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Maine Climate Adaptation Tabletop Exercise

After Action Report
May 7, 2015

The After-Action Report (AAR) aligns exercise objectives with preparedness doctrine to include the National Preparedness Goal and related frameworks and guidance. Exercise information required for preparedness reporting and trend analysis is included.

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EXERCISE OVERVIEW

Exercise Name	Maine Climate Adaptation Tabletop Exercise (TTX)
Exercise Date	May 7, 2015
Scope	Employ the Third National Climate Assessment (NCA3) and the Climate Resilience Toolkit (CRT) to lead Federal, State, local, non-governmental, academic, and private sector stakeholders in the Casco Bay Region through the five step climate change adaptation planning process. The CRT was used by participants in addressing the challenges associated with identified climate-related hazards and discussion highlighted best practices and improvement areas for the CRT. The exercise was an 8-hour discussion-based exercise held at the University of Southern Maine. This exercise addressed long-term preparedness and resilience planning, not the response and recovery aspects of a particular event. It was built from the findings from the Regional Resiliency Assessment Program conducted in the Casco Bay Region.
Mission Area(s)	Protection and Mitigation
Core Capabilities	<ol style="list-style-type: none"> 1. Planning 2. Community Resilience 3. Long-term Vulnerability Reduction 4. Risk and Disaster Resilience Assessment 5. Threats and Hazard Identification
Objectives	<ol style="list-style-type: none"> 1. Familiarize State, local and regional planners with the Northeast regional findings in NCA3, the climate impacts outlined in Maine's Climate Future report, and the CRT five step adaptation planning process. 2. Assess the utility of the CRT to support state, local and regional adaptation planning efforts. 3. Determine future requirements for CRT and the NCA to support state, local and regional planning. 4. Identify example decisions that stakeholders are making to adapt to a changing climate. 5. Provide information about current and future federal resources, tools and technical assistance that will be available and needed to state, local and regional climate change adaptation planners.

Threat or Hazard	Climate-related impacts on critical infrastructure lifeline sectors, such as sea level rise, changes in temperature and precipitation.
Scenario	<p>The Maine Climate Adaptation Tabletop Exercise focused on informing participants of climate-related hazards (e.g., changes in temperature, precipitation, and sea level rise), discussions and associated impacts on certain lifeline sectors, rather than on episodic events impacting the region (e.g., extreme weather events such as hurricanes, heat waves, floods). The scenario was derived from Maine's Climate Future (2009 and 2015 update), regional impacts outlined in the Northeast Chapter of NCA3 as they relate to the State of Maine, and other applicable sources.</p> <p>A note on terminology: <i>Mitigation</i>, as used in this exercise, refers to hazard mitigation. It is the effort to reduce loss of life and property by lessening the impact of disasters. This is to be differentiated from a common use of the term in climate change forums to refer to reducing greenhouse gas emissions; it did not carry that connotation in this exercise.</p>
Sponsor	Office of Infrastructure Protection (IP)
Exercise Participants	<p>Number of Exercise Participants</p> <p>Total in attendance: 90</p> <p>Players: 57</p> <p>Facilitators: 17</p> <p>Observers: 12 (10 STEM students, 2 teachers)</p> <p>Data Collectors: 4</p>
Point of Contact	<p>Bill DeLong Protective Security Advisor Protective Security Coordination Division Department of Homeland Security, Office of Infrastructure Protection Phone: 207-432-5975 Email: william.delong@hq.dhs.gov</p> <p>Rachel Liang Federal Exercise Lead Sector Outreach and Programs Division Department of Homeland Security, Office of Infrastructure Protection Office: 703-603-5136 Cell: 202-480-5281 Email: rachel.liang@hq.dhs.gov</p>

EXERCISE SUMMARY

The Maine Climate Adaptation Tabletop Exercise was an eight-hour discussion-based exercise held at the University of Southern Maine in Portland, Maine on May 7, 2015. The exercise consisted of two sessions. The morning session consisted of briefings on the Third National Climate Assessment (NCA3); Maine’s Climate Past, Present & Future; and the NOAA Climate Resilience Toolkit (CRT) and Five-Step Planning Process. For the afternoon session, participants broke out into groups of 5-8 to work through the five-step climate change adaptation process and develop notional climate change adaptation plans.

The majority of participants found the presentations, resources, and strategies discussed during the morning session valuable, and believe this information will enhance their own adaptation planning capabilities. There was consensus among participants that the wide range of tools and resources were extremely helpful, but the lack of a clear unified effort was frequently noted during exercise discussions. An overarching plan and single point of contact for incorporating localities into national climate change initiatives was a key requirement. Breakout groups also discussed increasing the awareness of climate-related hazards, as well as informing their respective communities of these tools and resources to increase capacity at the local level. Mechanisms such as public outreach efforts, education on the costs of “doing nothing,” and the benefits of climate adaptation planning were discussed. Exercise participants emphasized the need for more local leadership involvement, as well as coordinated public relations campaigns.

Players unanimously identified the need for technical assistance, specifically with visualization tools and downscaling data, as well as training to potential users. Some tools, like the CRT’s Climate Explorer, have many data layers that could make it difficult for beginners to extract the most relevant information. It was suggested that pre-loading several sets of common data layer configurations could be useful in quickly guiding new users to a dataset that is relevant to their needs. While the five-step process was identified as a good framework that can enhance climate change adaptation planning efforts, some participants found it confusing or duplicative. There was a common trend of confusion about halfway through the five-step process causing participants to lose momentum. More clarification was needed throughout the five-step planning process template as a whole.

Exercise participants found the CRT to be very useful as a convenient, interactive website providing a variety of scientific tools, resources, and information covering climate-related risks and opportunities to aid in planning for resiliency. The CRT was constructed to serve interested citizens, communities, businesses, resource managers, planners, and policy leaders at all levels of government – making the CRT versatile and functional. **Table 1** provides a summary of the TTX objectives and the most significant outcomes.

