

Climate Change Scenario Planning Workbook

Preparing communities for a future unlike the past



GLISA
A NOAA RISA TEAM



About this Workbook

This workbook is a guide to GLISA's scenario planning process with step-by-step instructions for communities to follow to complete a scenario planning exercise to prepare for future climate impacts in their city or local planning. GLISA's scenario planning approach is designed to produce a set of climate scenarios that are directly relevant to community decisions and future climate uncertainty. The approach builds a strategic framework that can be used by planners and decision makers to respond to potentially disastrous future weather and climate disruptions.

After completion of this workbook, which culminates in a scenario planning workshop, communities will have:

- 1) a set of customized climate scenarios directly relevant to their management and planning needs,
- 2) an understanding of their future climate impacts and potential challenges, and
- 3) a list of planning recommendations to better prepare for the future.

About the Climate Scenarios

Future climate scenarios can come in many different formats depending on who is developing them and who is using them. Typically, climate models are used to provide a starting point for thinking about the future, and future scenarios may include quantitative data, qualitative narratives, or both. Quantitative information coming directly from climate models is limited to how different climate variables, like temperature or precipitation, may change over time. However, many variables of interest to communities, such as freezing rain or wind storms, are not available or reliable in climate model projections. In order to address this gap, GLISA's scenarios are narrative-based and include plausible descriptions of weather and climate events that community practitioners may have to respond to in the future.

GLISA partnered with Great Lakes city adaptation practitioners to produce a set of plausible climate scenarios to aid in city and local planning. These scenarios can also be used at larger spatial scales (e.g., county) and are intended to be transferable across cities or communities, meaning the basic scenario details are relevant for any city in the Great Lakes region with the option to customize them further. While the scenarios are informed by climate model projections, they provide much greater detail than what models alone tell us; although still backed by models and projections, GLISA's scenarios make it easier to understand what projected climate changes could look like in reality. This combination of model data and real-world experience represents a holistic and practitioner-driven approach to scenario development.

Each scenario consists of a narrative description of weather conditions or events with details about sector-specific community impacts (e.g., city transportation, emergency response, etc.). Communities can customize the impacts described in the scenarios based on their own vulnerabilities and planning priorities to make the scenarios more relevant for their planning needs. Example customizations are provided with each scenario and this scenario planning workbook also helps guide these customizations. The scenarios can be used as a starting point for thinking about a future that may look different than the past and to develop ideas, recommendations, and plans to better prepare for that future.

For additional background information about GLISA's scenarios and access to the scenarios, please see: <https://glisa.umich.edu/climate-data/climate-scenarios/>

For a list of GLISA's past scenario planning projects and examples, please see: <https://glisa.umich.edu/engagement/scenario-planning/#examples>

Scenario Planning Roles

The **Lead Practitioner** is someone who spearheads the entire process and manages the day-to-day interactions and planning with the Core Team and other Stakeholders.

The **Core Team** is a small group of representatives, including the Lead Practitioner, who are involved throughout the entirety of the scenario planning process and lead the direction, planning, and execution of all activities. The Core Team should include at least one individual who will use the climate scenarios in future planning to ensure the scenarios are usable and relevant.

Stakeholders are individuals relevant to any part of the scenario planning process. They usually represent a diverse group of people willing and able to bring expertise and experience to the process. Anyone who may be asked to use the scenarios in planning should be included. It is also important to engage stakeholders outside of government early in the process, as valuable but sometimes less visible stakeholders can accidentally be excluded.

Scenario Planning Stages

Pre-Workshop

Who: Lead Practitioner and/or Core Team

Problem Statement Development
Build Your Core Team
Stakeholder Identification and Solicitation
Scenario Selection
Workshop Planning

Stakeholder Workshop

*Who: Lead Practitioner, Core Team, and All Relevant Stakeholders
see sample agenda and workshop activities*

Customize the Scenario(s)
Identify Impacts & Challenges
Generate Planning Recommendations

Post-Workshop

Who: Lead Practitioner and/or Core Team

Document, assess, and share scenario planning process, outcomes, and lessons learned
Make and implement management decisions based on the recommendations from the scenario process

1. Problem Statement Development Define the main problem(s)/challenge(s) or more generally, the problem area(s) that you would like the scenarios to address. Some examples of each are provided below. Choose either a specific problem/challenge to focus on or a problem area. It may help to start with a conversation about past and current vulnerabilities or challenges the city or community has faced with respect to climate and/or weather events. A formal vulnerability assessment is not required, but identification of the types of challenges that are most problematic related to weather and climate (e.g., extreme heat, flooding, infrastructure integrity, etc.) is helpful to guide the selection of meaningful scenarios. If several potential problems or problem areas are identified, start by focusing on one or two. This step is completed by the Lead Practitioner or a Core Team once one is formed (see Step 2).

