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Center for Law, Energy &
the Environment

Planning and Scoping a **Tahoe Climate Center**





PLANNING AND SCOPING A TAHOE CLIMATE CENTER

Final Recommendations

The companion documents to these Recommendations set forth many of the considerations and options for a possible Climate Center at Lake Tahoe. This document provides the recommendations of the primary authors of the full set of documents (Ken Alex, Rick Bolton, Michael Dettinger, Jordan Diamond, Terrell Watt, and Allison Wolff) based on multiple interviews, research, and our own observations and experience. The development of a Tahoe Center will be an iterative process, with significant input from any advisory board and the initial executive director, as well as from staff and other interested parties. These recommendations are designed to help start and shape that process without being prescriptive.

Recommendation #1: There is significant value in creating a new climate center at Lake Tahoe, but only if it is well-funded from the outset, has a purpose, function, and focus broader than the Tahoe Basin, and tethers science, technology, and policy, with the central goal of making impactful contributions to action on climate change. It is worth emphasizing that Tahoe should be the backdrop for the Center, not the primary focus, so as not to conflict or overlap extensively with existing entities.

Recommendation #2: The Center should aim to add value, promote the extensive science already underway in the Tahoe Basin and Sierras, and work with external partners. The Center should focus on how science applies to policy and implementation of climate solutions. The Center would aim to transform and lead on many of the issues, policies, and strategies that it addresses.

Recommendation #3: While there are many possible themes and focuses for a Tahoe Climate Center, two that had particular resonance are issues of the Mountain West and issues of Mediterranean climate, both of which also have implications and lessons for similar ecosystems around the world¹. Lake Tahoe would provide a great backdrop for study and action on these issues, and they are not currently the focus of any high-profile center. At the same time, we recognize that other themes, such as rural-urban interface, community resilience and adaptation, and transportation, to name a few, are also compelling. Many of these issues and themes overlap, and some of the Center's focus will necessarily depend on the expertise and interests of the board, executive director, and staff.

Recommendation #4: The Center's initial hire for an executive director is important for all aspects of the Center and its development, and should be done with great care.

Recommendation #5: Ideally, the Center would be part of the development of science technology, or sci-tech, as it relates to climate change. For example, big data and artificial intelligence are improving

¹ We note that the term "Mediterranean climate" may be too narrow if it is perceived to exclude the areas east of Tahoe, and, if so, a more inclusive description should be used.

our understanding of forest fire management and community resilience; satellite and optical technologies provide more precise measurement of greenhouse gas emissions sources. A new center that embraces technological advances could provide a unique perspective and voice, becoming a clearinghouse for technological innovation at the intersection of climate science, resilience planning, and decision-making, as well as a link between technology, science, and policy.

Recommendation #6: The Center should have a public aspect, through media, story-telling, and other forms of communication, with a focus on climate information/education, solution implementation, and action. This function could help amplify the work of other Tahoe-connected entities.

Recommendation #7: The Center should take advantage of the Tahoe's unique beauty and setting. It should be a place that people want to convene. Two location suggestions worth exploring are the Event Center on Kings Beach and the Sierra Nevada College.

Recommendation #8: The Center's convening function can and should take many forms. We like the concept of "convening-for-action," with the idea that, while dialogue is important, climate change requires action. The Tahoe Center, from the outset, should organize for, and promote, carefully targeted outcomes from convenings, whether they are among scientists working in the Basin or world leaders gathered for a summit. In addition, in light of COVID-19 as well as new technology, the Tahoe Center can be a leader in modernizing convening functions regionally and globally.

Recommendation #9: The Center should not be California-centric. The multi-jurisdictional nature of the Basin is a strength. This could be highlighted by including both Senator Diane Feinstein and Senator Harry Reid as founders of the Center.

Recommendation #10: A remarkable amount of scientific work in the Basin and across the Western US is tied to universities in California and Nevada. This should be supported and expanded, with even greater focus on particular policy initiatives. Partnerships with the University of California and others should be explored and formalized with this focus in mind.

Recommendation #11: Initial funding for the Center is key. If the Center is underfunded, it will become a competitor to other entities in Tahoe and other climate centers. If it is well funded from the outset, it will be perceived as a good potential partner and source of technical, political, and funding support. A number of factors are relevant to what the initial funding level should be. For example, the nature, size, and extent of the physical location are important to determine. Conversion of an existing building or complex may result in very different costs than obtaining and developing a new property. The size and experience level of staff could impact the budget, as could operating expenses, and technology costs. It would be a useful exercise to build a five-year budget in concert with several potential funding sources.

Recommendation #12: It is outside of the scope of this effort to develop a fundraising plan, but one would certainly be essential to the success of the Center. One important decision to come is whether the Center should rely heavily on any single source of funding, such as a wealthy donor, government, or a foundation for most of its funding. Each has different implications. An endowment, of course, would be ideal, but difficult to achieve.

Recommendation #13: In all likelihood, the Center would be established as a 501(c)(3) entity (that could be an implementing organization for a public-private partnership), tax-exempt, and able to receive foundation funding and tax-deductible gifts. It is conceivable that the Center would obtain formal governmental status through state or federal legislation, but that is unlikely at the outset, and would

need to be consistent with careful consideration of what governmental role is needed to maximize the prospects for a successful, productive, and even transformative center.

Recommendation #14: While governmental (local, state, or federal) should have a role in the Center, it should not be dominant. The Center should be a public-private partnership, with the participation of policymakers, but not run by policymakers.

Recommendation #15: If the Center develops important sci-tech, commercialization will become an important possibility and potential opportunity. However, we recommend that the Center commercialize only with great care and caution. Commercialization could complicate the Center's relationship to government, foundations, universities, and its non-profit status.

We very much appreciate the opportunity to evaluate the potential for a climate change center at Lake Tahoe, and would be pleased to help expand on the vision and bring it to fruition.

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PLANNING AND SCOPING A TAHOE CLIMATE CENTER

Climate Action Acceleration

As part of an evaluation of the potential and scope of a Tahoe Climate Center, the Center for Law, Energy & Environment at UC Berkeley (in conjunction with Rick Bolton, Michael Dettinger, Terrell Watt, and Allison Wolff) provides this vision and strategic framework, along with an organizational structure and financial sustainability strategy, as set forth in the Scope of Work. The framework is based on our independent research into needs and structure as well as over 60 discussions with Tahoe organization officials, government officials, scientists, NGO leadership, communications specialists, Tahoe community members, and funders (listed in appendix A). The Final Recommendations at the fore of this report detail specific recommendations; the remainder of the document includes and explains different options and approaches.

Summary

We found a surprisingly strong consensus of support for a Tahoe Climate Center, with some caveats. The consensus is centered around the idea that there are many climate centers and many entities working on science and Tahoe issues (identified in the landscape maps in appendix B), but a high profile, well-funded center with a strong identity and clear strategy addressing significant gaps that exist, located at Tahoe, would add significant value. For a Tahoe Center to succeed, it should focus on moving the vast body of scientific work on landscape resilience and climate solutions into demonstrative, systemic approaches that can be replicated. Focus areas could include exemplary ecosystem management and monitoring, facilitation of science-driven policy and policy-dictated science, “scitech” innovation (technology, such as remote sensors built to support science or data-driven decision support) and facilitating communication amongst researchers and with decision-makers; it should have a connection to Tahoe and the Sierras, but have a broader (including non-California-centric) reach and impact; it should provide a convening and visualization function; and it should be a place with attractive facilities that people want to visit. The key caveats are that it must have sufficient funding at the outset and into the future, otherwise, it will be just another center fighting for identity and donors; and the initial hire – the first Executive Director – is key to overall vision and success. As a result, we anticipate that the Center’s overall vision and scope will evolve through an iterative process of founding principles and Executive Director action.

With respect to its structure, it is clear that location, facility, and funding are essential elements. Funding will help define the size of staff, ability to provide grants, and extent of policy and applied

science initiatives. Ensuring and defining a role for government, without governmental control, is important, as is a role for academic institutions in both California and Nevada.

Climate Center Attributes

Most of those we interviewed agreed on much of what a Tahoe Center might/should encompass.

Location and Convening Function

The Tahoe location is very appealing, which is a significant factor in being able to attract high-caliber partners and participants, as well as attendees for Center functions. This is particularly important because most interviewees identified a convening function as an important part of the center's role. In addition, the physical attributes of the center, including where in the Tahoe area it will be located and what building(s) will it be located in, as well as what people experience, will make a difference in its ability to convene high-level participants. Two locations that were suggested are the Event Center on Kings Beach and the Sierra Nevada College.

Focus of Center

We heard repeatedly, and from different sources across government, science, NGOs, and more, that there is no need for an additional entity focused on hard science, and that any new effort needs to be clearly differentiated from, albeit with informal collaborative ties to, the missions of the Tahoe Science Advisory Council and the Tahoe Regional Planning Agency. Although there may be some local overlaps with some aspects of those missions, a new Tahoe Center could/should have at its focus a combination of:

- a. Tying climate science to policy beyond the Basin, with occasional examples within the Basin;
- b. Communicating science, particularly connecting science to policy, including multi-media, such as film, AR/VR, and podcasts, to affect public perception and understanding;
- c. Providing a science clearinghouse and data hub, including tracking climate activities to enable better communication and coordination;
- d. Leading community-based prioritization of efforts and data needs, synthesizing and analyzing science, and eliciting and communicating policy-focused expert opinion from the science community;
- e. A systems approach, combining science, policy, technology, and industry/business;
- f. Tool-making and remote-sensed monitoring (the next big thing) to bridge science into real-world land, infrastructure, and ecosystem management actions;
- g. Overseeing pilot projects with broader transferability (and probably with parallel sites outside of the Basin);
- h. Providing grants and fellowships; and
- i. Bringing scientists and policymakers together, and serving as a nucleus for organizing science and scientists, including identification of climate-adaptation science requirements (see Appendix A).
- j. Coordinating and complementing with other climate-action entities regionally and worldwide
- k. Providing a forum for technology/climate conversation and integration with government policy.

In addition, and in light of COVID-19, new technologies, and new options for how groups are convened,

the Center could integrate different models for convening under the rubric “convening-to-action,” which would also tie the convening function with the application of science to policy and promote a stronger set of international connections.

Relation to Tahoe and the Sierras

A Tahoe Center should not be solely or even primarily about the Tahoe Basin, but should use the attributes and uniqueness of the Basin and Sierras as a way to attract attention to and participation in its activities and objectives, and to communication of climate issues that are particularly well illustrated there. Some themes, applicable at any scale from Basin to international but well motivated and illustrated by convenings and activities at the Lake, were mentioned repeatedly by interviewees:

- a. The rural-urban interface, encompassing issues in both the Sierras and Central Valley;
- b. Transportation, particularly in heavily used, primarily rural forested areas;
- c. Rural, forest economy and the impacts of climate change (including opportunities like biomass management);
- d. Rural, tourist, ecosystem, community resilience, particularly with in-migration of wealthy city residents, and the relation of visitors to conservation in changing climate;
- e. Sustainability (broadly, and in association with the iconic ecosystem of the Sierra) and carbon neutrality;
- f. Wildfire and risk reduction;
- g. Water (snowpack, quality, watershed);
- h. Applied science, pilot projects, bridging with academia;
- i. Regional approaches, bi-state, local-state-federal, private-public issues and cooperation;
- j. Forest community sustainability (encompassing many of the above);
- k. Natural and working lands and landscape approaches to climate change, optimal land management;
- l. Climate issues as increasingly faced in Mediterranean conditions and landscapes (including the Great Basin landscapes east of Tahoe);
- m. Climate policy and land management, particularly in a tourist economy;
- n. Integration across multiple sectors (with key ties, especially, to economy and policy);
- o. Climate refugees and exurb pressures on the range; city dwellers moving en masse to the range, with many lessons to be learned from COVID-19 and social injustice-driven protests
- p. Mountain/forest areas of the West and indeed of the world;
- q. Climate adaptation across the American West;

- r. On-going role in California Assessment and any future Nevada Assessment.

