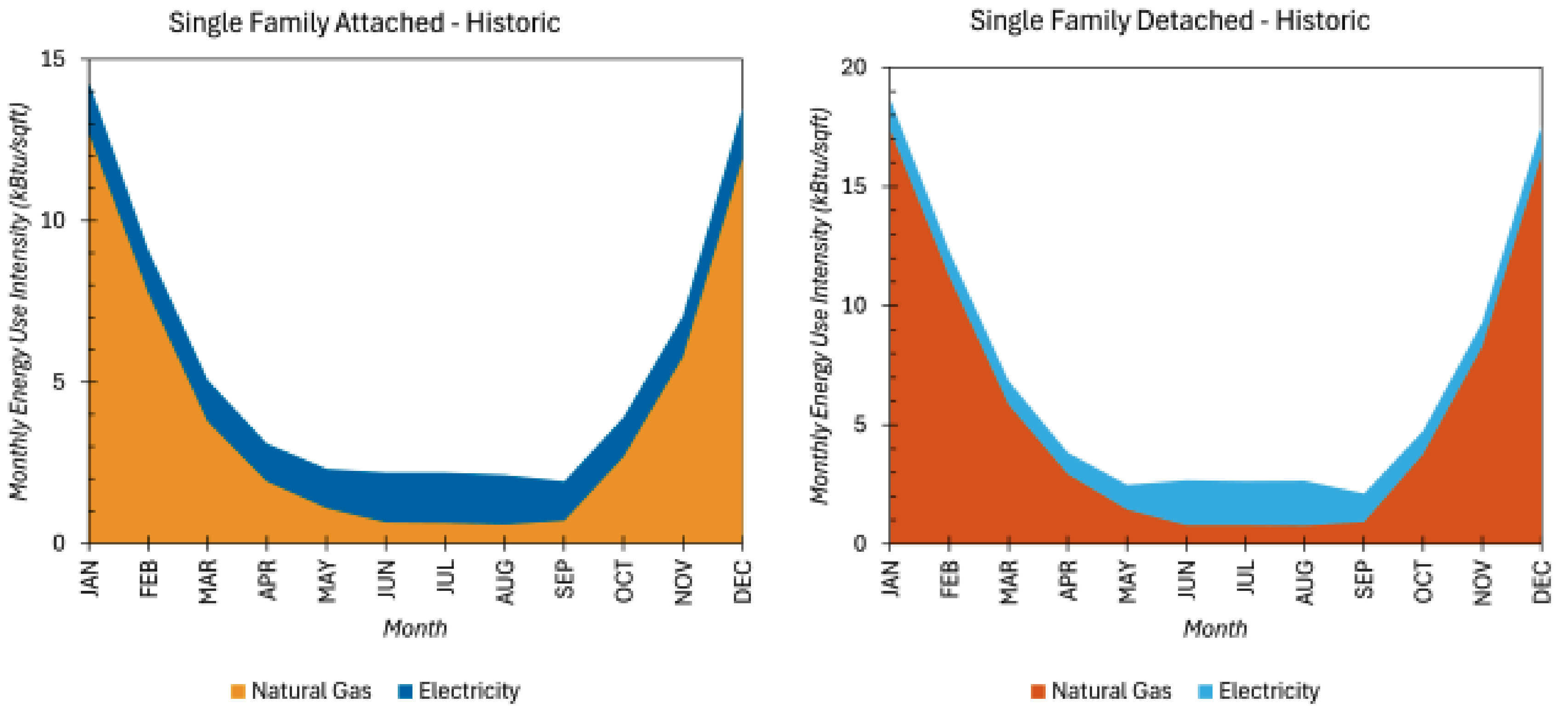


Figure 5.2: Modeled monthly space conditioning loads by energy source for single family attached and single family detached homes in the Metro Area under historic conditions.

BUILDING ENERGY DESIGN SCENARIOS

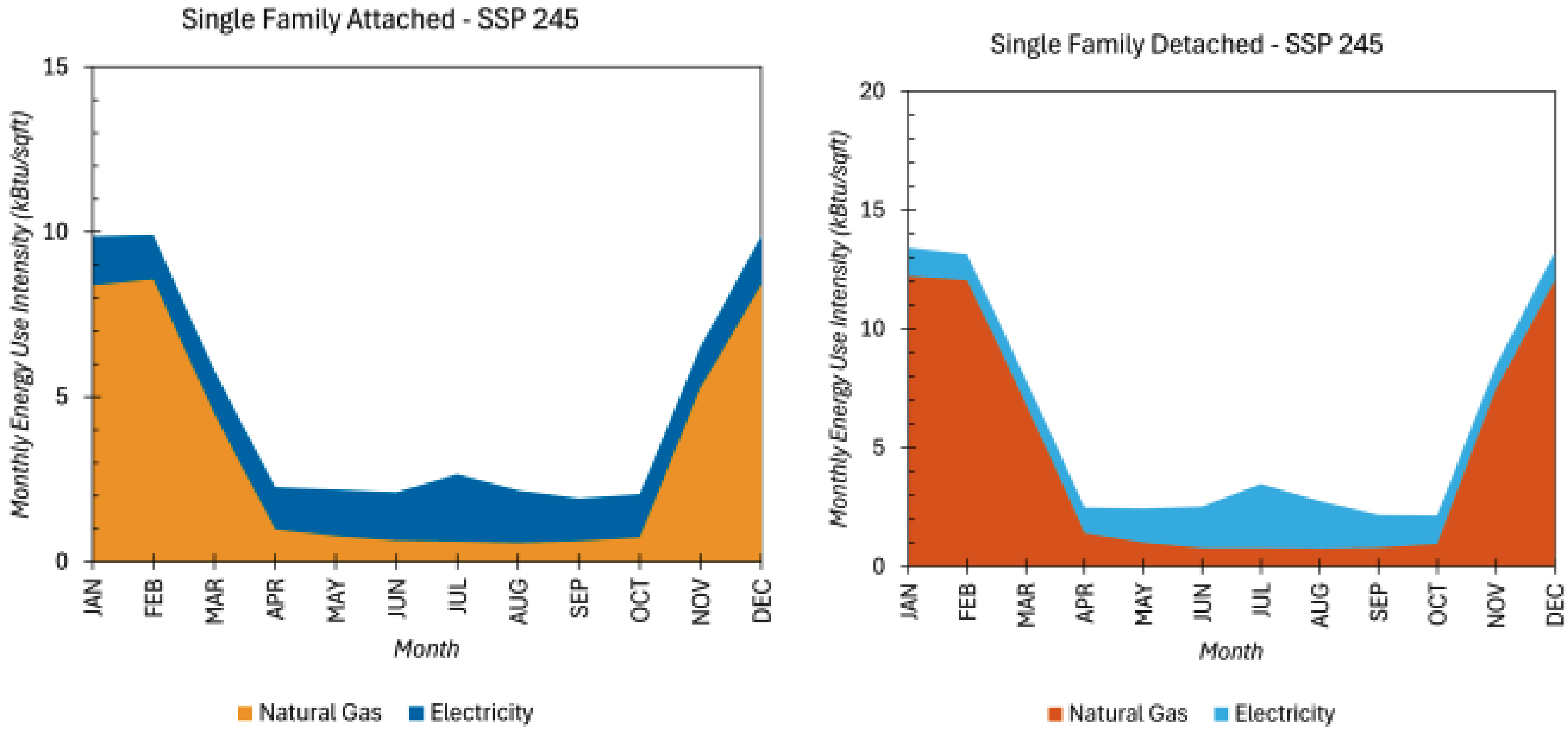
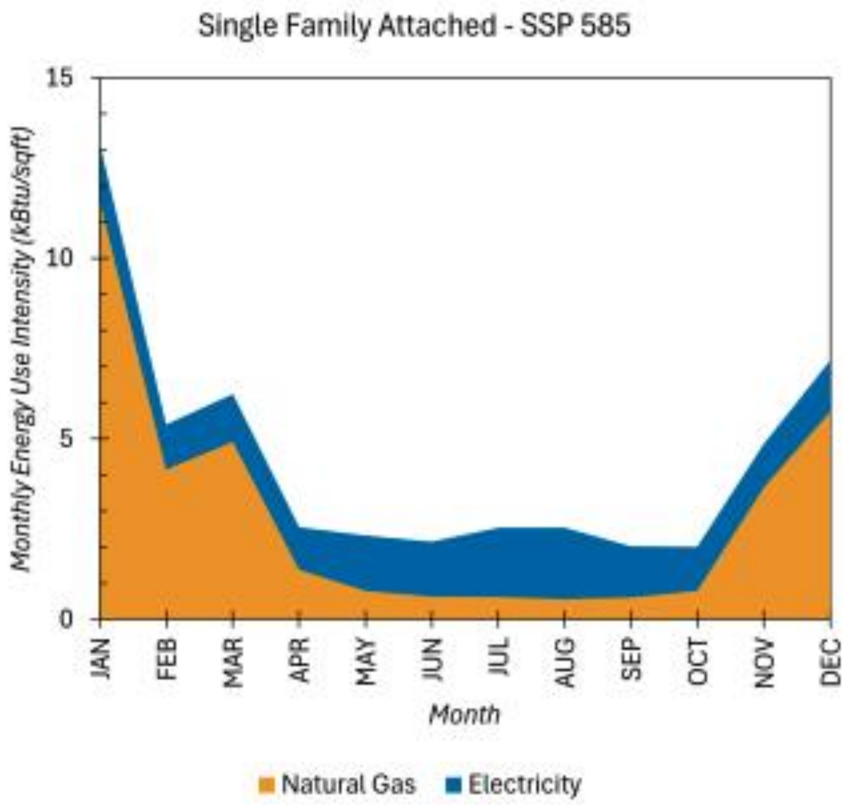


Figure 5.3: Modeled monthly space conditioning loads by energy source for single family attached and single family detached homes in the Metro Area under climate scenario SSP 245.

BUILDING ENERGY DESIGN SCENARIOS



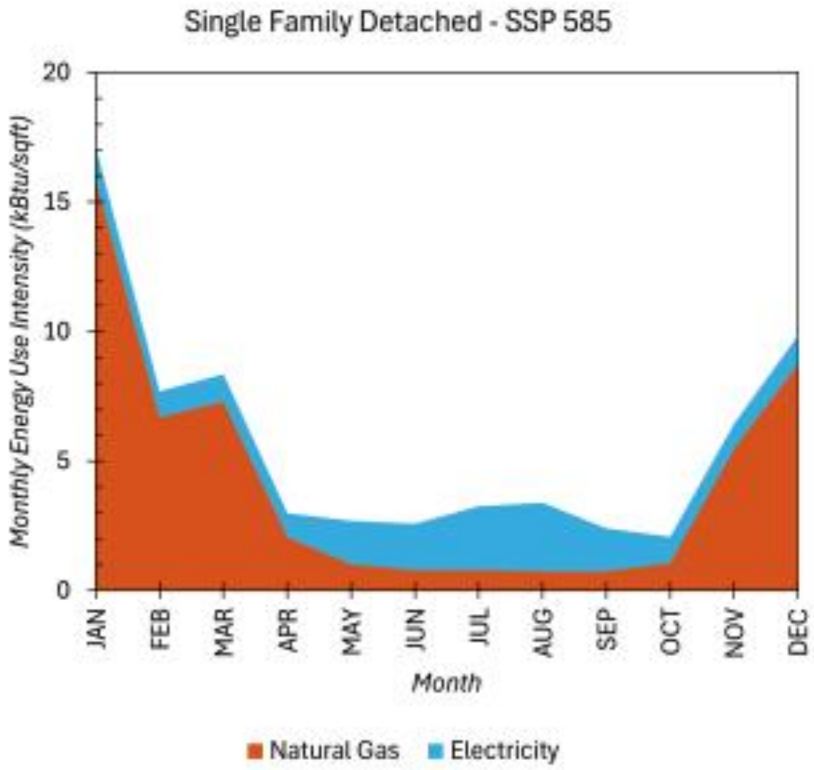


Figure 5.4: Modeled monthly space conditioning loads by energy source for single family attached and single family detached homes in the Metro Area under climate scenario SSP 585.