Table 1: Objectives and Outcomes

Exercise Objective	Outcome
Familiarize State, local and regional planners with the Northeast regional findings in NCA3, the climate impacts outlined in Maine's Climate Future report, and the CRT five-step adaptation planning process.	<ol style="list-style-type: none"> 1. Participants agreed that planners should consider incorporating the CRT Five-Step Adaptation Planning process into emergency response and preparedness planning efforts. 2. Private sector stakeholders should consider including the process in their Business Continuity Plans (BCPs). 3. Planners should examine existing plans and processes to determine if climate adaptation can be incorporated into established programs and timelines. 4. Plans should be shared among critical infrastructure owners and operators so all community stakeholders can work together to address long-term planning issues. 5. Stakeholders at the Federal, State, and local levels should also identify existing training and education programs to familiarize planners and risk managers with the impacts of climate change, and how critical infrastructure can be made more resilient in light of these threats.
Assess the utility of the CRT to support state, local and regional adaptation planning efforts.	<ol style="list-style-type: none"> 1. In addition to the SLOSH model, the CRT should include other available data sources, such as what is available in the Coastal Change Hazards Portal of the U.S. Geological Survey website. 2. Planners should identify other data sources or models that are available to support plans and regional projections. Additional datasets should be provided to NOAA for inclusion on the CRT. 3. NOAA should continue its efforts in establishing a team of experts in identifying and reviewing regionally and locally relevant map layers, tools, case studies, and resources. 4. NOAA is hosting a series of purposeful engagements at the local level to identify issues and assist in implementing the CRT at the local level. They should continue this initiative, and expand as resources allow. This can also be expanded to train-the-trainer programs, where regional groups or capabilities can participate, then share this information with their regional

Comment [DH1]: Seems this should refer to the Climate Explorer, not the CRT?

Comment [DH2]: "what" is vague. Can you be more specific? Are there datasets or map layers that are particularly desired?

Exercise Objective	Outcome
	<p>stakeholders.</p> <ol style="list-style-type: none"> To the extent that resources allow, the CRT should implement a virtual help desk to answer technical questions, and provide user assistance. IP should connect with CRT administrators and the USGCRP to coordinate efforts and engage in CRT and climate-related outreach. Several participants felt that several steps in the five-step planning process were somewhat redundant. Planners should emphasize that the five-step process is not linear; steps can be omitted, changed, or reordered to fit it to their requirements. The CRT team should review metrics to identify the most frequent or popular queries. This data can be populated into pre-set layers in the Climate Explorer. Planners should identify local data and maps that are necessary for assessing climate change risk and adaptation options that are not likely to be found in the CRT (such as property values), so they can be incorporated into the adaptation planning process.
Determine future requirements for CRT and the NCA to support state, local and regional planning.	<ol style="list-style-type: none"> In general, the language used in the CRT was sufficient to meet the needs of most planners and there were enough resources allowing a beginner to get up to speed on most of the topics. The variety of tools in the CRT will prove useful information for long-term sustainability initiatives. Planners should incorporate these into climate change adaptation activities. Overall, on a national scale, planning for climate adaptation is disjointed, and it is difficult for municipalities and states to tie into national initiatives and achieve a unity of effort. Planners should look to the CRT as a clearinghouse of climate planning data, best practices, and resources. The Expertise tab on the CRT has a range of searchable training courses available that organizations should consider incorporating into their training and development plans. NOAA should consider

Exercise Objective	Outcome
	augmenting this online catalog with training progressions designed to build awareness, understanding, skill, and capacity among users. Regularly scheduled (e.g., quarterly) expert-led webinars can be a sustainable way to engage users without overwhelming subject matter experts.
Identify example decisions that stakeholders are making to adapt to a changing climate.	<ol style="list-style-type: none"> 1. When developing climate adaptation outreach programs and materials, communicators should understand that efforts cannot solely be about the science; value propositions should also be considered, including social, political, environmental, economic, and other well-rounded approaches to appeal to different audiences. Communication materials should incorporate both scientific and human interest angles. 2. In the Casco Bay Region, there are specific critical infrastructure assets at high risk from future climate-related hazards based on current vulnerabilities. 3. Communities need to plan not only for flood potential they currently face, but also for sea level changes projected in the future as well as extreme events on top of that, such as strong storm surges. 4. A valuable first step is for communities to identify their most critical assets, then determine the extent to which these assets are vulnerable to climate-related hazards. This includes assessing exposure and sensitivity, appraising their risk, and identifying preventative actions that can be taken now to increase resiliency for the future. 5. Options for alternate and reserve capacity should be identified to mitigate the risk of losing critical services. 6. While political and cost constraints will substantially impact the ability to modify or relocate critical assets, planners should consider areas where new construction or expansion should be disincentivized.
Provide information about current and future federal resources, tools and technical assistance that will be available to and needed by state, local and regional climate change adaptation planners.	<ol style="list-style-type: none"> 1. Participants suggested more outreach to the community to raise awareness of impacts related to climate change as a way to gather public support for properly funding adaptation efforts.

Exercise Objective	Outcome
	<ol style="list-style-type: none"> 2. Stakeholders making climate adaptation plans should coordinate with government officials and other members of the community to develop and execute public outreach strategies and awareness/education campaigns. 3. Regions should consider implementing the notional Task Force utilized in the exercise scenario. This task force would bring together regional Federal, state, local, and private sector stakeholders to develop long-term climate adaptation plans, share resources and best practices, and identify gaps. 4. The Casco Bay Region should incorporate the findings from this exercise into the planning and development of the FEMA-sponsored regional exercise scheduled to take place later this year.
Exercise design, development, and execution	<ol style="list-style-type: none"> 1. Exercise planners should balance participant availability with the time needed to adequately complete the exercise assignment. It may be appropriate to break the exercise into two portions, or narrow the scope. 2. If the exercise is broken into two events, it is recommended that the first focus on steps one and two, with the following event looking at three through five. This also provides players the opportunity to digest the information, as well as arrive at the second event with any information identified as needed for the planning process in the first session. 3. Exercise facilitators should regularly reiterate that the five-step planning process is not linear, and can be modified adapted as needed. 4. Exercise planners should test the availability and bandwidth of the exercise facility's Wi-Fi network to make sure it can provide the bandwidth needed for participants to use the CRT. 5. Exercise planners should continue the use of table facilitators from different backgrounds and areas of expertise to assist with exercise activities.

