



CRF
CLIMATE RESILIENCE FUND



Resilience Ecosystem Workshop

SUMMARY REPORT

January 17–18, 2018

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1.0 EXECUTIVE SUMMARY

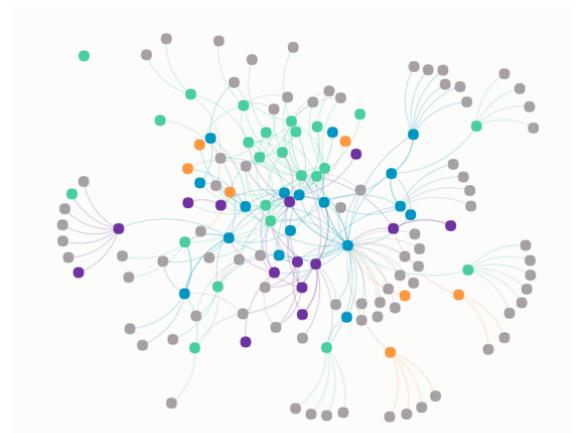
The Resilience Ecosystem Workshop (REW), held on January 17–18, 2018, in Silver Spring, Maryland, was co-sponsored by NOAA’s Climate Program Office, EcoAdapt, and the Climate Resilience Fund. The event was attended by 71 participants from across four domains: academia, business, government, and non-profit organizations. Workshop participants—professional decision-support service providers in the field of climate adaptation/resilience — were introduced to the ideas that: (i) we’re all a part of a young, rapidly-evolving “ecosystem” of interrelated members who share common goals and values; and (ii) when it comes to meeting the nation’s needs for actionable information that is timely, relevant, right-scaled, and in the right format(s), we’re more likely to be more effective and efficient working together rather than working alone. Hence, the workshop’s name is a metaphor for encouraging and facilitating discussions about whether and how our entities and efforts are interconnected, or should be, in more purposeful and strategic ways.

The REW’s agenda and dynamic was designed to help participants (members of the resilience ecosystem) get to know one another better while addressing questions and sharing knowledge about existing tools, methods, best practices, lessons learned, opportunities, and common challenges we all face. The workshop was designed to produce actionable outcomes beyond knowledge-sharing. We encouraged and facilitated discussions to produce ideas for pilot projects that address priority gaps and goals identified by participants and promote partnerships within the Ecosystem. In small groups, participants discussed whether, when, how, and why we may collaborate on purposeful projects/products that leverage, snap together, build upon, evolve, and/or extend already-existing products and services. We also discussed whether/how our collaborations may add value to our existing products and services while benefiting our stakeholders (U.S. communities, resource managers, and businesses) and enriching the resilience ecosystem as a whole. The workshop was not intended to create a new entity, nor is that an envisioned outcome.

1.1 Workshop Website

The workshop agenda, presentations, and other details are available online at:
ecoadapt.org/workshops/resilience-ecosystem-workshop.

The interactive map of the resilience ecosystem, produced initially using information provided by REW registrants, is available at:
<https://kumu.io/edwardprime/resilience-ecosystem#map-2kPOYK5Y>.



1.2 Climate Resilience Fund Grant Opportunity

Workshop participants were guided through a series of discussions where they were tasked with identifying essential components of, and identifying gaps or opportunities within, the Resilience Ecosystem. Participants were then invited to work together to generate ideas for projects that would address those same gaps and opportunities. These project ideas are summarized on pages 15-17 (Section 3) of this report.

The Climate Resilience Fund has announced a Request for Proposals (<http://climateresiliencefund.org/news/>) targeting projects that address these same gaps or opportunities. Grants will be made available to qualifying organizations seeking support for collaborative projects that build upon existing resources that support climate change adaptation and resilience activities and outcomes.

CRF will award up to six (6) separate grants of \$25,000 each to support partnerships/ collaborations that meet the grantmaking criteria outlined in the RFP. Grantees will be required to demonstrate a minimum 100% match for CRF funding. Total funding levels are limited (up to \$50K, with matching funds) so as to necessitate that applicants work within existing resources to build new connections, mechanisms, or arrangements that expand the operational effectiveness, interoperability, accessibility, or applications for existing tools, resources, or expertise.

2.0 WORKSHOP HIGHLIGHTS & KEY POINTS

The objectives for Day 1 of the REW were to help people understand the existing resilience ecosystem and to build and strengthen linkages with others in the ecosystem. There were three short plenary sessions early on Day 1 to introduce people to the notion that we're all members of a larger ecosystem of practitioners who share a common goal of helping communities and businesses build resilience to climate-related impacts and extreme events. We shared an interactive map depicting the portion of the resilience ecosystem that was represented in the workshop, and we invited three accomplished practitioners in the field to share their perspectives and lessons learned in their ongoing efforts to help communities and businesses build resilience. Those plenary sessions served as a springboard into three facilitated breakout sessions, focused on six different topic "clusters." Summary highlights and key decision points from each of these groups are provided in this section below, and the full set of notes from each breakout group is provided in Section 4.

On Day 2, we distributed "Ideation Forms" (Attachment 1) and encouraged and facilitated participants to break into small working groups to discuss possible pilot projects they could undertake to address the gaps and goals identified on Day 1. The outcomes from their ideation sessions are summarized in Section 3.

2.1 Day 1 Plenary Sessions

2.1.1 Welcome, Introductions & Overview

David Herring (NOAA Climate Program Office) welcomed participants and introduced the workshop's co-sponsors and planning committee members. He cited several motivating factors for this gathering. Foremost, our world is warming unusually rapidly—the last four years have been the warmest in Earth's recorded history, and 16 of the warmest years have occurred during the last 17 years¹—and this warming is producing climatic changes and extreme events that are very costly in terms of lives and property lost as well as economic damages.² Both the number of events and the costs associated with them are rising. In the most recent *BAMS* special issue on extreme event attribution, 21 of the 27 extreme events studied identified climate change as a significant driver; and of the 131 papers on extreme events examined over the last six years, 65 percent found that climate change played a significant role.³ On regional to local scales, climate-related extreme events create serious environmental hazards to people, property, and other things we value (economy, natural resources, health and well-being, etc.). Moreover, human-induced global warming is projected to produce more, and more extreme,

¹ NOAA NCEI, 2018: Global Climate Report - Annual 2017. <https://www.ncdc.noaa.gov/sotc/global/201713>

² NOAA NCEI, 2018: Billion Dollar Weather and Climate Disasters - 2017 Overview. <https://www.ncdc.noaa.gov/billions/>

³ Herring, S. C., N. Christidis, A. Hoell, J. P. Kossin, C. J. Schreck III, and P. A. Stott, Eds., 2018: [Explaining Extreme Events of 2016 from a Climate Perspective](#). *Bull. Amer. Meteor. Soc.*, **99** (1), S1–S157.

climate-related changes over the course of this century. Thus, U.S. communities and businesses cannot afford to wait. All across the nation, people must take action to adapt/build resilience to climate-related changes and extreme events. There is both a moral and financial imperative—a [recent study](#) found that society saves \$6 for every \$1 spent on climate resilience projects.⁴ What a great win-win incentive!

Herring asked, how can we, the ecosystem of adaptation service providers, meet the nation's needs for information given today's political climate and flatlined and (likely) future declines in federal funding? He suggested that our community can no longer afford to work individually and inefficiently, such as by competing with or duplicating efforts, when we should be collaborating. The "siloed" competitive, duplicative nature of our community of practice has led to a widespread perception that our ecosystem is fragmented, uncoordinated, confusing, complex, and inefficient. Herring cited an informal poll taken during a town hall session at the National Adaptation Forum, in May 2017, in which a members of our community said they would prefer it if we were more collaborative, better coordinated, more efficient and effective, better integrated, more synergistic and supportive of one another, having a clear and shared sense of purpose, etc.

In response to these motivations, Herring said the three goals of the REW were to:

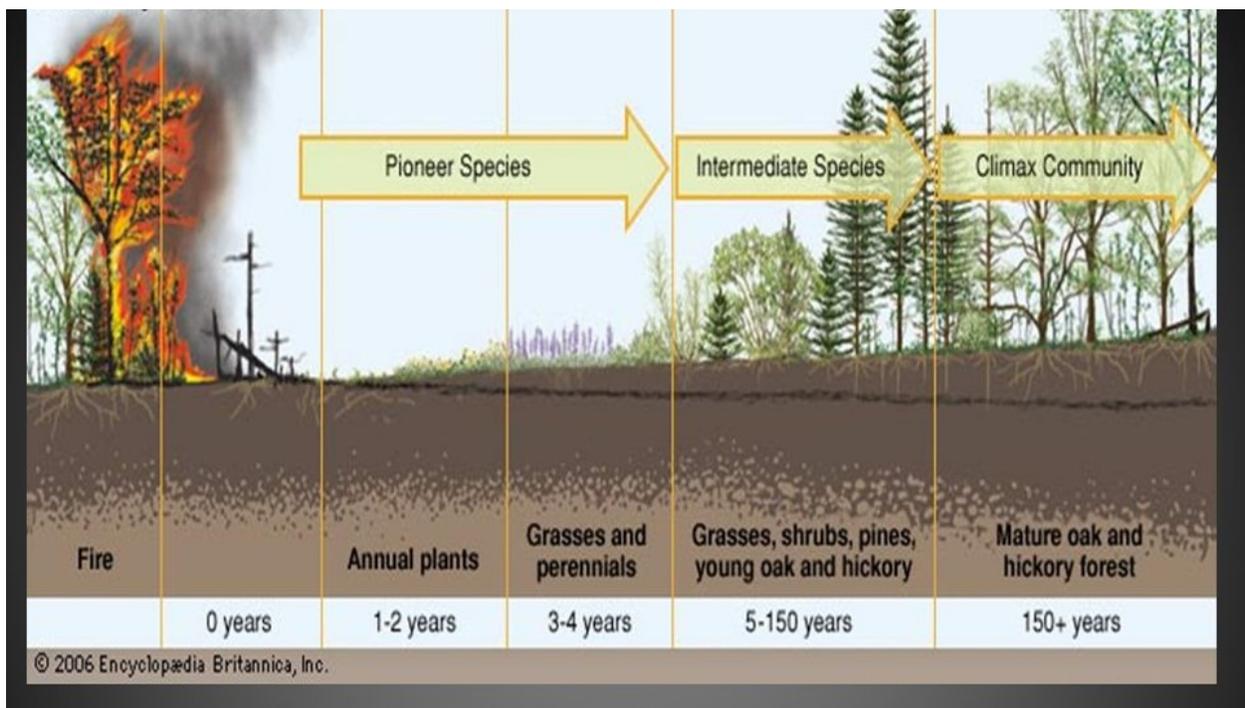
1. Identify ways we can help U.S. communities and businesses adapt and build resilience to climate-related extremes using scientific tools, information, expertise, and traditional knowledge. (~100% of participants raised their hands to indicate agreement with this goal.)
2. Promote opportunities for, and incentivize, collaboration among the members of the resilience ecosystem to achieve efficiencies, effectiveness, and scalability that otherwise might not be achieved. (~100% of participants indicated agreement with this goal.)
3. Establish, grow, and evolve the commercial marketplace of climate decision-support products and services. (~50% of participants indicated agreement with this goal.)

2.1.2 What is the "Resilience Ecosystem"?

Using RSVP survey information, an actor map was developed using an online tool; the compiled data may be browsed at <https://kumu.io/-/53378#map-2kPOYK5Y>. Edward Gardiner presented a preliminary version of this map via a [webinar in mid-November 2017](#). Following that webinar, a number of people mentioned they found the "ecosystem" metaphor to be somewhat confusing, especially when referencing the related concept of "trophic levels," which denotes the functional roles that people in this network of potential collaborators play when interacting and working with clients. In this talk, Gardiner revisited some important ecosystem ideas that deserve attention moving forward as a group. He introduced the idea of "secondary succession,"

⁴ Multihazard Mitigation Council (2017) *Natural Hazard Mitigation Saves 2017 Interim Report: An Independent Study*. Principal Investigator Porter, K.; co-Principal Investigators Scawthorn, C.; Dash, N.; Santos, J.; Investigators: Eguchi, M., Ghosh, S., Huyck, C., Isteita, M., Mickey, K., Rashed, T.;P. Schneider, Director, MMC. National Institute of Building Sciences, Washington.

whereby an ecosystem resets following a disturbance. For instance, following a fire, a forested ecosystem may be cleared. After a period of years, the land will support annual plants. Years later, grasses and perennials are recruited. The plants that grow in these early years are known as “pioneers.” Decades later, a mix of canopy and understory species may appear. After over 100 years, there may be a climax community that includes an emergent, overstory, understory, shrub, and even ground layer of vegetation. This process, called “succession,” is observable in forests, coral reefs, grasslands, and more. As succession proceeds, resources become more scarce, but organisms and species serve roles marked by mutualism, through which resources from one species or organism can be passed along to another. This leads to a general principle: as resources become scarce, mutualisms emerge in ecosystems.⁵



The analogy, then, is that we are a group of people analogous to “pioneers,” who are laying the groundwork for future collaboration. Certainly, the work we undertake today will create opportunities to forge new relationships in the future. Gardiner revisited the spheres of influence that we collectively brought into the room. While our numbers are significant and our collective network substantial, he, emphasized that there were important individuals and organizations not present. Further, our collective influence is much greater than the connections simply amongst those who were in the room. The collective, extended network of workshop participants reach into every geography in the nation and penetrate vastly divergent fields of professional practice, from coastal community management to technology to natural resources to health, etc.

⁵ Odum, H.T. 1992. Great Ideas in Ecology for the 1990s. Bioscience 42(7). DOI: 10.2307/1311885

Gardiner spent a few minutes revisiting the [CRT's Steps to Resilience](#), a framework that helps contextualize the problem of taking individuals and communities from data to decisions in addressing climate stressors. Noting that many individuals and organizations use their own methods and frameworks, the goal here was to request the use of the Steps to Resilience terminology during discussions being held at the workshop so that we could agree on a simple set of terms throughout those discussions.

In closing, it was acknowledged that there is some competition among participants, but this competition can give way to relationships with mutual benefit, especially in an era when more groups are coming online and resources are becoming more scarce. The actor map reveals broad overlap in service provision, an indicator of functional redundancy. The latter is another ecosystem concept representing a characteristic that allows for stability under stress. Strengthening mutual interactions through funded projects would, extending this ecosystem logic, improve mutualism and decrease competition amongst us.

2.1.3 Panel of Resilience Practitioners

This plenary panel was invited to share the perspective of the end user component of the resilience ecosystem (the consumers). This panel, facilitated by Lara Hansen (EcoAdapt), included:

- Katherine Johnson, District of Columbia
- Kristin Baja, USDN
- Yoon Kim, 427

The discussion focused on three questions:

1. What was / is “actionable information” from your perspective?
2. What existing tools, information resources, expertise are particularly helpful to you?
3. Conversely, where do you perceive critical gaps, stumbling blocks, or needs?