BUILDING ENERGY DESIGN SCENARIOS

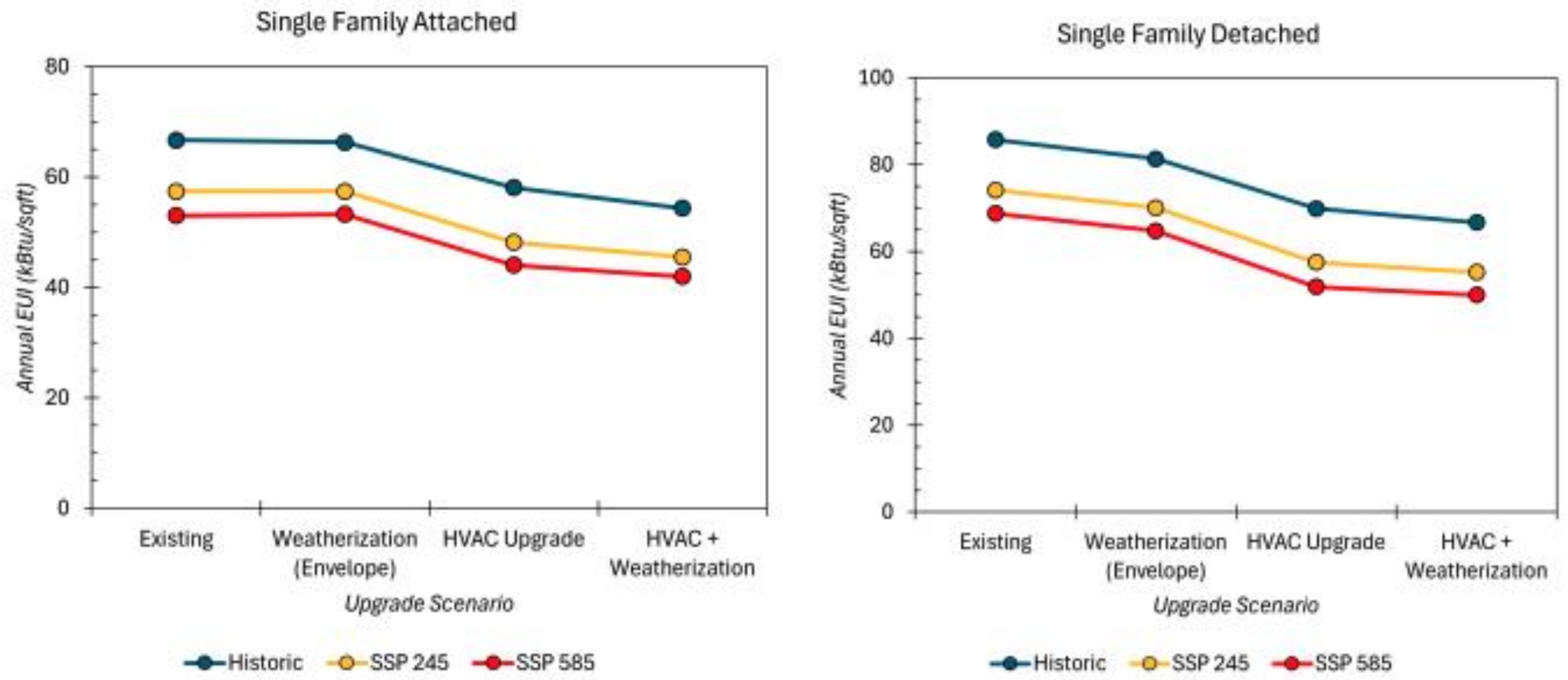
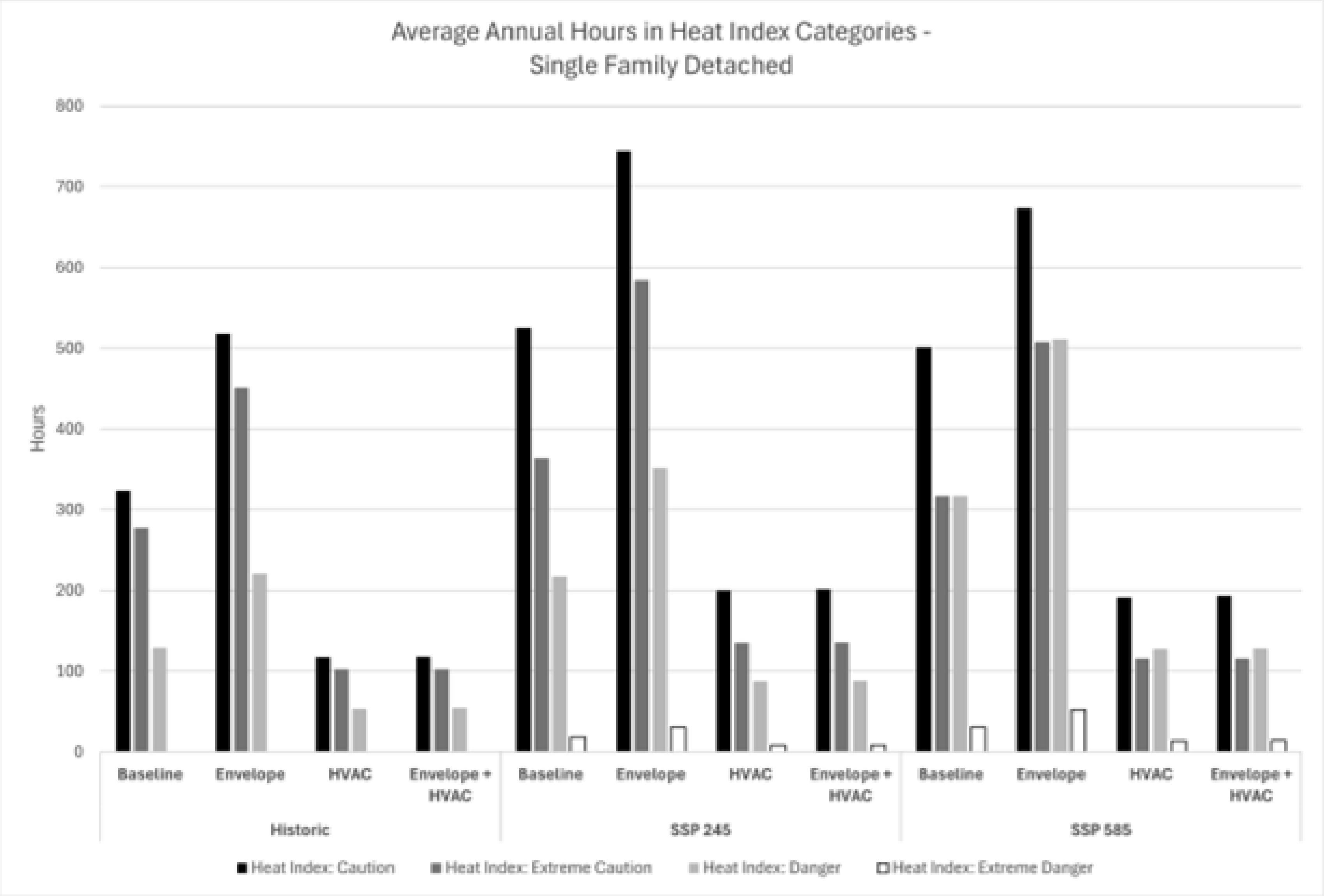
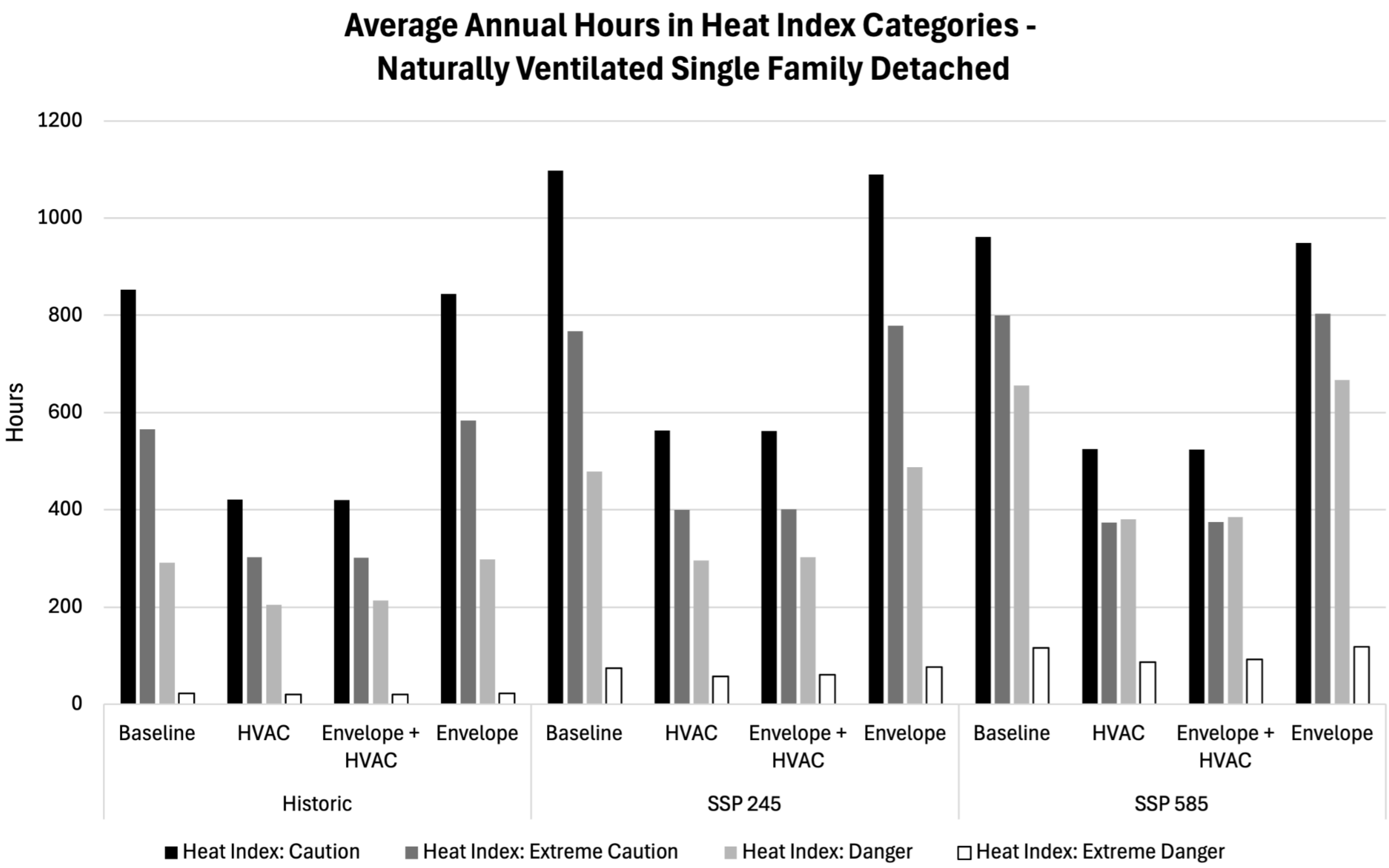


Figure 5.5: Modeled annual energy demand for single family attached and single family detached homes in the Metro Area for baseline and improved performance, in historic and future climate scenarios.

BUILDING ENERGY DESIGN SCENARIOS



BUILDING ENERGY DESIGN SCENARIOS



Analyzing infrastructure as a complex social, ecological, and technological system can reveal overlooked climate actions.

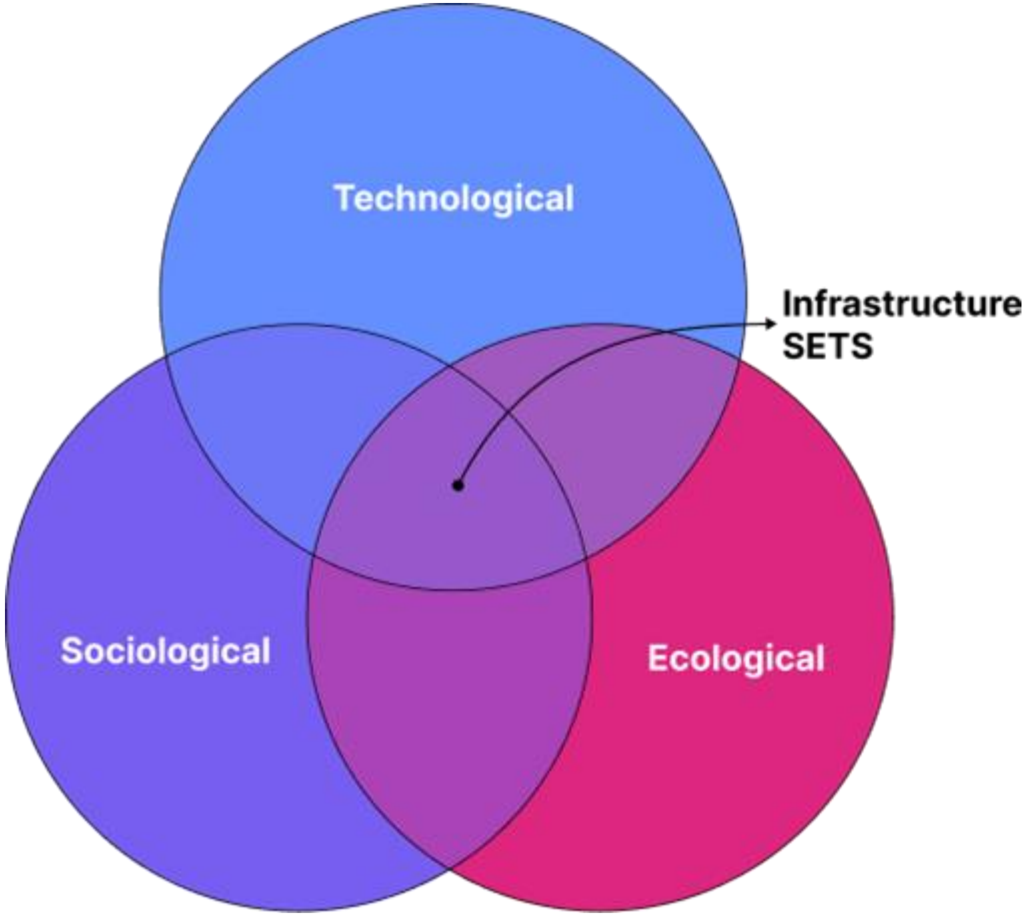
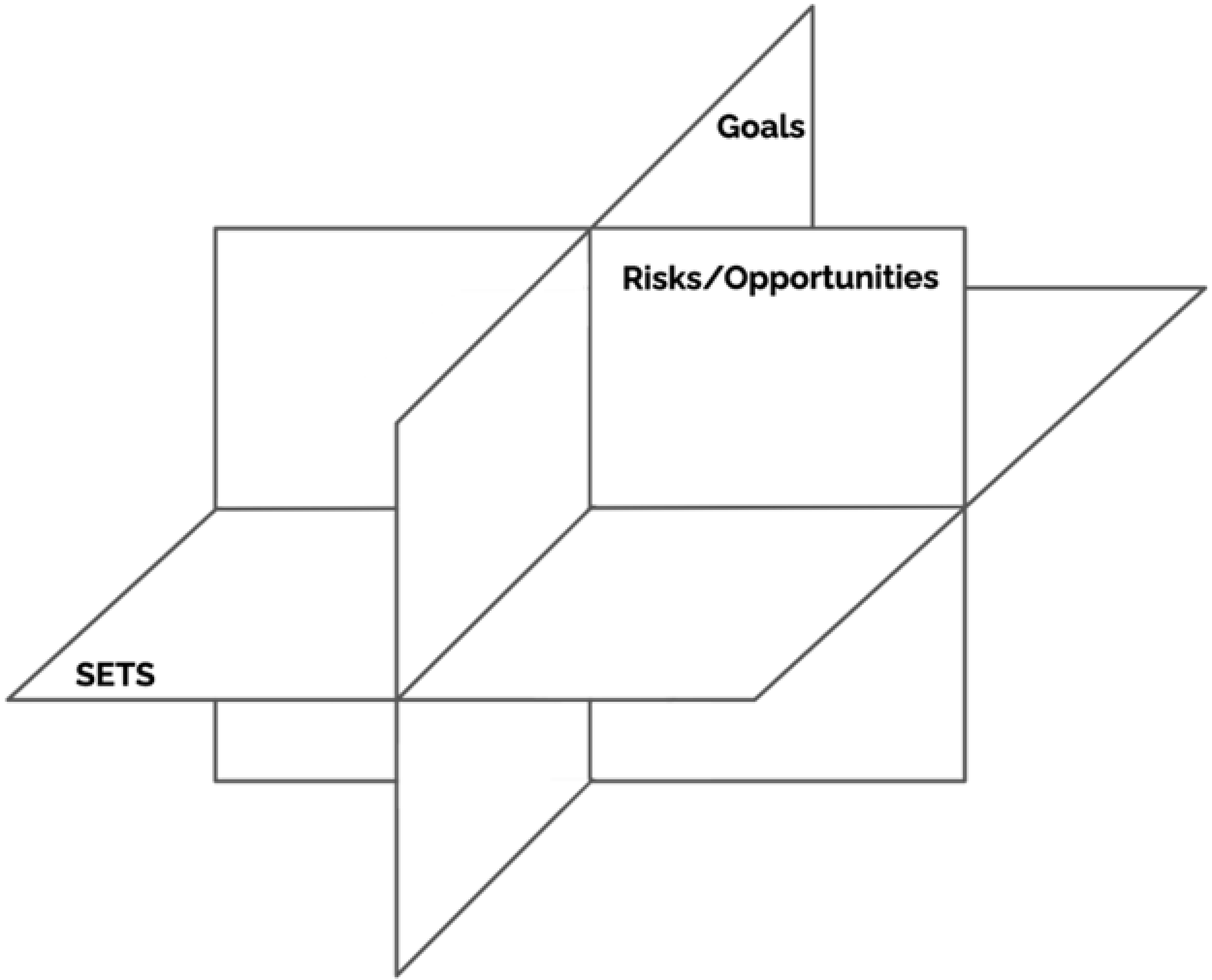


FIG. 1 INFRASTRUCTURE SETS MAP

- Anticipates complex and interconnected risks to infrastructure systems and the policies that guide their design and use.
- Captures the benefits, trade offs, and opportunities of decisions through integrated infrastructure planning.
- Models the capacity of policy responses to meet current infrastructure goals while ensuring resilient policy capacity to the range of potential climate futures.