Geographic Scope

Many interviewees expressed a hope that the Center might look beyond Tahoe and the Sierra Nevada to take a leadership role in regional to global issues. Several interviewees indicated that too much Tahoe focus would be a detriment for a variety of reasons, including that if the Center is too narrow in its geographic scale it would likely only add more competition to an already crowded science-funding environment. Most interviewees felt that the most useful niches for science-to-policy work by a new center may currently be at a regional, rather than either local or national, scale. The likelihood of success of geographic scopes that were suggested—Tahoe Basin, Sierras, Western mountains, or Mediterranean—will depend on the ability to integrate with ongoing activities at these levels and on the levels of funding available to the new Center. If the Center takes on a more regional or global scope, it would still work collaboratively with local science and land management institutions on exemplary, practical applications on land or in policy that would be relevant/replicable elsewhere (more on this below).

Among the more ambitious regional-scale suggestions were these examples, reflecting different possible emphasis:

- a. A Center focused on science-to-policy or science-to-action initiatives addressing mountain ecosystems, source water, and their far-reaching watersheds across the Western United States. (See Appendix A for discussion of the motivations and opportunities in this arena.)

While other institutions, including the Aspen Global Change Institute, do some work in this arena within the region, that effort is not central and has historically focused on the Rocky Mountains. A highly visible, well-resourced center at Tahoe could help to unify and coordinate activities across the region, including with other centers and leaders in the region, while ensuring attention to the unique aspects and needs of the Sierra Nevada, Cascades, and surrounding/downstream areas.

- b. A Center that develops a community of practice common to Mediterranean climates around the world was also an appealing vision. Mediterranean climates are characterized by cool wet winters and hot dry summers. In these settings, flora, fauna, water resources, and a significant fraction of the world's population and food production, all typically rely heavily on mountain snowpacks, directly or indirectly, to weather the long dry summers. The Sierra with its downstream California and Nevada watersheds (including desert areas) are prototypical Mediterranean landscapes.

Additional discussion of the motivations and opportunities for these particular regional suggestions is provided in Appendix A.

Independence and Innovation

Within core functions of convening, connecting science and policy, using Tahoe-related themes as a bridge to much broader approaches and activities, a Tahoe Center can (and should) build an

independent identity and promote innovation. This might take the form of a strong tie to new technology/tools, such as satellite-based vegetation and fire-related data. Another theme could be storytelling/media/visualization – using a Tahoe Center as a prime source of strong media content and stories about climate and science, helping people envision what is possible.

Role of Academia

Interviewees noted that the University of California (Davis, Merced, Berkeley, San Diego, and Santa Barbara primarily) and other academic institutions (including the Desert Research Institute and University of Nevada) have strong ties to Tahoe and the Sierra. The ties to the Sierra, as well as between the academic institutions, can and should be strengthened through a Center, with some suggesting that the ties be formal and others preferring more informal approaches. Some suggested that a multi-institute consortium, including multiple academic institutions and prominent partners, at a bi-state, regional or global scale could be a powerful combination. Given the many existing ties to Tahoe, we anticipate an on-going role for the University of California.

Major inputs to the Center from members of the science community would most often require funding. However, advisory or short-term contributions can often be procured for little funding, based instead on the visibility of the Center, its mission, specific projects, and the possibility that involvement will lead to future opportunities. Usually, raw data (existing observations and simulations) can be had almost gratis.

California and Senator Feinstein

To the extent that a Center is created in connection to Senator Feinstein, many interviewees suggested that it should not be overly California-centric. There was a strong suggestion that including Senator Reid in the identification (potentially a Feinstein-Reid Center or Institute) would nicely resolve this issue. Beyond this issue of identification, Nevada interviewees routinely cautioned against a too-California-centric Center on most issues and applications.

Caveats and Concerns

Two overriding caveats are the importance of funding and finding the right initial executive director. Without significant initial and sustained funding, interviewees felt that instead of adding value, the Center would be another entity competing for money, message, and identity. No one, however, wanted to hazard a guess as to the amount of funding that would make the effort viable, although it was suggested that having funding for five years of operation, hiring a strong initial staff, and an excellent location were important. Second, and related, interviewees felt that the person hired as the first Executive Director would be key to the Center's vision and success. This person would need to combine vision, strategy, networking ability, and leadership. Strong funding for the Center is key to attracting strong candidates and permitting ambitious goals from the outset.

Activities, Deliverables, and Objectives

Specific activities, deliverables, and objectives should be consistent with the functions and focus of the Center (convenings, data clearinghouse/scitech as a bridge to ecosystem management and policy action, policy proposals, communications, etc.), and will be largely dependent on the vision of the Executive Director and any associated board. And, of course, those functions are dependent on funding and staffing. The activities and objectives of a Center with an initial endowment or budget of \$10 million

would be very different from one with \$100 million. A significant level of funding would also ensure that the new Center would have a public profile and voice, essential for communication of climate issues.

In order to make a meaningful difference, have more than a skeletal staff, and provide support for work already taking place in Tahoe and the Sierras, we believe, based on our own experience, that initial funding needs to be closer to \$100 million than to \$10 million to make the effort worthwhile, aiming for a staff of ten to fifteen initially. A \$50+ million budget, for example, would allow recruitment and hiring of staff with capacity to build many of the functions identified above, and to do so over a 12- to 18-month period.

Strategy for Science and Technology Activities and Management

The science and technology strategy will depend on funding levels, but a few things are clear from the outset. First, the Center should not focus on doing new hard science in Tahoe and the Sierras; that science, to a large extent, is already being done. Rather, the science strategy should focus on prioritizing, consolidating, synthesizing, and communicating the science, and especially on applying it to policy and land/ecosystem management. This could take a number of forms, including outreach in the popular press and social media, convenings to share and elicit findings, development of tools for data analysis, visualization and education, and academic forums. With sufficient funding, the Center could help to drive science in under-addressed (but needed) directions by some combination of grant making and academic fellowship programs. In addition, the Center could help ensure transparency of data and science, and convene policy-focused gatherings of scientists, policymakers, and land managers (with the idea of convening-for-action).

However, the Center should do more than provide a forum for scientists to talk to each other. It should elicit findings and motivate studies and action in conjunction with the Center's broader policy aims and specific action items. Second, the Center could lead the "scitech for resilience" space - becoming a clearinghouse for technological innovation at the intersection of climate science, resilience planning, and decision-making, as well as a link between technology, science, and policy. This is dependent on staff expertise and interest, but could provide a strong focus and source of innovation. The management of these activities will depend on the vision of the Executive Director and Board and, as noted before, funding.

It should be noted that we are making a distinction between applied science (the application of scientific knowledge to practical applications and policy) and "scitech" (technology that bridges science to policy or land management actions, including monitoring, decision support, and communications). A Tahoe Center can promote both and provide added value together.

Organizational Structure

The organizational structure and culture of a Center will be influenced by the initial Executive Director (and any associated Board). Having said that, the location and function of the Center will impact its structure and culture, as will its potential association with any named founders. There are also some practical and legal considerations, including the role of governmental entities in the Center. Most felt that the Center should be a public-private partnership in some form rather than a wholly governmental entity. The potential for any earned income streams may also be worth exploring, as long as it is done with great care to preserve the overall credibility and integrity of the endeavor.

Optimal Positioning

What is the space a new climate organization can “own?” This issue is foundational to the Center itself, but also impacts structure. A convening function, for example, requires a facility, space, and location conducive to hosting; a science and data clearinghouse function necessitates technology and technological capabilities; a science-to-policy focus requires development of policy expertise and connections to government; a science-to-action focus requires land management ties and expertise. Therefore, positioning and structure should be reflective of the focus of the Center, which is still to be determined. However, some direction is already clear. For example, the Center should be independent (but with ties to academia, government, and NGOs), likely include a convening function, and likely provide ties between science, policy, and land management. So, structurally, the Center needs its own facility with space for convenings of various sizes, staff with science and policy expertise and connections, fundraising capacity, and strong communications functionality. In addition, there is a broad consensus that a Center should focus on opportunities that connect Tahoe to greater geographic scale, such as the suggestions around western mountain or global Mediterranean ecosystems, integrated with key issues such as land use management, rural/urban economy, and scitech.

Required Organizational Structure, Support Levels, and Institutional Connections

It is essential that a new Center interact positively with existing entities in the Tahoe Basin community, and that it adds value to those efforts where possible. However, in order to avoid adding to competition for resources within the Tahoe Basin or becoming too parochial, a common recommendation was that the Center have a broader geographic scope and vision. It is clear from the interviews that highlighting, communicating, and synthesizing existing science would be a well-received function, as would any ability of a new Center to help increase interest and support for action in the Basin. Given the likely focus on science-to-policy/science-to-action, a new Center should ensure clear ties to federal, state, and local governmental entities, particularly in California and Nevada, without becoming a governmental entity itself and while allowing for eligibility for grants (see below). The Center should also build its own capacity and relationships with academic institutions as well as with technology companies, through a number of avenues, including, potentially, partnerships and sponsorships.

Potential Legal and Fiscal Structures, Costs and Benefits

Role of federal, state, local government: There was strong support for a Center that has connections to government but that is not a governmental entity. It was important that the Center be independent and a trusted, transparent source for data, communication, and information. Government should be a participant in multiple ways, but not the dominant voice. The government role could take a number of forms, from an entity that has close government ties, to one that acts as a data provider, as a funder, or simply provides legislative recognition to the Center. Some possible governmental roles are set forth below.

Governmental entity. One model is an independent entity fully funded by the government with a particular purpose. The [Delta Independent Science Board](#), for example, is part of the state government funded Delta Stewardship Council and is designed to provide independent scientific review of issues in the Delta. While this structure provides a steady source of funding, it also limits the function and voice of the entity, which must conform to its statutory language and is subject to governmental oversight and

budgetary review (and could be subject to governmental budget issues). While this structure has some appeal, most felt strongly that a Tahoe Center should have greater independence and be less delineated by the government. Notably, TSAC leadership identified itself as working solely “at the behest of the agencies” active within the Tahoe Basin and not being an institute, but rather as representing science being done by agencies and academic institutions in the Basin and playing a role (already) in the Basin not too dissimilar to the Delta ISB.

Research arm. Entities such as the [Pacific Southwest Research Station](#) and [University of California Field Stations](#) provide another possible model. These entities focus on research and are funded by institutions (in this case, the US Forest Service and the University of California). They tend to be focused on hard science and have much less relation and connection to policy. Because a Tahoe Center should have a significant policy component, this structure does not seem to be a good fit. In addition, depending on the funding source and nature of the association with the funding institution, this structure runs the risk of being perceived as part of the funding institution rather than sufficiently independent.

Independent identity with a specific government role. [The Institute of Transportation Studies](#) at multiple campuses of the University of California provides an interesting and appealing model that would be very hard to duplicate. The state funds a portion of the Institute, but the institute acts independently with a focus on research, education, and policy, ensured of significant independence through the university setting. The combination of state recognition and funding, deep association with the university, independence, and clear function and niche could be a good model. It would be difficult to replicate, however. The association with the state began decades ago and has become institutionalized. Creating a similar relationship around a climate center would be politically challenging (although perhaps possible if Senator Feinstein were to be closely involved). As discussed above, a really successful center should have ties to multiple campuses within the UC system as well as to other academic institutions. Nevada also needs to participate for the Tahoe Center to be successful, and state funding would likely be modest. Establishing legislation would also possibly restrict the role of the Center, limiting its independence. This structure is worth exploring, recognizing that it could be a difficult political lift.

A related model is exemplified by the [National Center for Ecological Analysis and Synthesis](#) at UC Santa Barbara. The NCEAS received initial funding from the National Science Foundation and now is funded through government and other grants and donations. It was designed for independent science and research. While it does include some policy work, it is primarily focused on the synthesis of existing scientific research. The combination of government funding, association with academic institutions, and a good deal of independence is appealing, but the potential for limits on policy work would be challenging.