Key points from the discussion included:

Actionable Information

- This should be **practically and politically actionable information**

Particularly helpful tools, resources, expertise

- Peers and peer experts are at the top of everyone’s list
- NOAA tools helpful for guidance but application still requires additional help
- CAKE
- Infographics by the National Climate Assessment and Climate Central
- Case studies with phone numbers

Critical gaps

- Business case for adaptation
- Financing for implementation
- Translate ecosystem approaches to urban systems

2.2 Day 1 Breakout Session Summaries

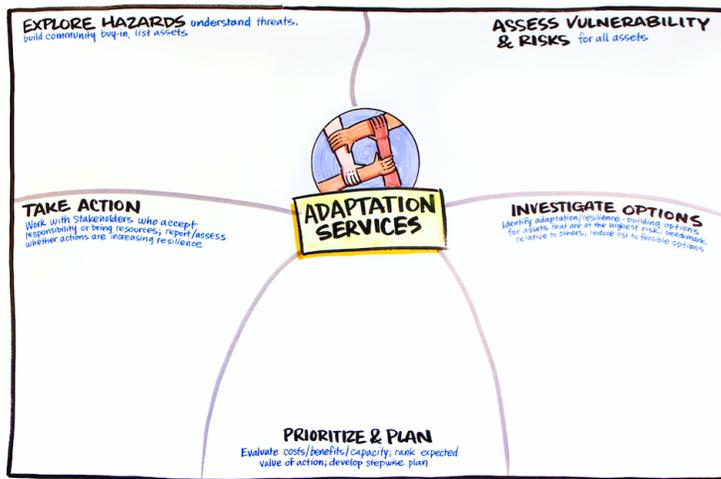
Late in the morning on Day 1, participants divided into six facilitated breakout groups to address specific questions in particular topic areas. Through the course of the day, there were three World Café-style breakout sessions in which participants rotated so that everyone could participate in at least three of the six concurrent sessions. The framing foci, key points, and outcomes from each are summarized below. (Refer to Section 4.0 for complete sets of notes from each breakout session.)

2.2.1 Adaptation Services

The Adaptation Services breakout group was tasked with exploring three main questions:

1. What services or support do practitioners need to make adaptation happen?
2. What exists now?
3. What is missing?

This conversation happened within the framework of five types of services (exploring hazards, assessing vulnerability and risk, investigating options, prioritizing & planning, taking action)



Across the three groups of participants, similar themes emerged culminating in the development of several collaborative project ideas. The underlying challenges for Adaptation Services were:

- A need to have service providers better identify their strengths in order to make it easier for potential collaborations to develop and for them to be found
- There was a good deal of activity in four of the five sections of the framework, however “Taking Action” was universally seen as needing more attention, support, and analysis.
- Future efforts in the Adaptation Services sector should do better at employing “co-production” techniques in all that they do.
- Need for more direct support of local communities and others who do not have internal adaptation capacity or resources to get it.

To respond to these challenges, three major proposals emerged:

1. Help desk to provide direct support to those who seek it
2. Registry to track the adaptation service provider community so that potential users can find the services they need and potential collaborators within the field can find each other to better provide the combination of services needed (e.g., to better respond to RFPs)
3. Harnessing Volunteer Capacity to help fill some of adaptation service needs

There was also a suggestion of a Jobs Board. Evidence suggested that such a tool already exists in several places (Climate Adaptation Knowledge Exchange, American Society for Adaptation Professionals) and did not need to be redeveloped, but did apparently need more interconnectivity (approaches discussed by other breakout groups).

2.2.2 Tools

Across the three groups of participants, all agreed on this key concept: the tools are not the important point—what’s important is how the tools are used to help decision makers build resilience. The discussions centered on how our resilience ecosystem provides products and services rather than tools.

All agreed that a critical element of tool development is to focus on the end user. Currently, a gap exists where tools are not developed in partnership with end users, which results in the tools being unusable and unused. Many tool developers have done no real user testing and have a limited understanding of UX (user experience).

- *Goal:* Move from tools that just “push” data to tools that allow users to “pull” information applicable to their problems and hazards.
- *Goal:* Determine who the “end user” really is for most of our tools. Only a limited number of municipalities have sufficient internal resources and capacity to use the tools themselves; instead, they hire boundary organizations to consult. The groups’ consensus was that *we should be creating tools for boundary organizations and members of our professional network.*

Another large gap is the need for standardized terms/vocabulary so that users can determine which tools apply to particular problems. It’s not helpful to the ecosystem when we interchange words/definitions and do not supply work at a professional level.

The groups agreed that our ecosystem needs tools to support the decision process, not just tools for impacts/data ingestion. These tools should be quantitative, probabilistic (supporting risk analysis) decision tools to support decision making at the right scale. The tools should readily integrate into existing decision frameworks and move addressing the “Did you know?” question to answering the questions “Why should I care?” (local vulnerability and risk) and “What can we

do about it?” (options and implementation). We also need full interoperability between these analytical tools and decision frameworks.

Discussion pointed out the need for a central database of adaptation strategy examples (options) with many access points (CRT, CAKE, etc.).

There was a long discussion about the business case: “What are people willing to pay for and what is driving this value?” This needs to be market- and demand-driven. There is a shortage of tools and information addressing the benefits of adaptation vs. the cost of the option (cost/benefit filter).

The resilience ecosystem currently lacks sufficient resources (both time and money). Given this, how can we survive? How do we create jobs and careers in resilience and adaptation, more specifically jobs related to tool creation and services linked to these tools? There is a lack of trained service providers who know which tools are best and when to use the tools—a “continuum of gaps” centered on knowing how to use tools—and an educational breakdown between tool creators and tool adopters/users. It was noted that some of the tools might be very good if people knew how to properly use them. One suggested project would be for a group to provide detailed training to our resilience service providers on how to use the right tools at the right time.

2.2.3 Professional Development

Across three groups of participants, this round-table developed a consistent thread. The first group adopted two goals which were supported by the two subsequent groups.

1. Reach climate champions where they are. Cultivate new ones. Support lifelong learning among professionals at all career stages so that climate information is contextualized.
2. Map what professional development exists through a user needs assessment. Provide wayfinding for champions to link to opportunities.

Each group of participants contributed to a listing of training and education opportunities that currently support professionals whose careers could be advanced by developing their climate expertise, or whose expertise in distinct job roles could be leveraged to improve climate adaptation efforts in communities around the nation. The complete list of training and education opportunities is included in the notes accompanying this summary.

The first two groups identified a latent opportunity: finding excellent teachers and employing them to train adaptation professionals. Exemplars in communication and training include extension agents, National Estuarine Research Reserves (NERR) outreach professionals, and Sea Grant colleagues. The American Society of Adaptation Professionals (ASAP) offered to hire an excellent trainer/teacher/mentor to broaden understanding of climate among adaptation professionals. There was strong interest in merging ASAP’s core principles with the Association of Climate Change Officers (ACCO’s) training pipeline. This relationship was not brokered at the table, however.

Participants highlighted that training and education are essential for advancing climate knowledge and its application. However, professional development necessitates building a broader set of opportunities. One discussion centered on the strategic value of climate credentialing programs through professional societies, but it was argued strongly that credentials alone are not sufficient motivation to incorporate climate-smart thinking into business practices. Rather, it's important to find ways to advance peoples' careers through climate-smart thinking. This shift in emphasis and perspective is subtle but important. Professionals engaged in climate adaptation need to learn business skills that enable them to move across departments and find the best opportunities to advance their goals. To that end, informal interactions, for example through organizations such as the Asheville Collider, can stimulate innovative thinking and business principles. We did not articulate a clear map for establishing this sort of professional development, but its logic is consistent with the theory of social diffusion. Our goal is to mainstream climate information and its application, and a powerful mechanism for doing so is to support career advancement by those who have earned credentials and built internal capacity. If they make smart decisions and succeed in their career by using climate adaptation methods, data, and strategies, their success will breed more interest and more success by colleagues eager to replicate success.

2.2.4 Measures of Success

This roundtable conversation was initiated, continued, and concluded by three different groups of participants over the course of the day. During the initial session, a determining question was "What are we measuring?": (1) communities moving toward resilience; (2) tool success; or (3) training/educational impact. After discussion, the conversation focused on *measuring community success toward resilience-building*.

Identified goals included:

- Across-the-board standard for resilience: allowing an apples-to-apples comparison
- Literature review to determine if/what standards are being used
- National-level survey of what's happening on the ground
- Inclusion of baseline assessments

The following metrics for tracking progress were suggested:

- | | |
|---|--|
| <ul style="list-style-type: none"> ● Institutional change ● Professional change ● Training/education ● Equity/inclusion | <ul style="list-style-type: none"> ● Document failures and successes ● Capturing data that resonate with different audiences (i.e., economic, ecosystems, human) |
|---|--|

Participants felt that the following would be essential in determining measures of success for community resilience-building:

- | | |
|---|---|
| <ul style="list-style-type: none"> ● Input from these sessions captured and distributed to ecosystem participants ● Standardization of metrics ● Centralized repository for data storage/input/analysis to which the | <ul style="list-style-type: none"> entire community has access (example: informalscience.org) ● Include different lenses: equity/economic/ecosystems ● Metrics should be people-centered |
|---|---|

- Objectivity—-independent third party? If so, must be politically neutral
- Commitment from ecosystem members to iteratively respond to development of success measures

It was highly recommended that the ecosystem adapt success measures from existing social science models, such as decision science (don't build a new model!!) and that we determine *why* we are measuring success (who will benefit from having the measures?). Participant Missy Stults later led an ideation group that is formulating a proposal based on this topic.

2.2.5 Enhancing Discoverability

There has been tremendous growth in the number of climate resilience-related tools and websites in recent years—so much so that the sheer number has become confusing and/or overwhelming for users and practitioners alike. This fact has prompted many entities to strive to develop THE one-stop shopping climate resilience portal/platform—but one of the quickest ways to disincentivize collaboration and promote competition is to present oneself as THE one-stop portal. When many entities strive to be THE one-stop portal, this creates confusion and/or competition, which is defined here as “portal syndrome.” Thus, the purpose of this breakout group was to discuss and identify possible ways of enhancing the discoverability of *all* of the information products and services that *all* members of the resilience ecosystem have to offer in ways that help us all to overcome “portal syndrome” while incentivizing collaboration.

Key questions addressed by the group:

- How can we enhance discoverability of our products and services beyond our own silos and networks?
- If our websites were haystacks, what if we could turn the notion a one-stop shopping portal inside out so that users can find the “needle” they’re seeking no matter which haystack they look in?
 - I.e., Is it possible somehow to connect our websites into a larger, interconnected ecosystem of websites and services so that there is “no wrong door,” and so that users are able to move seamlessly from one website to another across the entire resilience ecosystem?
- Where are there critical gaps and which are the most important to overcome?
- How are we connected today, and how can we get better connected?

Through three rounds of discussion, participants recognized that there are **three broad pathways for enhancing discoverability of tools and resources**:

1. Expert-curated online content (such as is found in [CAKE](#), the [Georgetown Climate Center](#), and the [U.S. Climate Resilience Toolkit](#));
2. An ability to talk to/receive guidance from subject matter experts; and
3. Semantic web tools that can crawl and index selected domains of online information (and metadata) to provide enhanced capabilities for discovering online resources that are particularly relevant to users’ specific search parameters.

We recognized that each approach has strengths and weaknesses, and all three approaches are needed.

Participants identified the following **critical gaps** in discoverability, listed in priority order:

1. Today, we lack both a systematic approach to gathering stakeholder needs and perspectives and motivations and a systematic approach to sharing the data and lessons learned from stakeholder queries.
2. We lack a right-scaled semantic web tool that can make the online content all across the resilience ecosystem discoverable in users' specific frames of interest.
3. There's too much focus on tool development but not enough focus and help in getting decision makers closer to taking action.

The following **solutions** were identified, in priority order:

1. Tapping into and leveraging existing professional societies and their networks to establish effective information push/pull capabilities—both marketing and information gathering, etc. If each society/network represents a “spoke,” then select one entity to serve as the “hub” that pushes and pulls relevant and timely information to and from each spoke.
2. Evolve and expand a semantic web tool to crawl and index the entire resilience ecosystem domain to enable rapid searches with an easy way for users to simplify/filter the result set according their interests and motivations. This same search capability should be able to be hosted on any/every website in the ecosystem, with a default for local searches and the option to expand to search across the whole domain. Thus, the tool must be modular and compatible with the host content management systems for different host websites.
3. Develop an optimized taxonomy that could be adopted by all members of the ecosystem for tagging their online resources so that search results (e.g., Google, Bing) are optimized.
4. Collaboratively develop an expert-led series of training webinars to promote awareness and use of decision-support tools, data, and methodologies—all binned into categories such as topics, regions, functions, etc.

2.2.6 Sustainability, Extensibility, & Interoperability

The Sustainability, Extensibility, and Interoperability breakout group was tasked with four main tasks:

1. Taking stock of the field of existing resources, service providers, and tools.
2. Brainstorming synergies and opportunities to increase sustainability of existing resources.
3. Identifying gaps, barriers to sustainability, extensibility and interoperability of fields existing resources
4. Determining who and/or what are essential to the viability of this cluster.

Themes: Throughout the day the conversation with breakout group participants, focused on numerous elements of the field and the services provided; however, a few central themes emerged.

Don't reinvent the wheel: There is a core need in the field to leverage existing resources. Effort needs to be put into increasing coordination and interoperability of the field's key, existing resources to ensure their long-term sustainability and viability.

- Creating partnerships between existing resources to fill gaps or emerging needs thus sustaining existing infrastructure and increasing efficiency.
- Funding mechanisms that support long-term sustainability of existing resources and/or interoperability are lacking.

Meet people where they are: To ensure the field is sustainable in its mission, we need to improve our communications with the public and with other sectors.

- Connecting climate to community (versus the other way)
- Values-based versus technical
- Solutions versus problems

Science translation: To be successful as a field and to maintain viability, we need to continue to build and grow the individuals' and the field's capacity for science translation. As a field, we need to meet decision-makers or concerned citizens in their own spaces and speak their language to them. While resources and tools are vital, the value of this translation and guidance cannot be overstated. Tailored science translation is a time-consuming endeavor that takes skill and expertise.

- Speak to individuals in their own language and space
- Tools and guidance need to come together

Solutions: Breakout group three reviewed the goals, ideas, gaps, barriers, and key elements of viability outlined by the previous group and voted for their top three areas of concern to brainstorm solutions to. Three innovative solutions emerged to address some of the topics raised by the group.

Funding: The funding landscape has shifted quite dramatically over the past year and will likely continue to shift as the federal government moves away from funding climate and science programs.

1. *Funder Memo:* There is a gap in the field being created by the shift in the federal government's priorities. Many service providers rely on grants received from federal agencies in addition the field relies on science and services historically provided by agencies. Continued sustainability of existing core resources in the field is vital to meet this gap. Improving and scaling up of interoperability between these core field resources is crucial to filling this gap. Participants discussed the need for an open memo to the field's core funders to express this shift in the field, its ramifications on service provides, and recommendations on how support could be provided.
2. *Innovative finance mechanisms:* As funding streams moves away from historical sources and mechanisms, we need to get creative. Participants discussed the need to harness the next generation of potential donors, who are increasing interested in values-based investing.

3.0 SUMMARIES OF PILOT PROJECT IDEAS

The sections below summarize the results of the workshop's Day 2 "Ideation" breakout groups in which participants discussed ideas and opportunities for addressing one or more of the recommended goals identified on Day 1 (see preceding section), by leveraging already-existing entities, platforms, resources, expertise, etc. (Note: these project ideas are not listed in priority order.)