MAP the relationship of the infrastructure SETS, goals, and risk



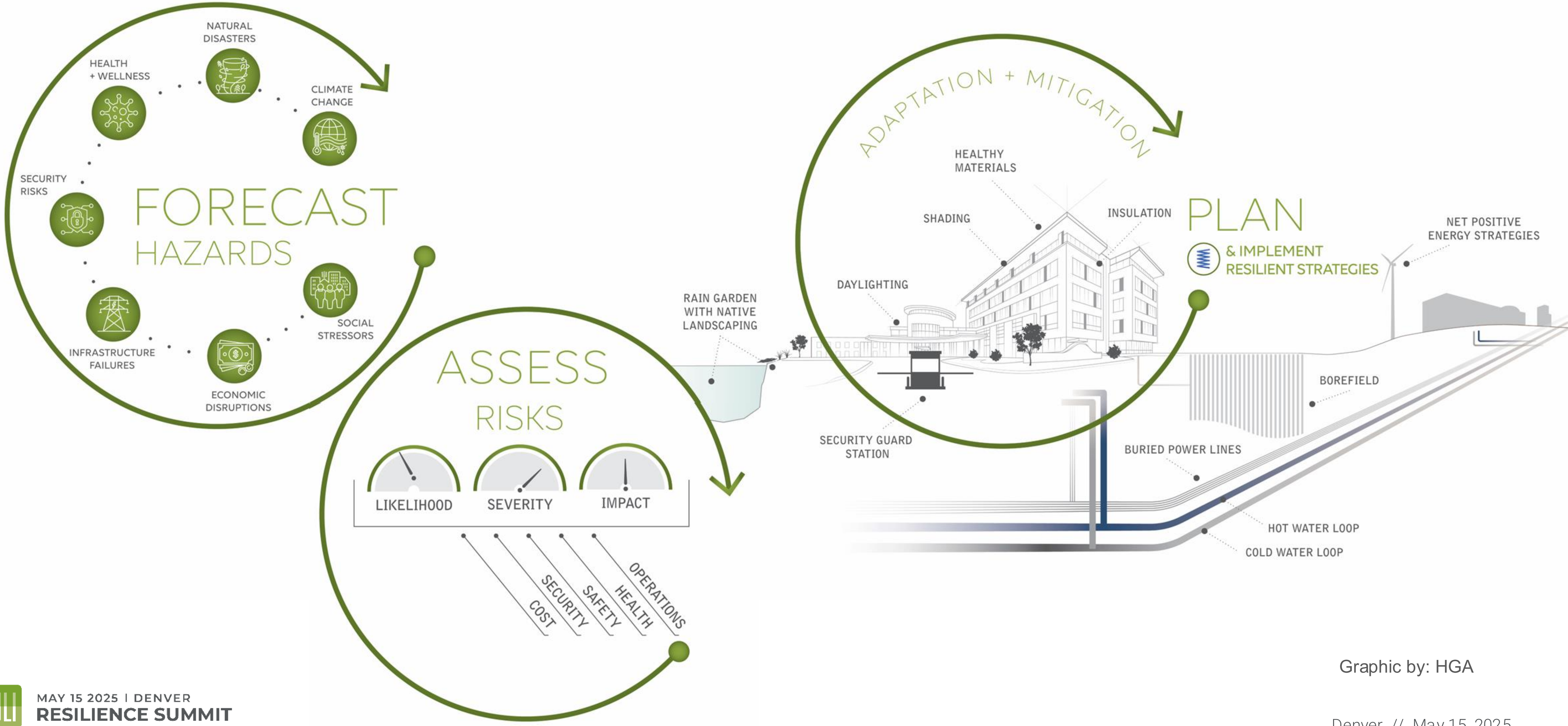
OUR WORK: examining water system resilience amid climate uncertainty

APPROACHES FROM PRECINCT & ASSET SCALES

Ariane Laxo, Director of Sustainability

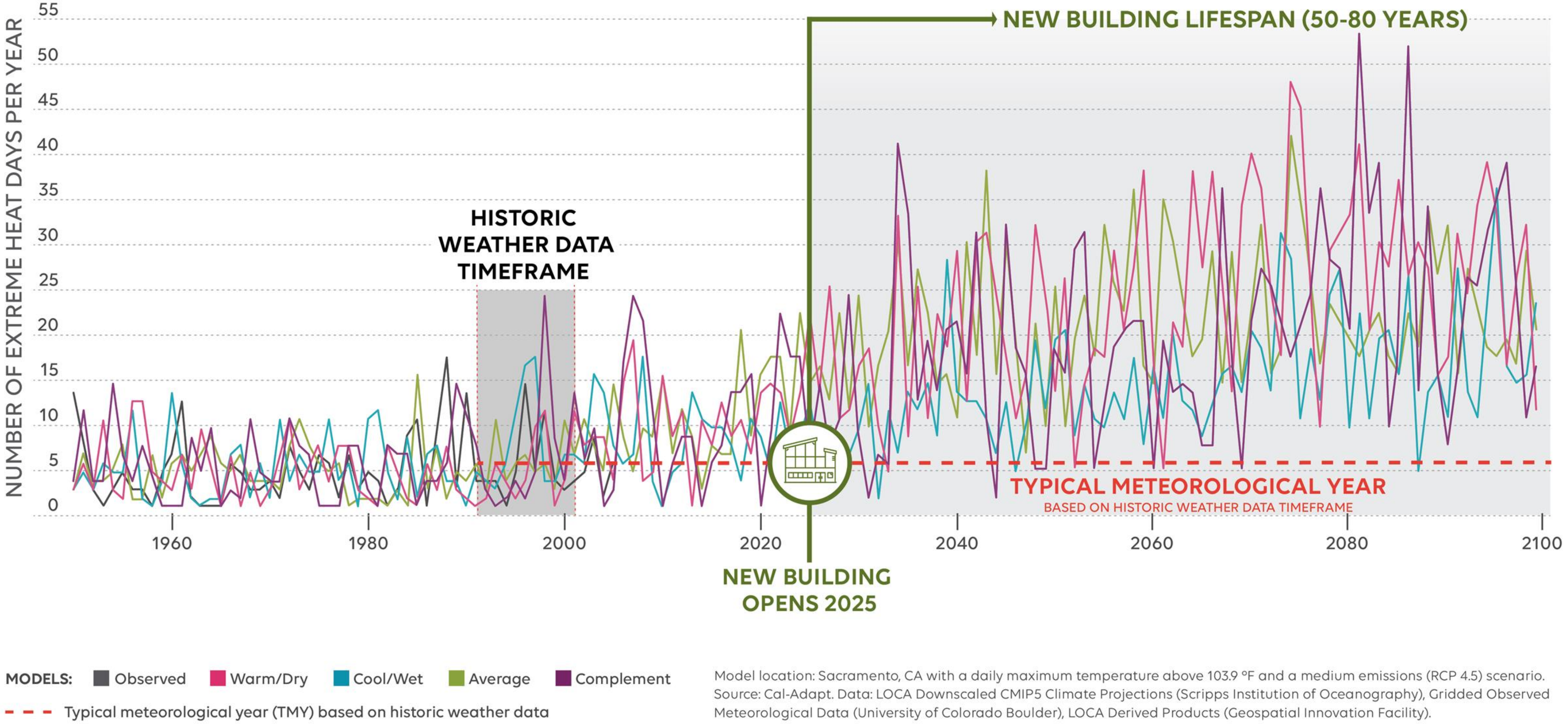
HGA Architects & Engineers

PLANNING FOR RESILIENCE



Graphic by: HGA

RISKS OF USING HISTORIC WEATHER DATA TO INFORM DESIGN



Model location: Sacramento, CA with a daily maximum temperature above 103.9 °F and a medium emissions (RCP 4.5) scenario. Source: Cal-Adapt. Data: LOCA Downscaled CMIP5 Climate Projections (Scripps Institution of Oceanography), Gridded Observed Meteorological Data (University of Colorado Boulder), LOCA Derived Products (Geospatial Innovation Facility).

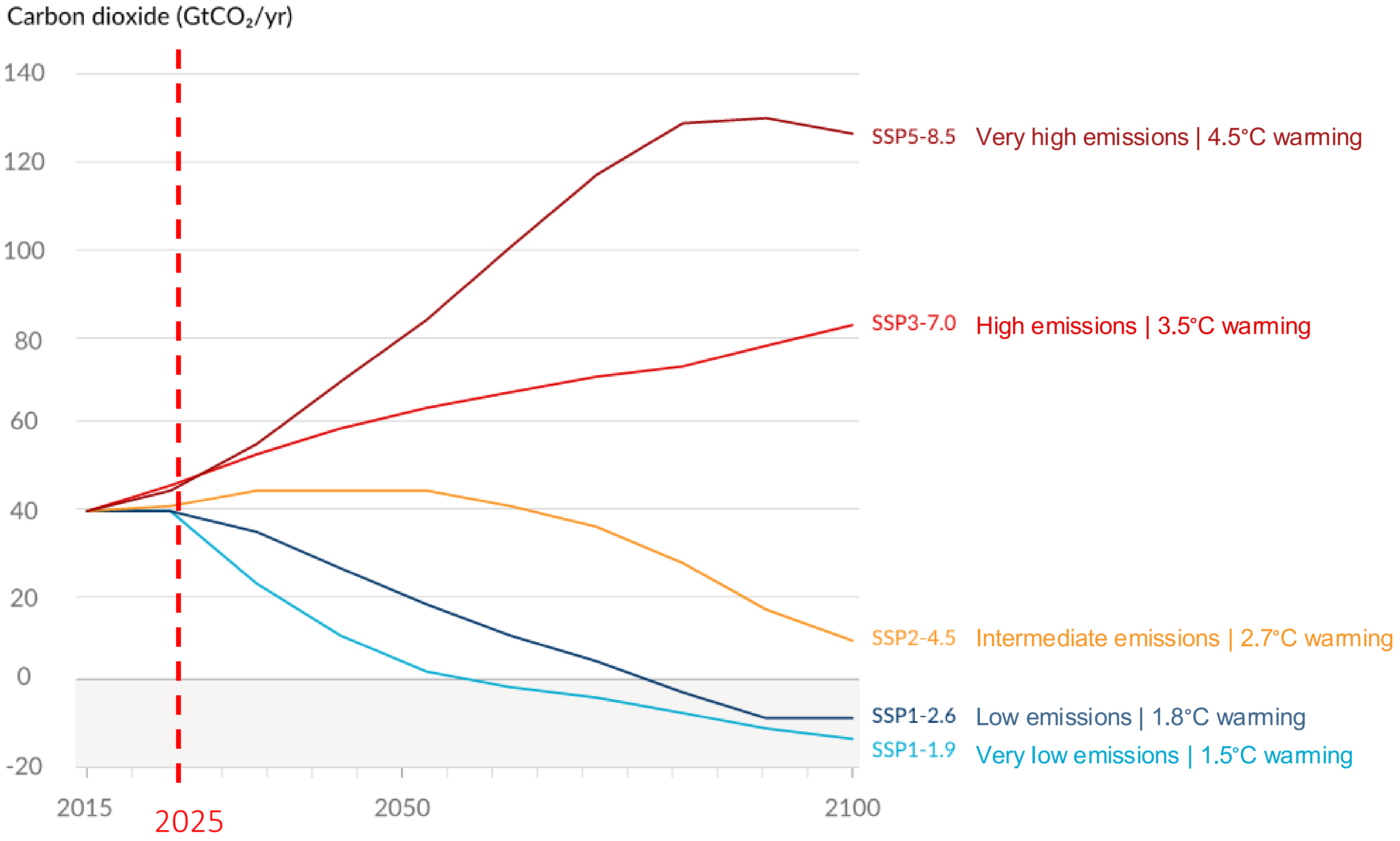
Graphic by: HGA

WHAT IS SCENARIO PLANNING?

Scenario planning constructs scenarios as *descriptions of possible alternative futures* and/or the causal events and trajectories that can lead to different future states. These scenarios are often presented in the form of narratives or storylines and are not predictions of what the future will look like, but *plausible representations* of possible futures based on drivers of change.

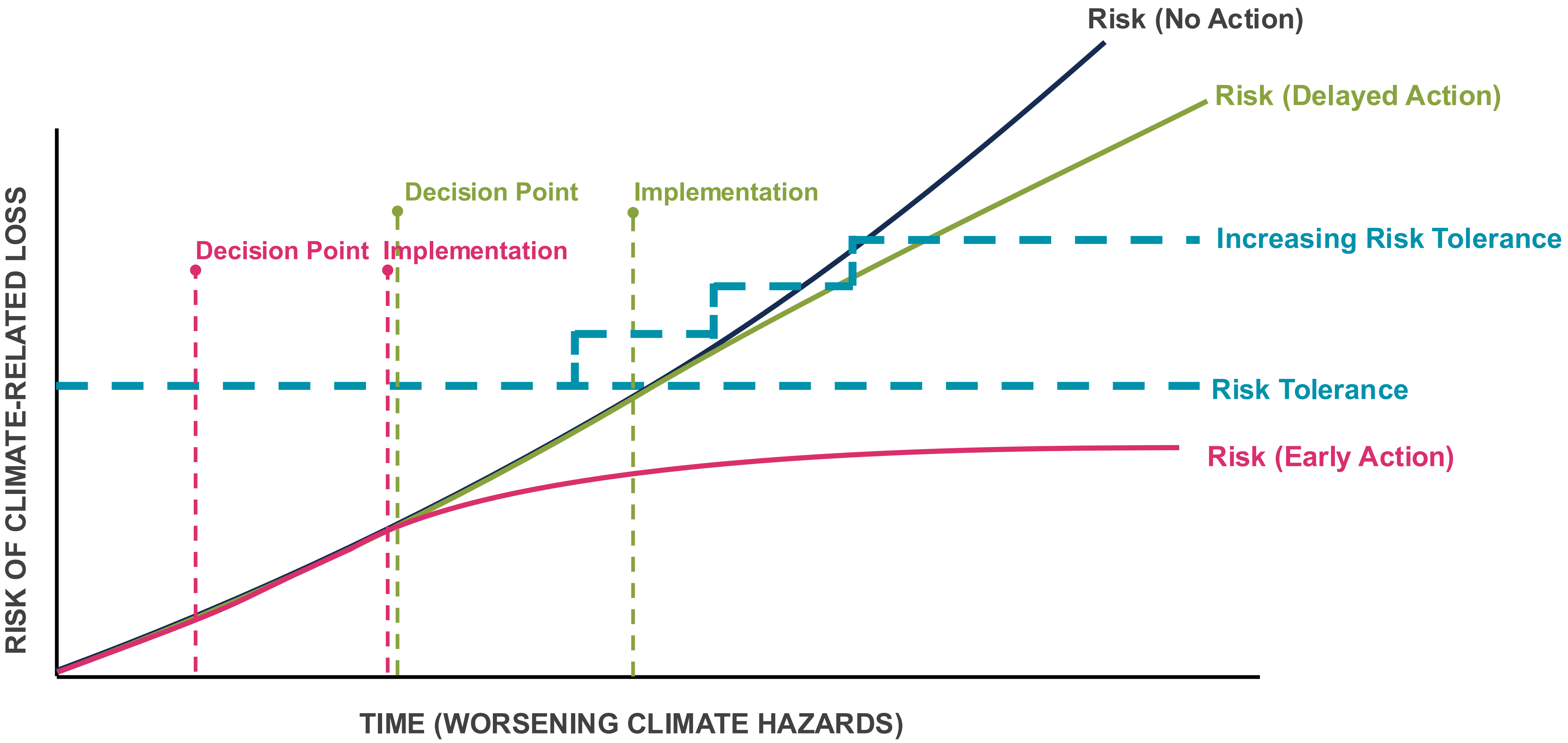
Silvia Serrao-Neumann et al., 2019
Scenario planning for climate change adaptation for natural resource management

WHICH SCENARIO(S) TO USE?