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ANALYSIS OF CORE CAPABILITIES

Aligned exercise objectives and core capabilities provide a consistent taxonomy for evaluation that transcends individual exercises to support preparedness reporting and trend analysis. Table 2 includes the exercise objectives and aligned core capabilities that were assessed during the exercise.

Exercise Objective	Core Capability
Familiarize State, local and regional planners with the Northeast regional findings in NCA3, the climate impacts outlined in Maine's Climate Future report, and the CRT five step adaptation planning process.	<ul style="list-style-type: none"> ✓ Planning ✓ Community Resilience ✓ Long-term Vulnerability Reduction ✓ Risk and Disaster Resilience Assessment ✓ Threat and Hazard Identification
Assess the utility of the CRT to support state, local and regional adaptation planning efforts.	<ul style="list-style-type: none"> ✓ Planning ✓ Risk and Disaster Resilience Assessment ✓ Long-term Vulnerability Reduction
Determine future requirements for CRT and the NCA to support state, local and regional planning.	<ul style="list-style-type: none"> ✓ Planning ✓ Long Term Vulnerability Reduction
Identify example decisions that stakeholders are making to adapt to a changing climate.	<ul style="list-style-type: none"> ✓ Planning ✓ Community Resilience
Provide information about current and future federal resources, tools and technical assistance that will be available and needed to state, local and regional climate change adaptation planners.	<ul style="list-style-type: none"> ✓ Planning ✓ Community Resilience ✓ Long-term Vulnerability Reduction ✓ Risk and Disaster Resilience Assessment

Table 2. Exercise Objectives and Associated Core Capabilities

The following sections provide an overview of the participants' discussion related to each exercise objective and associated core capability, highlighting strengths and areas for improvement.

OBJECTIVES

Objective 1: Familiarize State, local and regional planners with the Northeast regional findings in NCA3, the climate impacts outlined in Maine’s Climate Future report, and the CRT five-step adaptation planning process.

Core Capabilities: Planning, Operational Communication, Operational Coordination

Strengths

Strength 1:

Ellen Mccray, National Oceanic and Atmospheric Administration (NOAA), briefed participants on the U.S. Global Change Research Program’s Third National Climate Assessment (NCA3). The NCA3 summarizes the impacts of climate change on the Nation, now and in the future. The NCA3:

- Informs the Nation about observed changes, the current status of the climate, and anticipated trends for the future;
- Integrates scientific information from multiple sources and sectors to highlight key findings and significant gaps in knowledge;
- Establishes consistent methods for evaluating climate impacts in the United States in the context of broader global change; and
- Is used by the U.S. Government, citizens, communities, and businesses as they create more sustainable and environmentally sound plans for the future.¹

A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the NCA3 report, which was extensively reviewed by the public and experts, including federal agencies and a panel of the National Academy of Sciences. This briefing provided an overview of the document and discussed its findings at the national and regional levels.

During the morning session, overall findings for the U.S. were shown, as well as findings specifically for the Northeast Region. A key finding for the Northeast Region is that the area will experience more heat waves, extreme precipitation events, and coastal flooding due to sea level rise and storm surge. These events will likely heavily impact the region’s environmental, social, and economic systems. Due to many complexities and interdependencies between the different infrastructure sectors, disruptions of services in one infrastructure system will almost always result in disruptions in one or more other systems. The presentation clearly indicated that impacts due to climate change have moved firmly into the present; and how planning for these impacts now will be necessary. Ms. Mccray concluded how progress has been made on the national level, including assessments such as the NCA3; the support for climate-resilient investments; maintaining agriculture productivity; and providing tools for climate resilience planning to communities.

¹ “Assess the U.S. Climate,” U.S. Global Change Research Program, accessed February 18, 2015, <http://www.globalchange.gov/what-we-do/assessment>

Strength 2:

David Herring (NOAA) briefed on the U.S. Climate Resilience Toolkit (CRT) and the five-step adaptation planning process. NOAA developed the CRT and five-step process to provide communities a standardized, accessible planning approach for critical asset (people, resources, and infrastructure) protection and resiliency from climate-related hazards. The CRT is an interactive website that provides scientific tools, information, and expertise to help people manage climate-related risks and opportunities, as well as improve their resilience to extreme events. The site is designed to serve interested citizens, communities, businesses, resource managers, planners, and policy leaders at all levels of government. Version 1.0 was developed over a six-month period in 2014 by a partnership of federal agencies and organizations led by NOAA. The main goal for the initial release was to lay a firm foundation and inclusive framework that would allow the Toolkit to expand and grow over time, primarily in response to user needs and feedback. The Toolkit is available online at: <http://toolkit.climate.gov/>.

The CRT's five-step adaptation planning process presented in the exercise outlined a workflow that was developed through research and refined through practice. Communities and businesses across the nation are already using these steps to confront their climate vulnerabilities and build resilience.

The five steps of the process include the following:

1. **Identify the Problem** — Focus on climate stressors that threaten people, buildings, infrastructure, natural resources, or the economy in your area.
2. **Determine Vulnerabilities** — Identify specific populations, locations, and infrastructure that may be impacted by the climate problem you identified.
3. **Investigate Options** — Compile a list of potential solutions, drawing on the experiences of others who have addressed similar problems.
4. **Evaluate Risks & Costs** — Consider risks and values to analyze the costs and benefits of favored options. Select the best solution for your situation and make a plan.
5. **Take Action** — Implement your plan and monitor your progress. As necessary, adjust your plan to move toward your desired outcomes. Be prepared to iterate, if needed.

During the morning session, Mr. Herring described the adaptation planning process and walked through the CRT website to familiarize participants with the tool itself, where to find posted resources, case studies, tutorials, and other helpful information for them to access as they worked through the five-step process in the afternoon. As an example, Mr. Herring discussed how Asheville, North Carolina, applied this process to their adaptation planning efforts for flooding and visualized the process through conceptual model diagrams. A range of other climate change planning success stories are highlighted in different parts of the CRT.

Familiarizing players with, and providing feedback on the Toolkit was one of the key objectives of this exercise. The briefing gave participants an understanding of the resources available in the CRT, as well as how they can be used to inform climate change adaptation planning efforts. More specific feedback from the CRT is located in Appendix F.