Joint Powers Authority. Some suggested that we consider a Joint Powers Authority, which is a governmental structure for multiple governmental participants. A JPA tends to be used when the entity is regional and needs taxing authority, and does not seem to be a great fit here. There are other models for regional collaborations, including [One Tam](#), which is made up of local, state, and federal agencies that have jurisdiction connected to Mount Tamalpais in Marin County. It is similar to a JPA, but has some additional flexibility. It is, however, still a governmental entity, dependent primarily on government funding. There is also the [California Landscape Stewardship Network](#), which includes NGOs as well as government agencies. A Tahoe Center should consider joining that network, but it does not appear to be a model for the Center itself.

Independent entity with participation of government through the Board. The most likely structure, at least initially, would be as a 501(c)(3) tax exempt entity, which precludes lobbying but allows tax deductions for donations. That structure is sufficiently flexible to allow growth and evolution. A 501(c)(3) structure also requires a board, which would be beneficial, and could be the source of identity. Some analogous examples include the [Aspen Institute](#) and the [Rocky Mountain Institute](#). A 501(c)(3) structure could also serve as a catalyst for public-private partnerships, including, potentially, an operating model that includes the possibility of earned income through commercial opportunities. (A commercial aspect could change the nature of the organization, so would need careful consideration).

The Board could be structured in many different ways to suit the needs of the Center. For example, if the Center had a regional focus, representatives of multiple governments and governmental entities could constitute a portion of the Board or be an advisory board with a specific charge, and advisory board representatives could hold seats on the full Board. The scope of government role and involvement could be reflected in the Board makeup and function. Government members should not be in a position to dominate the Board or control the focus and function of the Center.

Funding and capitalization: As noted, a 501(c)(3) is the most obvious choice because it allows tax-deductible donations, unless there is a clear path to government funding, such as for the Institute for Transportation Studies (and this would still likely be set up as a 501(c)(3)). Funding is a significant challenge, but is benefitted by a clear focus, high profile, and accessibility. The Center would need to set out with specificity how it will handle funds, particularly if it has an endowment, to ensure long term liquidity and value. It would be worth reviewing strategies of select NGOs and centers in formulating this set of strategies. It is also worth having a fundraising strategy, models for potential earned income streams, and funding commitments before proceeding too much farther.

APPENDIX A

Recommendations from the Science Community

More than 30 scientists and science managers working on environmental and climate issues, locally to nationally, were interviewed to elicit recommendations for themes to which a Tahoe Climate Center might most usefully contribute. This appendix focuses specifically on the findings from the interviews with scientists and science managers, providing some extensions and justifications for findings reported more briefly in the body of this report. Some repetition of findings from the body occur here as part of this specifically science-focused discussion. Recurring themes and suggestions from these interviews follow:

Science-Community Support

All interviewees were supportive of a new climate center in the Lake Tahoe Basin and none felt that it would necessarily be redundant. However, avoiding redundancy will likely require that it have a broader-than-Basin-scale scope.

Mission

Most interviewees feel the open space for a new Tahoe Center is on the “service” rather than research side. There was a somewhat surprising acknowledgement that far more relevant science is being done than is seeing its way into policies and adaptation actions. Although there is still much research and monitoring that needs doing, the real scientific gaps in the climate-change adaptation realm are putting the science we already have into real-world action. This is the real gap identified by the interviewees.

Integration of the natural science side of sustainability and climate change issues with socioeconomics and policy is much needed and not being accomplished well at present. Science and policies that integrate problems and solutions geographically from mountains to floodplains/ocean/drylands below constitute a gap that is on everyone’s mind. Social science-based guidance regarding adaptation decision making and science-to-action implementation, despite much rhetoric, remains under-developed and under-utilized. If the center can develop a credible way forward to provide or help others to achieve more of these various forms of integration, it will be a success.

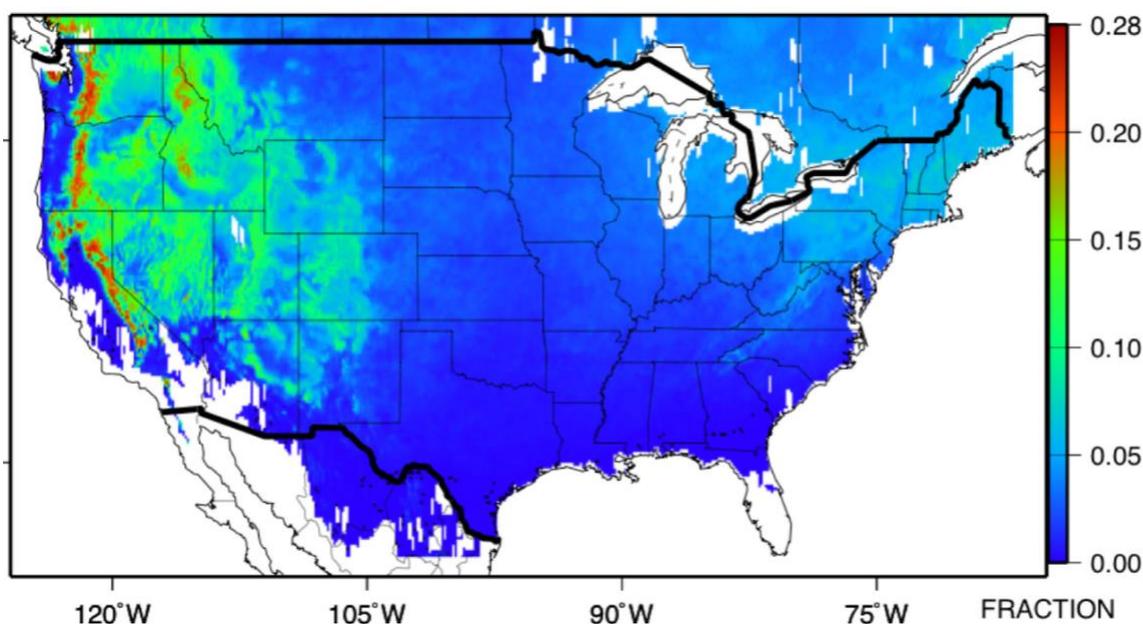
Focus and Scale

Technically, wildfire and related sustainability issues are the most pressing science-application arenas in the Tahoe Basin, across the Sierra, and in many settings outside the range. Beyond that, several interviewees identified the emerging issue of climate refugees and exurb pressures on the Sierra as a new topic of concern. Water (quantity and quality), ecosystems (including invasive species), and community resilience are also longstanding concerns.

If the Center is too narrow in its geographic scale, interviewees generally felt that it very likely would only add more competition to an already crowded science-funding environment. Several interviewees

indicated that too much Tahoe focus would be a detriment (for a variety of reasons). Most interviewees felt that the most useful niches for science-to-policy work by a new center may currently be at a regional, rather than either local or national, scale.

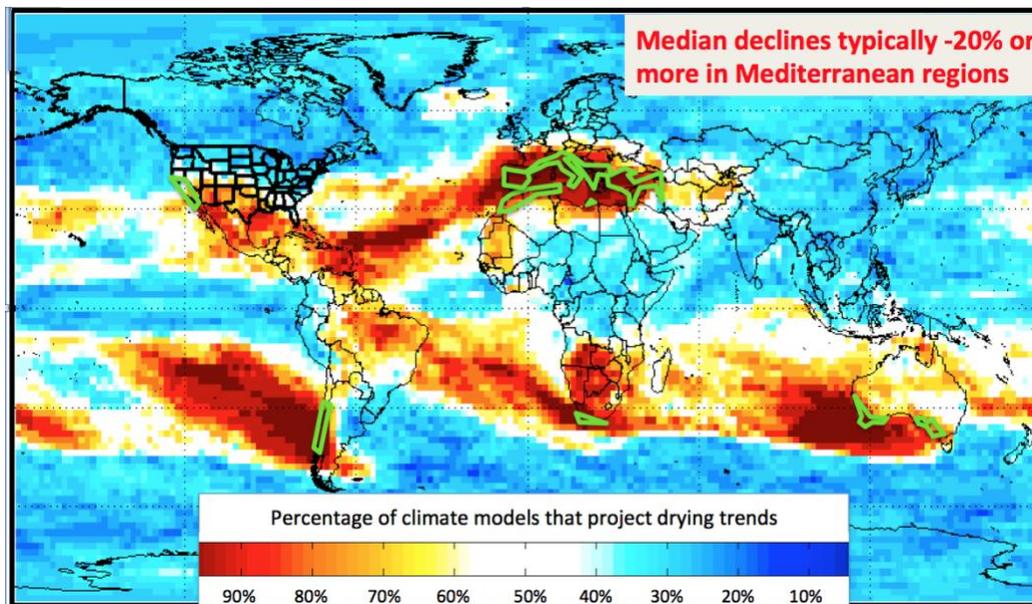
At a larger scale, a major gap—and a potentially unique target for a Tahoe Center—lies in acting as a nucleus and organizer for mountain science activities and applications across the Sierra, west, or globally. The mountains of the western US are in some crucial ways the areas in the US that are most vulnerable to impacts from global warming; e.g., as in Fig. 1.1, which maps vulnerabilities of snowpacks across the US to the first +2°C of warming. The Center’s efforts would most usefully address climate change issues in this region as an integrated spectrum of problems spanning the full range from environmental science issues to community resiliency, economic, and policy considerations. A slightly narrower theme for a Tahoe center could be a focus on western forests.



(Fig 1. 1) Vulnerability of winter snowpacks to a hypothetical +2°C warming, as indicated by the historical fraction of total precipitation that falls on days with temperatures between 0 and -2°C. This is the fraction of precipitation that is most likely to convert from snowfall to rainfall under a 2°C warming (Dettinger and Culbertson, San Francisco Estuary and Watershed Science, 2008). Warmer colors indicate more vulnerable snowpacks, so that the mountain West is the most vulnerable region in the conterminous US, with the Sierra Nevada and Cascades being the most vulnerable.

Some scientists (locally and nationally) suggested that another even larger scale niche for a Tahoe Center could be as a global center for climate adaptation issues in Mediterranean climates. Mediterranean climates are characterized by cool wet winters and hot dry summers. In these settings, flora, fauna, water resources, and human communities all typically rely heavily on mountain snowpacks, directly or indirectly, to weather the long dry summers, with California’s reliance on the Sierra Nevada for so many resources being a prime example. Global warming will deplete those mountain snowpacks, and current climate models almost unanimously predict declines in precipitation in these settings (Fig. 1.2), far more so than in other climatic zones. The many commonalities that ecosystems in these regions

share now, and their shared climate change vulnerabilities, argue for common and coordinated adaptation strategies. A Tahoe center could strive to lead a community of science and science-to-action players among Mediterranean regions globally with California, and the Tahoe Basin, as a centerpiece.



(Fig 1.2) The extent to which 15 modern climate models agree on the direction (sign) of annual precipitation changes that will accompany global warming in response to an extreme 21st Century emissions scenario. Warm colors indicate nearly unanimous projections of trends toward less overall precipitation, cool colors indicate a majority of models projecting more precipitation. Green boundaries enclose Mediterranean-climate zones globally. The deepest red zones coincide on land almost universally with the Mediterranean climates. (Discussed in more detail by Polade et al., Scientific Reports, 2017).

Whether it be for the Western US, California, the Sierra, or the Tahoe basin, most current science and science-to-action efforts tend to focus on impacts happening within the region. Many impacts within the region will happen because of changes far beyond the region (e.g., changing tourism patterns, food security issues, and air-quality impacts), and a center could make identification and mitigation of those remote connections an important theme.

Leadership

Several interviewees noted that there is already a great deal of scientific and adaptation activity going on in and around the Sierra Nevada, California, and the West on many fronts, but that these efforts currently lack integration and connectivity needed for real progress. Tracking (and providing easy information about and communication of) all the various activities in progress would make all these science and adaptation activities more efficient and productive. Compiling and communicating this information would be quite do-able by a Tahoe Center, but will matter relatively little unless the process and information are kept up-to-date. Thus, this activity should not be undertaken without a strong plan for continually maintaining and updating its findings.