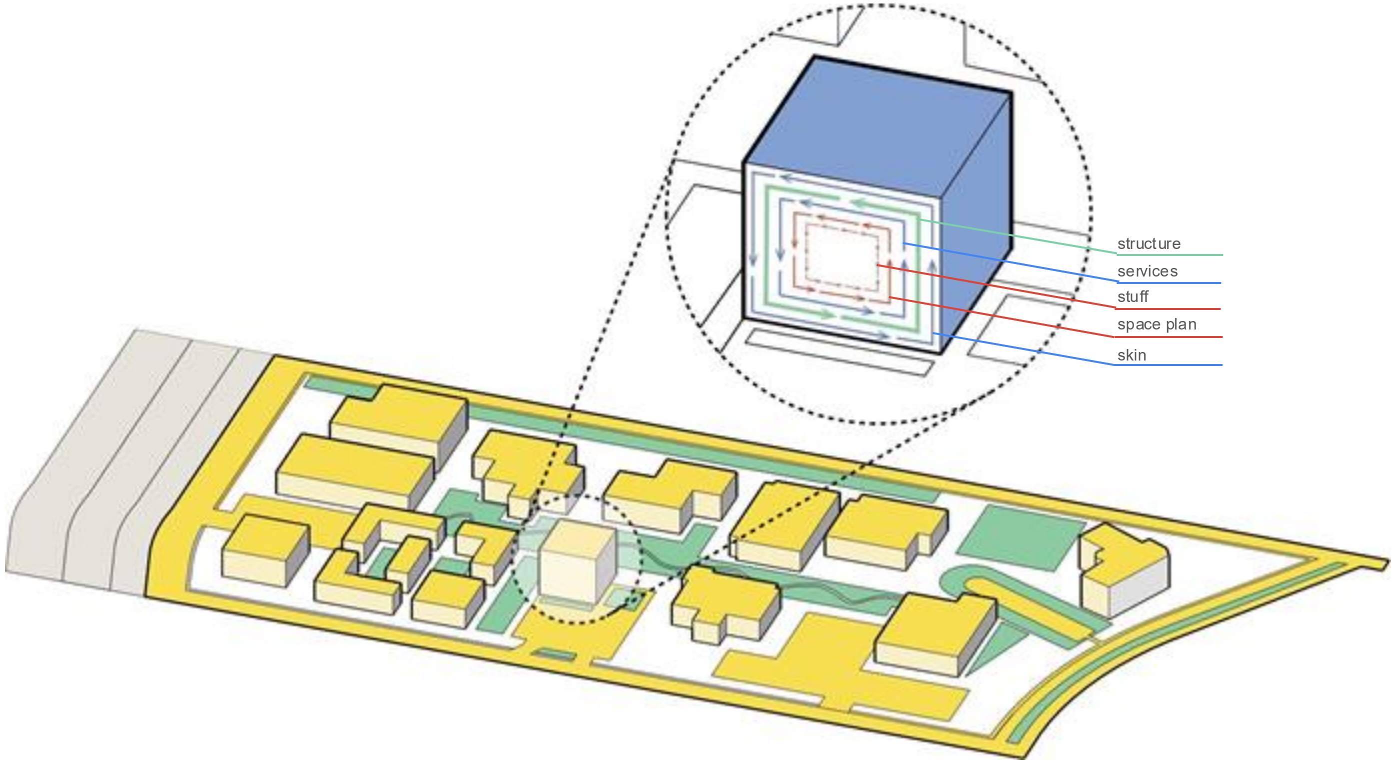


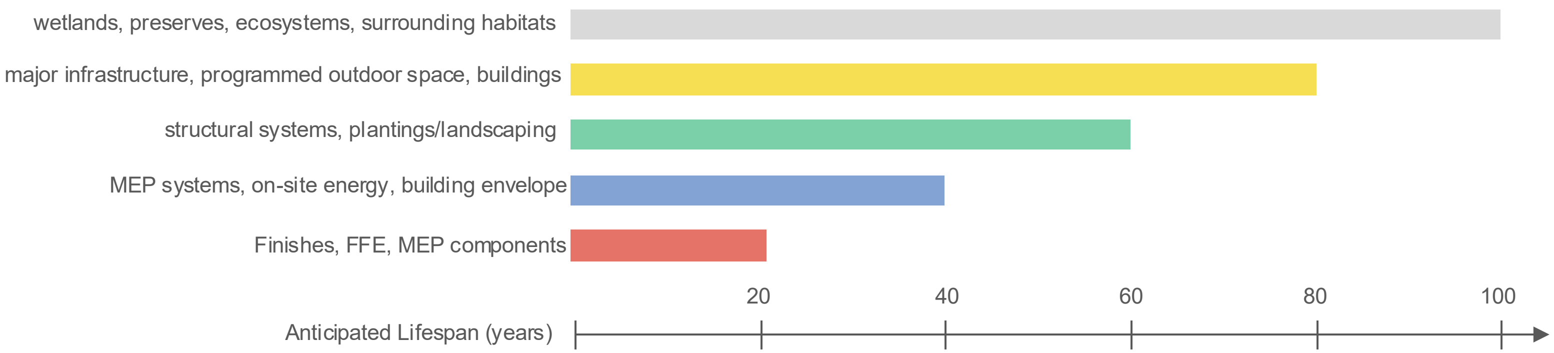
Source: 2021 IPCC AR6 Summary for Policy Makers

ADAPTATION PATHWAYS CRITICAL DECISION POINTS



TIME SCALE



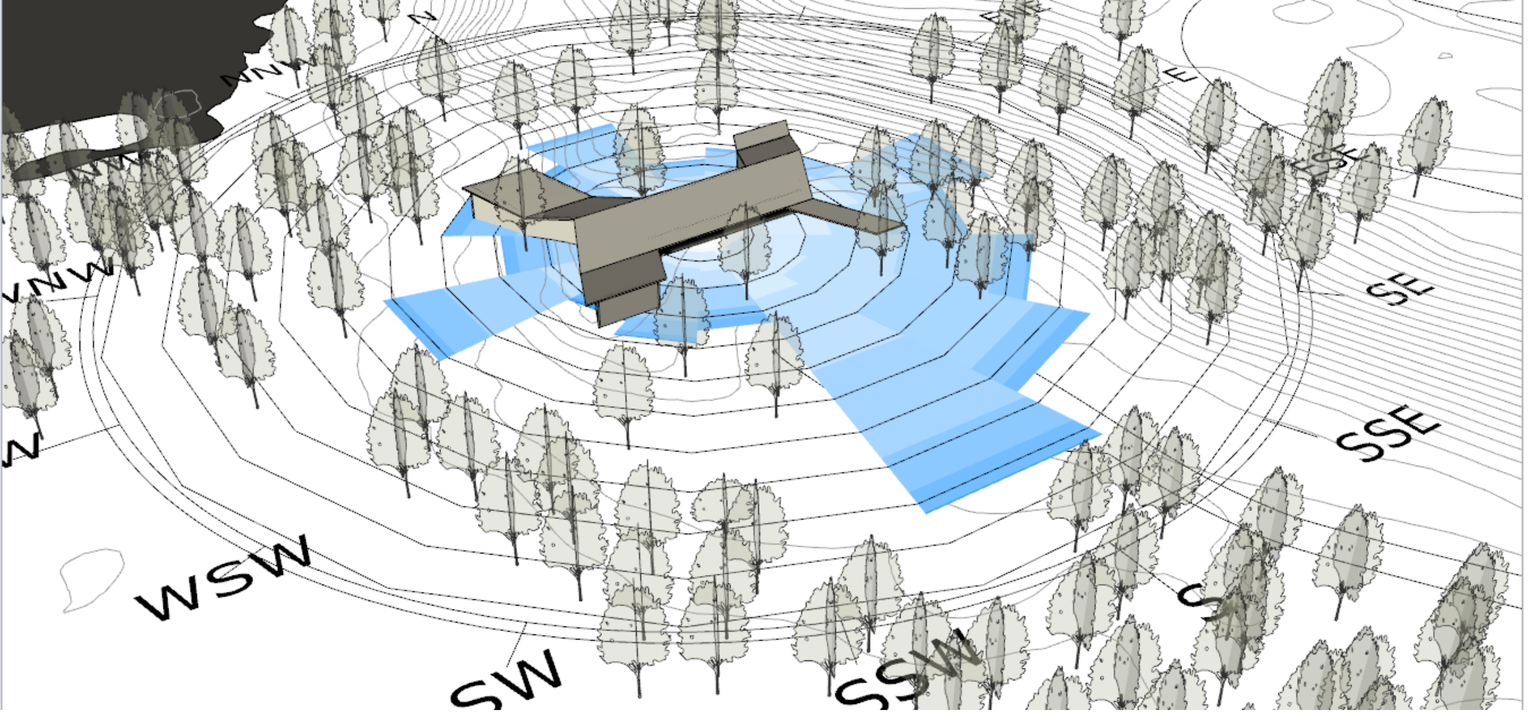


Graphic by: HGA

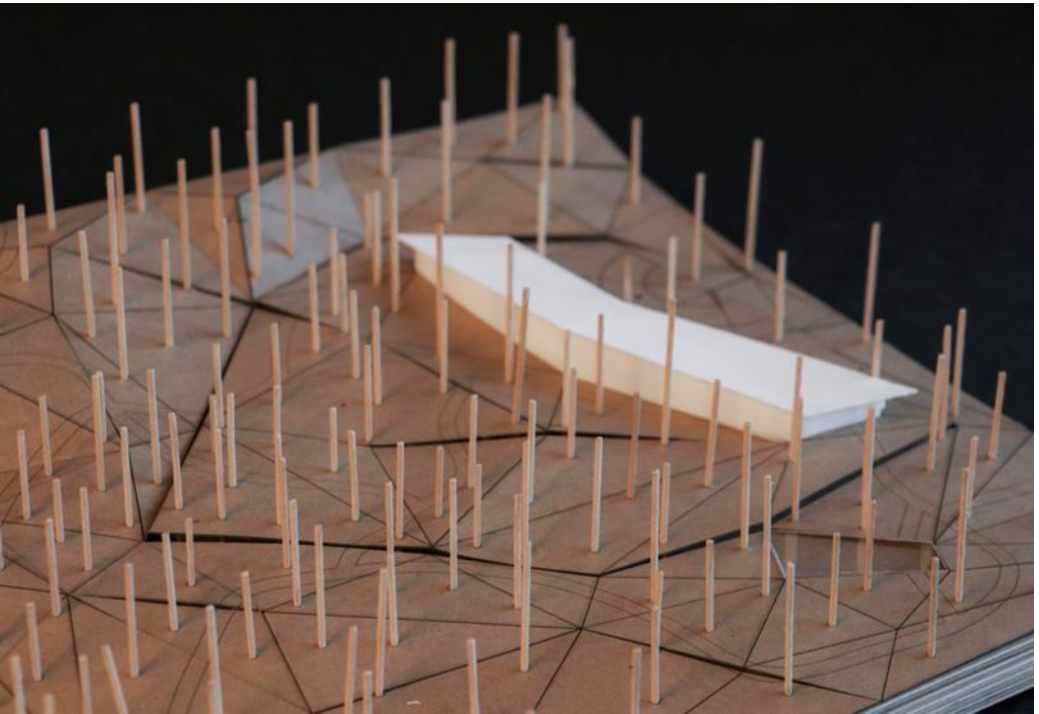
THREE CASE STUDIES

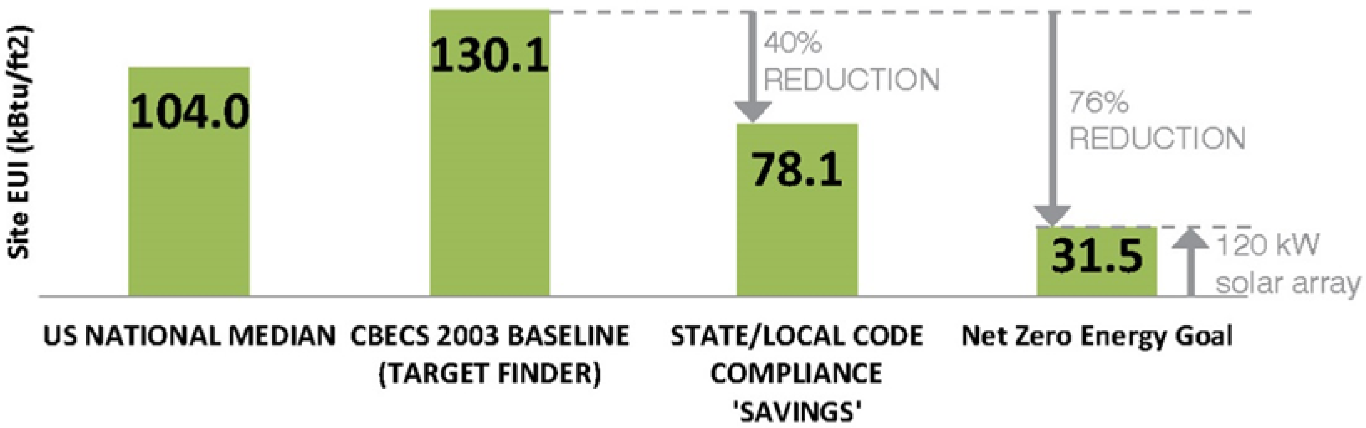
Midwest | East Coast | West Coast


WESTWOOD HILLS
NATURE CENTER
St. Louis Park, MN


WSW
SW
SSW
SSE
SE


FIRST INTERVIEW




Site EUI (kBtu/ft2)
104.0
130.1
78.1
31.5
40%
REDUCTION
76%
REDUCTION
120 kW
solar array
US NATIONAL MEDIAN
CBECS 2003 BASELINE
(TARGET FINDER)
STATE/LOCAL CODE
COMPLIANCE
'SAVINGS'
Net Zero Energy Goal

WEATHERSHIFT™ v2.0

Country	United_States_of_America
Location	Minneapolis
Emission scenario	RCP 8.5
Warming percentile	95% (most warming)

View Future Weather

or upload EPW file near Shift location

Buildings and infrastructure built today will experience significantly different weather patterns over the course of the 21st century due to the impact of climate change.