3.1 IDEA: Registry of Service Providers & RFP Aggregators

The idea to establish a free online registry of adaptation service providers, as well as an aggregator of requests for proposals (RFPs) for both federal and non-federal funding sources. The goal is to help adaptation service providers find each other. Desired outcomes are that the sophistication of adaptation services will improve over time, it will help create accountability in the field, and it may help calm the chaos among smaller communities. Users of the registry will benefit from an improved ability to vet contractors. Service providers will use it to put teams together, and end users will get higher quality services. Potential collaborators in this pilot project may include: the American Society of Adaptation Professionals (ASAP), EcoAdapt, and service providers from academic, commercial and non-profit domains. The estimated developmental timeline is nine months.

3.2 IDEA: Develop a National Climate Support Services Help Desk

The idea to develop the beta version of a multi-party national climate support services help desk. This pilot project would include a discrete topic survey of target user communities, the framework and general design of the Help Desk, and agreements from entities in academia, businesses, and non-profits who will contribute to/participate in it. The goals are to help end users who, today, can't find the help they need, and to help raise the visibility and use of resource providers' tools, information, and expertise for which they currently have a hard time attracting attention. The aim is to complement existing service providers, such as members of the resilience ecosystem, professional associations, USDN networks, and CAKE. A desired outcome is that the Help Desk will give the public a place to find high-quality help, and for service providers to promote awareness and use of their resources and expertise among potential users. Potential collaborators in this project may include: professional associations, practitioners with the resilience ecosystem in academia and non-profits, state associations, and federal agencies. The estimated turnaround time for this project is ~six months.

3.3 IDEA: Merge some of the Open-Source Graphing Modules in the CRT's Climate Explorer into PREP Platform

The idea is integrate two complementary, open-source mapping and graphing platforms provided under the auspices of the USGCRP: the Climate Explorer and the PREP platform. The objective is to integrate the open-source downscaled climate projection graphs from CE into PREP. Desired outcomes are to sustain and advance science foundation tools, and to improve the interoperability and extensibility of federally funded tools. Potential collaborators in this project may include: NEMAC, FernLeaf Interactive, PREP, Amazon Web Services, and Esri.

3.4 IDEA: Resilience Financing Bootcamp

The idea is to plan and host an innovative “Resilience Financing and Networking Event,” targeted at ~25 regional- or city-level resilience officers. Applicants would be selected by criteria like local leadership support and their history of innovations. Outcomes will include enhanced networking opportunities with financing professionals, replicable place-based curricula, and quantified learning outcomes. Desired outcomes are to improve understanding among adaptation professionals of innovative funding mechanisms and how to attract funding to resilience-building projects. Potential collaborators in this project may include: U.S. Forest Service’s Secure Vibrant Cities Lab, the U.S. Climate Resilience Toolkit, the EPA, and qualified venture capitalists with expertise in environmental and social impact bonds.

3.5 IDEA: Better Integration of Content Aggregators’ Websites

The idea is to create better linkages and/or interoperability among existing clearinghouse websites, including (but not limited to) CAKEx, Georgetown Climate Center, the U.S. Climate Resilience Toolkit, U.S. State Clearinghouses, etc. The goal is to reduce redundancy and the feeling that the climate adaptation field is “overcrowded.” A desired outcome is to address the question: what’s the difference between the various existing climate tool and information clearinghouses, and to better define each team’s contributions to, hopefully, increase overall efficiency. Potential collaborators may include: the Georgetown Climate Center, Climate Adaptation Knowledge Exchange, NEMAC, and the U. of Massachusetts-Amherst.

3.6 IDEA: Adaptation Training Curriculum for County Jurisdictions

The Model Forest Policy Program and National Association of Counties (NACo) will work with public and private collaborators to co-produce and beta test an adaptation curriculum for county jurisdictions and provide introductory training at NACo’s 2018 Annual Conference. County jurisdictions are under-resourced and in need of adaptation services to help them build capacity and respond to climate-related impacts. The curriculum will be streamlined to integrate into existing processes to minimize time and cost for county staff. Existing tools and resources that could be leveraged in support of this project include the Climate Solutions University adaptation training curriculum; the National Association of Counties (NACo) and its member counties; NOAA Explorer, Digital Coast, CRT, and other tools/platforms; and CAKE’s Comprehensive Plan Update Tool. Desired outcomes from this project are that this training will increase awareness and use of available adaptation services and the resulting benefits of resilience planning and actions taken. Also, county-focused, customized curriculum will give counties the ability to make a local business case for adaptation and to integrate available tools and expertise into their processes. For example, CAKE’s Dashboard will provide efficient access to county-specific resources. Potential collaborators may include: the Model Forest Policy Program, Climate Solutions University Curriculum, NACo, EcoAdapt, ICMA, and the Geos Institute. This is envisioned as a one-year pilot project.

3.7 IDEA: Landscape Assessment & Portrayal of Training Providers

The idea is to evaluate training that occurs with a strategic focus on distinct goals, including mitigation, adaptation, etc. The following questions would be addressed by this pilot project:

- What networks of service providers and potential clients exist?
- What certifications exist in different fields?
- What are the practitioners' needs?

Professional development was identified as a critical need/gap by workshop participants. Professional service providers need to know how their offerings dovetail with others'. Clients need to understand how the Adaptation Services Bureau's directory of professionals will identify alignment of members' skill sets within a matrix of skills. It's envisioned that this project will offer an opportunity for robust incorporation among service providers. Potential collaborators who may collaborate and provide existing resources for this project may include: Antioch University's seminar services, NERR's outreach network, ACCO, ICMA, Climate Access, and the U.S. Climate Resilience Toolkit.

3.8 IDEA: Certificate & Credentialing Program

The idea is to incorporate climate adaptation/resilience building into existing certificate and credentialing programs of key boundary professions. Missing today is a map of the professional development space, which is needed to identify opportunities. A desired outcome is to put climate capacity building into professional development programs. Also, to make "bridge professionals" aware that there are additional resources available, and where/how to find/use them. Potential collaborators may include: ICMA, ACCO, NACo, APA, ASAP, USDN, ASFPM, and the Urban Foresters Certification Program. This is envisioned as a one-year pilot project.

3.9 IDEA: Understanding & Evaluating Progress Towards Resilience

As we move to advance the climate resilience field, it is imperative that we have a collective concept (perhaps multiple concepts) of what progress and success look like—then we can evaluate our progress towards our goals. If we use common, standardized terms and metrics for defining and measuring success, then we can share and inter-compare our results, and we can show that we are learning, evolving, and accelerating our practices. Desired outcomes are accountability, maturation of the adaptation/resilience field, and better alignment among practitioners operating in the field. We envision a project that includes the following steps:

1. A rapid assessment of the peer-reviewed and grey literature to identify concepts of success and proposed metrics.
2. Meet with practitioners to understand their concepts of success within the resilience field.
3. Identify commonalities and differences between 1 and 2 (above), and attempt to reconcile them in a white paper.
4. Share the draft of this white paper with practitioners and iteratively evolve it, as needed.
5. Revise the white paper and share it through the RE's various networks.

4.0 COMPLETE NOTES FROM EACH SESSION

4.1 Practitioner Panel

Question by question highlights of the practitioner panel plenary discussion. Answers attributed to panelist or facilitator: Kristen Baja, Katherine Johnson, Yoon Kim, Lara Hansen.

What is Actionable Information?

- Translating climate science into decision relevant intelligence for both direct decision making and communicating with the community (Johnson)
- Using economic impacts to better understand vulnerability and opportunity in critical systems (Kim)
- Timely, actionable and “circular.” Getting beyond recommendations to cost-benefit analysis, feedback to researchers for service and making the business case for adaptation (Baja)

What existing tools, resources and expertise are particularly helpful in your view?

- Curated, authoritative data (Kim)
- Relationships are very important. Sources knowing users and vice versa (Baja)
- Tools need to be both technically and politically relevant. (Johnson)

What critical gaps or stumbling blocks do you perceive?

- Need better links of data and actions to election cycles in order to maintain will. (Baja)
- Financing for implementation (Baja)
- Better coordination between adaptation and mitigation (Johnson)
- Translating ecosystem work to human communities (Johnson)
- Ability to link efforts across jurisdictional level (municipal to county to state) (Kim)
- Improving capacity for all communities (not just larger or more affluent) (Kim)
- Metrics of what does and does not work (Kim)

Additional questions from the audience:

When implementing at local level, must assess what you have and often implement a one-off. How many of you have done comprehensive planning to determine gaps and where to integrate?

- Baltimore use hazard plans and cross walked the 231 actions to identify opportunities for climate action (Baja)
- DC action plan connects to all other plans (Johnson)
- CA law requires inclusion in plans (Hazard Mitigation) (Kim)

How to get things into your hands once we launch them? What networks do you use to find best-available tools and data?

- Through USDN User Group, and other networks (CNCA, C40, etc.) where practitioners are already (Johnson, Baja and Kim)

Re “circularity” how do we think about co-production of information that is useful to spur action for preparedness? How do we get local communities and tribes to help with that?

- Before applying for funding, bring in the municipal partner and get their input/engagement on what they need and how they will have capacity to use it. (Baja)
- Consider partnering with local CBOs and tapping into the local network of organization working on the issue. Start by asking what is needed. (Johnson)
- Engage target users before developing a project idea (Kim)
- There is available guidance by tribes about how to collaborate and partner with tribes (Hansen)

In Richmond, VA, we think about social justice and environmental equity. How do you incorporate that into your priorities?

- Sustained relationships with the neighborhoods/communities is vital. In Baltimore equity was used as a lens in the development of projects and their implementation. (Baja)
- Up front engagement that focuses on these issues (Kim)
- Improving equity in the process as well as the product. Provide services at the neighborhood scale. Need level playing field with community involvement. (Johnson)

How do we better document co-production processes so we can evaluate and learn from them w/o getting in the way?

- No answer to this yet. Need success metrics and during/post assessment. (Baja)
- Budget often does not include documentation and assessment. Need to make sure that is part of the process. Also need clarity of what outcome you are trying to achieve by documenting. (Johnson)

You mentioned case studies as a foundation. On other side, how do you become a case study yourself? Any examples? What avenues did you use?

- Not enough time to develop your own case study. Need external partners/working groups to do that. Ensure case studies include enough information to be useful—allow people to follow up and connect with a more in-depth conversation. (Johnson)
- Existing networks (Kim)

4.2 Adaptation Services

Group #1: Adaptation Services

4.2.1 Breakout Session One: Identify priorities, gaps, commonalities and isolations

Goals and Objectives

- Identify strengths and find partners to:
 - Complement and build on those strengths
 - Allow your organization or program to be found by users
- Create a standardized resilience processà that is also flexible for different applications
- More “Taking Action” activities needed. How do we get action taken? Increase this step
- Co-production for all processes, including capacity and resources

Essential to Viability

- Be appropriate for end users
- Consistency of the resource
 - Sustained and reliable: there now and in the future, where it is needed to be
- Trust and collaboration- know your capacity, the capacity of others, and when to hand off
- Sustained funding or design for hand-off
- Convening to Learn from different communities
 - Leverage existing network linkages, don't create new ones

Gaps and Barriers

- Young field still building capacity and proper training à higher education, professional development
- Funding to support sustained engagement
- Regulatory processes currently insufficient to achieve goals
- Political will beyond political cycles à new government can't halt action
- Cost-benefit analysis and prioritization (esp. cost of inaction) missing
- Need hand holding to provide capacity to over-taxed staff
- State and local government don't have political will or funds
 - Rating agency mechanism may be a lever (but short window of opportunity to influence)
- Existing plans not being implemented
- Need to influence bond rating criteria
- Complexity of the 3-dimensional model with interactions between scale, sector and step (sector, region and hazard)
- Identify barriers to taking action and using services
- Plus in with entities with knowledge and needs (e.g., Association of floodplain managers)

How are we connected in this cluster

- Build the road map to resources
 - Emergency airlift vs. interstate highway system
 - Connecting people to the tools that already exist
 - Leveraging clearinghouse content
 - Use "pathways" model with overlaps and collaborations
 - Some exist – connect those

4.2.2 Breakout Session Two: Develop a shared agenda

- Equity tools- Race Forward
- Association of community planners- report created with Movement Strategies
- Need Finance strategies: Cost assessment, avoided cost assessments, municipal reserve funds, Capital reserve funds,
 - Temporal Analysis
 - Related Bond Rating Work- bring together service providers with end users to develop strategies
 - How to finance resilience

- Maryland Environmental Finance Center
- Products/services with varying levels of need, specificity, detail
- There are lots of tools
 - we don't know:
 - Which are reliable
 - Where they all are
 - Which will work for who's needs
 - Service providers are overwhelmed
 - Not time to let tool providers know what works
 - No ability to let users know what to use
- Concierge is needed/help desk for communities
- Model for collaboration service providers:
 - Interdisciplinary approach
 - Ability to find each other
 - How do you bring separate skill sets to a collaboration?
 - Co-respond to RFPs for contractual services

4.2.3 Breakout Session Three: What is essential to maintain the viability of the tools sector?

Needs to be greater than the sum of the parts

- Help Desk
 - → Service Bureau poster; not new entity, builds on existing
- Registry
- Complete feedback loops, refine structure/process
- How do you maintain quality of providers?
- Need to institutional climate change adaptation to build the market
- Identification of adaptation practitioners in other fields (transport, development, etc)
- Use of volunteer (retiree) capacity
 - Resilience Dialogues, Small Business Administration
 - Job Board
 - Hand Holding → Help Desk

· **Link these notes to the capacity building breakout group!**

Synopsis of notes on ecosystem contributions by group

Explore Hazards (understand threats, community buy-in, list assets)

- Gulf of Maine Research Institute (GMRI)
 - High School Climate Ambassador Program
 - Engage 70% of Maine's 5th and 6th graders in an informal science experience around ecosystem complexity and climate
 - Community engagement for citizens of coastal communities to engage with localized visualizations of SLR and storm surge
- Climate Access
 - Look Ahead (virtual reality app): visualize risk and responses

- Free guidance to climate access network
 - Fee based guidance to develop engagement strategies
- World Resource Institute (WRI)
 - PREPData: open data platform with map-based visualization of climate/hazard data
- US Global Change Research Program (USGCRP)
 - National Climate Assessment
- Climate Central
 - Riskfinder.org (free public tool for risk/vuln/hazard screening)
- Environmental Protection Agency (EPA)
 - Technical assistance to utilities
 - Assess vulnerability, develop case studies and tools
 - Scientific research
 - Reporting
 - Funding
 - Cross agency collaboration
 - National Water program
- GLISA
 - Provide useful and usable climate information to better inform decision making in the Great Lakes Region
- Azavea
 - Explore hazard
 - Climate api and lab
 - Temperate- adaptation planning tool
- Model Forest Policy Program (MFPP)
 - Help rural communities understand that nat. res. (esp watersheds, forests) effect economies and ecosystem health
- National Association of Counties
 - Programming and toolkits to help local officials understand these topics and make informed decisions.
 - Disaster management
 - Coastal management
- Maryland Department of Natural Resources
 - Provide funding
 - Staff training from Association of Climate Change Officers (ACCO)
 - Data and Tools
 - Training Workshops
- US Geological Survey (USGS)
 - Datasets (landcover, elevation, waterways)
- Urban Sustainability Directors Network (USDN)
 - Tracking hazards, identify hazards in their communities and using downscaled data to explore future impacts from a changing climate
 - Connects and facilitates peer-to-peer engagement, innovation and collaboration in three main areas (mitigation, resilience and equity). Network provides