Strength 3:

Dr. Sean Birkel (Climate Change Institute, University of Maine) briefed participants on climate change over geologic time, recent evidence of accelerated rates of change, and the implications of continued climate change in Maine during the 21st century as a result of greenhouse gas emissions and their associated pollutants. A key point was that if a coordinated response succeeds in eliminating excess greenhouse gas emissions by the end of the century, something that appears highly unlikely today, climate change will continue simply because the elevated levels of carbon dioxide (CO₂) can persist in the atmosphere for thousands of years to come. The briefing shared climate-related findings and projections for Maine and the Casco Bay Region for participants to consider during the course of the exercise.

All speakers were available throughout the day to answer questions and discuss issues with participants, enabling participants to address any questions directly to subject matter experts.

Strength 4:

A wide range of stakeholders in the Casco Bay region had the opportunity to implement the five-step planning process in a no-stress, guided environment. The morning briefings provided context and illustrated the value proposition of the activity, while the afternoon enabled players to walk through the process together, with the assistance of subject matter experts. Players also had the advantage of regional stakeholder with a range of different disciplines and areas of expertise, adding valuable perspectives that individual planners would not have had. Ensuring each table had a variety of different players ensured productive and lively discussions.

Areas for Improvement

Area for Improvement 1: Planning. All three speakers identified the need for local plans to adapt to the risk of impacts related to climate change.

Analysis: Ellen Mecray and Dr. Sean Birkel laid out to participants the projections for future warming and the impacts that such a warming could have on the region. David Herring discussed resources the government has made available, such as the CRT, to assist in planning adaptation strategies. He also presented a methodology that has been developed for assisting in the adaptation planning process. During the breakout session, participants practiced using the five steps for the development of preliminary plans based on the information provided in the morning. There was an indication by several participants that the five-step planning process for climate-related hazards could be incorporated into other current planning updates being conducted, such as the Portland Comprehensive Plan and the Long Range Transportation Plan.

Recommendation: Local and regional planners and stakeholders in the Casco Bay Region who are responsible for various required plans should consider incorporating the five-step climate change adaptation planning process into emergency response and preparedness planning efforts. Private sector participants are encouraged to include the process into their Business Continuity Plans (BCPs). Additionally, planners should examine existing plans and processes to determine if climate adaptation can be incorporated into established programs and timelines. Where appropriate, plans should be

shared among critical infrastructure owners and operators, so all community stakeholders can work together to address long-term planning issues.

Stakeholders at the Federal, State, and local levels should also identify existing training and education programs to familiarize planners and risk managers with the impacts of climate change, and how critical infrastructure can be made more resilient in light of these threats. Training programs are highlighted in the “expertise” heading of the CRT, as well as FEMA’s Emergency Management Institute website.

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Objective 2: Assess the utility of the CRT to support state, local and regional adaptation planning efforts.

Core Capabilities: Planning, Risk and Disaster Resilience Assessment, Long-Term Vulnerability Reduction

Strengths

Strength 1: The CRT consists of a suite of tools that can assist in climate change adaptation planning efforts.

Strength 2: The CRT was widely used by participants in the afternoon sessions. This provided an opportunity for participants to gain familiarity with the online tools and assess their utility in local planning.

Strength 3: The five-step planning template was noted to be useful in organizing the thoughts and plans of the participants. Participants remarked on its utility in aiding people various experience and backgrounds to form a common planning framework and develop plans in an orderly manner.

Strength 4: Participants appreciated the functions and potential of the Climate Explorer. Local maps with a variety of data layers give local planners the ability to tailor the data to their particular needs. This was one of the most used tools in the exercise.

Areas for Improvement

Area for Improvement 1: Participants noted that the CRT uses the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model for its storm surge data.

Analysis: Some participants expressed that the SLOSH model does not provide very accurate results for Maine as the tool generally uses a one-kilometer (1-km) grid, which is insufficient in Maine due to the rocky coastline. It was noted that more accurate models exist and would be more appropriate for planners in Maine to use. The Coastal Change Hazards Portal of the U.S. Geological Survey (USGS) website was suggested as an example of a better model to use.

Recommendation 1: The CRT should examine the feasibility of incorporating additional model outputs in the Climate Explorer's "Coastal Flood Risk" section to better reflect the reality of coastal Maine and other similar geographies. This will make the tool more relevant and useful for planners at a regional to local scale, such as along Maine's coast. Similarly, the CRT should also examine the feasibility of incorporating select, authoritative map layers provided by state and local experts which will nicely complement the federal government's provision of national- and regional-scale map layers and thus better serve state, local, and tribal user communities by allowing them to compare a wider variety climate-related maps showing climate stressors as well as people and assets that may be impacted. We recognize that, if scaled up to a national scale, there are theoretical limits (in terms of interface design, work load, and management overhead of exponentially growing the tool's linkages to multiple new web map servers) on the Climate Explorer's capacity to incorporate state and local maps from all across the nation. To help enable the workflows that would be required, the CRT should consider

establishing regional theme teams (somewhat analogous to its topic theme teams) comprised of select climate science and services experts (such as state climatologists, municipalities' designated GIS specialists, etc.) to help vet, manage, and maintain the list of state and local map layers to be included.

Recommendation 2: Planners may require data that would not be appropriate for inclusion in the CRT, such as information on property values. They should identify these information requirements and where this data is held so they are able to incorporate it into adaptation plans.

Area for Improvement 2: Participants noted that the CRT language and terminology was obscure, and that the information became very technical and specialized very quickly.

Analysis: Many individuals who may rely on the CRT for assistance are not subject matter experts in climate change modeling, projections, or planning. While the CRT needs to have more advanced capabilities, there should not be too steep a learning curve for potential novice users. The Toolkit has a glossary in the overview portion of the website that has valuable background for novices, a site overview video, as well as a training repository that can be filtered by level of difficulty, which addresses many of these issues, but the quantity of information can still be intimidating.