Beyond merely tracking activities, several interviewees commented that an important reason that the large amount of climate-oriented science that is being done in California (and, arguably, nationally and even globally) is not finding its way to action is that objectives and efforts are not being coordinated

sufficiently from agency to agency, and from scientist to scientist. Scientific activities need to be contextualized in an overarching statewide or regional strategic framework that cuts across agencies and scientific institutions for greatest success. To address this situation, a concise, well-organized, and very specific “climate adaptation science requirements” document is needed, with community buy-in. NOAA, NASA, and DoD regularly develop such documents as a mechanism for identifying what specific scientific information is needed to support current and future actions, how reliable and accurate that information needs to be if it is to be acted upon, and when that information is needed. These documents typically address needs five to ten years in the future and differ from standard proposals and calls for proposals in that they do not prescribe the methods for achieving these results (leaving approach for the community to discover) nor do they usually depend on a specific funding mechanism. Rather they serve as an important organizational tool for drawing the science community’s focus to very specific needs of the action agencies while also providing a source of metrics that the action and funding agencies can use for gaging progress and directing resources. The documents are developed as a joint effort of the agencies and scientists, so that identified needs and targets are both realistic (scientifically) and pertinently actionable. A highly visible Tahoe center, with a mission that is not to do the science but rather to ensure science supports real action, might be able to organize or lead the development of requirements documents with broad buy-in, if the center and process are perceived to be inclusive, fair, and transparent enough.

The need for yearly science-to-action workshops came up in many interviews. Such meetings are fairly common at local and larger scales, too often with too narrow focuses. A sense of the interviewees was that too little interaction and cross coordination among scientists, and between scientists with policy makers, is happening in most areas at present. A regular, open, informal, and wide-reaching workshop series is needed to foster greater communications across regions, across sectors, across disciplines, across missions and political levels.

Contributions

Transaction costs for the science community, and between science and action, are dauntingly high. A center might aim to develop mechanisms for reducing those costs (e.g., by providing centers and services that take administrative costs and burdens off of small place-based efforts or of multi-institutional proposals to even larger funders). The region needs more long-term experimental watersheds and rangelands for science purposes. Some already exist but a center might be an important advocated for encouraging more or more stable sites.

A grant-making capacity would make the center a welcome addition for many in the science community, of course. Whether small or large grants, new options for obtaining funds for small to large activities are needed to propel scientific progress. A Feinsein Fellowship for students and postdocs would be an economical way to add energy and ideas to activities in the region.

Major inputs to the Tahoe center from members of the science community would most often require funding. However, advisory or short-term contributions can often be procured for little funding, based on the visibility of the center, its mission, specific projects, and the possibility that involvement will lead to future opportunities. Usually, raw data (existing observations and simulations) can be had almost gratis.

Local Concerns

Nearly all of the interviewees recognize that great science has been done in the Tahoe Basin, but that that science needs to be more widely aired and applied elsewhere in the Sierra (at least). At the same time, more opportunities for science done outside the basin to be replicated or tested in the basin are needed. The center can play an important role in helping these connections to happen, regardless of the scale of its overall themes. Both local and state-level scientists acknowledged that, to avoid redundancy and undue competition, the Center will need to have a mission that is clearly distinct from the Tahoe Science Advisory Council (TSAC) and agencies in the Basin and steers clear of actual policy making.

Primary interviewees:

- a. John Andrew, California Department of Water Resources
- b. Kumud Archarya, Desert Research Institute
- c. Greg Asner, Director, Arizona State University Center for Global Discovery and Conservation Science
- d. Kristen Averyt, Nevada climate-change "tsar"
- e. Roger Bales, UC Merced
- f. John Calloway, Delta Science Program
- g. Dan Cayan, Scripps Institution of Oceanography
- h. Sally Collins, former Deputy Chief, US Forest Service and founder of the Environmental Markets program
- i. Martha Conklin, UC Merced
- j. Jill Frankforter, USGS Director Nevada Water Science Center
- k. Greg Greenwood, Mountain Research Institute
- l. Alex Hall, UCLA
- m. Ellen Hanak, Public Policy Institute of California
- n. Alan Heyvaert, DRI Reno & TSAC
- o. Radley Horton, NASA/Columbia U (active in NYC climate planning)
- p. Susan Hubbard, Lawrence Berkeley National Lab
- q. Susan Jamerson, Washoe Tribe Department of Environmental Protection
- r. Robert Larsen, CTC & TSAC
- s. Jim Lawrence, NV Department of Conservation & Natural Resources
- t. Peter Lawrence, NCAR
- u. Amy Luers, Future Earth (ngo)

- v. Michael Mann, U Pennsylvania
- w. Kathleen Miller, NCAR & IPCC
- x. Jeff Mount, Public Policy Institute of California
- y. Anke Mueller-Solge, USGS Assistant Director for Projects, Sacramento
- z. Anne Nolin, UNR
- aa. Marty Ralph, Scripps Institution of Oceanography
- bb. Eric Reichard, USGS Director California Water Science Center
- cc. Hugh Safford, NFS
- dd. Geoff Schladow, UC Davis TERC & TSAC
- ee. Julie Vano, Aspen Global Change Institute
- ff. Tamara Wall, DRI & Western Regional Climate Center
- gg. Leroy Westerling, UC Merced
- hh. Susan Wilhelm, California Energy Commission (5th Cal Assessment)

APPENDIX B

Mapping the Landscape

What are the areas of opportunity for a Tahoe Climate Center? What are the best options for maximum impact? At what geographic scale should a Center operate?

The findings that follow provide context in relation to existing climate change centers and initiatives, with maps highlighting opportunities and the recurring themes that emerged in Discovery.

Without being prescriptive at this stage, the report focuses on important early insights, with suggestions for possible subject matter and geographies of particular interest. A primary mechanism for communicating the results is the following set of charts that plot subject matter focuses against geographic scopes for existing institutions and organizations in the climate change arena, as a means for identifying thoroughly covered combinations along with areas that are presently underserved. A diagram that displays the full climate and institute landscape is presented, and then filtered through the lenses of three distinct themes or pathways of possible focus recommended by stakeholders, in order to provide a sense of where a Tahoe center could best fit and add value: **Southwestern U.S. Resilience; Western Mountain Socioecological systems Resilience; and Global Mediterranean Ecosystem Resilience**. These themes, which should include the landscapes east of Tahoe, are among the possible focuses of a new center, and all reflect the single resounding signal that came from the scoping process: ***“Move science into action.”***

Interviewees were clear: considerable hard science exists or is in progress. What is needed is an entity that moves science into land management and policy action, with the potential to integrate exemplary land management, policy-shaping, convening, and specific initiatives, such as, for example, a full scoping of biomass issues/solutions and an ability to communicate an effective narrative.

The mapping exercise is informed by these considerations and by the general view that this project should reach beyond an exclusively local agenda, to a more regional, national, or even global footprint.

Methodology

As a companion to the ***Climate Action Acceleration: Planning and Scoping a Tahoe Climate Center*** report, the insights represented in this mapping have been informed by 60+ stakeholder interviews and additional research.

Legend

- In the initial maps provide an overview of the climate center landscape, we have plotted organizations against the axes and sized them to reflect a relative weighting of their influence and relevance to their coordinates on the map.
- An organization may appear in a number of locations, reflecting its multiple disciplines.

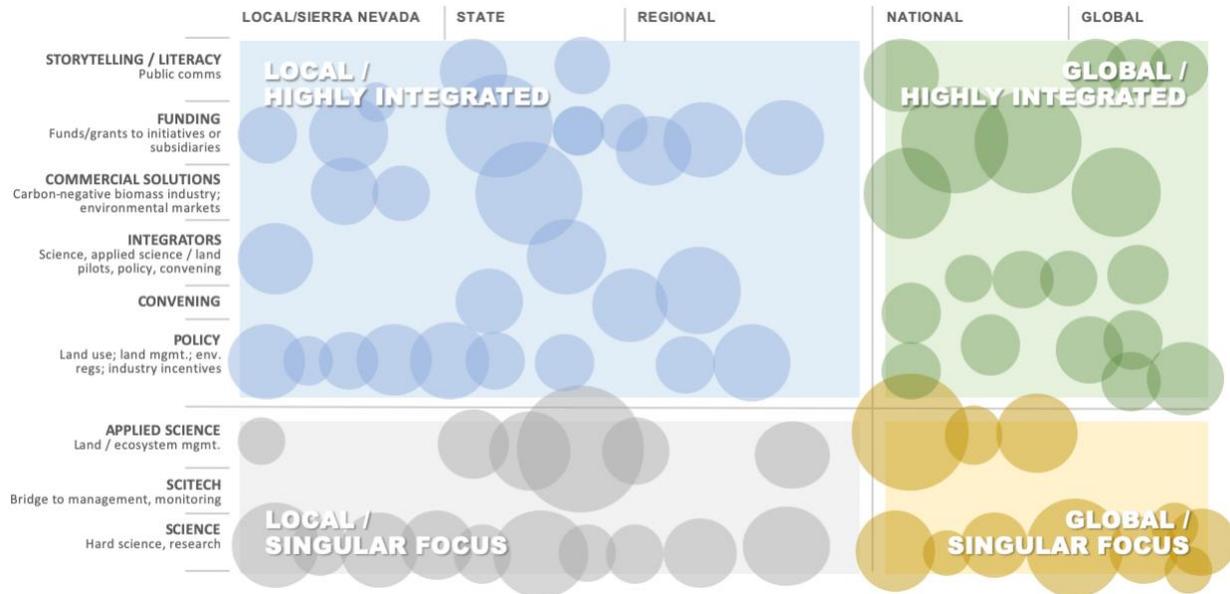
- The key insights from these maps appear as reasonably scribed “white space,” areas that are not subjects of existing organizations and initiatives.
- The next series of maps provides a snapshot for examples of possible center pathways, that occupy subject matter and focus in less congested white space of opportunity.
- Lastly, we have provided a catalog and short dossiers for the full list of organizations plotted in this report.

Glossary

- **Science:** Defined as “hard science,” meaning mostly research and basic monitoring; generally only marginally connected to specific land management practices. Sometimes informs policy.
- **Scitech:** Data-driven tools/platforms for land/ecosystem management and monitoring that bridge science to decision making at every scale, from plot and organism scales” to state/nation-wide prioritization and policy. For example, satellite-based monitoring systems or data driven decision support tools for land restoration.
- **Applied Science:** Scientifically-informed land management, for example, actual forest treatments on landscapes (e.g. thinning, Rx burns, meadow restoration, etc.).
- **Convening:** Gathering, and eliciting opinions and plans from, thought leaders or stakeholders to foster new solution options, and to increase collective understanding and action.
- **Integrators:** Entities that focus on promoting or implementing systems approaches to solving climate adaptation and land resilience problems by means that include science, scitech, applied science, and policy.
- **Commercial Solutions:** Promoting and enabling adaptation and resilience activities that will ultimately be self-supporting through market mechanisms. For example, commercial solutions would include things like tech transfers and (ideally carbon negative) biomass industry.
- **Funding:** Providing grants and other forms of financing made directly from the Center or managed into place from third parties.