- Funding, peer engagement, innovation projects information sharing while also connecting cities to partners and research info
- National Oceanic and Atmospheric Administration (NOAA) RISA
 - National Network of climate adaptation research and engagement teams at regional (cross-state) level
 - Research climate impacts and hazards
 - Researches social context where hazards occur
- Antioch Center for Climate Preparedness and Community Resilience
 - Stakeholder process to ID what is/has changed and then prioritize focus of applied research
- Columbia University
 - Methods for assessing baseline
 - Climate Outlook (for participatory processes)
- ICF
 - ID past and future climate variability and change, assess exposure
- Department of Interior (DOI) Climate Science Centers
 - Fund projects that investigate impacts (physical, hydro, ecological, social)
- NOAA Environmental Literacy Program
 - Models of engagement of public (youth and adult) (e.g., ASU Forum, Gulf of Maine Research Institute Citizen Engagement)

Assess Vulnerabilities and Risks

- Climate Central
 - Provide info/tools/local fact sheets
 - Coastal flood/SLR index for muni-bond managers.
 - Custom analysis work for public and private sector
- Pepperwood Foundation
 - Provide outputs of regional climate models to stakeholders
 - Work collaboratively to build tools/reports tailored for a specific geography or jurisdiction
- UMass Amherst Extension
 - Massachusetts Climate Action Tool (online resource)
- Azavea-
 - Temperate: Wizard for completing a vulnerability assessment
- MFPP
 - Assess natural resource vulnerabilities especially water, watersheds, forest
- Northern Institute of Applied Climate Science
 - Work with partners (academia, Forest Service, other gov't) to create ecosystem vulnerability assessments
- Antioch Center for Climate Preparedness and Community Resilience
 - Conduct vulnerability assessments that look at what and who is vulnerable
- ICF
 - Assess exposure, sensitivity and adaptive capacity for gov't, private and NGO clients to ID vulnerability and risk

- Develop tools and frameworks for vulnerability and risk assessment
- NOAA RISA
 - Creates vulnerability assessment frameworks
 - Conducts vulnerability assessment for sectors and communities in region
 - Assess risk
- USDN
 - City members develop new vulnerability and risk assessment tools/structures with partners, and use those results in plan development and prioritization
- DOI Climate Science Center
 - Fund projects that assess vulnerabilities and risk of natural resources to climate change
- USGCRP
 - National level climate assessments to explain vulnerabilities by sector and region
- Gulf of Maine Research Institute
 - Steward of Northeastern Regional Association of Coastal Ocean Observing Systems databases and visualize those data for stakeholders
 - Produce foundational science documenting the impact of climate on the Gulf of Maine ecosystem
- Columbia University
 - Participatory vulnerability assessment and process
- Climate Access
 - Tools for training network members to co-explore vulnerabilities and risks with stakeholders
- WRI
 - PREPData- data on hazard, exposure, vulnerability for US and global (open source)
- USGS
 - Risk and vulnerability assessment, multiple synergistic and sequential hazard assessment

Investigate Options

- American Society of Adaptation Professionals
 - Connect adaptation professionals to improve climate adaptation practice through member series, training, standardization, mentorship, regional adaptation forums, communications
- USGS
 - Community options to mitigate hazards
 - Stormwater management best management practices and Green Infrastructure
- Northern Institute of Applied Climate Science
 - Adaptation Workbook: Used with land managers to select/refine adaptation actions that fit their processes
 - 200+ examples of on the ground adaptation projects
 - “menu” of adaptation actions for many systems
 - Runs the USDA Northern Forest Climate Hub

- Runs the USDA Climate Change Resource Center
 - Training and Outreach
- NOAA RISA Program
 - Co-production
 - Helps identify adaptation opportunities/measures
- National Association of Counties
 - Strengthening Coastal Counties' Resilience: technical assistance program supports counties in the Gulf of Mexico Region
 - Digital Coast Fellow will assess resilience/ROI of coastal counties in AL, LA and MS
- Azavea
 - Temperate: wizard-like process for creating a plan, utilizing strategies other cities are using
- DOI Climate Science Centers
 - Trainings, convenings that focus on adaptation planning and options
- ICF
 - ID Adaptation options, cost/benefit analysis
- Antioch Center for Climate Preparedness and Community Resilience
 - Design and Deliver Capacity Building programs connect local decision-makers with resilience preparedness resources/examples/services
 - Local Solutions Conferences and webinars
- UMass Amherst Extension
 - Expert working group coordination (e.g., salt marsh, coldwater streams)
- Georgetown Climate Center
 - Clearinghouse- provide resources to decision-makers for evaluation of best options
- Climate Access
 - Free network series and fee based client series to create response strategies with stakeholders
 - Look Ahead (virtual reality app)
- WRI
 - PREPData- includes dashboards and "stories" of good practice
- Model Forest PP
 - Climate Solutions University- 1 year planning process to help rural communities assess options and chose solutions
 - Cost/benefit analysis and strategy creation
- USDN
 - Supports and funds exploration and innovation of new processes and projects

Prioritize and Plan

- Antioch Center for Climate Preparedness and Community Resilience
 - Take stakeholders through challenges, barriers and implementable solutions so to develop a viable plan
- ICF:

- Develop action plans
- Mainstream within existing processes
- Maryland Department of Natural Resources
 - Ecosystem Service Valuation- cost/benefit analysis, ROI, Cost Avoidance
- NOAA Environmental Literacy Program
 - Provide models of public engagement of youth and adult stakeholders that help them understand trade-offs relevant to their community
- Georgetown Climate Center
 - Provide legal and policy analysis to decisions makers to build capacity and prioritize and plan

Take Action: Work with stakeholders who accept responsibility or bring resources; report/assess whether actions are increasing resilience (monitoring and evaluation)

- Climate Access:
 - Free network series and fee based client series re: building internal and external support for action and partnering with stakeholders to create plans and act
- ICF:
 - Develop adaptive management approaches
 - Climate adaptation M & E
- Georgetown Climate Center
 - Provide technical assistance to city, state and federal officials to implement their climate policies and laws
- Maryland Department of Natural Resources
 - Work with communities and governments on nature-based resilience and restoration projects
- Antioch Center for Climate Preparedness and Community Resilience
 - Resilience Facilitated Community of Practice
- UMass Amherst
 - Mass ECAN – network for practitioners

Whole process support/assistance/collaboration

- NOAA Environmental Literacy Program
 - Grantees have models of engagement of helping community stakeholders do all of these (e.g., ASU Forums, GMRI SLR citizen engagement)
- USGCRP
 - National Climate Assessment, CRT Climate Explorer, Resilience Dialogues, PREP, Coordinate USG with civil society
- Climate Resilience Fund
 - Support/enable coordination of service providers
 - Support boundary organizations and capacity building grants on topics or regions of interest to funding partners
- NOAA Digital Coasts
 - Data, tools, training, technical assistance for each step
- RISA/CSC

- Engage communities/stakeholders in co-production activities
- Assess risk
- Develop prototype tools
- Assess adaptation options
- Geos Institute
 - Climate Wise Initiative: provides services to communities to help them develop comprehensive climate adaptation and resilience plans.
 - Climate Ready Communities program works to address issue of affordability
- Model Forest Policy Program
 - Climate Solutions University
 - Facilitate community based planning and implementation
 - Build local capacity
 - Partner with communities
 - Build field of practice with presentations, webinars, publications
- EcoAdapt
 - State of Adaptation
 - Awareness to Action
 - CAKE
 - National Adaptation Forum

4.3 Tools

Prior to workshop, the Tools Sector was defined as having five main components, and Edward Gardner populated the poster with information from each registrant. Then attendees added sticky notes under each section during the workshop, all of which are transcribed below.

- Visualization
 - Climate Central impacts tools/analysis/visualizations
 - Reusable modules that support the Steps to Resilience
 - Resilient Hospitals dashboard
 - Is it accessible/compliant?
 - Is it intuitive? Colors, shapes, etc. convey the message better
 - Proprietary software is prohibitively expensive for decision level visualization and data access for all impacts
 - There is no such thing as the “general public” (in a strategic planning sense)—we need to develop visualization tools for people who come from different points and perspectives
 - Need interactive, decision-informed visualization tools for public consumption (tool agnostic for museums)
- Analysis
 - Azavea planning app
 - Climate Access research, modeling application and communication tools
 - ICF: Identification of climate risks and management options
 - ICLEI-USA: Tech support, report guidance, tools
 - Consultants: translation of data to decisions

- JGCRI: assessments and tailored information
- NE CSC: Endangered species adaptation
- Northern Institute of Applied Climate Science: Vulnerability assessments and real-world examples of adaptation of natural resources
- Gap: Need to move from just exposure tools to ones that support the full risk framework
- Goal: include health impacts and economic impacts in analysis
- Gap: Need the ability to select “Thresholds of Interest”, not just days over 95 degrees (secondary impacts)
- Gap: Process for customizing information based on local and or traditional knowledge
- Data Access
 - Adaptation Strategy Database: CRT,CAKE, Georgetown Climate Center Adaptation Clearinghouse
 - PREPdata.org
 - Digital Coast
 - Semantic web and search optimization
 - Gap: Have to go to different places to get a single answer (and the information is in different formats and scales)
 - Gap: Easily accessible adaptation strategy examples,
 - not in cased studies or plans,
 - scalable,
 - central database with many access points (CRT, CAKE, etc)
 - Need to provide access to underlying data and methods for tools so a user can make more effective
 - Before making tool, ask:
 - Do you need to make a tool?
 - What tools already exist that could be modified?
 - Is the toolmaker agreeable to the modification?
 - Is data better off on its own platform, or integrated?
 - Gap: Researchers are great at creating data, but there is often a lag or lack of release of this information especially in a way that relates to the communities in need
- Topic (Dialogs, Engagement, etc.)
 - Resilience Dialogs
 - Partnership-building and products around ecosystem resilience and natural resources adaptation in Massachusetts
 - Communication and stakeholder engagement strategic services, capacity building programs, and pilot outreach projects that build political and public buy-in for climate resilience policies and programs
 - Scientific Museum of Virginia (Richmond): convene scientists and citizens
 - UGA Sea Grant: Community rating system support
 - GLISA: Scientific translation for decision making
 - Engagement Process

- Need tools to support the decision process, not just tools for impact and data
 - Open source tool development should be supported by community engagement techniques
 - Goal: Difference between a tool that just “pushes” information toward a tool that allows users to “pull” information that is applicable
 - Economics
 - Gap - lack of tool and information on the benefit of adaptation vs. the cost of the option (cost/benefit filter)
 - Model Forest Policy Program has tool for ecosystem economics assessment
 - Gap - develop a business case tool that includes the cost of doing nothing
 - Gap - tools that help communities access financing
 - Let market decide what is the best approach, not the government
 - Let users and solutions drive what tools to develop
 - Framing
 - Gap - tools need to readily integrate into existing decision frameworks
 - Goal - incorporate local data into decision making
 - Tools need to be pitched to existing levels of understanding among decision makers (vs. requiring extensive professional development and certification)
 - Gap - Tools that translate climate hazards into specific, salient impacts on specific assets like infrastructure, private property, etc.
 - Gap - independent analysis and verification of tools (at the current time it is the wild, wild west)
 - Need interoperability analytical tools and decision frameworks
- Other
 - Whole Community Adaptation Framework
 - Network support and society building
 - ASAP
 - Climate Resilience Fund
 - Intermountain West Dashboard
 - Service Bureau
 - RISA
 - Georgetown Climate Center: law and policy technical support
 - Climate Solutions University
 - Plan Development Program
 - Implementation program
 - PG&E: Energy Infrastructure
 - SC SCS: Science translation
 - USFS Vibrant Cities Lab
 - EcoAdapt CAKEX.org - community website of geotagged case studies, resource library, directory of individuals and a tools section full of other online resources
 - NAF - compiles and posts presentations from in-person knowledge sharing

- Think about end users
 - Gap - tools not developed in partnership with end user end up being unusable and not used
 - Fill the gap between the tool developer and the end user
 - Federally funded tools needs to be developed in coordination with end users
 - Partnerships needed for individual components, who are the experts for visuals, analytics, etc.?
 - Need standard terms!
- Gap - Build local capacity for future tool user
- Gap - Provide methodology or guidance for modifying or scaling tool to a uses need
- Challenge - we are running out of time and money to follow best practices
- Project Idea - train service providers in the array of tools and when to use each tool
- Gap - my staff need access to open source exposure tools and training on how to use them - we work with rural and underserved areas who need simple summaries
- Gap - lack of money, time and training to know which tools to use and how to apply
- Goal - determine if we are creating tools for the boundary organizations/networks or the end user? Consensus at the table was for the boundary organizations.

4.3.1 Breakout Session One: Identify priorities, gaps, commonalities and isolations

- Priorities (but also the main gaps)
 - Database of adaptation strategies and options
 - Need for interoperability between tools and the resilience decision process
 - Lack of sufficient resources (both time and money)
 - Making a business case for adaptation and resilience
 - The same frames that work for public communication should also work for business
 - Economic, health, personal economics and safety
 - Build local capacity
 - Tools for Community Financing and funding resilience
 - Major funding goes to “flashy” new tools
 - Limited resources for long-term maintenance
 - Group expressed interest in:
 - Projects to sustain popular/useful tools
 - Community finance opportunity “tool” (link to Sustainability group)
 - Hierarchy of what is really “good”, what are the best tools? (Link to metrics group)
 - Assessing tool usefulness
 - Lack of trained service providers who know which tools are best and when to use the tools

- Tools are more useful for the service providers than they are the ultimate end users
- Major group focus on gaps and difficulties
 - Developer to end user disconnect, not an awareness of what is really important to the customer, no real user testing or understanding of UX
 - Larger cities have resources for resilience, most small cities do not
 - “Continuum of gaps” centered on knowing how to use tools - there is an education breakdown between the tool creators and the tool adopters and users (some of the tools might be very good if people knew how to properly used them)
 - Connection to the “Professional Development” group
 - Connection to the “Interoperability” group
- Public/academic/private opportunities
 - Private business cares about climate impacts in dollars, this is a current gap
- Understanding community process (how are municipalities making decisions related to resilience?)
 - There are different thresholds of interest for climate impacts in different sectors
 - Resources, both dollars and time, limit the ability for communities to make progress on resilience
 - How do we know we are making a difference? (Link to “Metrics of Success” group, “Did we really build resilience?” How do we know?)
 - Is there a link of resilience to sustainability?
- Importance of the translation of climate information into field-specific vocabulary and metrics. Example; are flood magnitudes increasing due to an increase in heavy precipitation events and more impervious surface?
 - Mainstreaming climate information; no need to convince, just show the numbers of increased frequency and severity of flooding
- Viability of “Tool” Cluster
 - Limited resources for educating the process/delivery end-user folks (educators, bridge organizations, museums) on how to use the best tools
 - Crucial for survivability - effective leveraging of tools
- How do we “lift all boats”?
 - Get beyond portal syndrome
 - Train all trainers
 - Who is really using these tools? How do we know?
 - How can we understand the lifespan of tools?
 - Lack of trained service providers

4.3.2 Breakout Session Two: Develop a shared agenda

- Need to move from tools about “Did you know?” to tools that answer the questions “Why should I care?” (local vulnerability and risk) and “What can we do about it?” (options and implementation)
 - Very large discussion around the business case - who is willing to pay for tools and associated services?
 - This is also a theme that came out during the morning plenary.