Action Item: Develop a problem statement describing one or two main problems, challenges, or management areas the scenarios will address. This description should include relevant background information about the problem or problem area including past impactful weather or climate events (gleaned from personal experiences, news stories, academic research, or other credible sources), current conditions/challenges, anticipated problems, etc. This description will guide the selection of scenarios and can be used to recruit new stakeholders to the scenario planning exercise.

<i>Example Problems</i>	<i>Example Problem Areas</i>
Combined sewer overflows	Energy supply
Neighborhood/downtown flooding	Transportation
Coastal flooding	Housing
Heat stress on vulnerable populations	Green Infrastructure and Ecosystem Services
Aging infrastructure	Security and Emergency Response
Air/water pollution and health impacts	Key Economic Sectors and Services
Erosion of public/private property	Water Supply Systems (e.g., infrastructure, demand side management, water quality)
School closures/student access to meals	Waste Water Systems
etc...	Telecommunications (e.g., for emergency response and early warning)
	Poverty and Access to Basic Services
	Coastal Zone Systems (e.g., port facilities)
	Food Systems Security
	Tourism/Recreation
	Human Health - vector and water borne diseases, water contamination, heat stress, etc.

Example Problem Statement

The following is an excerpt from “Using Climate Change Scenarios to Explore Management at Isle Royale National Park” 2013 workshop report, which is available on GLISA’s website. The main problem and focus of the workshop is highlighted in **bold**. In-text citations are included since this was a scientific report, but a problem statement does not have to be this formal.

“For Isle Royale National Park, effective resource management, including that of the island’s forests and wildlife populations, requires an understanding of past and present conditions as well as projected future trends. The climate of the region is changing, bringing warmer overall temperatures, extended summer seasons, changes to the precipitation regime, warmer water and reduced ice cover of Lake Superior, and many other shifts (Kunkel et al. 2013). **Low wolf population numbers, as few as eight individuals in early 2013, and possible inbreeding depression have heightened concerns about the long-term persistence of wolves on the island (Vucetich and Peterson 2013). Moose populations in the region (outside of the park in northern Minnesota), have been declining for more than a decade (Lenarz et al. 2010, DelGuidice 2013).** For many people these wildlife populations and their conservation are a central feature of Isle Royale’s wilderness character. Some projected changes are relatively well understood but many are not. Given the uncertainty associated with climate change, the NPS held a workshop in January 2013 to explore the implications of plausible futures as climate and related ecosystem conditions change on Isle Royale. The NPS needs better understanding of the potential direction and magnitude of change on the island in the coming years and decades to inform appropriate and effective management of island resources and operations.”

2. Build Your Core Team A small team (3-5) of experts should be assembled early on in the scenario planning process to help guide the focus, goals, and anticipated outcomes of the scenario planning workshop. These experts are responsible for bringing foundational knowledge, or critical perspectives to the process. Core team members will likely come from existing relationships, networks, or practitioners in similar fields. Lastly, it is beneficial to include a climate expert on your team to answer any specific climate questions you may have and provide a more customized climate narrative for your community.

Action Item: Secure commitment from select individuals to join the Core Team.

3. Stakeholder Identification and Solicitation Identify a diverse team of stakeholders willing and able to bring their expertise and experience to the scenario planning process in a workshop setting. This step is completed by the lead practitioner or the core team. The master list of all relevant stakeholders should consist of experts knowledgeable about the problem or problem area, but it is also important that anyone who may be asked to integrate the scenarios into their work and/or use them in planning is included in the process. In some cases, the public, or those who live, work, or play in a manner that intersects with the problem or problem area, may also be important stakeholders.

Action Item: Identify names of individuals or organizations to partner with and reach out and invite them into the scenario planning process. Some example language is provided below to briefly describe this process. You should include a description of the level of commitment you are seeking, including participation in the workshop and any pre- or post-workshop activities you anticipate. Individual circumstances, the anticipated timeline of the work, and the receptiveness of the stakeholders may help guide decisions related to the time commitment and workshop planning. Details such as dates and times and length of workshop can be determined after a group is assembled.

Example Language to Describe GLISA's Scenario Planning Process to New Stakeholders:

Scenario planning is used as a method to manage future uncertainty, especially high-risk events, and unfolds during a process that brings together a diverse group of stakeholders, like yourself, in a workshop setting. GLISA is a leader in designing climate change scenario planning exercises, and we will be using their scenario planning approach and future climate scenarios to address future risks or challenges associated with [borrow text from problem or management area definition].