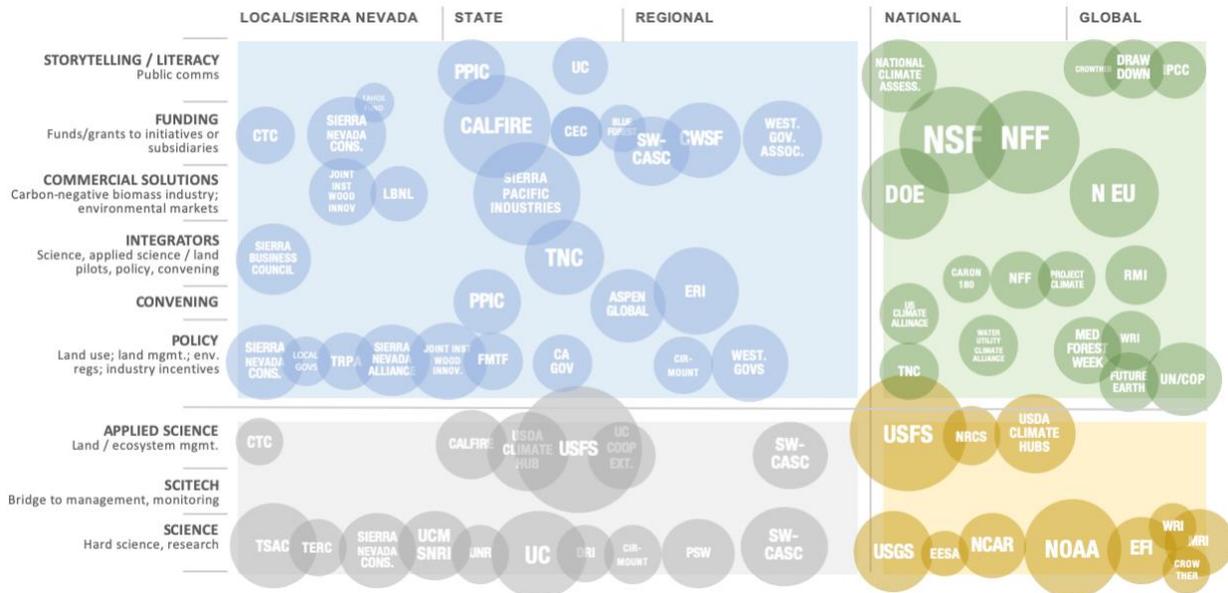
Climate Center Mapping Overview

Climate Center Mapping: The Quadrants



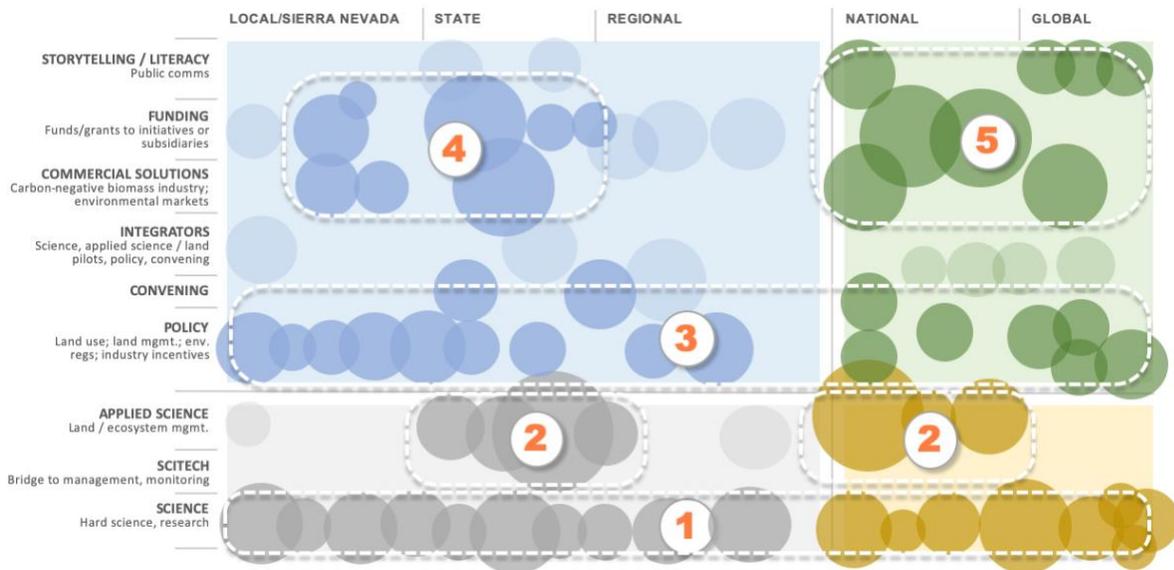
(Fig. 2.1) **The Quadrants:** Four corners of opportunity are marked by geographic reach on the horizontal axis and possible practice areas on the vertical axis. The areas where dots cluster are scopes and scales that have already attracted attention and action so that, although truly new ideas might be able to add to progress towards solutions, a new center will likely nonetheless have difficulty adding much without some truly lucky and revolutionary strategies. Areas that are devoid of dots are the scope and scale combinations that are, at present, not receiving as much attention, and where a new center can exert the most immediate and progressive leadership and progress.

Climate Center Mapping: Overview



(Fig. 2.2) **Overview:** Organizations generally have their specific core purposes and competencies, although some institutions/agencies are notable for broader capabilities and motivations, e.g., USFS and university systems. Clustering in this landscape also reflects differing histories of action and levels of development. *For example, storytelling/literacy and scitech are emerging focuses while Hard Science and Policy both have much longer histories and thus larger numbers of organizations involved.*

Climate Center Mapping: Existing Clusters



(Fig. 2.3) **Existing Clusters:** Understandably, *Hard Science* (1) is the most developed and occupied space at all geographic scales. This correlates to a key insight from our research: Most of the hard science that already exists is not being applied to land management or policy. ***What is needed is an entity that moves science into land management and policy action.***

Applied Science (2) requires significant resources, and has tended to happen most often at state and national levels. Historically, there has been a lack of funding sources for regional work, with most regional organizations (e.g., WGA) tending towards policy discussion etc. The DOI's SW-CASC is an example of regional science, but is relatively new and supports, but does not engage in, actual management actions.

Policy (3) occurs and is developed, and thus has been addressed at most scales, except the regional scale. The regional gap reflects a history of relatively limited regional governance and problem solving. This has materialized only recently.

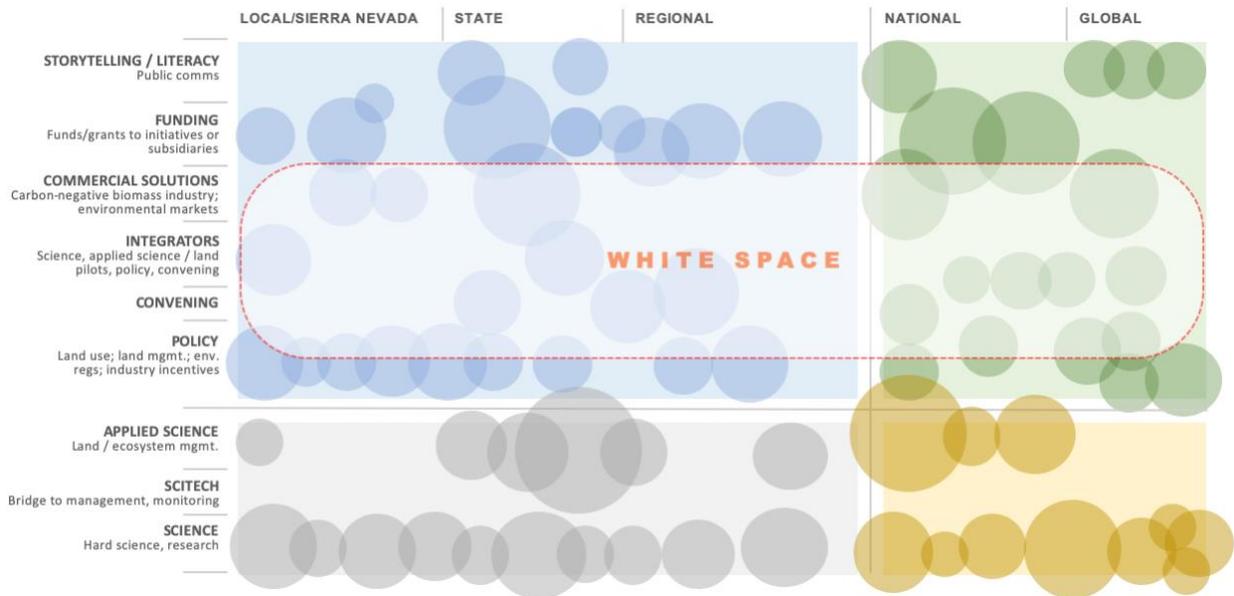
Escalating wildfire, tree mortality, and water issues have generated increased focus and *Funding* (4) for resilience e.g., Calfire, state conservancies. These resources have been historically directed to diverse activities at local to State levels, but with relatively recent regional coordination (mostly in the fire realm). The critical nature of megafire has caused an alignment around the need for ecosystem restoration across every sector, but this new alignment is recent enough and contentious enough so that technological and policy innovations, investments, and coordination that need to be developed and scaled now can probably not be provided quickly enough by the public sector on its own.

Storytelling, Funding and Commercial Solutions, National and Global (5) addresses a more general list of issues—including climate change itself—and the mobilization of resources. Often, it is not that a particular problem requires national or global solutions, but rather that the issue depends on resources and information inputs at levels that can only be met by activities coordinated at both hyper local and regional or global scales, and by mobilizing markets.

Functional Focus Areas to Consider

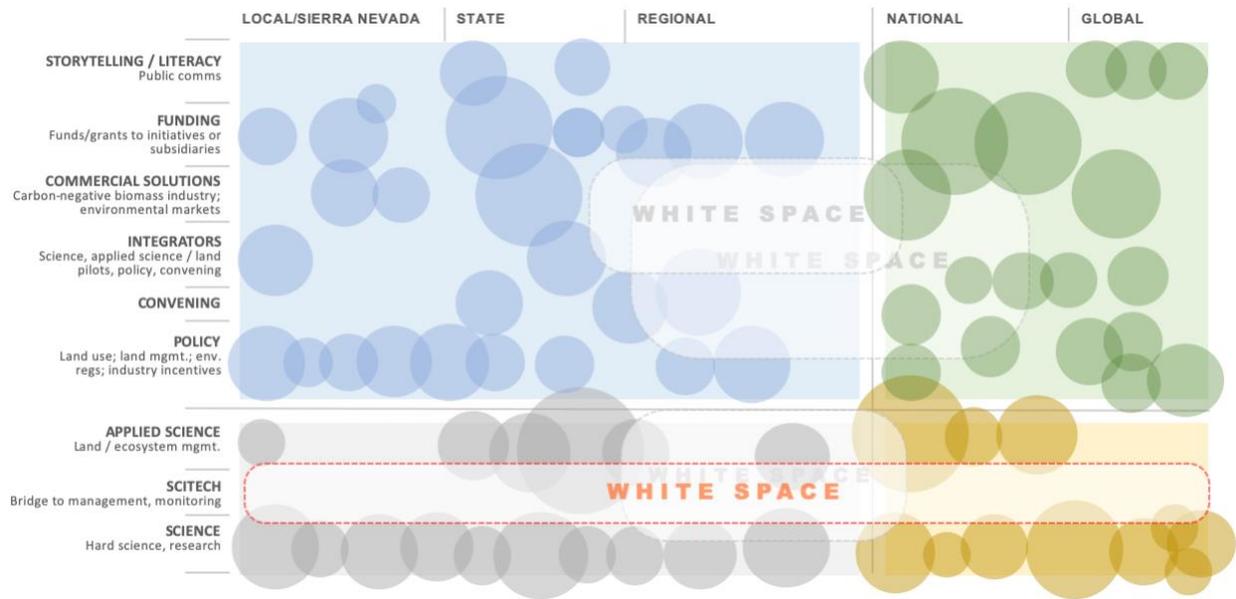
Various functional areas consistently emerged in our research, from applied science to convening to narrative and storytelling to enabling and accelerating integrated approaches. Below we have identified potential white space opportunities within each key functional area.