- Need to map communication efforts between the end user and the federal government. What are the inputs and outputs needed by each tool?
- Need a shared vocabulary so people can really tell what tools apply to what problems
 - Standardization of terms, definitions, and nomenclatures.
- How do we build out the network diagram (actor map), so that it is really tied to key work processes? This will really help to determine who needs to be involved in which collaborations.
 - Who are the actors that are playing referee?
 - Who can (and should) curate tools, data and information?
- How do we reduce the redundancy of tools?
- How can we standardize the resilience work process? Is there broad support for the Steps to Resilience?
- How do we improve existing tools?
- How can we be efficient under a constrained budget?
- What is the granularity that people need to make decisions?
- What are the different pricing models?
- What should be open source and what should people pay for?
- How do we create jobs and careers in resilience and adaptation? More specifically, related to tool creation and services linked to these tools?
- Tool user support - How do you provide instructions and training to end users?

4.3.3 Breakout Session Three: What is essential to maintain the viability of the tools sector?

- It is not the tools that are important, it's how the tools are used to help decision makers build resilience. This discussion is more about products and services rather than tools.
- Sustaining and advancing climate science foundation tools (NCA, Climate Resilience Toolkit, etc.) examples: Richard Moss new work supporting the NCA outside of Federal funding
- Quantitative, probabilistic (supporting risk analysis) decision tools to support decision making at the right scale
- Defining success of a tool, not only for the developers but more importantly for the end user. What are the metrics of success?
- Tools that support resilience work beyond exposure and vulnerability.
 - What are the tools that support implementation?
 - This talks about the importance of linking services to a total resilience process.
- Connect tools to change systems – what services are necessary to really elicit change at a municipal or company level?
- Articulate the business case – what are people willing to pay for and what is driving this value? This needs to be market and demand driven.
- Tool interoperability – how can we make sure that our resilience tools integrate with other tools (stormwater, etc.) that the client is already using?
- Common vocabulary and industry standards. We are not doing our ecosystem any favors when we interchange words/definitions and do not supply work at a professional standard.

- Tools that integrate social science and vulnerability
- The importance of public/private partnerships to really start building the resilience ecosystem and being able to contract with the right entities.
- Lack of trained service providers who know how to use a variety of tools to provide critical services to their clients.
- How do we reduce redundancy and improve existing tools.
- How can we survive as an ecosystem with reduced resources (both time and money)?

4.4 Professional Development

4.4.1 Goals

1. Reach climate champions where they are. Cultivate new ones. Support lifelong learning among professionals at all career stages so that climate information is contextualized.
2. Map what professional development exists through a user needs assessment. Provide wayfinding for champions to link to opportunities.

4.4.2 What's essential?

Jobs, funding

Leaders, experts, and money to support them to lead. Trusted, authoritative trainers who can communicate among peers.

Core skill sets and standards identified, accredited, and mapped to the Steps to Resilience for distinct regions and sectors.

4.4.3 Gaps

1. Fragmentation/not wholistic
2. Funding for maintenance and ongoing provision of resources that have been compiled
3. Full-time professional development trainers who are qualified/good teachers and qualified in the techniques
4. Lack of incentives

There exist qualified personnel and knowledge (e.g., among NERR, NGOs, ...) but there is neither money nor coordination, so clients/end users lack guidance regarding when to use one resource over another. Further, training and professional development are highly fragmented.

There is a dearth of opportunities for people to get together who are in the professional development space.

There needs to be more emphasis on organizational change within professional development.

There is a lack of funds for maintaining databases and website with tools. Open source can be a barrier if people need to be able to make money to maintain resources such as this.

There is a lack of full time professional development trainers. How deep is the bench. See note from ASAP regarding opportunities to support someone to do this.

Mid-career professionals need support and development to bridge into climate resilience. E.g., Keely Brooks of SNWA got herself moved to another part of her organization so she could be more effective in putting climate thinking into the planning and infrastructure processes. Also see The Natural Step by Paul Hawken.

4.4.4 Existing Tools/Resources

Types: peer learning (e.g., SARP grant showed that farmers learn best via face to face interactions); professional teaching for a sector; professional training for climate experts/practitioners; formal edu; train the trainer; direct technical assistance.

US Climate Resilience Toolkit (CRT)

Best Practices in communicating climate change

- Climate Communications Strategies Trainings. Many professional publics. AMS, AGU, AAAS, GMU, Yale, Stanford, Antioch, ASU, U of Ariz., Columbia, U. Mich., U. of Oregon. Learning how to talk about communicate Climate Change.
- NOAA Office of Coastal Management Risk Communication

Climate Masters degree programs and undergraduate programs

Informal interactions, e.g., Asheville's Collider, allows professionals and climate scientists to interact

Extension agents, e.g., Ag, Sea Grant, State Climatologist, UMass Amherst Environmental Extension (Climate Adaptation Coordinator and Extension Coordinator)

Existing local government certification programs

Leverage: SAP Living Guide on Climate Adaptation; ASAP Principles and Code of Ethics; ACCO Courses

Inst. For Tribal Env. Professionals. ITEP Tribal training. Soup to nuts training build on this for next version...

Wide variety of guidebooks online

In person workshops; feed into learning programs. AMS (Climate Matters, e.g.), AGU, AAAS workshops...

Merge components, e.g., CRT Water Resources Dashboard trainings/webinars

Climate Access serves USDN, ICLEI—helps people get started website goes from basic to advanced. Passive to active consulting.

ICLEI: learning management; climate mitigation; now looking at resilience and R/Vuln Assess. Works with covenant of mayors. Cohort training—biweekly seminars. Learning management.

Institute of Sustainable Communities.

GCC, Climate Access say there isn't a clear path from fundraising to delivering accredited content.

Who has legitimacy for accredited training?

People writing RFPs need guidelines

Network of service providers: consultants who do work need training; identify consulting firms

Discoverability of training--- what's out there?

Science translators is not a sufficient descriptor for describing the guilds of professionals who are doing specific job roles that could be augmented to be climate smart. Need to find ways to support the development of these professionals so they become politically savvy, e.g., working across departments within their orgs, and for advancement of their careers. Person leading resilience process needs support for Steps to Resilience. The process for getting people to become skilled is prof dev- not just "training"

Climate has been siloed. Need training in other sectors.

Harvest knowledge of pioneers.

4.4.5 Whole Greater than Sum of Parts

Pedagogy and climate experts could work together to improve training

Bridging Professions- professional associations working with adaptation professionals (e.g., ASAP)

Bridge Theory & Practice

Mutual solutions/co-development. User needs assessment after training (survey). Understand what is needed to do job. Evaluation (formative and summative). ID core competencies for professions. Train the trainers by guild/sector/implementers. CLIMAS, WWA, DRI Service Provider Network- survey of what they provide, gaps, ...

NOAA Office of Education Environmental Literacy Program

Develop Accessible/low cost trainings

Make training relevant

Connect ACCO and ASAP. Quality courses. ACCO courses provide pathway to certification for professionals. ASAP living guide on climate adaptation principles and Code of Ethics can be incorporated into a single set of standards that could provide a consistent baseline for the field. More cooperation. Train local government public works council people/elected officials. Define the field via training standards. Training of adaptation professionals is a tip of spear. Training for incorporating adaptation into other professions was a goal shared at the table. Public health,

engineers, architects, planners have different needs for prof dvt than climate adaptation professionals. ASAPA sets standards and sites shoulder to shoulder with other professional societies, e.g., APA, APHA, ABA, AAA,

4.4.6 Essential for Viability

Find a trainer- ASAP has funds if a good trainer/teacher is identified, they can support deployment

Gather credential officers from organizations and work with them to integrate climate training

Special journal issue annually on co-production of knowledge in adaptation

4.4.7 How to Sustain?

Training which is applicable and interactive

Incentive structures

- Accreditation
- Law
- Integrate climate information within “guilds” (concept of specific job roles such as municipal public works or city managers)

Grow professionals in place/within their job roles

4.4.8 Stronger Together

CEUs

ASAP’s Core Principles and Code of Ethics can support APA, AIA, NACo, ICMA, AGU, AMS, WUCA... programs

ASAP+ACCO (ACCO was not at the table)

Expand AMS Certified Broadcast Meteorologist seal to include climate training

4.4.9 Tip of Spear

ASAP has a Code of Ethics and Core Principles. These can and should be adopted widely for advancing training/prof dvt. Within “guilds” of professionals.

4.4.10 Barriers

Organizational change

4.4.11 Sticky note exercise with resources

4.4.11.1 Basic

4.4.11.1.1 Federal

USAID Climate 101

UNDP Adaptation Webinars- free, international case studies and tools training. Biodiversity focused.

Climate.gov climate literacy section- free resources for formal education at K-12 level especially

NERR (Climate Access supported) climate communication and engagement training for two NERRs in CA. They took it to Maine. **National program with regional outlets is needed.**

Institute for Sustainable Communities offer training for communities or climate planning. NGO efforts based on their own models often don't link to other resources or have money to pay.

NASA monthly climate impacts forum

Great Lakes Region climate Service training. Static slide series. Can be delivered (?)

4.4.11.1.2 Not-for-profit

Itep: Institute for tribal environmental professionals climate training

Seattle Northwest School K-12 Curriculum

USDN Support and help cities and city staff doing training in LEED, marketing, CFM (Floodplain Management), Hazard Mitigation (FEMA), and identifying other opportunities. Also provides Climate 101 training developed by cities for cities.

Climate Matters by Climate Central educates and supports broadcast meteorologists to expand competency for their roles as station scientists.

ASAP mentorship program. Currently aimed at new entry professionals. Being designed for senior and mid level professionals.

ACCO Climate 101. Background on Climate science. Counts toward accreditation. Live but potentially moving online. For example, MD State DNR training- accreditation offered; fee required. Self-driven and in-person training. ACCO defining core competencies for different organizational groups within the unit. Next stage will be customized to staff function.

Climate Access Comm/engagement 101. Live webinars. Tools and resources. And custom fee-based training.

ICLEI Cohort training. 10-12 week webinar series. Class size ~20. Combination live and self-paced. Homework assignments to work through an assessment or planning process. Attendees have a work product at the end. Paid or sponsored.

Civic Spark. Administered by local government commission. Student fellows placed with cities for doing focused climate work. Paired with many training opportunities with partners.

AGU sharing science workshops. No accreditation. Target at academic scientists. No fee. Serves memberships.

ASAP member orientation webinar series.

ICMA LG 101. International City/County Management association. Local government 101. Professional certificate offered for fee. Targeted at local governmental staff- fundamentals of government.

4.4.11.1.3 Academia

Six Americas

RISA offers training through universities- CLIMAS webinar; Climate Science Centers

Duke Marine Lab Trainings. Climate adaptation and marine planning trainings. Free, local, in person.

ISA climate profiles development and presentation for cities/communities. Can be live or webinar. Targets specific community/down/city. Provides context for further adaptation and relationship building.

RISA presentation to various sectors, in multiple regions, on climate impacts, projects and risks. Also participation in city/town advisory roles (e.g. NY climate panel).

RISA NW climate boot camps for young scientists

Western Water Assessment usable science training. No accreditation. No fee. In person workshops. Focused on how to produce usable science and co-production. Targets other academics. Any region.

WWA snowpack data workshop. No fee. No accreditation. Targeted to water managers. In person. CO, UT, WY/Upper CRB

Antioch CCPCR. Local Lever Decision Maker. Local solutions conferences. Tools content/literacy. How to. Primarily eastern USA.

Tribal climate camp workshop.

Tribal liaisons training through climate science center.

4.4.11.1.4 For Profit

improveScience! Free organization-wide live training. No accreditation. Improv techniques for communication literacy. All sectors, all regions.

4.4.11.2 Intermediate

4.4.11.2.1 Federal

CRT Water Resources Dashboard. Includes scientists who describe data/website and decision makers who describe the use of the resources. Posted to YouTube and accessible on WRD for training. Recorded webinars about using tools for specific applications available through the USCRT. Currently working on "learning progressions" with a variety of partners (e.g., WUCA, EPA, water foundations...)

Adaptation Planning for Coastal Communities from NOAA OCM. 2 day in person training. Introduces vulnerability assessment and developing/implementing options. Targets municipal, county, and coastal program staff.

EPA training webinars for local and state government. Huge participation ca. 500/webinar

USFS Climate Change Education modules; certificate of completion provided

1. Basics
2. Impacts on forests
3. Adaptation/response

USGS Regional CSCs. Graduate student and professional training. Invitation only. /fee based. Non accredited. Context/literacy. Structured for decision making. Basic interdisciplinary. Communications, climate science, tribal, traditional ecological knowledge.

USDOT peer exchanges on climate change

Adapting to Rising tides- San Fran BCDC. Available on Digital Coast. Assessment questions, planning process. Guide and worksheets. Examples from California but broadly applicable.

FAPP- Forest Adaptation Planning & Practices. Training using a real-world forest management project results in selection/refinement of adaptation actions. NIACS.

RISA network activities. Bring PIs together once a year (live). Subsidized but there is a fee. Monthly calls and webinars. Helps individual RISA teams representing a region to learn from each other, share tools, etc.

Extension Agent Training through land grant and/or Sea Grant college programs.

PREPData Training webinars. Coming this spring. Free webinars on how to use a climate adaptation and resilience planning data platform. Would like to expand to in-person trainings.

4.4.11.2.2 Academia

Adaptation seminars. Multi-week seminar at Univ. of Michigan that teaches student about adaptation and actions across scales from international to local.

Antioch Weather Change webinars. US and International Audience. Tools, context, literacy, how-to. Local-level decision makers are target audience.

University of Wisconsin Climate Impacts in Great Lakes Region MOOC.

Massachusetts Climate Action Tool trainings. No accreditation, free, live and webinar. Tool focused. Provides context. Focuses on Mass. natural resources.

Mass ECAN conference and member trainings- e.g., communications workshops. Live, free, no accreditation. Provides context and literacy Ecosystem resilience practitioners in Mass.

4.4.11.2.3 Non-profit

USDN Game of Floods/Climate 201. In person. Local gov, students, decision makers. Interactive training. Provided at NAF, USDN, cities, u of m, etc.

Climate Nexus Communication training- how to communicate with media and the public. Science to action communication.

ASAP Living Principles of Adaptation (formerly fundamentals). No accreditation currently. Webinar and live. No fee for members. Opportunity to train all adaptation folk into what emerging promising practices

ASAP Adaptation Code of Ethics. No accreditation. Every ASAP member has to agree to. Training will be available to ensure people understand the code.

Webinars by ICMA, NLC, USDN, ICEI, ASFPM, others. Provide training to stakeholders.

Glen Gerberg Weather and Climate Summit for broadcast meteorologists in Steamboat each January.

WUCA climate resilience training. Fee. In person. Target water utilities. Provides climate context and intro to decision tools. No accreditation. New/being developed.

USDN. Using Racial Equity Lens for Climate Planning and Implementation. In person, online, web, etc. In network. Funding available.

ASAP/ASU training. Likely accreditation will be arranged. Fee. Online. Credits. Many experts teaching about action across scales and sectors.