Recommendation 1: NOAA has begun a series of purposeful engagements with stakeholders in businesses and municipalities to help them identify issues and assist with CRT use at the local level. NOAA should continue this initiative as resources permit so that users can resolve any challenges they encounter and provide feedback on the site. While the site has information designed for novices, it may not be intuitive for all users, who may be intimidated by the depth of information on the website, and these engagements enable these focus groups to test and refine the language used in the tool.

Recommendation 2: To the extent resources allow, the CRT team should consider establishing a virtual help desk function to provide technical assistance to users, troubleshoot issues, and answer their specific questions.

Area for Improvement 3: Several participants noted that around step three in the five-step planning process template, the process became redundant. This caused some participants to get bogged down and lose momentum. More clarification was needed on these steps, and more generally throughout the document. It was noted that example answers would be useful in understanding the template and that the directions were too wordy. Furthermore, many participants found that the language was either too basic or too technical.

Analysis: While the template was a useful tool to guide players through the five-step process, it needs refinement. It was indicated by some participants that the language and terminology used in the CRT was too technical and specialized. On the other hand, some participants noted that the language was too basic for those with more knowledge and experience with contingency planning.

Recommendation 1: Example completed templates should be developed so that planners using the process have points of comparison. As these examples are developed, any points of confusion or duplication should be clarified or refined. Local and regional stakeholders should provide the federal authors and creators of the CRT and the planning template timely comments and feedback regarding the effectiveness and accessibility of

Comment [DH3]: Can we identify where in the CRT the language was found to be obscure? It will help us address it if we can identify where this is referring to.

the language used in the tool and the template via the feedback mechanism on the CRT. Lastly, the planning process is intended to be cyclical, with some steps taking place concurrently or out of order depending on the capabilities and requirements of individual planning communities. This aspect should be emphasized and expanded to prevent planners from being discouraged or bogged down by specific elements of the process.

Recommendation 2: Workshops, references, and written materials, should all emphasize that the five-step planning process is not linear or set in stone. It is recognized that local and regional considerations will impact requirements, and potentially dictate that the steps be modified, reordered, or omitted completely. The five-step planning process is intended as a framework to organize thoughts, not to be a constraint.

Recommendation 3: Facilitators of the five-step process should help participants understand that there are no “right answers”; rather, there are ranges of possible outcomes based on participants’ goals, values, climate-related stressors, etc. The aim is to help stakeholders understand and describe their tolerance for risk in certain scenarios, and those options for which taking action is less costly and/or more beneficial than not taking action. Similarly, facilitators should also help participants understand that the CRT cannot provide data and/or answers to address all of their questions. Other types of data and information (such as local real estate values, quantifying risk to local assets, etc.) may have to be brought to the table by local experts participating in the planning process.

Recommendation 4: Consider producing a video, guide or tutorial to help novice users work through the five-step process.

Objective 3: Determine future requirements for CRT and the NCA to support state, local and regional planning.

Core Capabilities: Planning, Long Term Vulnerability Reduction

Strengths

Strength 1: In general, the language used in the CRT was basic enough for all levels of expertise and knowledge to understand. There were enough resources allowing a beginner to get up to speed on most of the topics.

Strength 2: There are a variety of tools on the CRT that could provide useful information for long-term sustainability initiatives.

Areas for Improvement

Area for Improvement 1: The Climate Explorer has many data layers that can make it difficult for a new user to extract the most relevant information for their needs.

Analysis: The Climate Explorer has many data layers and configurations which are useful in tailoring data to meet a specific need. However, these can be complicated and difficult for a novice to use effectively. It was suggested that pre-loading several sets of common data layer configurations could be useful in quickly guiding new users to a data set that is relevant to their needs.

Recommendation: Develop a set of common algorithms or pre-built data layers tagged for common requests in the Climate Explorer; such as a “most popular” or “most used” tab. Using pre-built layers aligned with the most common queries, sets of correlated hazards, and biggest risks could be more quickly identified and more widely used by participants. These layers can be developed by reviewing site metrics, in-person engagement, and user feedback.

Area for Improvement 2: While players were positive towards the CRT, they also proposed testing a new engagement model in which federal partners coordinate with regional and local communities to identify specific local climate-related stressors and their goals and objectives for building resilience to them. The CRT federal partners would then tailor the engagement precisely to help the local stakeholders make an action plan by which they can address the concerns and objectives they identify. An additional goal of the engagement could be to build stakeholders’ knowledge, skill, and capacity needed to use the tools and resources they need to address their concerns. Subsequent to the engagement, the CRT federal partners would follow up to see if additional engagements or iterations are needed. This was felt to have a high likelihood of effective and meaningful engagement with positive outcomes.

Analysis: Continued local engagement remains the best way to ensure materials are relevant, actionable, and meet the needs of the communities for which they are intended. The case studies and success stories are good examples of this in action. Similarly, this exercise specifically was an ideal venue for this kind of engagement.

Recommendation 1: Incorporate the feedback from this exercise into the CRT and five-step planning process. Hold similar exercises and training events across the country, ensuring participants and locations reflect the various hazard profiles, geographic, social,

and economic considerations planners face. Highlight these engagements on the CRT so users know local input is being considered, and regional stakeholders can request exercises in their own communities. This will help promote the CRT as a national clearinghouse for climate change adaptation information and resources.

Recommendation 2: The Expertise tab on the CRT has a wide range of searchable courses available that organizations should consider incorporating into training and development plans. NOAA should consider adding structure to the training course by designing purposeful learning progressions and with scheduled, expert-led courses and webinars that can build awareness, understanding, skill, and capacity among participants. Such courses could be sustainable and not overwhelming to subject matter experts if conducted at set intervals (i.e., quarterly or biannually).

Area for Improvement 3: Planning for climate adaptation is disjointed, and it is difficult to tie local adaptation initiatives into national initiatives and achieve a unity of effort.

Analysis: Participants observed the variety and number of tools available on the CRT. These provide useful capabilities and information, but still leave each community to conduct adaptation planning on its own. This leads to a lack of unity of effort and shows the absence of an overarching plan for incorporating localities into a national initiative.