4. Scenario Selection This phase of the scenario planning process includes multiple steps to help guide the Lead Practitioner or Core Team to the most relevant climate scenarios for their problem or problem area. The goal is to select one or more scenarios that are directly relevant to your planning decisions and address future planning uncertainty. Later, in a workshop setting, stakeholders will be asked to identify how the scenario exacerbates current challenges and/or creates new ones and make recommendations for how to prepare for or mitigate impacts.

GLISA's scenarios are designed around weather and climate-related concerns raised by city practitioners, such as flooding, runoff, heat stress, etc. Each scenario is a narrative description of disruptive weather conditions or events with details about sector-specific impacts (e.g., city transportation, emergency response, human health, etc.). **The focus of this activity is identifying important weather and/or climate events to include in the scenarios.** Basic descriptions of possible impacts from these weather/climate events are provided in the scenarios, and during the workshop stakeholders will customize the description of impacts based on an individual community's vulnerabilities and planning priorities.

Action Item 1: Use the Disruptive Weather & Climate Events Table (next page) to identify which weather and/or climate events should be the focus of the scenario(s). Weather events are short-lived meteorological conditions, such as a storm. Climate events are longer-term changes in weather patterns, such as prolonged drought. Consider if/how each event in the checklist impacts your problem or problem area. Determine the severity of impact from each event and place an "X" in the appropriate column (low, medium, or high).

Action Item 2: Decide if you want your scenarios to focus on low, medium, or high impact events (or a combination). For the purpose of this exercise you can consider each event equally likely, since both low- and high-probability events are important for scenario planning.














Action Item 3: Decide how many scenarios you will use in a workshop setting. The number of scenarios will depend partially on the size of the stakeholder group participating in the workshop. Typically a group of 3-5 people can easily work together on a single scenario. If there are more participants, form multiple groups to work on the same or different scenarios simultaneously during the workshop. At least 2 scenarios should be selected and no more than 3-4 scenarios for the first time through this process.

Action Item 4: Based on your impact rankings, your choice of focusing on low, medium, or high impact events, and the number of scenarios you plan to use, make your final scenario selections by reading through the scenario descriptions of the events that resonate most with you (see last column of the table). For example, if your problem area is highly sensitive to a changing hydrological cycle and you want that to be a focus of your scenarios, read through all of the GLISA scenarios that feature a changing hydrological cycle to choose one that is relevant to your work. It is likely more than one type of weather or climate event will emerge as important to consider, so read through all relevant scenarios before making a final selection.

Action Item 5: Update your problem statement to include any important details that have emerged during this step about the weather-climate intersection for your problem or problem area.

Action Item 6: Download the desired scenario(s) from GLISA's website. (<https://glisa.umich.edu/future-climate-scenarios-for-great-lakes-cities/>)

Disruptive Weather & Climate Events Table Use the table below to complete Scenario Selection Action Items 1-4. Mark an "X" in the column that describes how disruptive each weather event is (low | medium | high) to your Problem Statement. These events may exacerbate existing problems or create new ones. If there are events that are not listed but are important, please add them to the table and reach out to a climate expert who can help you determine if/how they should be added to the scenario(s). The first column features icons used to identify the types of events in the scenarios and the last column names the GLISA scenario(s) corresponding to each type of event.

Scenario Icons	Event Description	Low Impact	Medium Impact	High Impact	GLISA Scenario(s)
	Changing seasonal hydrologic cycle				Winter 4, Spring 1
	Prolonged periods of drought				Summer 2, Fall 1
	Flood-producing precipitation events				Winter 2, Winter 4, Spring 1, Spring 2
	Extreme heat event				Summer 1, Summer 2, Fall 1
	Extreme cold event				Winter 1
	Hot and humid				Summer 1
	Hot and dry				Summer 2, Fall 1
	Intense storm events, storm surge				Summer 1
	High wind storms				Winter 2, Summer 1, Summer 2
	Heavy snowstorms				Winter 2, Spring 1, Spring 2
	Ice storms and freezing rain				Winter 3
	Massive sudden snowmelt				Winter 2, Winter 4, Spring 1
	Increased number of freeze/thaw events during winter				Winter 4

5. Workshop Planning The workshop will bring together a diverse stakeholder group to have conversations around each selected scenario with the goals of 1) providing an opportunity for engagement and networking among stakeholders, 2) customizing the scenarios further, 3) identifying important considerations and impacts in the scenario, and 4) making planning recommendations to better prepare for the future.