Climate Access. Webinars, tools and resources. Specific resilience topics & effective engagement in resilience planning. Custom/fee-based.

ASAP webinars. No accreditation. No fee for paid members. Peer learning.

NAF forum and regional conferences. No accreditation. Live. Fee.

World Bank/GBCI/ICLEI. City climate planner certificate. Current mitigation focus. Likely will expand to adaptation.

ACCO Climate 202. Data and Tools for decisions. Live. Each event focuses on a region and sector. Focused on USGCRP and compatible tools.

TNC Community resilience building. MA MVP program. Allows one to become accredited service provider. Free. Live in person. Process focused. Across sector. Massachusetts.

NNOCCI Climate Communication Training. Live, free, accredited? Not specific to region or sector.

ICMA LG 201 (?) International city/community management association local government 201. Professional certificate is offered. Fee. City/county manager/Local government staff targeted. Focused on core topic areas

Annual conferences of local government associations and related fields: ICMA, APA, NCL, NACo, NARC, NADO, APWA.

Society of American Foresters

4.4.11.2.4 For-profit business

CEUs for other professional societies who need them is a GAP: APA, AIA, CE

[Security & Sustainability Forum \(SSF\) webinar program](#). Some paid, some not.

4.4.11.3 Advanced

4.4.11.3.1 Government

USAID Monthly Adaptation Community of Practice meetings.

Energy Star Training Program. Most not certified but one is- licensed practitioner.

COMET hydrologic modeling/climate training. Requires registration and basic science literacy. Topics focus on disciplines.

ASCC: Advanced Silviculture for Climate Change. Certificate provided. Forest Service Silviculturists and planners.

FEMA's continuing practitioner and training program.

4.4.11.3.2 Formal Education

Columbia University Climate and Society Master's Program.

University of Michigan Applied Climate Program.

Georgetown Climate Center's Regional Collaboration Forum. Accreditation: no. Fee: no. Live (telepresence). This is a bimonthly call series meant to support regional collaborations nationwide by providing space to share best practices and do peer learning.

Georgetown Climate Center's state policy forum. No accreditation. N fee. Telepresence/live. This is a bimonthly call series with state adaptation practitioners to share best practices and advance climate knowledge.

CISA RISA VCAPS process. No fee, no accreditation. In person/facilitated. Targets cited (?)

Resilience Fellows. A concept Kathy Jacobs has been working on.

Fellowship program in resilience- post graduate placement in organizations of choice to learn and share knowledge.

Antioch University New England. MS Sustainable Development and Climate Change. 36-credit, 5-semester program for \$29,000. Hybrid (F2F with some online). Focus on training students to manage complex challenge due to a changing landscape in the context of a changing climate. Beyond science-based courses; communication; facilitation; leadership; management; theory & practice. Culminates in applied internship and an applied capstone project for an external client (community or organization).

4.4.11.3.3 Non-profit

AAAS Policy Program Training. Fee-based. Live/in-person. Provides context and literacy. National-focused on early and mid-career or those interested in understanding how to better apply science to policy.

Climate Access provides fee-based, customized trainings and tools, research, and strategy.

ASAP sometimes provides accreditation for a fee. Provides context and literacy across sectors and regions. Curriculum affinity group (no detail provided on this).

National Adaptation Forum. All training presentation are available as PDFs after NAF. Pre-forum trainings can be accredited and are free. Trainings occur during the forum across multiple sectors, sometimes providing credit through participating organizations. Webinar series provided quarterly on tools, training, case studies, and more.

International Society of Sustainability Professionals (ISSP) provides credentialed certification in sustainability. Targets professionals for a fee.

American Institute of Certified Planners (AICP). American Planning Association certification offered. Fee; virtual. Planning sector.

ASAP Living Guide Principles of Practice training.

ICMA Credentialed Manager (CM) program; fee-based; city and county managers.

ISO Standards. Working on a vulnerability standard so there will have to be training and support developed around the final standard.

Civic Spark Resilience Fellows. Recent graduates that provide resilience capacity in different scales and sectors in California. They also get extensive training and support. Organized via the Local Government Commission (LGC).

4.5 Measures of Success

4.5.1 Notes

Session 1

1. Program changes: require changes in city codes as a result of receiving funding
2. Locally articulated and defined success metrics for both processes and outcomes
3. Measurable, quantifiable diminishment in vulnerability
4. Institutional change to embed success metrics and congruence between larger and smaller scales.
5. Quantifying benefits of success
6. Noted absence of post-it notes in the Jobs created and Revenue produced boxes. Too early?
7. Need tools for initial assessment to establish a baseline
8. Disaster Risk Scenarios (table top exercises) could be useful to measure success
9. Each locality needs a prioritization of metrics (infrastructure, equity, dynamics)
10. Internalizing externalities (social, ecological)
11. Make a clear distinction between disaster recovery and long-term resilience
12. Track benefits at multiple scales
13. Note: Moody's will include climate resilience in municipal bond ratings
14. Need separate metrics for success in education and other programs (i.e. RISA)

Session 2

1. Measuring a reduction in risk is here is the ecosystem overpopulated?
2. Social scientists have already developed models and decision tools for measuring success. It may be smarter to adapt one of these models to our needs than to reinvent them.
3. Communities need to document any reduction in risk, but this is only possible if it's been quantified beforehand.
4. Unrealistic to think there could be just one list of indicators or metrics for all sectors
5. RISA's 3 types of uses: Justification use, conceptual use, instrumental use.
6. How can equity metrics be incorporated into planning documents? Can the shift of power be documented? Can we document a shift from ensuring attendance at public meetings is representative of the population, to ensuring engagement and involvement are representative?
7. Need a metric to measure empowerment of various members of the community.
8. USDN is working w/ cities to track a lot of this via surveys. What tools they use, what funding they're getting, etc. Kristin Baja is consulting on adaptation plans and clients are tracking whether or not that's helping.
9. Sometimes it doesn't make sense to just provide a checklist. Instead, communities need processes and framework to get people to devin their own metrics.
10. Kristin Baja contends that measuring "avoided damages" is a realistic and worthwhile goal, but it will take a long time to incorporate tricky aspects of indicators such as health.
11. First step might be a literature review.
12. Community resilience indicators from FEMA seem a bit archaic.
13. Community Rating System (FEMA) is unnecessarily complex, and though it can reduce insurance costs, it may not actually reduce risk
14. If we are an ecosystem, we have to recognize that all actors in the ecosystem should not necessarily continue to survive. Wt failures as well as successes.
15. Social Coast Forum mentioned as a meeting that could inform this effort.

Session 3

1. Request for a centralized, ideally mandatory repository for folks to post their metrics. Informalscience.org as an example
2. Grantees are required to submit evaluations. Can we perform meta-analyses of these?
3. Sea Grant has a series of one-pagers that show their economic relevance. These could be useful.
4. Environmental Ed groups have very broad goals that are hard to measure. They're divers, long-term, and involve a variety of infrastructure from different sectors.
5. Though schools are designated as emergency shelters, they seem to be among the least resilient locations.
6. Suggestion: if all the entities at NOAA got together and came up with an agency-wide list of measures of resilience, we'd have something to start with.
7. Can we identify and then advertise the benefits of having metrics to encourage folks to sign on to the effort of developing them?

4.5.2 Flip Chart Notes

General

- Adapt from social science models—don't build a new model!!! (example: decision science)
- Why are we measuring? Figure out who will benefit from having the measures
- What are we measuring?
 - Communities moving toward resilience
 - Tool success
 - Training/educational impact

Goals

- Across-the-board standard for resilience: apples-to-apples comparison
- Literature review
- National-level survey of what's happening on the ground
- Baseline assessment

Things to Track

- Institutional change
- Professional change
- Training/education
- Equity/inclusion
- Document failures as well as successes
- Capture data that resonate with different audiences (i.e., economic, ecosystems, human)
- Make it evidence-based (i.e., CalAdapt's inclusion requirements)
- Consider use of UN's Millennium Goals

Essential

- Input from these sessions captured and distributed
- Standardization of metrics
- Centralized repository for data storage/input/analysis, entire community has access (example: informalscience.org)
- Use different lenses: equity/economic/ecosystems
- People-centered
- Objectivity—independent third party? If so, politically neutral
- Commitment from ecosystem members to iteratively respond to development of success measures

Existing Tools/Models/Platforms

- CRS
- STAR communities
- LEED for Cities
- ACEEE
- Disaster Risk and Reduction Indices
- Moody's/Investor Rater
- USDN Indicators Report

- FEMA Community Resilience Indicators
- Sea Grant one-pagers
- NOAA Storm-Ready and Tsunami-Ready programs

Potential Solutions

- Measure resilience built at community-level key institutions
- Independent evaluation
- Increased internal communication and cohesion at NOAA
- Track long-term lasting impact
- Requirement to include assessment measures in RFPs, etc.

4.5.3 Cluster Poster (Sticky Note Exercise)

Number of people, businesses, communities who have accomplished a given step to resilience.
Lead Notes: Information may be helpful for actor mapping, otherwise this field didn't seem to produce much useful data.

Step 1:

- Four Twenty-Seven (Orange)
- PG&E (Orange)
- RISA Program (Blue)
- USGCRP (Blue)
- USGCRP (Blue): In a public-private collaboration, we co-manage a product called the Resilience Dialogues. We connect communities with SMEs via an online platform. After the two-week dialogue, we regularly follow up with those communities to determine any progress on their next steps.

Step 2:

- PG&E (Orange)
- NOAA Environmental Literacy Program (Blue)
- Four Twenty-Seven (Orange)
- USGCRP (Blue)
- RISA Program (Blue)
- Pepperwood Foundation (Green): County-specific, North Bay California, climate reports co-produced with managers

Step 3:

- PG&E (Orange)
- USGCRP (Blue)
- RISA Program (Blue)
- NOAA Environmental Literacy Program (Blue)
- Arizona State University Consortium for Science Policy and Outcomes (Purple/Pink): Public and policy decision maker engagement

Step 4:

- Antioch Center for Climate Preparedness and Community Resilience (Purple)
- USGCRP (Blue)
- Four Twenty-Seven (Orange)
- PG&E (Orange)
- ICLEI (Green): Tracking via reporting to CDP or carbon as part of covenant of mayors, EarthHour City Challenge, or other campaign

Step 5:

- Maryland State Government (Blue): Community plans and assessments funded
- Unattributed (Green): The Steps to Resilience are good for process-based success, but we need outcome indicators; equity and the needs of front-line communities need to be central
- USDN (Green): Tracking municipalities that have (1) thought about climate resilience, (2) done a vulnerability assessment, (3) created an adaptation or resilience plan, (4) started implementation, (5) fully implementing and metrics
- PG&E (Orange)

Routine service production (e.g., by CRT) reduces cost associated with bespoke tools, analysis, visualization

- Pepperwood Foundation TBC3 collaboration (Green): Watershed analyst tool, outreach to water agencies, county government, and open space councils
- Azavea (Orange): Climate API, Lab, Temperate tool for adaptation planning—Temperate is intended to provide and process tailored human-provided support for a city's adaptation planning, engaging a consultant to do so would cost \$10k+
- NOAA Ed (Blue): Number and quality of NOAA assets on resilience that are incorporated into education program
- GLISA/RISA Program (Pink): Customized climate information
- WRI—Lauretta Burke (Orange): PREP reduces time and cost for finding data and tools to do climate vulnerability assessment and adaptation planning

Summary reports about project success

- PG&E (Orange)
- Four Twenty-Seven (Orange)
- RISA (Blue): book
- USGCRP (Blue): Resilience Dialogues program summary reports for specific communities outlining tools and next steps
- Maryland State Government (Blue): Case studies
- Antioch (Purple)
- NOAA Ed (Blue): Developing “models” of how education can support community resilience
- NOAA Environmental Literacy Program (Blue): Grantees' summative reports show lessons learned and impacts
- Columbia University Earth Institute (Purple/Pink): NCA
- GLISA (Purple/Pink): Project white papers and impact stories

- Unattributed (Blue): Producing reports about what people need for climate adaptation and resilience planning
- Arizona State University Consortium for Science Policy and Outcomes (Purple/Pink): Handbook, reports, journals, books, blogs
- Georgetown Climate Center (Purple/Pink); Do resources or plans apply an equity lens?

Jobs created

- Antioch (Purple/Pink): Graduate-level certificate for climate adaptation professionals: 3 theory skills courses, 1 applied exercise for an external requirements; focus on (1) leadership skills, (2) communication skills, (3) vulnerability assessments, (4) planning process, and (5) ecosystem services
- RISA (Blue): Creates program-specific jobs in regions; for example, program managers for regional adaptation and resilience
- USDN (Green): Documenting through cities different number of jobs created/required in new policies, codes, and project
- Gulf of Maine Research Institute (Leigh Peake) (Green): Facilitating financing for investment in fishing industry that accounts for climate (number of boats shifting gear for a new kind of fishing)
- Gulf of Maine Research Institute (Leigh Peake) (Green): Funding climate-ready aquaculture start-ups through dedicated investment fund (number of businesses started and thriving)

Revenue produced

- Antioch (Purple/Pink)
- NOAA Environmental Literacy Program (Blue)
- Gulf of Maine Research Institute (Leigh Peake) (Green): Hindcasting and forecasting industry revenue and links to climate change (revenue produced and lost)

Estimate of savings (deferred costs)

- Antioch (Purple/Pink)
- PG&E (Orange)
- WRI (Lauretta Burke) (Green): “coastal capital” developed method for estimating cost of avoided damages due to maintaining natural infrastructure
- Unattributed (Green): Avoided costs have to integrate social, economic, and environmental cost, not just economics
- The Clark Group (Orange): In area of energy efficiency, training for measuring savings. Also, training participants in training reporting
- Maryland State Government (Blue): Developing metrics to account for avoided loss of ecosystem service dollars

What are you doing to document your success?

- CRT (Blue): Counting visitors to site $\geq 10\%$ or more per year
- Maryland State Government (Blue): Number of projects funded in climate-vulnerable areas to build resilience

- Georgetown Climate Center (Pink): Assessing which resources are being rated, viewed, and shared
- Antioch (Purple/Pink): Project reports, webinars about projects, speaking at national conferences where local decision makers are audience
- Georgetown Climate Center (Pink): Assessing if states are implementing goals in their adaptation plans
- Pepperwood Foundation (Green): Number of organizing community lectures showing project examples; number who are developing tailored outreach materials by jurisdiction or user group
- NOAA Environmental Literacy Program (Blue): We collect statistics from grantee reports to aggregate impacts
- PG&E (Orange): Tracking for reduced asset failure
- Arizona State University CSPO (Pink/Purple): Narratives/stories, reports, briefings
- Unattributed (Blue): Tracking frequency of dataset use in case studies from CRT, CAKE, and others
- GLISA (Pink/Purple): Website hits, list publications, document impact stories, media interactions, number of engagements
- RISA (Blue): Impact stories, anecdotal information on RISA program
- Unattributed (Blue): Video case studies
- Four Twenty-Seven (Orange): Case studies, thought leadership process, showing through existing networks(?), vulnerability assessment debrief
- RISA (Blue): Number of organizations engaged by type, funds leveraged, new tools/services developed at state level, publications, impact on broader population, number of stakeholders reached, next generation of scientists and practitioners trained, co-production
- WRI (Lauretta Burke) (Green): PREP provides case studies of successful processes and adaptation. Also dashboards of indicators.
- GMRI (Leigh Peake) (Green): Measuring learning outcomes for participants in programs, not just attendance
- ICLEI (Green): Blog and other social media posts and reports to COP processes
- USDN (Green): Indicators Report
- USDN (Green): Tracking number of cities using network website and accessing online tools, tracking cities participating in user/topic calls, tracking cities accessing funding and project support

Miscellaneous (Uncategorized)

- Antioch (Purple/Pink): Number of climate resilience coordinators trained and embedded in local communities within regional collaboratives
- Antioch (Purple/Pink): Number of regional collaboratives sustainably launched (cross-jurisdictional, cross-positional)
- Antioch (Purple/Pink): Quality of capacity-building webinars and conferences, inclusiveness of capacity-building programs, number and quality of resources mobilized to build capacity (number and size and distribution of travel grants)

- Unattributed (Green): We need something about usability, not just production
- Unattributed (Green): Co-benefits need to be integrated into our value assessments
- USDN (Green): Plan support working on metrics for success in equity and climate adaptation with cities in the network. Example: Seattle Office of Equity and ENvironment, building on their attempt

4.6 Enhancing Discoverability

(NOTE: this section offers the full set of notes from the “Enhancing Discoverability” breakout group. To read a summary digest of the group’s outcomes, refer to [Section 2.2.5](#).)