Climate Center Mapping: White Space Integrators

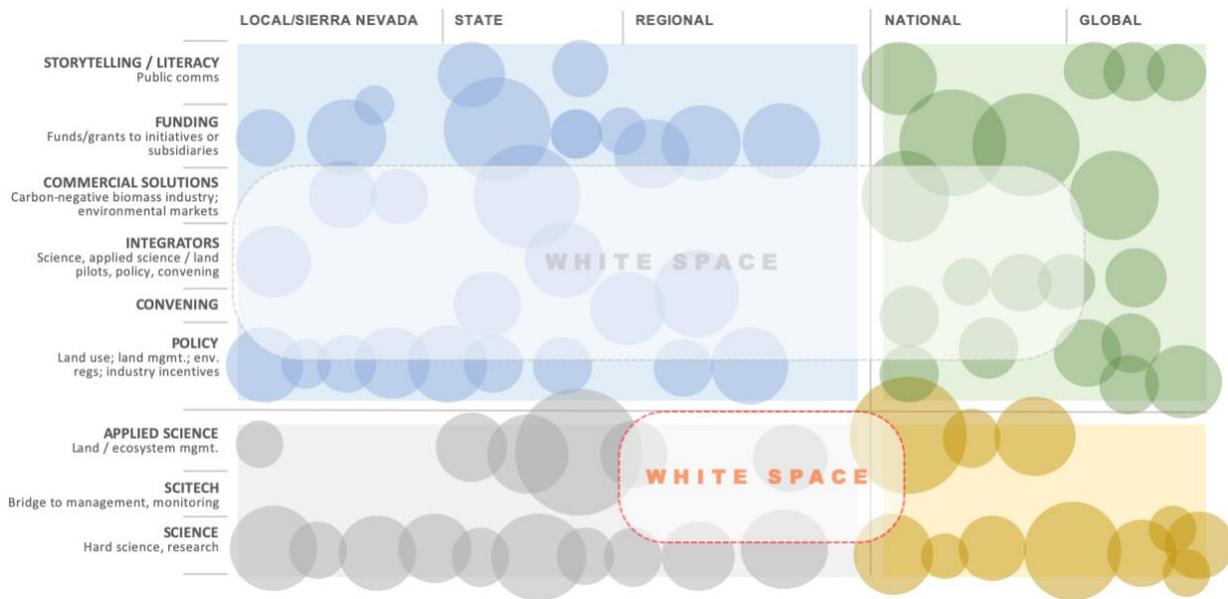


(Fig. 2.4) **White Space - Integrators:** With the clusters understood, the white spaces not only emerge but their size and firmness as opportunities become well defined. It is clear that an integrated approach that combines applied science, policy, markets and narrative, in various forms and degrees of inclusivity, is needed at all geographic scales and is well-supported by the qualitative research. While some aspects of an integrated approach may be portable across geography, tailor-ability to local needs and opportunities is key.

Climate Center Mapping: White Space Scitech (regionally applied)

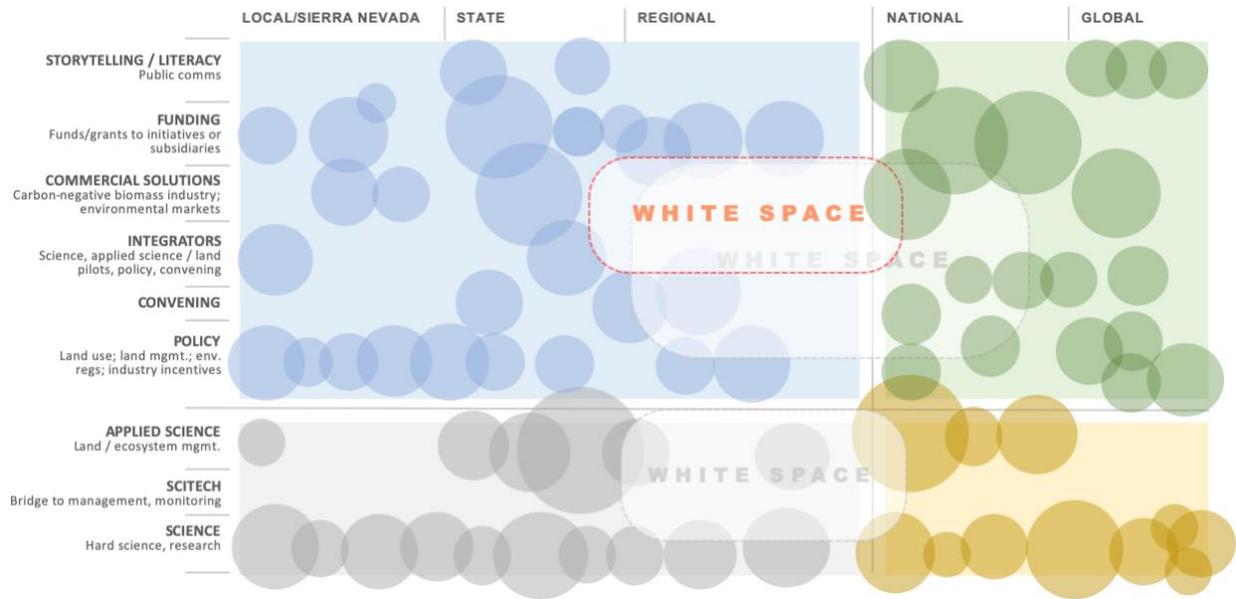


(Fig. 2.5) **White Space - Scitech:** *Scitech* is new and could develop quickly enough that it offers many discrete opportunities across all scales, but its power needs to be focused on the highest impact opportunities – a key role a new center could play. Whereas digital transformation has evolved banking, entertainment, retail—and just about every other space—these technologies are underdeveloped in their application to natural resources and are critically needed to help scientists, land managers, policy makers, and public keep up with today’s dramatic rate of ecosystem change. This tech can be the bridge from the existing abundance of science to the creation of new useful tools that apply that science in the field from the tree/house level up.



(Fig. 2.6) **White Space - Scitech:** At minimum, the development of *Scitech* coupled with (and enabling) *Applied Science* is an integrated solution that would clearly differentiate the Center. While this opportunity exists at all scales, economies of scale would be achieved best at larger landscape or regional levels.

Climate Center Mapping: White Space Commercial Solutions

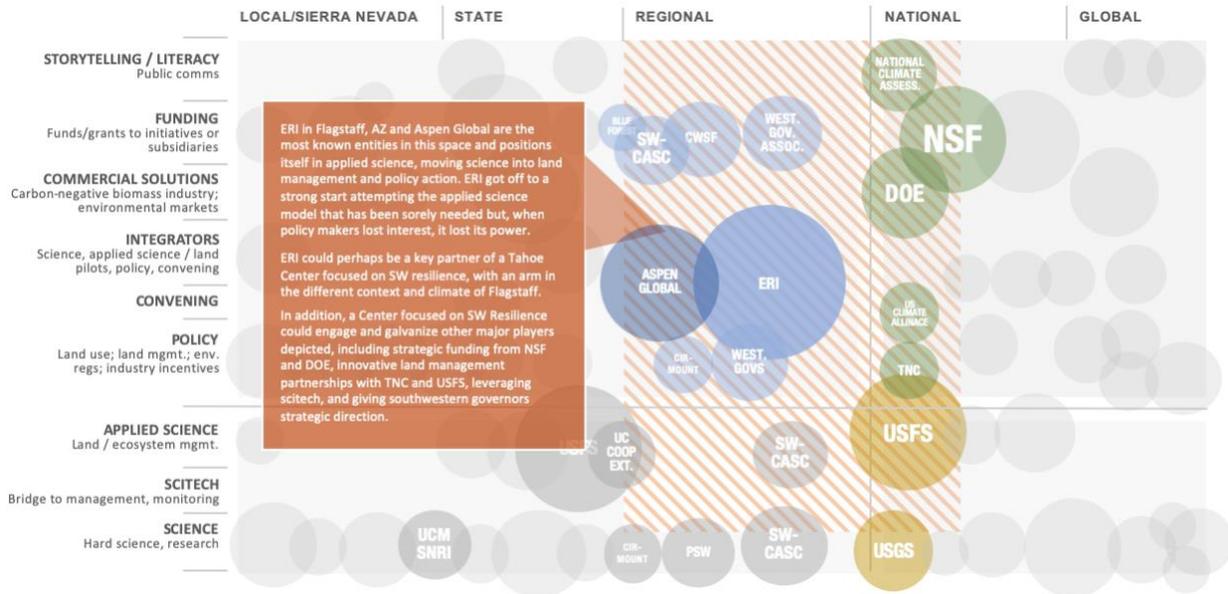


(Fig. 2.6) **White Space - Commercial Solutions:** *Commercial Solutions at the core of a restoration and resilience industry (e.g. biomass markets, precision forestry equipment) are clearly needed to solve the challenges we face at scale. Commercial solutions offer a mechanism for “right sizing” for local needs and capacities while allowing coordination at regional or global scales, without the burdens of increasing direct government control. Extending the model into this territory would likely raise the capital hurdle at first but could create long term economic flows to a Center, possibly sustaining the center over time.*

Geographic Scales to Consider

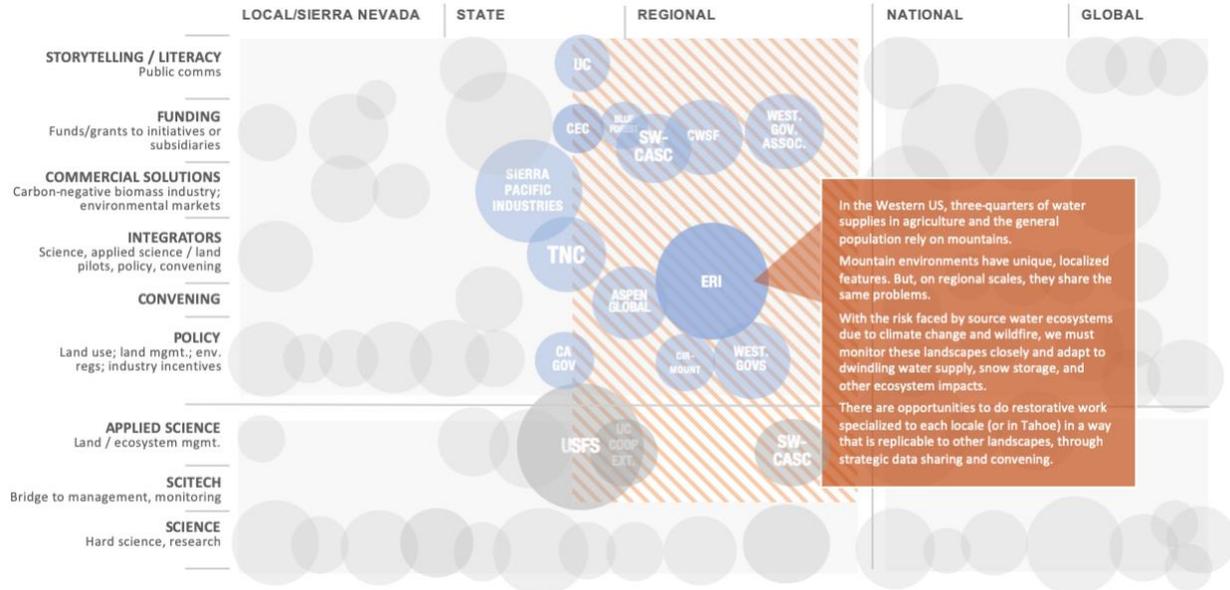
Three geographic focus areas consistently emerged from our research: Southwestern U.S. Resilience, Western Mountain Socioecological Systems, and Global Mediterranean Socioecological Systems (including relevance to landscapes east of Tahoe). All three of these geographies are at risk in the face of climate change and could meaningfully contribute to land-based carbon drawdown, in addition to protecting many other ecosystem services, if resilience is restored.