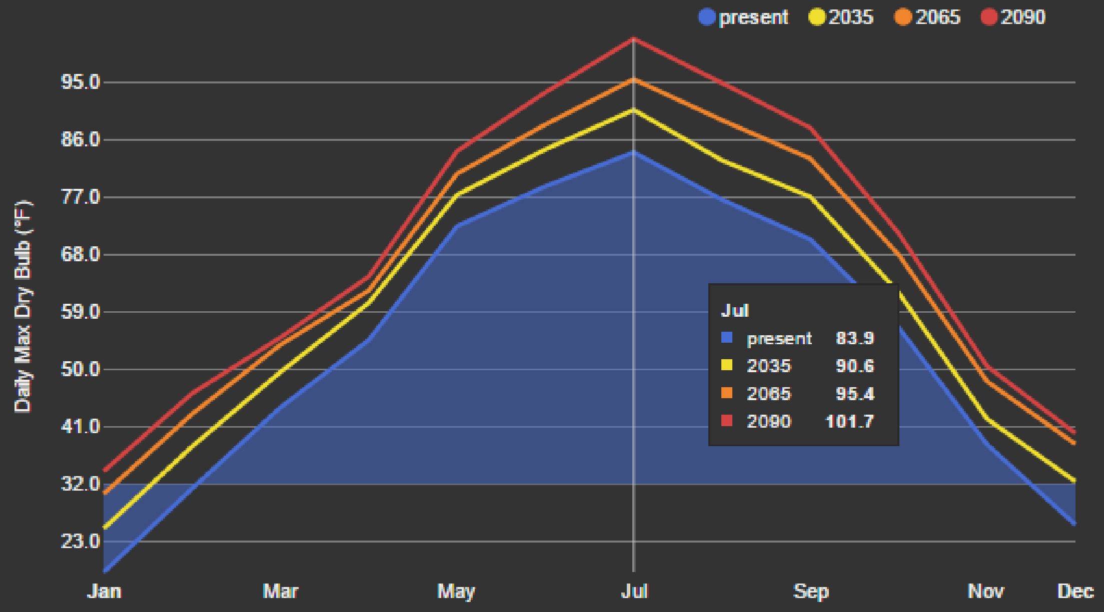
The WeatherShift™ tool uses data from global climate change modeling to produce EPW weather files adjusted for changing climate conditions. (EPW files contain hourly values of key weather variables for a typical year and are intended to be used for simulating building energy requirements.) The projected data can be viewed for three future time periods based on the emission scenario selected to the left.

* This site is preloaded with some EPW files provided to the public domain by the US Department of Energy. For all other shift locations -- *indicated by an* * -- an EPW file must be uploaded as the basis for shifting.

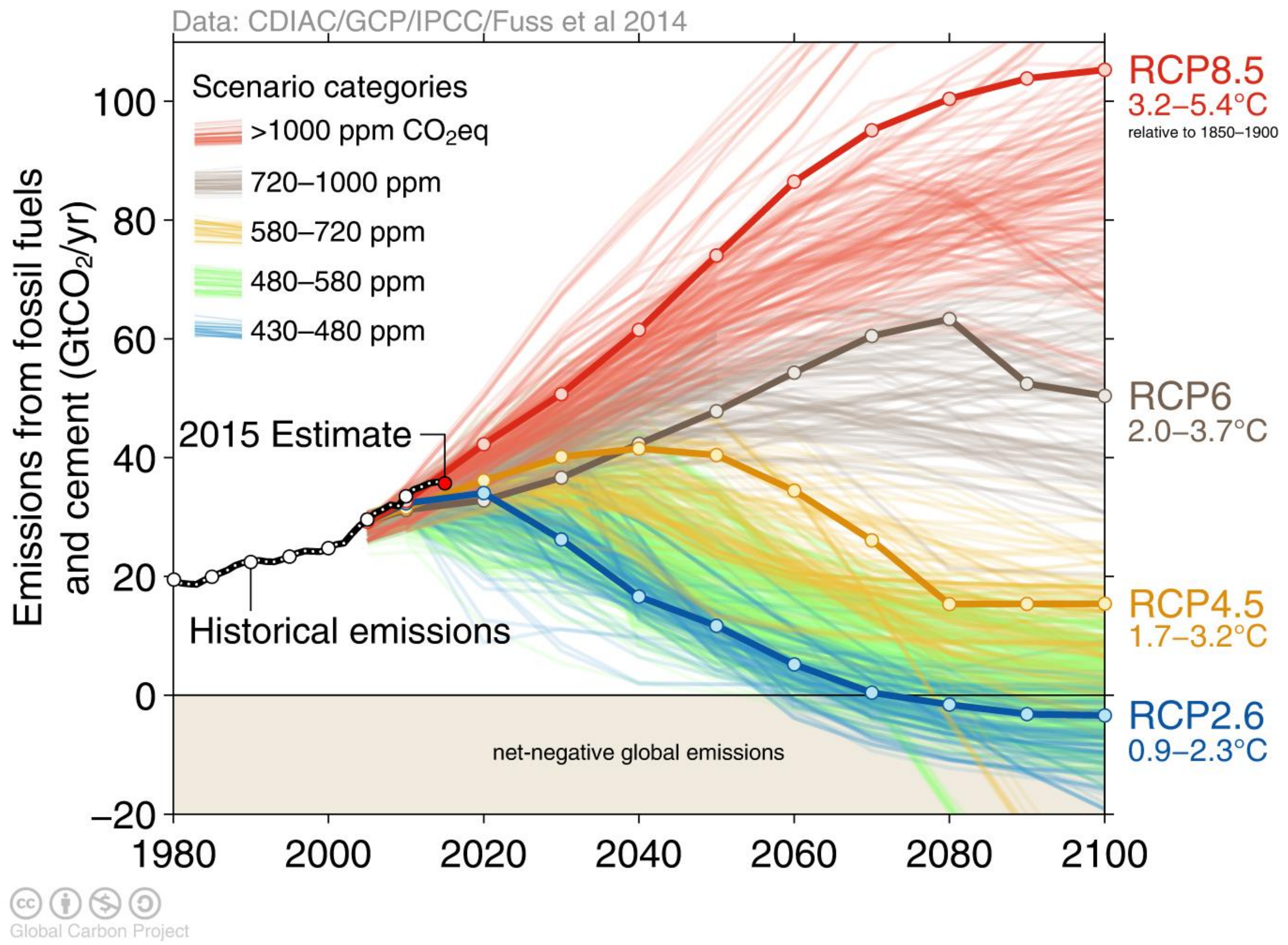
Average Monthly Data

Daily Max Dry Bulb

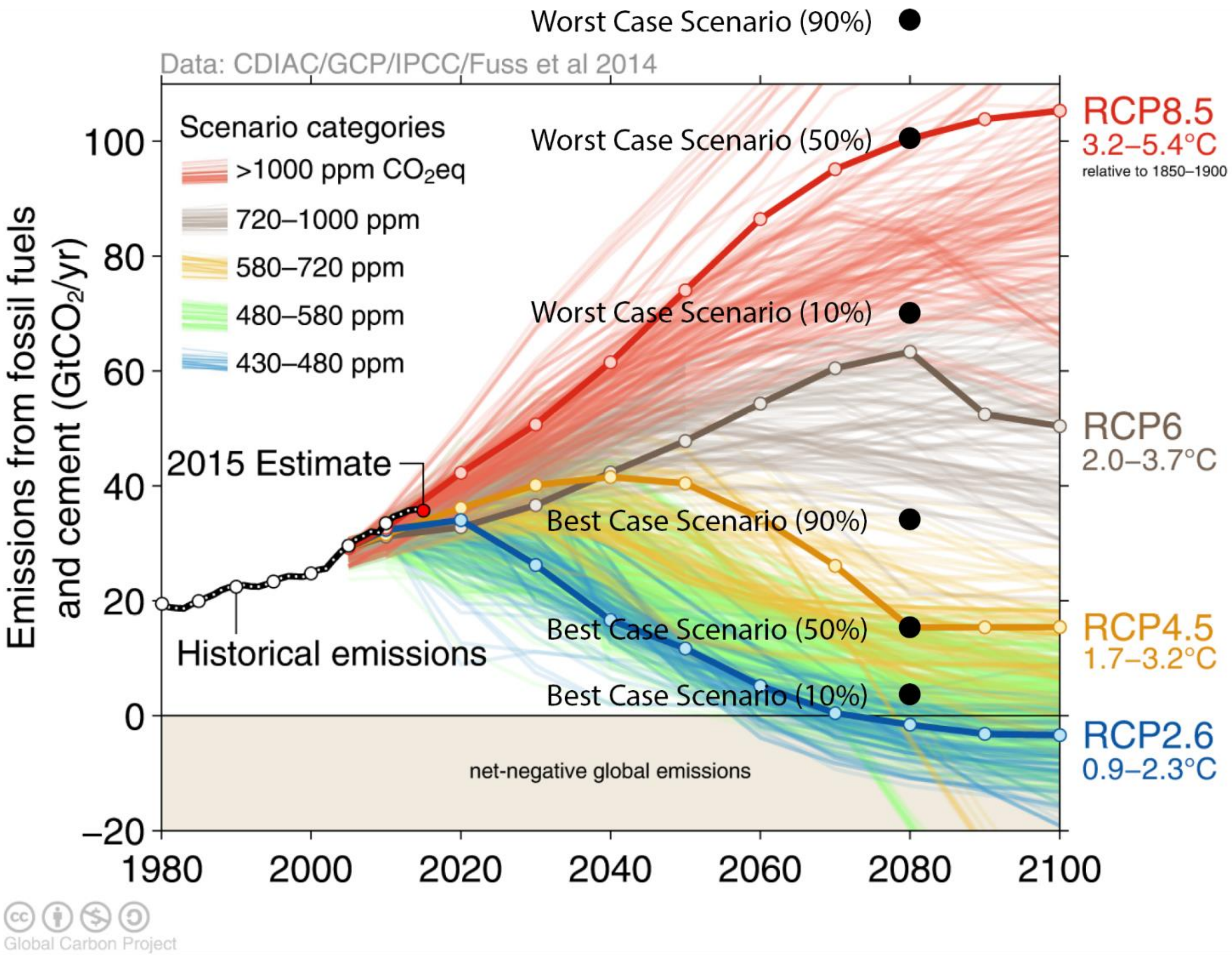
Projected changes in typical weather conditions can be reviewed month-by-month for a number of weather variables.



WHICH SCENARIO(S) TO USE?



WHICH SCENARIO(S) TO USE?



Future Weather Data Options:

TMY Format (Typical Year)
AMY Format (Actual Year)
XMY Format (Extremes)

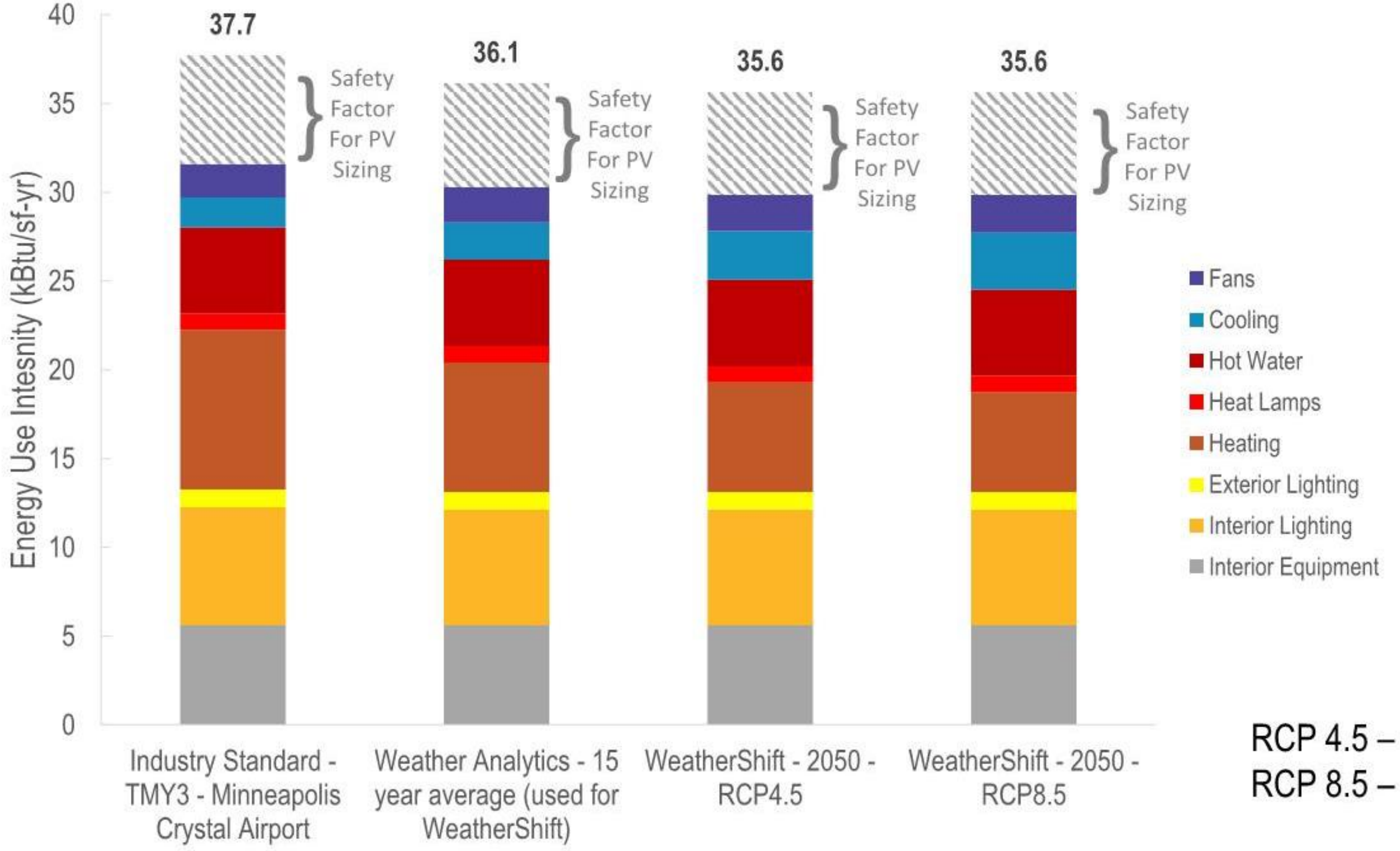
Any location (using WeatherAnalytics)

Emissions Scenarios:
RCP 4.5
RCP 8.5

Future Time Period:
2020s (2011-2030)
2030s (2021-2040)
2040s (2031-2050)
2050s (2041-2060)
2060s (2051-2070)
2070s (2061-2080)
2080s (2071-2090)
2090s (2081-2100)

Percentile:
10th Percentile
50th Percentile
90th Percentile

WHICH SCENARIO(S) TO USE?