There has been tremendous growth in the number of climate resilience-related tools and websites in recent years—so much so that the sheer number has become confusing and/or overwhelming for users and practitioners alike. This fact has prompted many entities to strive to develop THE one-stop shopping climate resilience portal / platform. But one of the quickest ways to disincentivize collaboration and promote competition is to present oneself as THE one-stop portal for climate resilience. When many entities strive to be THE one-stop portal, this creates confusion and/or competition, which is defined here as “portal syndrome.” Thus, the purpose of this breakout group was to discuss and identify possible ways of enhancing the discoverability of **all** of the information products and services that **all** members of the resilience ecosystem have to offer in ways that help us all to overcome “portal syndrome” while incentivizing cross-linkages, interoperability, and collaboration.

David Herring (NOAA/CPO) led this group and Heather Coleman (NOAA/NOS) was the facilitator. David prompted the group with this opening question: How can we enhance the discoverability of our products and services beyond our own silos and networks? If we imagined our websites as haystacks and “the right” tool or information as the needle, what if we could turn the notion a single one-stop shopping portal inside out so that, in the future, users will be able to find the needle they’re seeking no matter which of our haystacks they look in? Specifically, is it possible somehow to connect our websites so that there is “no wrong door” into the resilience ecosystem (RE) domain of products and services, and users are able to move seamlessly from one website to another all across the entire RE?

This breakout group had three discussion sessions on Day 1, as follows:

- Session 1: What Already Exists, Where are there Gaps, and What are Our Goals?
- Session 2: What existing tools / platforms are better leveraged than competed with?
- Session 3: What solutions do we have a mutual interest in seeing developed?

Participants in each session reviewed and commented on the preceding group’s notes, thus the notes regarding each question below are all-inclusive, and are not parsed by individual session.

4.6.1 What Already Exists? Where are there Gaps? What are Our Goals?

At the outset, of each session participants were asked to take ~10 minutes to jot down what they’re aware of that already exists that may be leveraged to help achieve the group’s goals and

objectives of enhancing discoverability. The following notes on **what already exists** were collected in six categories:

1. Semantic Web

- [webLyizard](#) — a semantic analysis / web intelligence tool, currently used to power the [U.S. Climate Resilience Toolkit's](#) search capabilities, which could be extended to serve the entire resilience ecosystem
- Facilitate the use of NOAA's resources for resilience among formal and informal educators
- Connect climate assessment to source data / publication / organizations through the [Global Change Information System \(GCIS\)](#)
- Cloud computing, such as through [Amazon Web Services](#) and [Google's Cloud Platform](#)
- Use semantic web tools to connect the [Climate Resilience Toolkit](#), the [Climate Data Initiative](#), and [Data.gov](#)

2. Social Media

- Work with professional organizations to advertise joint work on the [Water Resources Dashboard](#) — includes tweets, webinars, articles in newsletters and trade journals, etc.
- Local government professional associations' social media; i.e., ICMA, NACo, NLC, ADA, etc.
- The [Resilience Dialogues](#) online platform acts as a type of social media, connecting participants from distinct communities and backgrounds
- Various participants noted they echo and shed light on important news and resources through popular social media platforms, like Twitter, FaceBook, & LinkedIn
- Websites, Twitter, Facebook — updated with research, tools, and media
- The [National Association of Counties \(NACo\)](#) has a dedicated social media staff. They hold a Twitter chat to share resources and gather stories, tips, etc.
- The [Model Forest Policy Program](#) uses newsletters, blogs and LinkedIn to connect with climate resilience planners
- The [Urban Sustainability Directors Network \(USDN\)](#) uses active media and support of / for cities' social media platform; and also offers support in developing social media & marketing
- [HEALTHeWeather](#) blog

3. Professional Societies

- Water Utilities & Water Planning Organizations
 - Work with water & planning organizations to develop a joint tool on water resources (e.g., the CRT Water Resources Dashboard).
 - Work with the same water organizations to develop education & outreach materials, webinars, etc., to provide scientific background and examples with users on how data are developed & used in a practical setting.
- USDN

- Weekly network informational email with questions & answers, news, tools, jobs, etc.
 - Monthly calls on topics of interest identified by cities
 - Innovations & high-impact practices
 - Peer-to-peer support
 - Project support
- American Society of Adaptation Professionals (ASAP)
 - Model Forest Policy Program is a member of ASAP
 - The Resilience Dialogues connects its participants to ASAP, which manages the program
 - John Nordgren, director of the Climate Resilience Fund, is a member and board member of ASAP
- Pacific Gas & Electric Bay Area Regional Council for technical advancements, communications on resilience, and many more.
- Arizona State University Consortium for Science Policy and Outcomes (CSPO)
 - Policy workshops for science & engineering graduate students
 - Seminars for program managers and science policy professors
 - Books, reports & publications on science policy & decision making
- National and Regional Adaptation Forums — convening practitioners and peers to share knowledge about tools and methods
 - National Adaptation Forum (NAF)
 - Regional Conferences for Local Climate Preparedness (e.g., Antioch University’s Eastern Climate Preparedness Conference)
 - NOAA NWS’ Climate Predictions and Applications Science Workshop
 - National Council for Science and the Environment (NCSE)
- Local government professional associations (have periodic networking events, regional meetings, annual conferences, certificate programs, etc.)
 - International City / County Management Association (ICMA)
 - National Association of Counties (NACo)
 - American Planning Association (APA)
 - National League of Cities (NLC)
- The Association of Climate Change Officers (ACCO) is a professional society that works with numerous other professional societies to align efforts and integrate climate competencies into their own frameworks.
- HEALTHeWeather — medical / health societies

4. Metadata

- The Dept. of Interior’s [Climate Science Centers](#) provide a database of their projects and those of the [Landscape Conservation Cooperative \(LCC\) Network](#) via the [USGS ScienceBase](#), which includes discovery metadata about each project.
- [U.S. Climate Resilience Toolkit](#) (CRT) is an integrating framework with discovery metadata in its [Tools](#) compendium, [Case Studies](#) from every U.S. sector and region, [Find Experts](#) map, and [Reports](#) listing.

- Develop assessments of the impact of climate in the U.S., and provide this info via interactive and easy-to-use websites (e.g., the [National Climate Assessment](#))
 - Case Studies and Tools on the CRT within the '[Built Environment](#)' and '[Water](#)' sections
 - Organize metadata for climate assessments through the [GCIS](#)
 - Contribute to interagency groups on data management, including discoverability
 - [Climate Central](#) (an NGO) developed a [sea level web tool matrix](#) with NOAA, which points our web visitors to state / local resources. We're always looking for ways to reach more audiences who could benefit from our tools.
 - Arizona State University Consortium for Science Policy and Outcomes (CSPO). We generate public value data on climate change / resilience through a facilitated public consultation process.
 - Land cover / land use standards — [The National Map](#) (USGS)
5. Advertising / Marketing
- The U.S. Forest Service stood up a web portal for the best-available tools and practices in green infrastructure / urban forestry
 - [www.mfpp.org](#) & webinars & conference calls & conferences / public speaking & newsletters and e-newsletters
 - Local government professional associations (e.g., ICMA, NACo, NLC, APA, etc.). Our tools include newsletters, websites, conferences, reports, and blogs.
6. Other (*folks were invited to add their own miscellaneous items here*)
- The Resilience Dialogues (hosted by the U.S. Global Change Research Program) connects communities looking to build climate resilience with subject matter experts and federal and non-federal resources via an online dialogue.
 - Arizona State University Consortium for Science Policy & Networking develops and maintains a network between the university, museums, and policy makers.
 - NACo supports engagements and partnerships where people can share their work and discuss current topics.
 - Azavea is a for-profit benefit corporation that offers:
 - An open-source API and Lab using NEX-GDDP and LDCA data
 - Launching "Temperate" — an adaptation planning tool for cities to create vulnerability assessments and action plans
 - Partnership with ICLEI USA
 - USGCRP coordinates interagency groups on climate data, information, & tools
 - ACCO educates and trains decision-makers on climate-related competencies and points them to sample resources & tools.
 - Model Forest Policy Program provides rural adaptation planning focused on natural resources — watershed, forests, economic.
 - Climate Solutions University:
 - Facilitates community-based adaptation plans and implementation
 - Builds capacity of local communities in skills to assess risks, develop solutions, and adaptively manage adaptation actions
 - Collaborates with organizations or local governments for funding and technical support of implementation

- Education to build the field of adaptation practice
- Allergy Projections based on temperature and precipitation forecasts
- NEMAC / FernLeaf:
 - Helped define the CRT's 'Steps to Resilience' methodology
 - Build tools and implement solutions that support the Steps to Resilience methodology
- Ensure incorporation of education users' impact of resilience tools to developers.

4.6.2 What resources are better leveraged than reinvented or duplicated?

The following existing resources were identified as better leveraged than reinvented / duplicated:

- webLyzard
- Cal-Adapt (open source, on GitHub)
- Georgetown's Climate Center
- CAKEx
- DOI's ScienceBase
- DataBasin
- U.S. Climate Resilience Toolkit
 - Steps to Resilience framework
 - Climate Explorer (open source, on GitHub)
- Resilience Dialogues
- The [CLEAN network](#) has a taxonomy and resource peer-review process that could be leveraged

4.6.3 What key gaps & issues should we address?

- Need a common metadata schema for tagging our online content (relates to next two bullets)
- Need better curation of our online content to make it more easily & more widely accessible
- The language we use in different places is different in terms of key questions and their answers, the scale of thinking, the framing of issues, etc.
- Need an ability to identify and characterize users (their needs, motivations, values, information-seeking behaviors, etc.)
- Need a mechanism to flag missing resources, or when desired resources don't exist
- Need a better ability to communicate / share lessons learned across sectors
 - Similarly, there's a lack of "bridges" between sectors
- A systematic process for sharing stakeholder surveys (i.e., social science research) and lessons learned
 - E.g., the Association of Floodplain Managers surveys its members every 5 years. Would they be willing to share their results with everyone in the RE?
- Need ways of dealing with misinformation
- Government personnel's inability to attend conferences
 - Similarly, government agencies not engaging with public communities

4.6.4 What is necessary for the viability of this group's goals?

- Overcome the limitations in guiding people to private-sector resources.
- Need to break down / bridge over organizational silos.
- The ability to share and intercompare our results and lessons learned, in association with quality assurance, best practice, success metrics, practitioners' and clients' perspectives, etc.
- Need a quick and easy way to narrow / filter search results
 - Online tools and content could be tagged with specific attributes, such as relevance to location(s), profession(s), functionality(ies), etc.
- Multiple funders investing in one open-source application (rather than duplication / competition)
- Build intelligence into curation. Some related notes:
 - Guided by subject matter experts' (SME) knowledge, contributed to by collective crowd-sourced intelligence
 - The CRT was built using interagency teams of SME who identified what exists for hand-curated syntheses and collections of content and tools.
 - The CRT's Steps to Resilience are a framework of "action verbs" that can serve as frames of reference for tagging our tools and content.
- Galvanizing people is about pooling strengths into unifying focal points for outputs / outcomes that benefit all contributors.
 - How can we support this work going forward as federal funding declines?
 - Should we set up a lasting system or identify an entity or organization who can serve as the engine / catalyst to drive the agenda of "enhancing discoverability"?
- People (clients, stakeholders, decision makers, etc.) need help getting closer to taking action, more than they need us to develop another tool.
 - We need to form strategic relationships that recognize and take advantage of our complementary skills, functions and resources — snapped together like puzzle pieces.
 - How can we continually share ideas, create and develop strategic plans, curate our resource for enhanced discoverability and interoperability, for each step in the CRT's StR?
- Cloud computing is essential — how might we work with companies like Google, Amazon, and Microsoft to activate and leverage their expertise and products?
 - Think in terms of how *they* benefit from partnering with us.
 - Free access to tools, data, and information is important.

4.6.5 How are members of this group (or "cluster") connected to each other; how *should* they be connected?

- The Climate Resilience Toolkit (CRT) brings together inter-agency teams of SMEs who serve as science panelists to review and evaluate information and tools for inclusion.
- The U.S. Global Change Research Program (USGCRP) is a hub for global change and climate research from all across the U.S. federal family of science agencies.
- Professional Societies — enhance the discoverability of other practitioners

- The Urban Sustainability Directors Network (USDN)
- American Society of Adaptation Professionals (ASAP)
- Association of Climate Change Officers (ACCO)
- Social media — our connections need to improve
 - Linked-In and other professional groups can help
 - Could establish a listserv with moderator(s)
 - Google alerts, e-newsletters, and other content pushes
- Could create a “Registry of Adaptation Practitioners”
 - Offers details about what “piece of the puzzle” each entity has
 - Characterizes needs and behaviors of users (e.g., market research)
 - Addresses the advertising problem (i.e., building the market and the solution(s) at the same time)
 - Bridges the gap between those who are “plugged in” and those who are uninformed

4.6.6 Where are we stronger together, rather than going it alone?

- Community adaptation planning is inherently a co-production of knowledge process
 - Regional and local context
 - Need many partners
 - Need diverse perspectives from: information providers, stakeholders, users, etc.
- Identifying common user / audience needs
 - What is known about user needs today?
 - What user surveys / studies are being done, or will soon be done? (to avoid duplication and/or stakeholder “fatigue”)
 - What lessons were learned? What are resulting recommendations (e.g., dos and don’ts)?
 - How do they seek / use information?
 - What services / formats / protocols exist for interoperability of our tools and data products?
 - Utilize regional forums for knowledge sharing on these things and more!
- Leverage what exists
 - Saves time and money
 - May achieve scalability / replicability that wouldn’t otherwise be possible

4.6.7 What should be our goals?

- PROPOSED GOAL 1: Adopt, adapt, and expand a selected semantic web tool (e.g., webLyzard) to enhance discoverability to content all across the resilience ecosystem (RE).
 - The CRT offers webLyzard, which could be leveraged, modified, and expanded to serve this purpose. Theoretically, any / all websites in the RE could host the CRT’s same search functionality, with two settings: (i) search local (default), and (ii) search the entire RE, with an ability to parse the results according users’ facets of interest, e.g., location, functionality desired, topic, etc.