Recommendation 1: Currently, climate change adaptation efforts reside across many different departments and agencies, including FEMA, NOAA, EPA, and others. Streamlining and combining these efforts for climate change adaptation planning could simplify the process and decrease confusion. Similarly, the wide range of methodologies used for climate projections can be confusing. The CRT is a good first step in this process, and the expansion of its use may alleviate this concern.

Tying climate change adaptation initiatives to existing critical infrastructure planning and resilience efforts may also enhance unity of effort and more closely align it with existing planning cycles. Substantial work is already underway to increase resiliency against both natural and manmade threats, and linking climate change adaptation planning under this umbrella may address this challenge.

Recommendation 2: IP should coordinate with CRT administrators, FEMA, the USGCRP, and other climate change adaptation subject matter experts to coordinate outreach and education. By supporting each other through this engagement, the Federal interagency can have a more unified, coordinated approach that ensures local and regional equities are adequately addressed.

Objective 4: Identify example decisions that stakeholders are making to adapt to a changing climate.

Core Capabilities: Planning, Community Resilience

Strengths

Strength 1: Local planners had a strong working knowledge of their vulnerabilities and were doing what they could under current budget constraints to address vulnerabilities.

Areas for Improvement

Area for Improvement 1: It was noted that many local planners have not been approaching long-term preparation and adaptation planning efforts for climate change in a systematic manner.

Analysis: Local planners were well aware of current vulnerabilities and were planning to address those in an environment of constrained budgets. However, there was a varying level of awareness that climate change can also exacerbate existing vulnerabilities in addition to creating new ones. Participants showed a willingness to factor in more extreme conditions, but have not had future climate impacts presented in a systematic manner with respect to critical infrastructure planning.

Recommendation: Climate change adaptation planning should become an integral part of local stakeholders' planning processes. In some cases, a standalone program may be warranted, but in many cases climate change adaptation planning can be incorporated into existing all-hazards planning procedures and timelines. Planners and risk managers should also examine current plans with climate stressors in mind to identify potential weaknesses and areas they can be expanded to address climate-related hazards. Lastly, regions should share, or continue to share, adaptation plans so that all communities are aware of regional capabilities.

Area for Improvement 2: In the Casco Bay Region, there are specific critical infrastructure assets at high risk from future climate-related hazards based on current vulnerabilities.

Analysis: In the afternoon breakout sessions, participants noted multiple locations that are currently dealing with regular flooding from either storm water or seawater inundation. Based on climate projections, the flooding in these areas will continue to get worse and more costly. Often, these areas are not incorporating the risk of more extreme events in their future planning efforts.

Recommendation: Communities need to plan not only for flood levels they currently face, but for the levels of flooding projected in the future; and in places where valuable assets are exposed and sensitive to impacts, and there is a low tolerance for risk, then those communities should plan for worst-case scenarios — such as strong storm surges on top of N feet of future sea level rise. A valuable first step is for communities to identify their most critical assets, then determine the extent to which these assets are vulnerable to climate-related hazards. This includes conducting cost and risk assessments, and identifying preventative actions that can be taken now to increase resiliency for the future. Options for alternate and reserve capacity should be identified to mitigate the risk of losing critical services. While political and cost constraints will substantially impact

the ability to modify or relocate critical assets, planners should consider whether new construction or expansion should be disincentivized in certain areas.

DRAFT

Objective 5: Provide information about current and future federal resources, tools and technical assistance that will be available and needed to state, local and regional climate change adaptation planners.

Core Capabilities: Planning, Community Resilience, Long-Term Vulnerability Reduction, Risk and Disaster Resilience Assessment

Strengths

Strength 1: David Herring briefed participants on the five-step planning process and the multitude of tools available on the CRT. He also walked participants through some of the planned additions to the Toolkit.

Strength 2: Regional Director Kim Erskine and Protective Security Advisor (PSA) Bill DeLong discussed with participants the resources that IP provides to local stakeholders to help in planning efforts.

Strength 3: Aside from climate change adaptation planning, this exercise brought together a wide range of stakeholders who would not otherwise have worked together in resiliency training. This coordination has impacts outside the climate change adaptation arena, as increased coordination and partnership is beneficial to all. All participants were willing to share contact information, illustrating commitment to coordination and resilience.

Strength 4: Political leadership, both elected and appointed, supported and attended the exercise, illustrating how important climate change adaptation is to the region. Leadership support is vital to continued climate change mitigation efforts, and their participation strengthened the exercise.

Areas for Improvement

Area for Improvement 1: Resourcing and messaging for critical infrastructure adaptation.

Analysis: Cost will be a major factor in climate change preparedness efforts. Adaptation has often been shown to save money in the long run compared to the costs of inaction. However, adaptation actions require the expenditure of funds, and the current resource environment is constrained. Participants in the exercise suggested more outreach to the community to raise awareness of impacts related to climate change as a way to gather public support for properly funding adaptation efforts.

Recommendation 1: Climate change adaptation planning stakeholders should coordinate with government officials and other members of the community to develop and execute public outreach strategies and awareness/education campaigns. Implementation of these campaigns could focus on the costs of inaction from projected impacts and the benefits of taking action to increase resiliency. These efforts could be tailored for a range of citizens, starting as early as kindergarten, so citizens are prepared to address these issues in the future.

Recommendation 2: When developing climate adaptation outreach programs and materials, communicators should understand that efforts cannot solely be about the

science; value propositions should include social, environmental, economic, and other well-rounded approaches to appeal to different audiences. Communication materials should incorporate both scientific and human-interest angles.

Recommendation 3: Regions should consider implementing the notional Task Force utilized in the exercise scenario. This task force would bring together regional Federal, state, local, and private sector stakeholders to develop long-term climate adaptation plans, share resources and best practices, and identify gaps.

Recommendation 4: The Casco Bay Region should incorporate the findings from this exercise into the planning and development of the FEMA-sponsored regional exercise scheduled to take place later this year.

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EXERCISE DESIGN ANALYSIS AND RECOMMENDATIONS

Exercise Design: Analysis and Recommendations

After the exercise, recommendations regarding exercise design were noted by planning team members. They include the following:

Strengths

Strength 1: Continue to include the “human element” when communicating impacts of climate change.