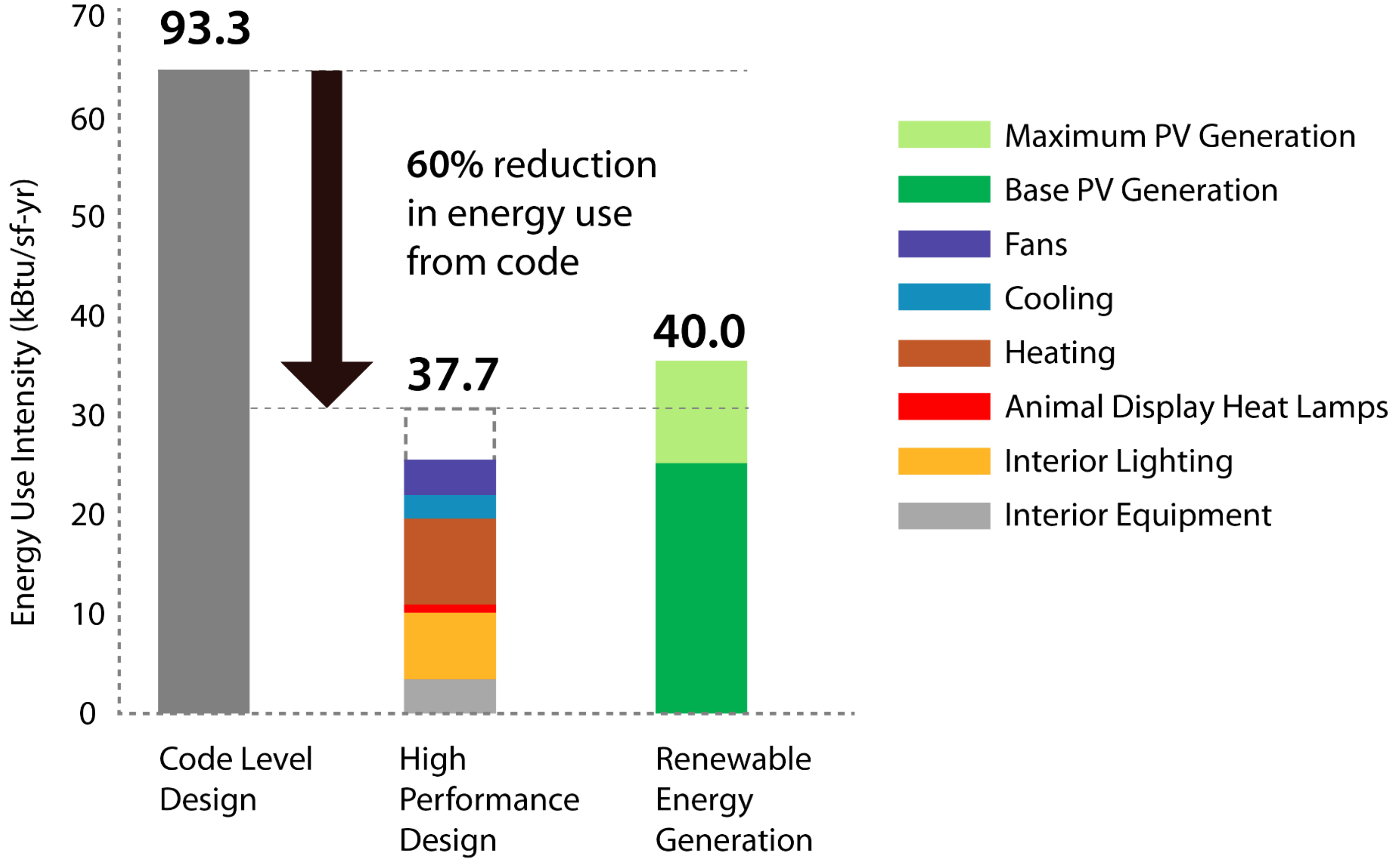
This heating dominated building will see a reduced EUI with a warming climate

The 15-year data is used as the "base" year in which the WeatherShift algorithm transforms based on various emissions scenarios

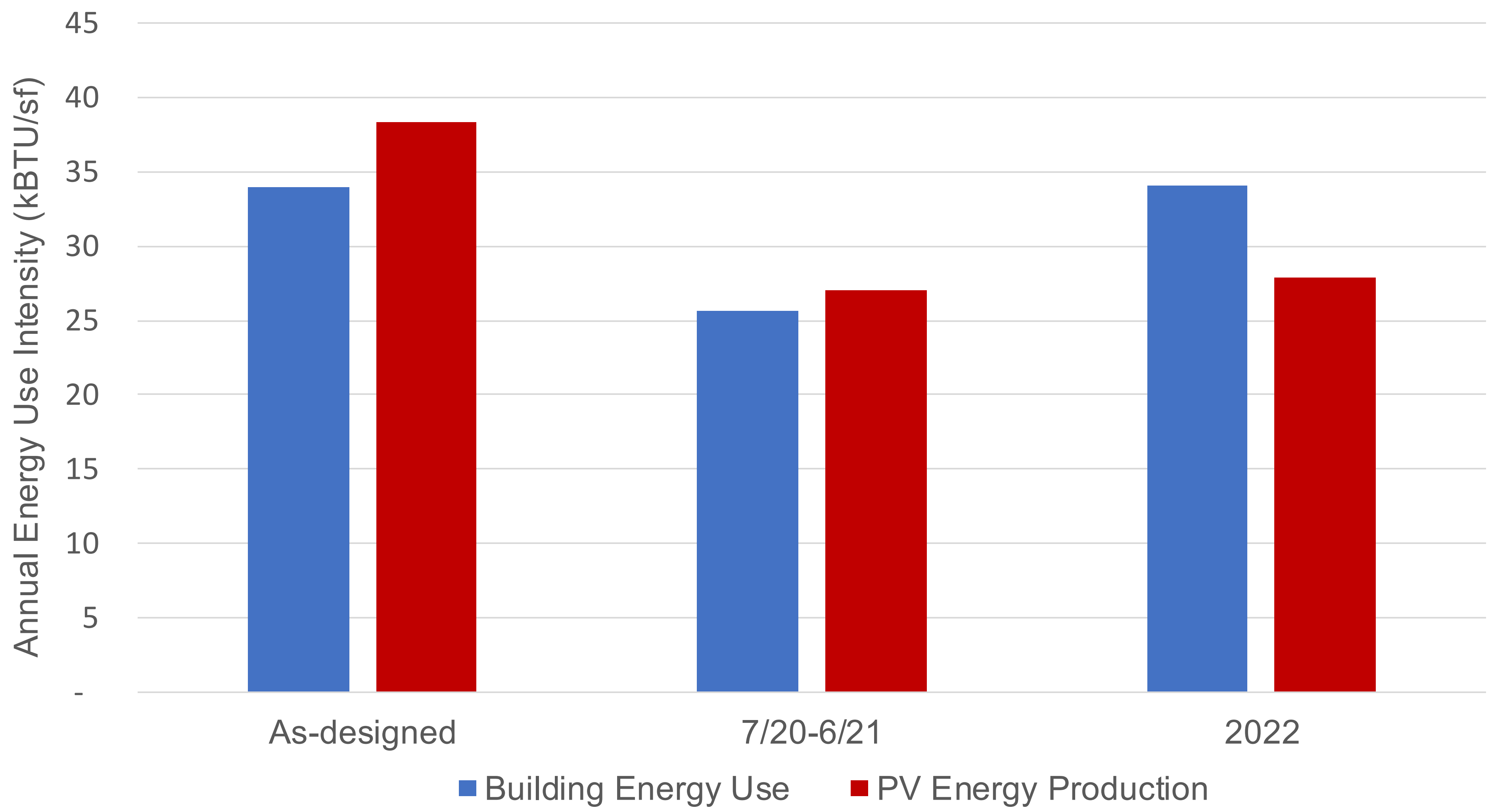
15-year Weather Analytics data shows less heating energy than standard TMY3, though we have known these weather files to be questionable (uses climate forecasting "reanalysis" instead of directly measured data)

RCP 4.5 – Optimistic Emissions Scenario
RCP 8.5 – Pessimistic Emissions Scenario

WILL NET ZERO REMAIN NET ZERO?



WILL NET ZERO REMAIN NET ZERO?




CELL SIGNALING TECHNOLOGY
Manchester-by-the-Sea, MA

Climate Resilience Design Standards Tool
Apply statewide data to assess the climate resilience of your project site.
LEARN MORE >

ResilientMass Maps and Data Center
Explore the latest statewide climate data and projections.
LEARN MORE >

Climate Resilience Funding
Learn about EEA's municipal grants supporting climate resilience.
LEARN MORE >

Feedback

ResilientMass is the Commonwealth's initiative for building statewide capacity for climate change adaptation and resilience. ResilientMass provides funding, localized climate change science and data, and decision support tools for the Commonwealth to facilitate

Climate Resilience Design Standards Tool
ResilientMass Action Team

Project Search

Project Name

cell signaling

Advanced Query

Clear Search | Search

1 Result:

New Project

Cell Signaling Technology
PrivateOther

Created By: ArianeLaxo | Project #23914
Towns: Manchester | Assets: 1

Cell Signaling Technology

Project Number: 23914 (Link)
Project Status: Not Scored

Tool Reporting Workflow

Hello, ArianeLaxo
Terms of Use
Delete Project

START HERE
LOCATE PROJECT — Project Located
PROJECT INPUTS — Missing Information
PROJECT OUTPUT

Overall Project Scores Output

The Ecosystem Service Benefits Score and Preliminary Climate Hazard 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

Does this project fall within mapped Environmental Justice neighborhoods? No

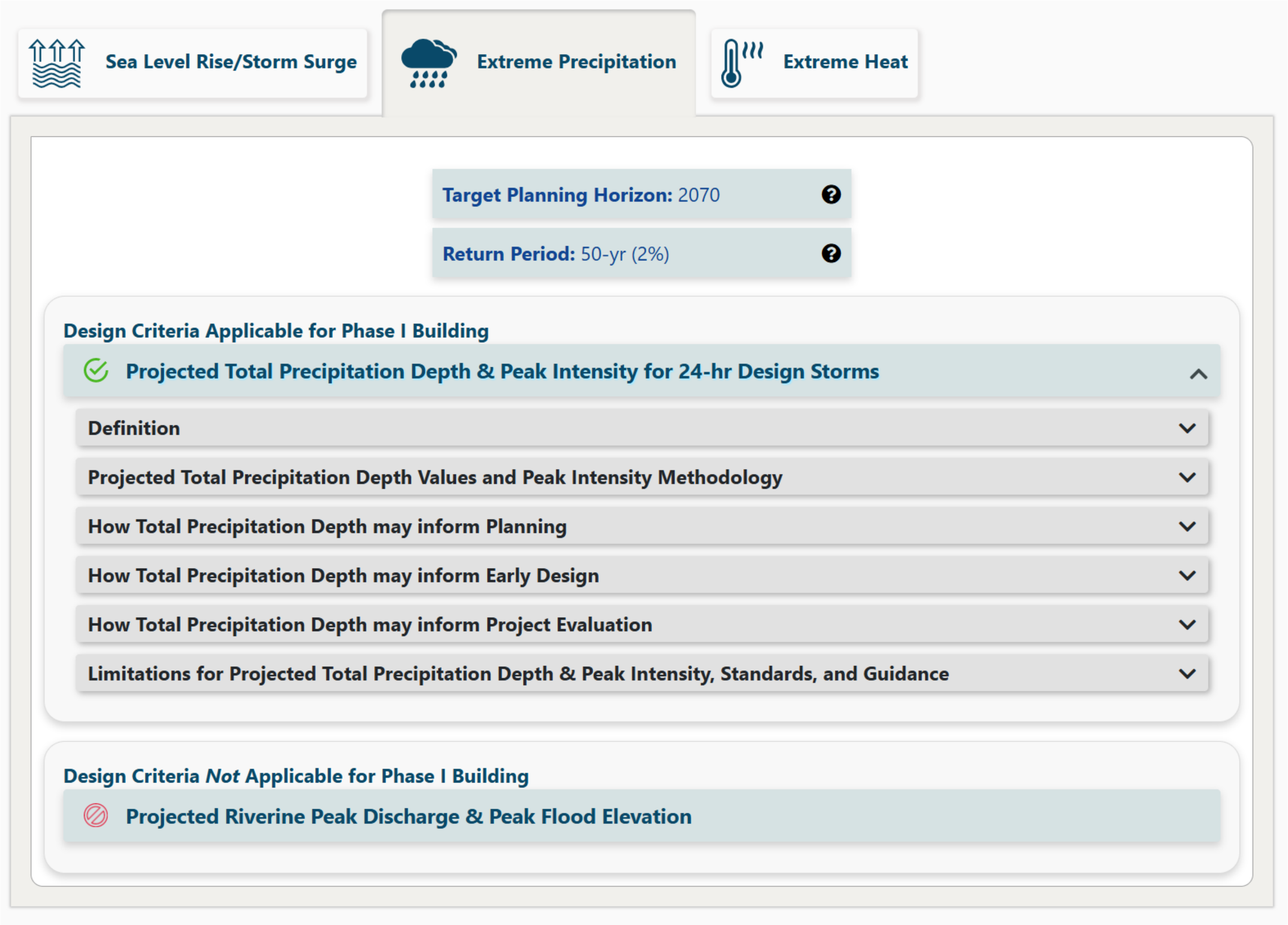
Ecosystem Benefits

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

Ecosystem Benefits Scores High

Preliminary Climate Hazard 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



Sea Level Rise/Storm Surge
Extreme Precipitation
Extreme Heat
Target Planning Horizon: 2070
Return Period: 50-yr (2%)
Design Criteria Applicable for Phase I Building
Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms
Definition
Projected Total Precipitation Depth Values and Peak Intensity Methodology
How Total Precipitation Depth may inform Planning
How Total Precipitation Depth may inform Early Design
How Total Precipitation Depth may inform Project Evaluation
Limitations for Projected Total Precipitation Depth & Peak Intensity, Standards, and Guidance
Design Criteria Not Applicable for Phase I Building
Projected Riverine Peak Discharge & Peak Flood Elevation