Climate Center Mapping: Southwestern U.S. Resilience



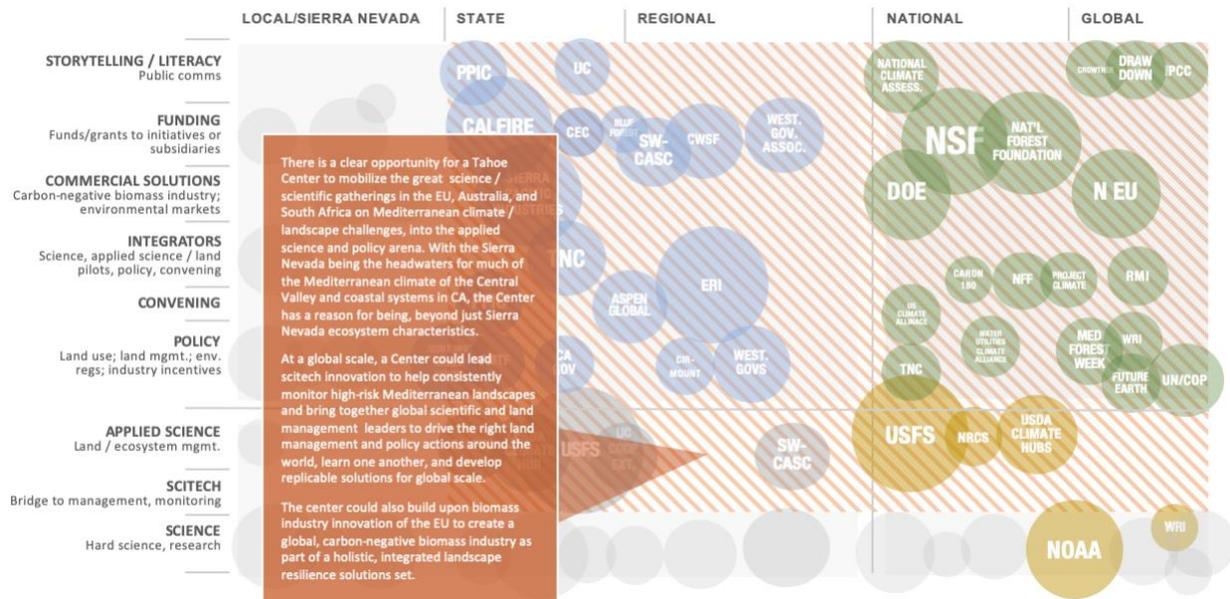
(Fig. 2.7) **Southwestern U.S. Resilience:** The Southwest is extremely vulnerable, with a rapidly changing climate and growing population, over-fueled forests, a vast amount of flammable grass- and shrub- lands, and dwindling water supplies and will make community safety and “saving what we can” priorities.

Climate Center Mapping: Western Mountain/Source Water Ecosystem Resilience



(Fig. 2.8) **Western Mountain/Source Water Ecosystem Resilience:** With 75% of water supplies across the west originating from forested mountain ecosystems, urban populations and agricultural systems in the west rely on winter snowpacks—stored and filtered by forests—to supply clean, abundant water year-round. Climate change means more rain, less snow, more intense storms, less of the overall water supply stored in snowpack, and more of the year’s runoff arriving in surrounding areas as dangerous flood flows. It means aridification, as a warming, dryer atmosphere pulls more moisture from land surfaces, trees and other vegetation, creating tinder dry landscapes. More than half of western wildfires can be attributed to climate change—Daniel Swain, UCLA, Aug 2020. Hazardously overgrown dry forests fight for room and water resources and succumb to disease, drought, and wildfire, making even more fire and flood risk likely and a reliable, clean water supply questionable for large populations and some of the world’s largest agricultural centers (CA represents 13% of global agriculture). The importance and services of western mountains do not end at their bases, but rather any meaningful attempts to address western-mountain issues will necessary want to/need to extend to the downstream areas, populations, and ecosystems that will be at the receiving end of many of these services and impacts. The good news is that resilience can be restored to these ecosystems, if action can be organized and taken soon.

Climate Center Mapping: Global Mediterranean Ecosystem Resilience



(Fig. 2.7) **Global Mediterranean Ecosystem Resilience:** Mediterranean “climates” occur across the southern EU and northernmost Africa, South Africa, the coastal parts of the Middle East, Chile, southern Australia, and California. These settings are regions where human and ecological communities alike depend on mountain snowpacks, catchments, forests, and other resources to survive the precipitation-free summers that broadly define Mediterranean landscapes. They also are home to a significant percentage of world population and food production (e.g., California provides 13% of global agricultural production). The Sierra itself are not a Mediterranean climate but the snowfed downstream California and Nevada watersheds (including desert areas) are prototypical extended-Mediterranean landscape; “extended” in the sense that most parts of the two states depend on areas with Mediterranean climates for water, energy, and other ecosystem services, even if they do not themselves fit that particular climatic description. Mediterranean ecosystems will be among the most impacted of any ecosystem by climate change, due to their extreme dependences on disappearing snowpacks and precipitation regimes that are projected to be the most likely to decline of any land regions globally. In spite of the importance of these landscapes, the risk to them and humanity is remarkably unrecognized, outside of a narrow roster of international scientific institutions focused on forestry aspects of these issues (European Forest Institute, ICUN, International Association for Mediterranean Forests, etc.).

APPENDIX C

Models to Consider for Structure, Operations and Funding

Initial Insights & Guidance

Structure and funding are interrelated challenges for a new Center. While both will be impacted by the Center’s mission and operational purview, this document anticipates scenarios identified in the *Mapping the Landscape* section of this report. This following describes some possible approaches along with specific concerns and corresponding requirements for optimal set-up, funding and governance.

As noted in the attached *Climate Action Acceleration: Planning and Scoping a Tahoe Climate Center* section of this report, any new center should launch with considerable resources and a substantive focus. This suggests the need for significant initial capitalization and the need for reliable funding sources, particularly if capital expenditures are anticipated (such as a new building). Other considerations include:

- Structure that ensures independence and enables work toward the overarching aim of bringing “science to action” (and “science to policy” as an important subset);
- Functional connections to academia, government (and a certain neutrality to navigate those corridors) and NGOs;
- An ability to add value to local organizations (versus competing for attention, talents and funding) and the science currently taking place in the region;
- A geographic reach extending beyond Tahoe;
- Ties to technology providers for potential partnership or sponsorship;
- Dedicated facilities to carry out the many forms of “convening-for-action”;
- The potential for placing land under management for purposes of science and demonstrating exemplary management practices;
- Ties to practitioners/managers (application/action, in general) in commercial and non-commercial capacities;
- An ability to tackle large, well-defined initiatives, i.e., regional- and/or ecosystem-based resilience initiatives; and
- The ability to attract and be accountable to a range of funding sources.

Further, to be viable, models for structure and funding should be tied, respectively, to territories of “white space” identified and defined in the landscape mapping exercise. These areas of opportunity, revealed and explored in the discovery leading to this report, point to a 501(c)(3) format as the basis and

with a charter designed for the specifics of the organization’s scope. This is a recommendation of this report, as the 501(c)(3) provides the requisite versatility and ability to speak to all of the above considerations.

The *Planning and Scoping* section identifies a number of possible structure options, ranging from “Government Entity” to “Private Enterprise”. While each model could play a role, for purposes of this, we are focused on 501(c)(3) scenarios.

As the focus of the Center becomes more fully defined, that will also narrow and clarify some of the structure issues and approaches. This array is presented as a list of “ingredients” (not mutually exclusive) for stakeholders to consider and potentially fold into their visioning and planning:

Ultimate Aims and End State

Capital Intensity: At the outset, it will be key to determine what assets and operational activities the Center wishes to eventually own, develop and/or manage plus the timeline to reach these goals. For example, developing a portfolio of land and facilities may quickly limit the number of pathways to funding and efficient construction. Additionally, the need for a significant and stable level of working capital will impact any of the more ambitious plans.

Operational Elasticity: Regardless of complexity, certain discrete practice areas suggest specific structures, e.g., a focus on *Commercial Solutions* could open up valuable revenue streams, but also result in expenses connected with developing, commercializing and protecting intellectual property and products at or above market benchmarks. If the Center includes the potential for commercialization, success here may rely on effective partnering for speed, distribution, and best practices, in addition to sufficient capital. We note that, if there is a commercial aspect, more evaluation and structural analysis is needed.

Domain: Even aside from funding, a Center focused on national or global impact will face incrementally different organizational and cultural pressures than an organization with a more local or regional focus.

Business Model, Operating Model, and Funding

If the Center takes on a broader set of the available opportunities—e.g., national or global focus combined with the development of technologies; commercial ventures; granting to other organizations and initiatives; media strategy and relations; and/or education—a case may be made for any number of scenarios involving **public private partnership** (PPP), for infrastructure or services, for reasons including:

- The scale of the ambition and the capital requirement;
- The range of operations and the need for best practices throughout;
- expanding the options for funding (including novel forms);
- Quality and cost efficiencies;
- Resilience and risk mitigation;
- Speed-to-market.

Figure 1. Different Levels of Private Sector Engagement in PPP Contracts

	Identify Infrastructure Need	Propose Solution	Project Design	Project Financing	Construction	Operation/Maintenance	Ownership
Bid/Build	Public Sector				Private Sector	Public Sector	
Design/Build	Public Sector	Private Sector	Public Sector	Private Sector	Public Sector		
Design/Build/Finance	Public Sector	Private Sector				Public Sector	
Design/Build/Finance/Operate/Maintain	Public Sector	Private Sector					Public Sector

Source: Brookings analysis and expert interviews

(Fig 3.): **Sample PPP Delivery Models:** Within this grid, the Center might find successful scenarios for capital and construction expertise; or this grid could extend into alternative models that, for instance, keep Ownership in the hands of private partners for issues of risk.

The structure and terms of any such partnerships are dependent on specific goals and the problems that are being solved. These partnerships are particularly relevant if the Center wishes to pursue and monetize the development of assets or products, provide ongoing services such as land management, accelerate aspects of *Scitech*, or bring about overdue tools for managers. A good analog is the use of PPPs by universities to rapidly expand technologies for online learning, as a means of catching up to a forceful trend.

If the Center seeks a significant level of financial self-sufficiency/sustainability (and less reliance on grants and donors), the Center can consider a number of **earned income streams that derive revenues from commercial ventures** within the project and consistent with its mission, i.e., tech transfer, commercialization of tools for managers, consulting, content production, and so on. This approach has become something of a trend in some areas of nonprofit funding.

In scenarios with commercial focus, funding sources could also feature **impact investment through such avenues as Donor Advised Funds, Program Related Investments (PRI) or other forms of appropriate, patient venture capital flowing through funds or from family offices** that are built to consider and properly value social and environmental impact alongside any financial returns. Impact financing could also flow from well-aligned Benefit/B-Corporations. In all cases, the Center would need to factor in, and be comfortable with, the expectations and oversight coupled to these forms of financing (and ensure that its non-profit mission and functions are not compromised).

Corporate social responsibility (CSR) dollars could become a source of funding (with clear transparency) and one potentially coupled with additional corporate spending that would amplify the Center’s work. The Center would need to ensure that the relationship is clear and delineated and that it does not impact the overall independence of the Center. Universities have had some success with the approach, but have also faced criticism.

If the Center sets a lower initial capital goal and limits its mandate to a smaller geography and fewer practice areas—and less or no commercial entanglements—a more **straightforward nonprofit modality**

and donor- and grant-based funding model sourced from individual donors, foundations and endowments might be the simple solution to augmenting any built-in government funding.

Another possible pathway—for consideration if there is a level of longer-term commitment to diversity in operations—could involve a **consortium** approach. This could leverage complementary institutions to execute a strategy such as “Make, Activate and Socialize” the science. Such a schematic could bring together a university system + a government agency + a scientific organization + NGOs.

This model has been used in science and healthcare, but its benefits may come at the cost of complexity and the potential for rigidity and slow progress. Nonetheless, if these issues can be mitigated, this can be an effective format that can comprehensively and concurrently address a range of disciplines while enlisting support from the community of existing organizations.