Lead Practitioner or Core Team Workshop Roles:

The Lead Practitioner or Core Team is responsible for:

1. Identifying goals for the workshop. This may be as simple as getting a group of stakeholders together to talk about current issues and increase communication among stakeholders. There may be a more specific goal of getting community input for a planning decision, or stakeholder input may be needed/desired for a report that will be generated. The goal(s) should reflect how the Lead Practitioner or Core Team plan to use the stakeholder workshop experience to advance or benefit the community they're working in.
2. Recruiting all relevant stakeholders
3. Providing a suitable setting for workshop attendees to break-out into groups for the scenario planning exercises
4. Securing the necessary audio/visual equipment for presentations
5. Providing participants with materials from the Workshop Materials List below
6. Convening all relevant stakeholders in a scenario planning workshop (1/2 to full day)
7. Facilitating the workshop, which should ideally be lead by someone that most participants are familiar with and trust
8. Providing refreshments or meals for longer workshops

Action Item: Specify workshop goals

Action Item: Schedule the workshop date/time and space and invite all relevant stakeholders

Action Item: Secure necessary equipment, prepare workshop materials, and plan refreshments/meals

Action Item: Prepare presentations, talking points, and plan how each component of the workshop will be facilitated (see Sample Workshop Agenda).

Workshop Materials List

1. Print or digital copies of the Problem Statement
2. Print or digital copies of the scenario narratives. At least one printed copy should be provided to each group. All members in a group will work on the same scenario
3. Print or digital copies of the workshop agenda for each participant
4. At least one print copy of the Workshop Activity pages in this workbook for each group
5. Large paper pads and pens/markers (or other means of group note taking) for group brainstorming/recording

Facilitating Break-Out Groups

All attending stakeholders will be arranged into groups at the workshop to discuss a specific scenario. The grouping method can be arranged in advance of the workshop or on-the-fly, but a strategy for how participants will be grouped is necessary. There is no right or wrong way to form groups, but it can be advantageous to group people with diverse backgrounds that bring unique perspectives to each scenario discussion. Random selection or numbering off are grouping options, too. Each group will need a dedicated writer to record the conversations during the workshop exercises and a group speaker to report out to the larger group.

Sample Workshop Agenda

This sample agenda is formatted to work well in a half-day (~4 hour) workshop setting with <25 participants and 2-4 scenario groups. *If more time is available, some of the steps could benefit from an additional 5 to 10 minutes.

	Time to Complete	Time Elapsed
Introductions <i>Everyone in the room introduces themselves (<1 min/person).</i>	15 minutes	15 min
Overview of Problem Statement and Scenario Planning <i>The Lead Practitioner or Core Team provides an overview of the Problem Statement and the workshop goals and process. Take questions at the end. **Presentation slides are recommended.</i>	15 minutes	30 min
<i>Break out into workshop groups (1 group per scenario)</i>	5 minutes	35 min
Introduce and Complete Workshop Activity 1: Community Goals and Actions <i>See activity description for details.</i>	*30 minutes	1 hr 5 min
Introduce the Scenario(s) <i>The Lead Practitioner or Core Team introduce GLISA’s scenarios that will be used in the workshop, provide the justification/motivation for selecting each specific one and how it relates back to the problem statement. Assign each group one scenario to discuss. **Presentation slides are recommended.</i>	*10 minutes	1 hr 15 min
Introduce and Complete Workshop Activity 2: Customize the Scenario <i>See activity description for details.</i>	55 minutes	2 hr 10 min
Break	10 minutes	2 hr 20 min
Introduce and Complete Workshop Activity 3: Identify Scenario Challenges <i>See activity description for details.</i>	*20 minutes	2 hr 40 min
Introduce and Complete Workshop Activity 4: Generate Recommendations <i>See activity description for details.</i>	*20 minutes	3 hr
Groups Present their Scenarios & Recommendations <i>Each group summarizes their scenario and initial recommendations.</i>	10 minutes per group	----variable---
Full Group Discussion of Recommendations <i>All participants join in a discussion around recommendations. The Lead Practitioner or Core Team can determine how to structure these conversations - either discuss recommendations by scenario, across scenarios, identify no-regrets options, identify low-cost options, etc. These conversations can be continued at a later time if needed.</i>	*20 minutes	
Next Steps and Closing Remarks <i>The Lead Practitioner or Core Team thanks participants for their time and provides relevant details about next steps in the project, like how the scenarios will be further developed or used. **Presentation slides are optional.</i>	5 minutes	~4 hours