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

Target Planning Horizon: 2070

Percentile: 90th Percentile

Design Criteria Applicable for Phase I Building

- 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
- Projected Cooling Degree Days & Heating Degree Days (base = 65°F)

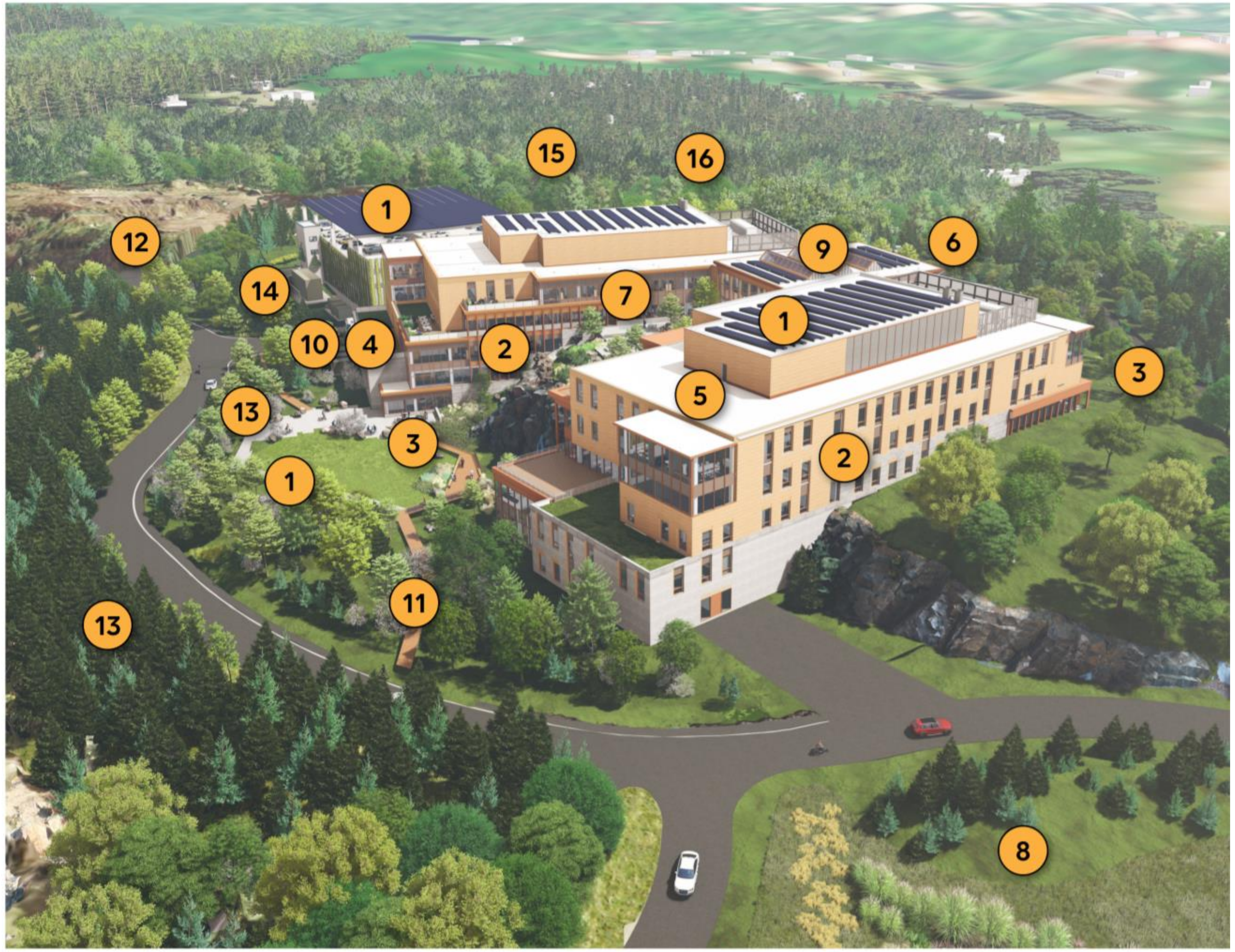
Design Criteria *Not* Applicable for Phase I Building

- Projected Growing Degree Days

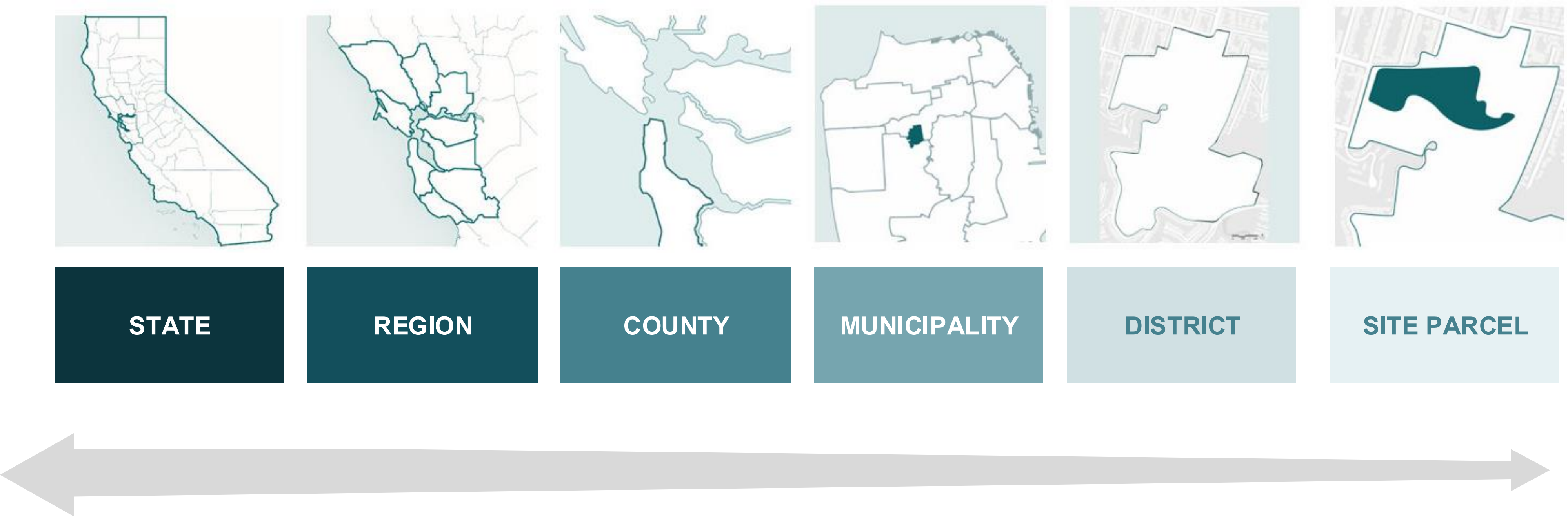
CO-BENEFITS OF SUSTAINABILITY & RESILIENCE

CO-BENEFITS OF SUSTAINABILITY & RESILIENCE

1. On-site renewable energy
2. Envelope designed to maximize natural light and minimize heat gain
3. Indoor / outdoor connections
4. Biophilic design strategies throughout to connect humans to nature
5. High SRI roof to minimize heat absorption
6. Bird safe glass
7. Access to daylight & views for improved well-being, with daylight sensors for energy use reduction
8. Stormwater management & rain gardens sized for future climate change projections
9. Mass timber lobby structure for lower carbon
10. Healthier Materials & Indoor air quality monitoring
11. Campus accessibility, walkability & wayfinding
12. Public parking & trailhead connection to Monoliths
13. Native plantings and ecological services restoration
14. Rainwater/greywater collection for site irrigation
15. Battery storage
16. Building load reduction and electrification strategies



RESILIENCE ACROSS SCALES: CALIFORNIA



Graphic by: HGA

Explore and analyze climate data from California's Climate Change Assessments

Cal-Adapt provides the public, researchers, government agencies and industry stakeholders with essential data & tools for climate adaptation planning, building resiliency, and fostering community engagement.

Cal-Adapt is evolving!

Learn about the Cal-Adapt enterprise and our mission to support California's climate change initiatives and preview our future plans.

READ MORE

Looking for climate data for California's Fifth Climate Change Assessment?
Visit the blog post on accessing next generation climate data

Explore interactive maps and charts

Visualize and download **downscaled CMIP5 climate data** and other datasets developed for California's Fourth Climate Change Assessment. Read our Get Started guide to learn more about working with climate data.

Designed for a **broad range of users.**

Local Climate Change Snapshot Tool

Quickly view a variety of climate data for a city, county, or other place.

Explore all Climate Tools

Explore data on temperature, precipitation, snowpack, wildfire, and more

Download Data

Download Fourth Assessment climate data in NetCDF, GeoTIFF and CSV formats

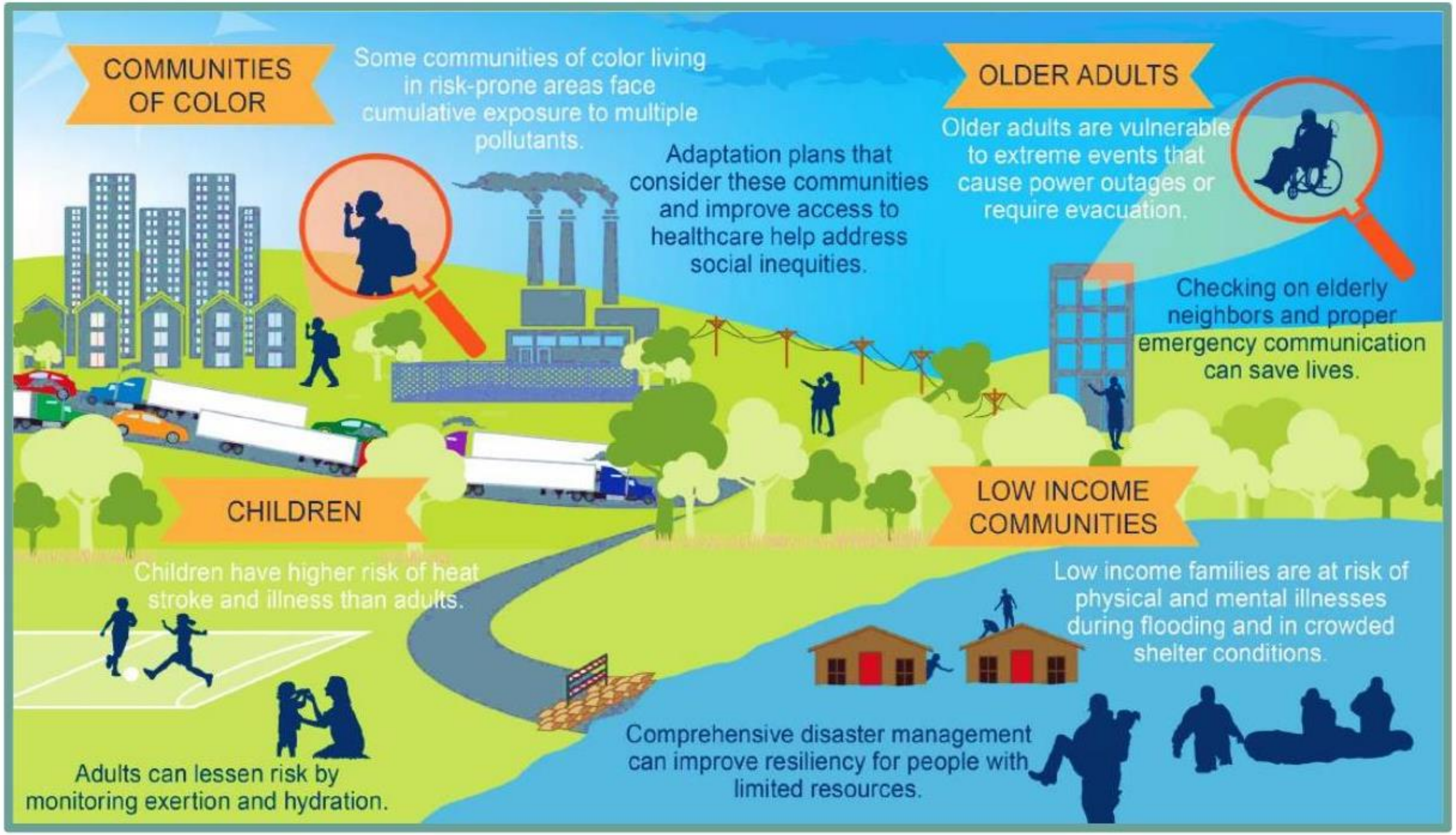
Latest on Cal-Adapt Blog

Empowering Climate Resilience at the California Adaptation Forum 2023

After two great sessions at the California Adaptation Forum in Pomona at the end of July, attendees at both of our Forum sessions had the chance to use Analytics Engine tools for the months of August and September.