- Could collect and share data on how people are searching for information, what they're searching for, what are their questions, and what content is most popular.
- PROPOSED GOAL 2: Develop and implement methods for optimizing search results in popular search engines like Google and Bing.
 - Regarding goals #1 and #2, it was agreed that emphasis in enhancing discoverability should not be placed solely on digital content.
- PROPOSED GOAL 3: Conduct a cross-RE workshop to develop and implement a common metadata / content tagging schema
 - It was noted that the [Federal Geographic Data Committee](#) (FGDC) has developed a common taxonomy, and has a committee for this purpose.
 - There could be some sort of “seal of approval” from an overarching national organization, such as the FGDC or USDN or ASAP.
- PROPOSED GOAL 4: Contribute to and participate in Regional Adaptation Forums to help sustain learning networks with training / capacity-building sessions. (This item was seen as linked to goals #3 and #5.)
- PROPOSED GOAL 5: Identify and select a standard-bearing entity or professional society who will act as a “hub” in leveraging multiple other professional societies and capitalize on their networks and communication channels (“spokes”).
 - Someone noted AGU is already doing this.
 - Build capacity within science museums to engage communities

Participants voted to select their top two gaps, goals, and recommended solutions, the outcome of which is summarized in Section 2.2.5.

4.7 Sustainability, Extensibility, & Interoperability

4.7.1 Paper notes

Breakout Session 1

Goals:

General Themes

1. Field level signal: resources that are existing
2. Finance Mechanisms
 - More efficient coordination between organizations and the functions they perform
 - Increase available funding for community-based organizations
 - Highlight education and how it furthers resilience
 - Push to work with networks with sustained funding and leverage existing networks
 - Increasing incentives for interoperability
 - More rapid identification of existing funding
 - Extensibility
 - Create partnerships that service the gaps in existing programs
 - Fill gaps with pre-existing programs and funding through interoperability
 - Keeping national conversation going – keep the trusted voices talking

- Learning from those who have the most success
 - Successful models of dissemination
- Building out the community of practice
- Reducing redundancy and increasing efficiency

Gaps:

General Themes

1. Levels of education
2. Effective science translations
3. Interoperability between existing organizations
 - Effective means of communication across ecosystem
 - Standards of practice on how we present data
 - Lack of regulatory drivers
 - Lack of fundamental science/science literacy
 - Resilience decision making takes time
 - Granularity – tension between granularity and extensibility
 - More money to build platform versus maintaining
 - Lack of understanding of how the world is operating
 - The way science is being disseminated into the marketplace
 - Initiatives need field level significance at individual level
 - Diversity is missing – low income/frontline voices missing
 - We are building new things, instead of using existing bodies of knowledge
 - Building out more effective science translators
 - Incentives for using existing products
 - Complicated space – over reviewed stock taken in at an inefficient and separate way
 - Integration of existing tools
 - How do we organize to the field level?
 - Education of the public and elected officials
 - Become more relevant in non-traditional communities and dispel misinformation
 - De-politicization – what words can we use to reach the end user
 - Make sure science translators can reach non-traditional partners
 - Essential to viability of the ecosystem
 - Connect climate change resilience to community needs
 - Reduce redundancy and increase efficiency
 - Messaging tools in a more relatable and applicable ways
 - Rebranding climate change dialogue on how it can improve lives at the individual level
 - Solution-based approach to communication
 - Values-based framework
 - Knowledge of community-based resources
 - Create communication play-book
 - Making data digestible for public health (or other non-science)
 - Extension of tools across areas
 - Taking stock of current resources

- Products are not being tailored to existing needs due to lack of direct interactions
- Decision spaces are very different across fields
- Time consuming to reach out to people who do not identify with what you do
- Speak to individuals in their own language and space
- Improve translation capacity
- Incentives to align mitigative platforms
- What does a mature ecosystem look like?
 - Diversified ecosystem

Breakout Session 2

- Need to move more to model open-source tools as well as data so people can build from a big head start in development
- Knowledge producers, brokers, and users
- Knowing what is used most often helps focus development and funding
- CAKE users are very broad from novice to expert and come from many sectors
 - How do we make specific tools that still serve everyone?
- Pepperwood Foundation: people actually paid for custom, brand-able portals
- Shouldn't we develop competition around search?
- How to get funders to prioritize interoperability (or leveraging existing tools?)
- Connecting CAKE, PREP, and RD to get many levels of support and engagement
- E CAST network
- Ways to create new wholes greater than sum of parts?
 - Too many tools, not enough guidance. Tools and guidance should come together. Help people figure out both the relevance of tools and the methods for using it
- Why has drought consolidated into one authoritative tool but sea-level rise hasn't?
 - What is a proper level of consolidation
- EcoAdapt made partnership to make case studies of use of tools
 - Should systematically rather than ad hoc
- What level of diversity across industries and interests are there on various topics?
 - Drought interest focused within agriculture, sea level rise all over the place
- Actually cataloguing actions instead of plans is difficult
- What didn't work? Failures and lessons learned in case studies is rarely studied
 - People don't have to share their failures; fear of funder response
 - These lessons learned are crucial
- How to identify actions as related to adaptation? Gets very complicated
- How do we continue the conversation?
 - Consider partners more for capturing stories (e.g. use media)
- Top info source is always peers and colleagues even if not most authoritative

4.7.2 Flip chart notes

Session 1

Goals & Objectives

- More efficiencies, coordination between organizations and functions they perform
- Increase available funding for community-based adaptation
- Highlight education and how it furthers community resilience
- Leveraging existing networks and resources to meet gaps
- Increasing incentives for interoperability
- More rapid identification of funding (and more finding overall)
- Identifying different types of funding
- Assess existing tools
- Building community of practice

Gaps or Barriers

- Depoliticize ecosystem and address misinformation
- Effective communication across ecosystem
- Across stakeholders and scales
- Standards of practice
- Lack of regulatory drivers
- Takes time
- Lack of coordination with private sector
- Lack of fundamental science education
- Emphasis on public education
- Achieve engaging product for larger scale decision-making
- Funding for maintaining versus building
- Lack of communication to target user
- Knowledge of sources for community solutions
- Diversity in producers
- Increase science 'translation' capacity of field of service providers
- Integration of current tools
 - Expand existing tools/resources to meet emerging gaps/needs
 - Taking stock of who does what
 - Funding for expansion vs new tool

Essential to Viability

- Connect climate to community
- Decreasing redundancy and efficiency
- Messaging/Communication to the public
 - Value-based versus technical
 - Solutions versus problems
- Extension of tools across areas to meet new sectors and needs
 - Taking stock of current resources
- Improved translation capacity
- Define 'Adaptation' and 'Resilience' as a field
 - Related to other fields of practice/sectors (health, water)
- Understanding what mature ecosystems look like
 - Diversity in the ecosystem (some redundancy is okay)

Session 3

Connections?

- Interoperability across search features
- Resilience Dialogues (Online)
- ECAST Network (Universities, Museums, Think Tanks)
- Translation
- What tools to use, how to use tools, where can it be applied?
 - Develop Case Studies
- Coordinate funding for sustainability
- Challenging to find funding for integrated efforts
- Framework to collaborate

Solutions?

- Diversify funding sources
 - Public-Private partnerships
 - Diversity funding sources
 - Breweries as Public-Private
 - B-ventures
 - Social Impact Ventures with millennials
- Connect partnerships to user/audience interests
 - Get creative
 - Include Youth
 - Flip the narrative
 - Connect community to climate
 - Get involved with informal education
- Coordinate gaps in funding with foundation program service
 - Funders facilitate the building of new things to solve problems
 - Not maintenance of existing things
 - Need maintenance strategy*
 - Need funder memo to communicate support needed*
- Better include tech transfer (pilot action)
- Federal-Private partnerships related to congressional foundations

Participants voted to select their top two gaps, goals, and recommended solutions, the outcome of which is summarized in Section 2.2.6.

4.7.3 Cluster Poster (Sticky Note Exercise)

1. Can your content be syndicated?

Jessica Hitt, EcoAdapt

- State of Adaptation -Field level synthesis and analysis reports
- Case Studies, resources, tools

Carrier McDougall, NOAA Education

- Develop models for how education can support community resilience

G. Griffith, Climate Solutions University

- Community based adaptation planning
- Proprietary curriculum materials – potential for broader use if funding were available

Lauretta Burke, WRI

- PREPdata.org is global and scalable
- Applications anywhere at any scale

ASU CSPO - We extract public value about climate change resilience through facilitated, informed, representative public forums. Materials and process can be used/repurposed after they are developed

ASAP - Yes – prize for progress in some cases ; Webinars

Anonymous Contribution - We're building the software in an API so that it can be widely distributed for integration into other apps.

USGCRP - GCIS (climate report provenance database) content is sources from report authors (a crowd?) and can be downloaded or processed for user use

2. Do you crowdsource?

- USGCRP - GCIS (climate report provenance database) content is sources from report authors (a crowd?) and can be downloaded or processed for user use
- Anonymous Contribution - Platforms to share existing resources created by other organizations when possible – so not to reinvent the wheel (Ex. MA Climate Action Tool)
- Jenna Maran, NAC - Have Twitter chats with own members on specific subjects and gather stories/tips/etc. during meetings & conferences
- Lauretta Burke, WRI - PREPdata began (launched Jan 16th) on a curated data platform. Now launched, it will be a crowd sourced data platform.
- Anonymous Contribution - One aspect of Daily Breath is crowdsourcing flare-ups
- ASAP - Leverage Adaptation Pros in ASAP
- Jessica Hitt, EcoAdapt - CAKE case studies
- Anonymous Contribution - Curated crowdsourcing for Vibrant Cities Lab

3. Does citizen science have a role?

- Leigh Peake, GMRI - Produce collaborative research on the Gulf of Maine Ecosystem – working to incorporate data produced by fishermen and other ocean stakeholders along with basic science
- Anonymous Contribution - For Daily Breath, we're pursuing a grant to connect data from clean Air Carolina & Our Keepers Program (citizen science) the the app

- Anonymous Contribution - Long-term obs. Network; validate climate models & projections; engagement with data and uncertainty
- Anonymous Contribution - Specific projects use citizen science but not integrated through the program
- RISA Program - Yes – through collecting drought impacts information

4. Can your service feed into others?

John Nordgren, CRF

- Support efforts to coordinate C.S>
- Enable collaboration among entities
- Provide *resources* and *connections*

Gwen Griffith, MFPP

- Facilitate community based adaptation planning and implantation
- Build Capacity of local communities to assess risks and take action to address risks
- Create resilience for forest and water resources
- Collaborate with communities for implementation projects

Carrie McDougall, NOAA Education

- Facilitate use of NOAA's resilience resources aiming educators to improve environmental literacy for community resilience
- Builds capacity within community *members* (not professionals) so that they can participate in decision making

Lauretta Burke, WRI

- PREPdata.org is highly interoperable – working with over 30 partners we link to and allow others to link to us. *Open Source, Open Data.*

Anonymous Contribution

- Our data and information is used by practitioners in their system models

DOI Climate Science Centers

- We promote the development of partnerships and fund projects that leverage their work

ASAP

- Our API integrates other sites' info

Jessica Hit, EcoAdapt

- Technical Platform for knowledge exchange and community driven content
- CAKEx.org

Leigh Peake, GMRI

- Creating tools for localizing data for a variety of ocean stakeholders (for example, Parks & Rec folks responsible for beach closures)

USGCRP

- GCIS can be used to enable other services, like visualization of data used in NCA

Lauren Lynch, EcoAdapt

- National Adaptation Forum: in-person meeting that allows colleagues to share best practices and catalogues those for future use

5. Are your data downloadable?

- Laretta Burke, WRI
 - PREPdata – we serve up data; visualize on map; data from platforms
 - *Most* are downloadable from source
- Anonymous Contribution - Form data is downloadable, but we often want to know how they use it first
- GLISA - Yes, all info publicly available
- DOI Climate Science Centers - Our data are mostly downloadable
- Lauren Lynch, EcoAdapt - National Adaptation Forum: PowerPoint presentations available to view and download

6. How sustainable is your operation?

- Gwen Griffith, MFPP/CSU (Climate Solutions University) - Sustainability depends on grant funding for community participation and our services
- Laretta Burke, WRI - Sustainable finances – not yet. We have some funding for platform application, but we have not identified core operational funding for PREPdata.org
- Anonymous Contribution - Hard to fund maintenance for all our online tools
- Eric, Healthy Weather - Health Weather is personalizing public health, so we're targeting climate/weather context for driving preventative health and wellness
- DOI Climate Science Centers - We have a line item in the federal budget, comeliness ultimately decides out funding
- GLISA - Mostly dependent on federal funding – NOAA
- Anonymous Contribution - We depend a lot on NOAA funds
- USGCRP - We work on a public-private collaboration called the Resilience Dialogues. This partnership between Feds + non-Feds helps to distribute responsibilities and resources, enables specialization, and reinforces the sustainability of the effort.

7. How many months of funding do you have?

- Anonymous Contribution - Funding Climate for Health: investment grants, government, foundations, international
- Laretta Burke, WRI - PREP has about 5 months of funding
- Anonymous Contribution - The water resources dashboard was created through joint efforts of NOAA and a number of national foundations and organizations

- Anonymous Contribution - The actual development was by CRT to continue influence, we anticipate volunteer contributions
- MASS ECAN - No on-going funding for staff time for network building
- ASAP - Approximately 24, plus sustained funding
- Anonymous Contribution - Funding is decided annually by congress (and it's always late)
- GLISA - Up to congress
- Anonymous Contribution - In theory, 5 years, but depends on federal government

8. Other?

Jenna Moran, National Association of Counties

- Educate county elected officials (webinars, publications, conference sessions, etc)
- Provide spaces for local governments to share their stories (peer exchanges, caucuses, committees)
- Build tool kits/tools to help local communities build their resilience
- Specific products/programs
- Resilient counties Initiative
- Disaster Toolkit for counties (coming)
- Strengthening Counties Coastal Resilience
- Guide to Coastal management (tentative title_ for local elected officials (coming)

Leigh Peake, GMRI

- Offer public engagement events in informal science centers for the interested public to interact with data on SLR + Storm Surge

Anonymous Contribution

- Establish collaborative studies around authoritative data

Anonymous Contribution

- Adaptation Strategy Database
- - build on and integrate with existing tools
- CAKE
- Georgetown
- USON

NOAA Education

- Coordinate funding with other federal and non-federal entities

Eric Klos, Health & Weather

- Deliver personalized weather insights for better patient health
- A weather and environmental intelligence data platform
- 1st solution targets asthma

Lauren Lynch, EcoAdapt

- National Adaptation Forum – provides professional development for adaptation professionals

- Contributes to community of practice
- Creates in-person/online venue to share information

Leigh Peake, GMRI

- Engage 70% of Maine 5th/6th graders in exploration of ecosystems of Gulf of Maine including climate impacts, SLR, and storm surge

DOI Climate Science Centers

- We are a government supported network of climate science centers that service natural resource professionals in a variety of ways.

Lauretta Burke, WRI

- Co-Lead the Partnership for Resilience and Preparedness (PREP) which seeks to reduce barrier to accessing data for climate resilience planning.
- We promote interoperability and PREP has developed an OPEN data Platform for map-based visualization of climate, physical, and social data.