Workshop Activities

Lead Practitioner or Core Team and All Relevant Stakeholders

1. Goals and Actions Identify the main goals in your problem statement and the actions you take to achieve them or the factors that could impede those goals (e.g., environmental, policy, funds, etc.). Goals may include a description of ideal operating conditions. For example, if your problem area is public transportation, one goal might be to provide uninterrupted services 24/7, and an action taken to achieve that goal could be to maintain a regular maintenance schedule for vehicles and roadways. Goals might also describe what you are striving to achieve in your community or in the use of various city resources, infrastructure, or entities. For example, coastal communities want to maintain safe and healthy beaches, which may be accomplished through regular water testing/monitoring programs, environmental clean-ups, and public warning systems. Cities may have a goal to effectively manage wastewater and prevent flooding, which may be accomplished through regular maintenance, repair, and updates to critical infrastructure. In the example problem statement, Isle Royale National Park's goal was to appropriately and effectively manage island resources, including the dwindling wolf population. The wolf population naturally increases or decreases based on the health and habitat available to the wolves and opportunities to enter/exit the island on winter lake ice cover. One action the park could take to increase the wolf population is to transport new wolves from outside locations.

Directions: In column 1, describe community or management goals related to your problem statement. In column 2, describe the planning decisions, actions, or factors that impact success in achieving those goals. (30 minutes)

Problem Statement Goals	Decisions, Actions, or Factors that Determine Success

2. Customize the Scenario Each stakeholder group will customize at least one scenario during the workshop to include further details about potential impacts and challenges resulting from the scenario.

Directions:

1. Read the assigned GLISA scenario narrative and discuss initial reactions to the scenario (5 minutes):

Does the scenario make sense?

Are there any points of clarification about the weather and climate events and/or impacts that are needed? If so, groups should reach out to the Core Team with questions.

2. Read the customization options in the scenario narrative and decide as a group which (if any) of the **weather customizations** will be added to your scenario. If a climate expert is available, confirm any changes with them before recording customizations in the box below. If a climate expert is not available, make sure the customizations are plausible within the scenario - *a snowstorm during a summer extreme heat event is not plausible*. (10 minutes)
3. Read the customization options in the scenario narrative and decide as a group which (if any) of the **impacts** will be added to your scenario and describe them below. Include any details relevant to the Problem Statement that reflect local vulnerabilities, risks, and disruptions to operations or community goals. Think about other sectors that would have cascading effects on your Problem Statement or inhibit meeting your goals and include those details into the scenario. Be creative and detailed in developing this description of impacts so that the scenario offers enough information to base future decisions on. (25 minutes)

Workshop Activities

Lead Practitioner or Core Team and All Relevant Stakeholders

4. Assemble the new scenario by either rewriting the narrative to include the added details or by outlining the new scenario in chronological order of weather/climate events and impacts. This step should also be recorded in a way that can be shared with the larger group for discussion (e.g., written on large paper posted in the room) (10 minutes)

Customized Scenario Narrative/Outline

5. Give the scenario a new name that reflects the types of challenges or impacts described. (5 minutes)

GLISA Scenario Name _____

New Scenario Name _____

Workshop Activities

Lead Practitioner or Core Team and All Relevant Stakeholders

3. Identify Scenario Challenges This step aims to identify how the scenario impacts the goals outlined earlier and where gaps and uncertainties exist. This information will then be used to brainstorm recommendations that can inform future planning.

Directions: Answer the following questions as a group and record your responses. (20 minutes total)

At present, are you already preparing for the conditions in your scenario?

Which goals can be met in this scenario? Do assets function under these conditions?

Which goals will be more difficult to meet in this scenario? What are the functional deficiencies or vulnerabilities?

Which goals cannot be met in this scenario?

Workshop Activities

Lead Practitioner or Core Team and All Relevant Stakeholders



4. Generate Recommendations Identify what actions need to happen to make unattainable goals achievable. Identify new goals that may be needed to address the issues identified for your focus area.

Directions: Using the goals categorized in Activity 3, think about which ones can be met easily, with additional effort, or not at all. Focusing on the difficult to achieve and unattainable goals from activity 3, talk about how you can still meet those goals given the conditions in scenario. Of the goals that cannot be met, what can you do or change to make them achievable? Answer the following questions as a group and record your responses. (20 minutes total)

Which of the goals identified stay the same?

Which goals need modification to be achieved? Describe how/what modifications are needed? Describe what is the effort/cost of these modifications?

Are there new goals that should be considered? Is there something you need to do that you aren't doing now, based on this scenario?