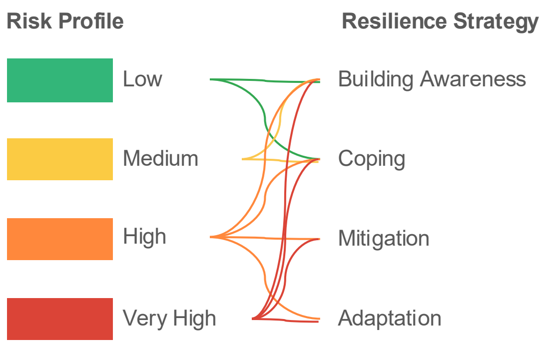
SEE ALL POSTS

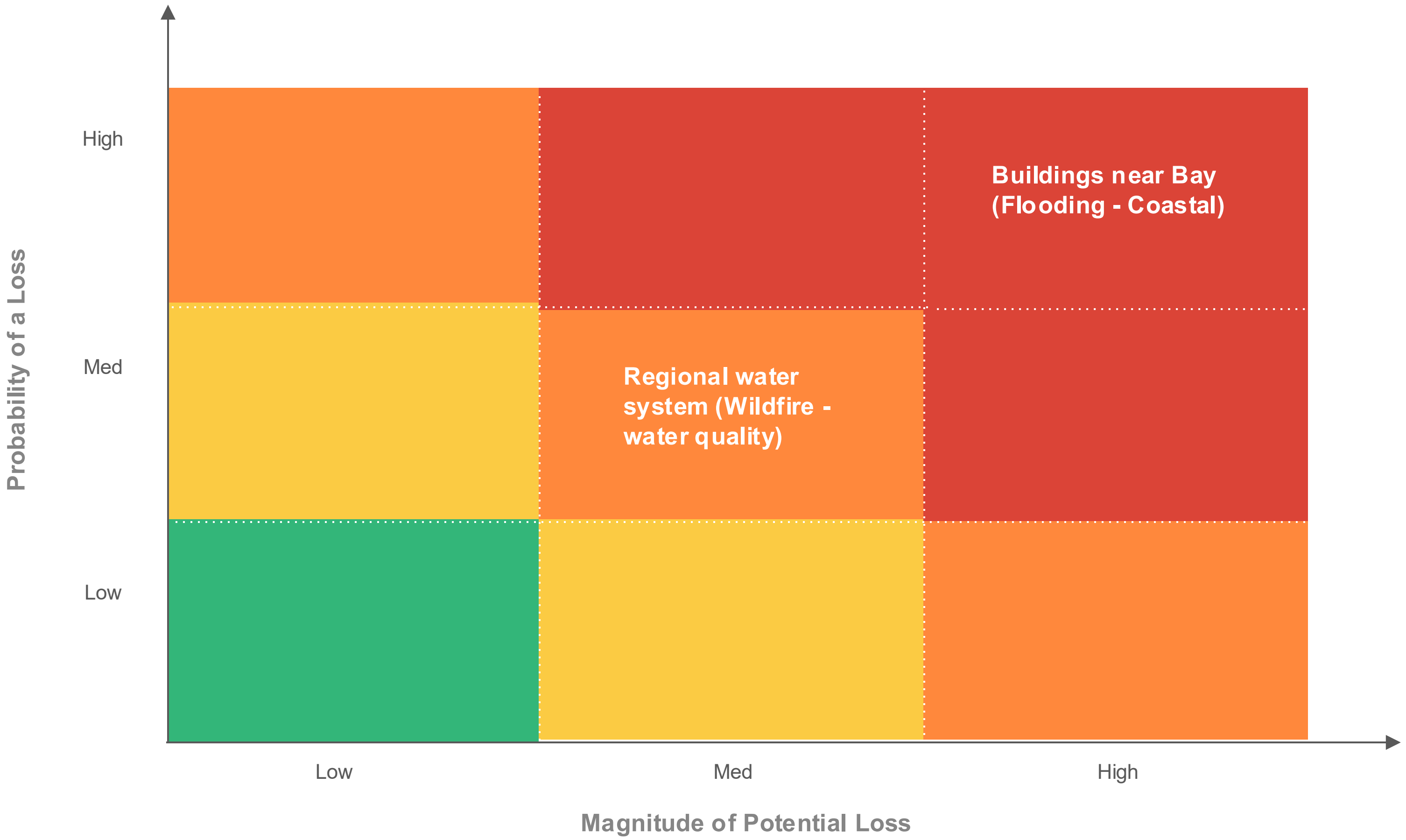
ASSESSING RISK: BEGIN WITH VULNERABLE COMMUNITIES



UCLA Health®

RISK PROFILE: PRIORITIZING ACTION





RISK TOLERANCE EXAMPLES

	Extreme Heat	Flooding	Drought	Wildfire	Energy Insecurity
People	No net increase in heat health events by managing exposure and readiness for coping with system failure.	No net increase in flood-related health events	No net increase in water demand beyond project targets	No net increase in smoke-related, or fire-related injury. No net loss of working hours during wildfire season.	No negative health impacts; No interruption to work
Buildings	N… U…	No net occupancy loss of residential or workplace buildings. Sustained access/emergency egress.	Sustained access to potable water and flushing toilets during shelter in place events; no subsidence-driven losses; Maintenance of indoor air quality during high dust events	…d, or …ldings.	No net loss in residential building functionality; Accessibility to cooling centers; Targeted drawdown on office functions to redirect resources toward residential buildings
Open Space	H… m… channeling	N… sp… D… …h	…t,	…play, …n to …ents are not safely occupiable due to smoke. Districts must manage ecosystems for wildfire readiness and recovery.	…ate …ance …nated
District Infrastructure	System readiness, in concert with passive strategies, for increased demand load	Demonstrable graduated flood response in alignment with flooding thresholds	…nd	Districts must have demonstrable capacity to manage smoke impacts on district infrastructure.	…ate …nce …nated
Regional/ Municipal Systems	Preparation for city/municipal failures	Preparation for municipal failure and need to self-manage district resources for passive habitability and ongoing operations	Recognizing growing public water shortages, consider extent to which districts can be independent of municipal water systems	Districts must have backup resources for those services provided by the municipalities (water, power) that may be purposefully taken offline as part of preemptive measures or may lose capacity during redirection efforts for wildfire responses.	Districts must have ability to operate district infrastructure without reliance on municipal services for a designated period of time

No net increase in heat health events by managing exposure and readiness for coping with system failure.

No net occupancy loss of residential or workplace buildings. Sustained access/emergency egress.

Sustained access to potable water and flushing toilets during shelter in place events; no subsidence-driven losses; Maintenance of indoor air quality during high dust events

No net increase in smoke-related injury. No net loss of working hours during wildfire season.

No net loss in residential building functionality; Accessibility to cooling centers; Targeted drawdown on office functions to redirect resources toward residential buildings

Open Space

Plant Stormwater Tolerant Species

Defend

Hazards Addressed:

Strategy Description:

Plant species characteristics are important in effective flood resilience strategies. Plant design should tend toward stormwater resistant species in areas at risk of flooding. These species will help reduce damage by encouraging the growth of root systems which stabilize banks and prevent erosion.

Image Source: http://www.3riverswetweather.org/

Performance Metrics:

- # stormwater tolerant plant species
- Area covered by stormwater tolerant plant species

Case Studies:

- Plants for Swales (Minnesota Stormwater Manual)
- Georgia Stormwater Management Manual

Dormant Buildings

Accommodate | Relocate

Hazards Addressed:

EXTREME HEAT

ENERGY INSECURITY

Strategy Description:

During hazard events buildings can be assigned to shut off or become dormant. This will allow for energy savings when there is an energy insecurity event. Buildings can be partially or fully dormant, and some active buildings may be assigned an altered program to accommodate for occupant needs. The system energy saved from the dormant buildings will allow for the preservation of cool buildings and program function during hazard events.

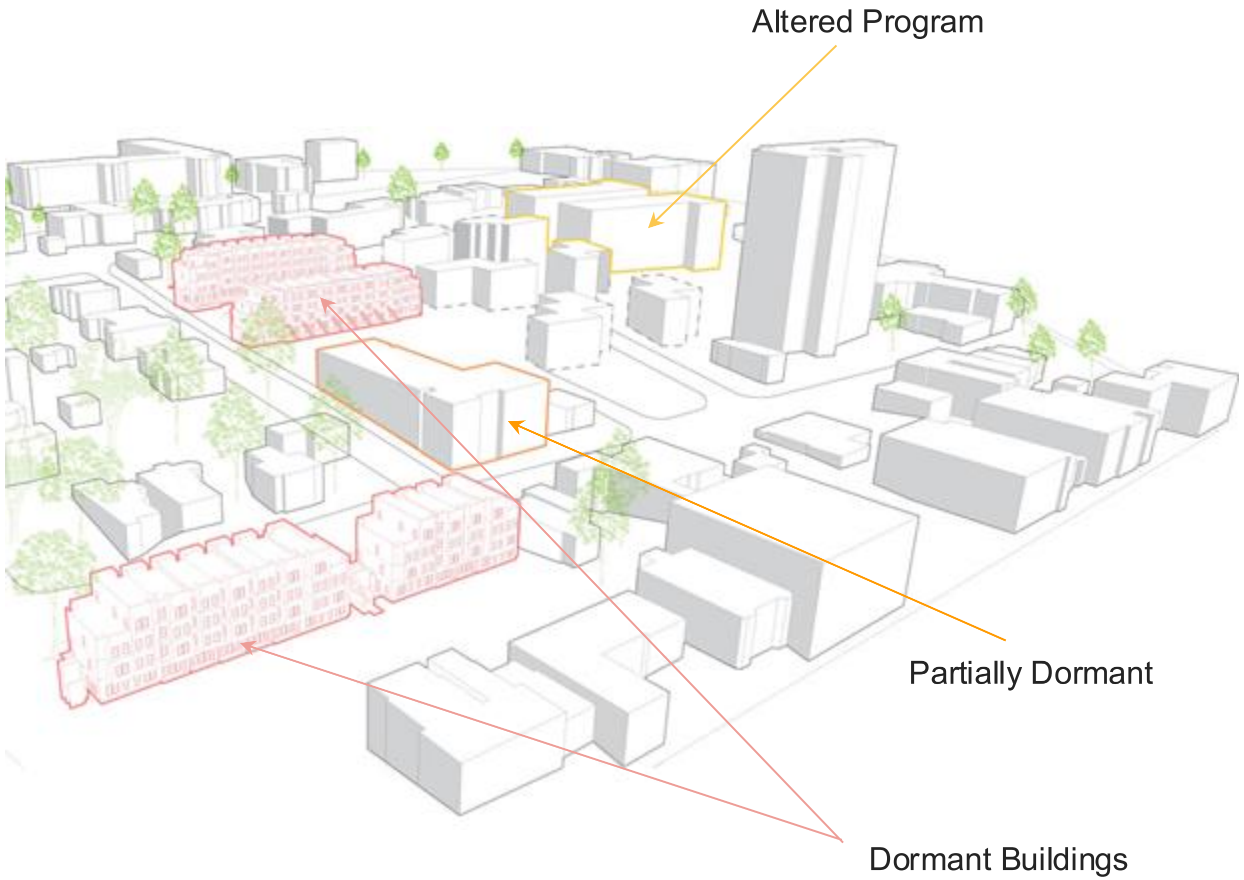


Image Source:https://www.maparchitects.com/cottage-gardens-redevelopment

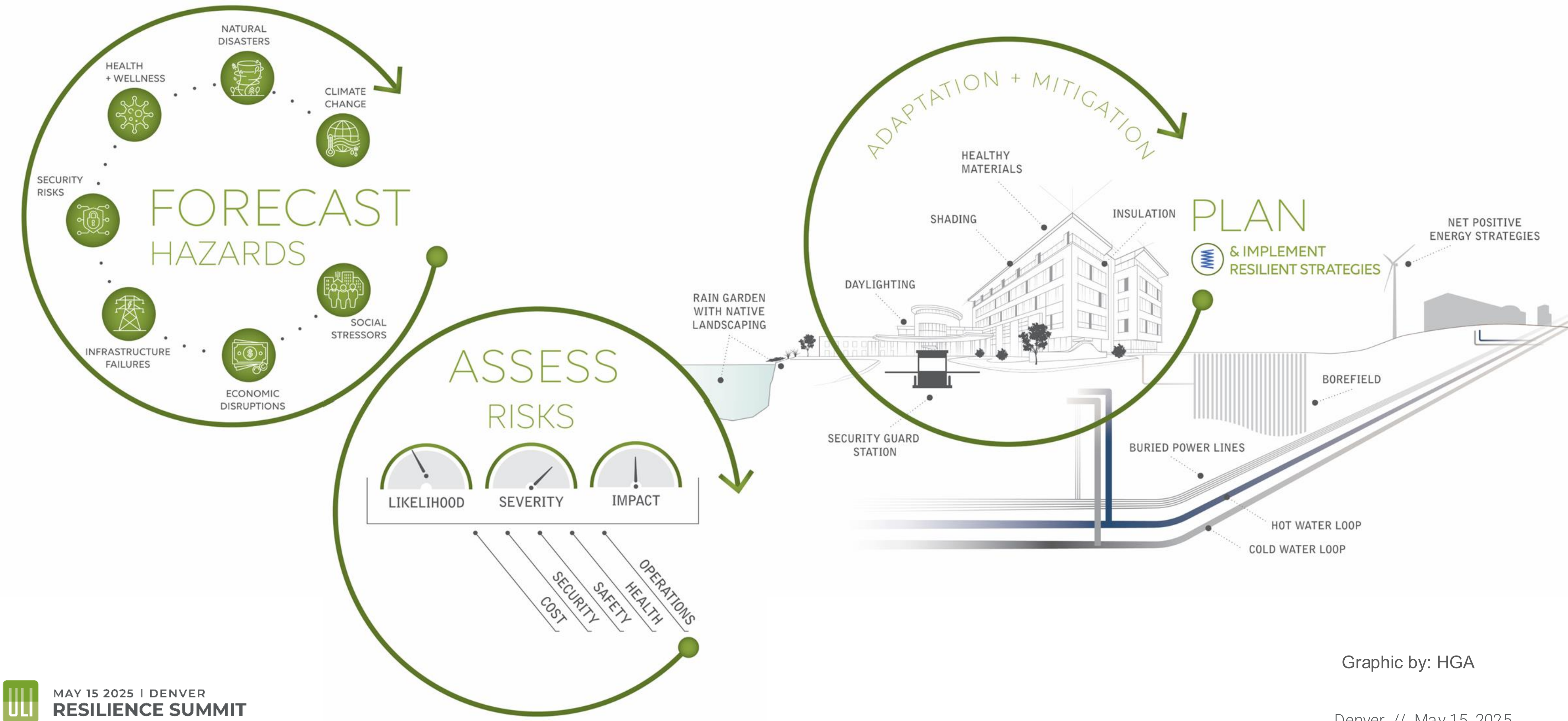
Performance Metrics:

- # of dormant or partially dormant buildings
- # of buildings with altered program

Case Studies:

[Building America Solutions Center Design for Extreme Heat Guide]

PLANNING FOR RESILIENCE



Graphic by: HGA

INSIGHTS TO ACTION

Roundtable Activity

PURPOSE

We’ve explored new climate data, design processes, and implementation strategies.

Now, we shift from learning to doing — by grounding insights in your region, your role, and your sphere of influence.

Let’s make it real and explore how we can leave this room with the seeds of action.

INSTRUCTIONS

- Form groups of 3-5 at your table
- Use the conversation prompts (on screen + handout)
- Designate a timekeeper and facilitator (rotate roles if needed)
- Respect Chatham House Rule: share lessons, not names
- Raise your hand to flag down a facilitator of if your group has questions or wants support

SELF FACILITATION GUIDELINES

🔄 Equal Air Time
Invite everyone to speak, ensure no one dominates the conversation. Make space for quieter voices.

🤝 Chatham House Rules
What's shared in the room can inform others—but don't attribute comments to specific individuals outside this space.

💭 Speak from Experience
Share personal insights, professional challenges, or regional observations. All perspectives are valid.

🧭 Stay Curious, Not Certain
Approach the conversation with a learning mindset. Ask questions, listen generously, and reflect before responding.

📍 Keep It Grounded
Center your discussion in your region, role, or sphere of influence. What's happening now, and where can you take action?

ROUND 1: COMPARE NOTES

Share recent climate experiences that either:

- You experienced directly
- Your work or community or somewhere nearby was affected by

ROUND 2: LANDSCAPE OF ACTION

Where is action happening?

For those involved in action to mitigate or adapt:

- What was the catalyst? Reactive vs. proactive?
- What changed or is in the process of changing?

Discuss: Where is action most needed and not happening?

ROUND 3: CO-CREATE A PROVOCATION

Develop a “How might we…” statement that could spark new thinking or action in your region.

Example:

How might we better align our regional planning efforts with future climate risks before funding decisions are made?

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ROUND 4: SPHERES OF INFLUENCE

Where do you have agency to make changes or decisions?

What can you do within your sphere of influence toward regional action?

What is something you learned from one of the speakers today that motivates you to act?

RESOURCES

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Q&A

SHARE & WIN

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