Analysis: During his morning session presentation and overview of specific historical weather events for Maine, Dr. Sean Birkel included several personal examples of how he has been impacted by changes in Maine climate since his childhood. These examples, often supplemented by photographs, were appreciated by the participants and helped to relate the impacts of a changing climate with a “human connection.” It also helped to reinforce an overall message that climate-related impacts are currently occurring.

Recommendation: For future events, exercise planners should consider different and unique approaches for presenting climate change impacts from a relatable, human perspective, as well as with charts and data sets. This will also help to communicate the significance of climate projections and underscore that climate change is happening currently.

Strength 2: The exercise brought together a wide range of stakeholders.

Analysis: The TTX involved many stakeholders who would not otherwise have worked together in resiliency training. This coordination has impacts outside the climate change adaptation arena, as increased coordination and partnership is beneficial to all. All participants were willing to share contact information, illustrating a commitment to future coordination and resilience.

Recommendation: Exercise planners should consider continuing to invite a wide range of stakeholders to future endeavors. They should also continue the use of table facilitators and exercise planners from a range of organizations and expertise.

Areas for Improvement

Area for Improvement 1: Increase networking opportunities and group interaction.

Analysis: Some planning team members expressed that, since it was likely that many participants were meeting for the first time at the TTX, a group lunch would have been a great opportunity to encourage networking. It was also suggested to arrange groups with more varied backgrounds at tables to facilitate exposure to a wider variety of perspectives. Additionally, allow for more opportunities for the group as a whole to interact and have discussions with the SMEs who are present.

Recommendation: For future similar events, exercise planners should consider different options and opportunities to allow for participants to meet and network before, during, and following the event. Also, planners should consider including more times in the schedule for group interaction and progress and activity discussions.

Area for Improvement 2: Consider facility Internet connection capabilities

Analysis: With several participants accessing a robust online tool such as the Climate Resilience Toolkit, broadband Internet access is necessary. The facility provided complimentary “Guest” Internet access; however, bandwidth was not sufficient for this level of use.

Recommendation: Ensure high level/wide bandwidth in facilities if using the CRT.

Area for Improvement 3: Balance participant availability with the time needed to adequately complete the exercise assignment.

Analysis: It was noted that a half-day or even one full day may not be sufficient to effectively work through the five-step planning process. Adding time would allow for more thorough thought processes and discussions in the early steps of the template, as well as data gathering (e.g., local property values or risk assessments) that may be helpful to participants.

Recommendation: Consider adding time to work through the five-step planning process. This could be seen in expanding the exercise to two full days, or even to an entire day for each step. If this is not feasible or key participants are unable to commit to two events, consider constricting the scope to examine only a few hazards, assets, or locations.

APPENDIX A: FEEDBACK FORM RESULTS

Have you implemented any of the action items identified from the exercise?	56.5%
Did our product or services meet your expectations?	100.0%
Did you find the exercise useful?	4.0
Do you believe the exercise enhanced your organization's resiliency?	3.6
Was the exercise team professional and working towards your needs?	4.6
Would you recommend the exercise program to your partners?	4.0
How likely are you to request another exercise from DHS/IP?	3.7

APPENDIX B: PARTICIPANT HOT WASH NOTES

Strengths

- **Overall:**
 - Morning presentations were good.
 - There is the benefit of the different backgrounds of participants.
 - Helpful to have a structure; it will be great for locals, for those who are not well known with this process. Unsure if tools are ready to deploy at neighborhood level, but if it can be used to see where these applications have been applied, would be helpful to modify it to community use.
 - Great to have all these different people together.
- **Specific to the 5 Step Planning Process:**
 - Two major plans in the Portland region are being updated this summer, so this is great timing for the 5 step planning process.
 - Overall, the approach of not coming up with an answer before you analyze the problem is good.
 - Template was good – nice to have a template, but cumbersome after step 3.
 - Worked well through steps 1, 2, and 3.
 - Generated good discussion, so it was successful there, but would be more practical to narrow in on one sector or vulnerability at a time.
 - It was helpful to move through all of the exercise.
 - Used the mapper, but not all of the charts and graphs; we used the maps a lot.
 - Thought structure worked very well for us; came up with a common problem very quickly; short timeframe though we forgot about it and got lost; but thought it was effective tool.
 - Steps 1 and 2 went well.
 - If looking at community engagement, idea of first finding out what is important to them will give you an endpoint that is more meaningful to them. It may not be the 1-5 Steps, but they will end up with more meaningful.

Areas for Improvement

- **Overall**
 - Needs to be more city leadership and promotion of this topic (public relations campaign) –need a way to follow up on to continue the conversations.
 - We need a county, local joint planning body to address details of critical infrastructure.
 - Discussed water and wastewater – key component was storm water runoff; may not have been part of intent, but it is a major issue.
 - Wi-Fi connection was not fast enough in this facility to access online version.
 - A barrier of tackling a lot of subjects – electric, transportation, etc.
 - Compressed timeframe to apply the method. Some adapted well and some were challenged. Time to familiarize with tools ahead of time would have been helpful for some of us.
 - If we had a series, we could have used 2 days with the way that it is set up. A planning board wouldn't have that time. If you have same players as here, would have a great product.

- With a large group like this, climate driver needs to be narrowed – will give more confidence in the application.
- The starting point will not be at the same place every time for different users, need to be sensitive to this.
- Is there any thought to building this into comprehensive planning rather than creating a separate process? There are a ton of processes that locals have to go through due to the Feds saying “you need this plan, etc.” Seems that this would lend itself to incorporating into other planning processes.
- Biggest barrier is that it is not going to happen here; there is not a sense of urgency.
 - If we do not get to adaptation with our resources, there won’t be any adaptation.
 - Paying for implementation and cost of infrastructure – “who pays for it?”
 - How do you get decision makers to appropriate?
 - Need to spend time to do the benefit/cost analysis (BCA)
 - There is a mentality of short-term politics to deal with long-term solutions – doesn’t work.
- Need to build a critical mass – find someone who can model the process for you – get a success story.
- Money after a disaster, FEMA doesn’t direct funding to adaptation, instead of building to “as was.” That is where money is and missed opportunity. Until FEMA gets to where they are addressing that policy, key element we have tried to change and it’s time has come.
- Lack of community effort. So many success stories, but there is not an overarching plan at the local level to have this one strategy moving forward.
- Will come down to funding.
- **Specific to the 5 Step Planning Process:**
 - Storm surge data – comes from SLOSH model - could be a lot more accurate than what it is showing; usually models are 1 kilometer; Maine needs more detail – different models could be used for storm surge for better accuracy.
 - Cost will have a major influence on planning; when looking at the area, it will take multiple iterations and considerable amount of time.
 - Steps 3 and 4 need clarification.
 - Found the CRT a little bit obscure.
 - Drill got repetitious.
 - Needs to be streamlined – a simple SWOT analysis could be used.
 - Group ran out of gas by step 3.
 - Terminology could be simplified in the forms – too wordy.
 - The CRT is reading for a steeper learning curve; a lot of stuff that we didn’t need to do; knowledge level at our particular table was high.
 - If we had focused more on step 1, we would have got to technical information by step 4.
 - Regarding the map tool: the icon to work with the layers was difficult to find; map gave colors in orange red, didn’t tell you what level of flooding.
 - Got hung up on step 3 – climate driver created different effects – maybe need 3D matrix, not 2D.

APPENDIX C: EXERCISE PLANNING TEAM

Organizations
Federal
Argonne National Lab
Department of Homeland Security / Office of Infrastructure Protection
Environmental Protection Agency (EPA)
Federal Emergency Management Agency (FEMA) Region 1
National Oceanic and Atmospheric Administration (NOAA)
U.S. Global Change Research Program
U.S. Geological Survey
State/Regional
Greater Portland Council of Governments
Maine Emergency Management Agency (MEMA)
University of Maine Climate Change Institute
Private Sector
Iberdrola/Central Maine Power Company
Local
City of Portland
City of South Portland
Cumberland County EMA
Portland Water District
Waterfront Coordinator, City of Portland

APPENDIX D: MAINE CLIMATE ADAPTATION EXERCISE PARTICIPANTS

Organizations
Federal
Department of Homeland Security / Office of Infrastructure Protection
Department of Homeland Security/ Science & Technology
Federal Highway Administration
National Oceanic and Atmospheric Administration
US Geological Survey
US Environmental Protection Agency
State/Regional
Greater Portland Council of Governments
Maine Department of Environmental Protection
Maine Department of Transportation
Maine Turnpike Authority
Maine State Legislature
Maine Drinking Water Program
Maine Department of Agriculture, Conservation, and Forestry
Private Sector
Context Green
Iberdrola/Central Maine Power
Eastern Maine Health Service Center for Emergency Preparedness
Woodard & Curran
Portland Pipe Line Corporation
Local
City of Portland
Cumberland County EMA
Harpwell Heritage Land Trust
City of Saco
Portland Water District
Town of Falmouth Maine
Town of Cape Elizabeth
City of South Portland
South Portland Water Resource Protection
Academia
University of Maine Orono/Climate Change Institute
Lewiston High School

APPENDIX E: ACRONYMS

Acronym	Term
AAR	After Action Report
CO ²	Carbon Dioxide
CRT	Climate Resilience Toolkit
DHS	U.S. Department of Homeland Security
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
HSEEP	Homeland Security Exercise and Evaluation Program
IP	Infrastructure Protection
MEMA	Maine Emergency Management Agency
NCA3	Third National Climate Assessment
NOAA	National Oceanic and Atmospheric Administration
PSA	Protective Security Advisor (Office of Infrastructure Protection)
RD	Regional Director (Office of Infrastructure Protection)
SitMan	Situation Manual
TTX	Tabletop Exercise
USGS	U.S. Geological Survey

APPENDIX F: CRT FINDINGS

Strengths:

The CRT is an interactive website that provides scientific tools, information, and expertise to help people manage climate-related risks and opportunities, as well as improve their resilience to extreme events.	Objective 1
The site is designed to serve interested citizens, communities, businesses, resource managers, planners, and policy leaders at all levels of government.	Objective 1
Familiarizing players with, and providing feedback on the toolkit was one of the key objectives of this exercise. The briefing gave participants an understanding of the resources available in the CRT, as well as how they can be used to inform climate change adaptation planning efforts.	Objective 1
The CRT's five step adaptation planning process presented in the exercise outlined a workflow that was developed through research and refined through practice. Communities and businesses across the nation are already using these steps to confront their climate vulnerabilities and build resilience.	Objective 1
The CRT consists of a suite of tools created to assist in climate change adaptation planning efforts.	Objective 2
The CRT was widely used by participants in the afternoon sessions.	Objective 2
The five step planning template was noted to be useful in organizing the thoughts and plans of the participants.	Objective 2
Language used in the CRT was basic enough for all levels of expertise and knowledge to understand.	Objective 3
Variety of tools on the CRT that could provide useful for long term sustainability.	Objective 3
David Herring briefed participants on the five step planning process and the multitude of tools available on the CRT. He also walked participants through some of the planned additions to the toolkit.	Objective 5

Areas for Improvement:

Participants noted that the CRT uses the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model for its storm surge data. Some participants expressed that the SLOSH model does not provide very accurate results for Maine as the tool generally uses a one (1) kilometer grid, which is insufficient in Maine due to the rocky coastline. It was noted that more accurate models exist and would be more appropriate for planners in Maine to use. The Coastal Change Hazards Portal of the U.S. Geological Survey (USGS) website was suggested.	Objective 2
Participants noted that the CRT language and terminology was obscure, and that the information became very technical and specialized very quickly.	Objective 2

Several participants noted that around step three in the five step planning process template, that information became redundant; they bogged down and lost momentum. More clarification was needed on these steps, and more generally throughout the document. It was noted that example answers would be useful in understanding the template. The template directions were too wordy and too basic for some of the more experienced and knowledgeable participants.	Objective 2
It was noted that it would be helpful for the climate explorer to have a series of algorithms, or data layers pre-built and tagged for common requests. This would help quickly bring users to relevant information.	Objective 3
Participants noted the variety and number of tools available on the CRT, but also that there was a lack of unity of effort and an overarching plan for incorporating localities into a national initiative.	Objective 3