Similarly, the Center could be established as a **subsidiary or initiative of a government agency, NGO or university system**. Given the level of institutional involvement in climate work—and the relative regionality being promoted for this project—the Center could exist under the authority (and, potentially, funding) of, e.g., the University of California or the US Forest Service. (Some of the drawbacks to this approach are set forth in the *Scope and Planning* section, specifically related to the loss of independence and the potential for imposed limitations that could run counter to key opportunities). While this structure could open the opportunity for certain grants and legislative funding, the Center might not need to be a subsidiary entity for such funding.

If land management were to become a significant feature of the capital expenditures and/or operating model—and to the degree that carbon sequestration could be a project outcome—the **carbon credit exchange** could provide a stream of funding. Land management and banking, however, also introduces various difficulties and complications.

Governance

Given the range of the activities contemplated, and the type and nature of stakeholders within the project and community, the solution for governance will be **a critical element of structure and the Center’s ability to sufficiently fund and manage itself within the landscape** of similar initiatives. Failure of oversight can appear quickly in projects like this. A single large board may not be the best approach, as noted below.

If we plot operational structure on a spectrum—with a straightforward and local focus, on one end, and the more complex models involving partnerships and a grander mandate, on the other—in each case, and in addition to recognized best practices for nonprofit governance, **the board should be representative of the stakeholders while also firmly connected to nuanced mission-critical concerns** such as:

- **Type of structure:** As an example, a Public Private Partnership model has the potential to impact the mission of the Center, so needs management for risk, clear internal policies and controls along with experienced oversight in areas of deal structures, conflicts of interest, project financing and controls, and ongoing, objective evaluation;

If the Center were to emerge as a consortium, the cautions would shift to balancing some number of prominent (and potentially competing) voices. Oversight would need to counter tendencies to “stall out”, possibly by layering in tools such as Advisory and Steering Committees.

The risk of rigidity could be further addressed in the bylaws, to ensure the consortium construct remained sufficiently fluid;

If the Center were to be realized as a subsidiary, the concerns would likely turn to ensuring sufficient autonomy, with the interests of the Center needing to be represented at the parent level.

- **Development:** Any roster of directors and advisors should be equipped for ongoing fundraising from a range of suitable sources, including private sources (not always instinctive to nonprofits). The organization would need to consider executive skill sets to support the capital plans and the sources and deal structures covered here. The nature of development is also relevant in the recruiting of the Executive Director.
- **Expertise:** The practice areas of the Center should be represented in governance, proportionate, to the extent possible, to their roles in the business model. It would be easy to have blind spots at the board level, in any of the more complex scenarios. Establishing Advisory roles at the outset would be strategic in any scenario involving multiple disciplines or activities.
- **Org & Culture:** Organizational complexity places pressure on the development of capabilities, capacity and speed, and also on the ability to galvanize the human resource around clear goals and values. An effective Board (and Executive Director) need to be cognizant of the organizational development challenges. These should be felt and managed in real-time at the board level, if directors are to be effective at resourcing the new organization with executive talents.

In summary, structure and funding are interrelated with goals and function of the Center. Greater ambition for the Center will call for greater funding and structural ambition and consideration. In any scenario, ensuring significant and early capital is essential, but not the only requirement. In all instances, the executive team must have access to skills, knowledge and resources necessary to effectuate the vision of the Center and gain the support of the community. This is particularly the case if part of the funding mechanism is to include some commercial aspect, (which will likely require more specialized consultation). All of these considerations auger for serious upfront focus on governance, advisory and counsel, particularly if business affairs and oversight are to be shaped to fully support operational areas.

In closing, initial decisions regarding the scale of the project, identification of its mandate, and any approaches that may be non-starters, will enable deeper consideration of analogous structures and approaches and further refinement.

APPENDIX D

Recommendations for the Center’s Geographic and Functional Focus

This appendix consolidates input from key stakeholders received at the exploratory stage and shows how we translated it into two focused recommendations.

We provide here draft purpose and vision language to help dimensionalize each of these recommendations, as well as a “minimum viable” and “maximum impact” strategy recommendation, delivered in a visual strategic framework. The strategic framework showcases four vertical focus areas and four cross-cutting functional areas, which are “turned on” (colored) or “turned off” (greyed out) in each minimum viable or maximum impact strategy for each of the two geographic areas we recommend the Center consider.

Many interviewees expressed that the center should focus beyond Tahoe and the Sierra Nevada to take a leadership role in regional to global challenges. Tahoe Basin, Sierran, Southwestern US, Western Mountain Socioecological Systems, and Global Mediterranean Ecosystems were suggested, with strong encouragement to focus on the latter two and to take into consideration the landscapes east of Tahoe. If the center takes on Western Mountain Landscapes or Global Mediterranean Socioecological Systems, it would still work collaboratively with local science and land management institutions in and around the Tahoe region on exemplary, practical applications on land or in policy that would be relevant/replicable elsewhere. Tahoe would also be an exceptionally fruitful place to host regional or global convenings.

These geographic scopes both fit into the single resounding recommendation from stakeholders to **“move science into action.”** Interviewees were clear: Considerable hard science exists or is in progress. What is needed is an entity that moves science into land management and policy action, with the potential to integrate exemplary land management, policy-shaping, convening, as well as complementary initiatives such as market building (e.g. carbon negative biomass or environmental markets) or the building effective public narratives.

Geographic Scope 1:

Western Mountain Socioecological Systems

With 75% of water in the west originating in forested mountain ecosystems, urban populations and agricultural systems in the west rely on annual snowpack—stored and filtered by forests—to supply clean, abundant water year-round. Climate change means more rain, more intense storms, and less year-round water supply stored in snowpack. It means aridification, where a warmer, dryer atmosphere pulls more moisture from land surfaces, trees, and other vegetation, creating tinder dry vegetation (more than half of wildfires can be contributed to climate change—Daniel Swain, UCLA, Aug 2020). Hazardously overgrown dry forests fight for resources and succumb to disease, drought, and wildfire,

making a reliable, clean water supply questionable for large populations and some of the world’s largest agricultural centers (CA represents 13% of global agriculture). The good news is resilience can be restored to these ecosystems, but solutions must be scaled immediately in a world concerned with many other challenges.

Minimum Viable Strategy

WESTERN MOUNTAIN SOCIOECOLOGICAL SYSTEMS

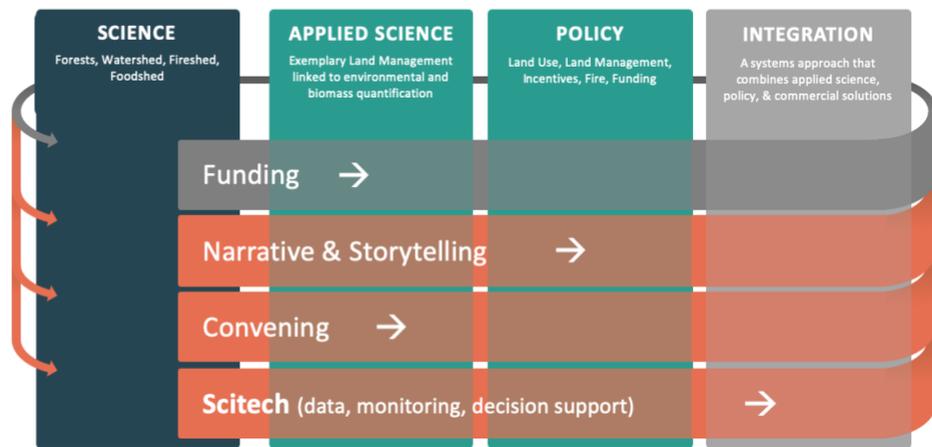
minimum viable strategy

OPPORTUNITY:
Gather existing mountain ecosystem science and partner to fill gaps.

Scitech and convening are foundational to success, as is establishing the public narrative RE: what’s at stake for Western Mountain Ecosystems and the urban, ag, and natural systems that depend upon them, in the face of climate change to build public will for policy change.

PURPOSE: Mountain ecosystems are the source water for large urban population and agricultural systems. They are our recreational playgrounds and home to immense biodiversity and an ever-growing human population. Climate change, disease, and catastrophic wildfire have put these ecosystems at huge risk. The Mountain Resilience Center at Tahoe will galvanize and support science, policy, and ecosystem management actions to protect western mountain ecosystems.

VISION: Secure the future of diverse mountain ecosystems to deliver reliable ecosystem services downstream, including water supply, stable carbon storage, abundant wildlife habitat, recreation availability, and quality of life for all species into perpetuity.



(Fig. 1) There is a lack of understanding by key stakeholders and the public about what’s at stake in western mountain socioecological ecosystems, and how dependent water sources for urban areas and agriculture are on stable headwaters. Surprisingly, the science on this is nascent but a number of publications came out in 2018-2020 showing that headwater forest treatments likely result in increased water reliability. The center, at a minimum, should bridge from science to connected strategies around exemplary land management and policy - i.e. as land management methods prove out and the economic challenges of transitioning to restorative and regenerative land practices are solved, policy is shaped to adapt or scale what works. The Center should leverage or lead emerging, ecosystem focused scitech innovation to bridge scientific information to action, monitor progress, and visualize data in ways that drive understanding and, ultimately, policy change.

Convenings to share learnings and drive forward practical progress is crucial, as is narrative, storytelling and experiences to build the public will necessary to enact policy change.

Maximum Impact Strategy

WESTERN MOUNTAIN SOCIOECOLOGICAL SYSTEMS

maximum impact strategy

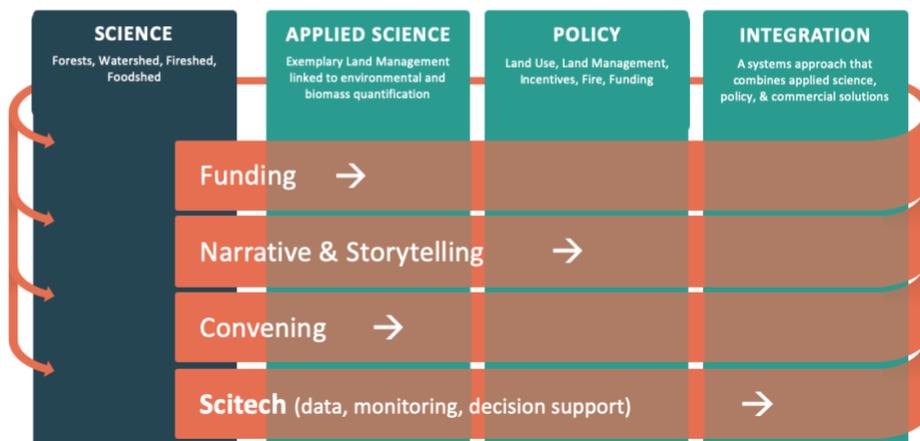
OPPORTUNITY:

Gather existing mountain ecosystem science and fund gaps.

Scitech and convening are foundational to success, as is establishing the public narrative RE: what's at stake for Western Mountain Ecosystems and the urban, ag, and natural systems that depend upon them, in the face of climate change. Move funding to solutions, particularly workforce development and kick starting a carbon negative biomass industry (which, in turn, can create economic flows back to the center).

PURPOSE: Mountain ecosystems are the source water for large urban population and agricultural systems. They are our recreational playgrounds and home to immense biodiversity and an ever-growing human population. Climate change, disease, and catastrophic wildfire have put these ecosystems at huge risk. The Mountain Resilience Center at Tahoe will galvanize and support science, policy, and ecosystem management actions to protect western mountain ecosystems.

VISION: Secure the future of diverse mountain ecosystems to deliver reliable ecosystem services downstream, including water supply, stable carbon storage, abundant wildlife habitat, recreation availability, and quality of life for all species into perpetuity.



(Fig. 2) The “integration” vertical pillar and “funding” cross-function turn on in the maximum viable strategy, adding to the mix a more systems approach where the center might take on commercial endeavors like tech transfers, facilitating the growth of a carbon negative biomass industry, and even directly investing in/incubating companies (see Structure and Funding document). In addition to commercial investments, the center could regrant funds to key implementation partners.

Geographic Scope 2:

Global Mediterranean Socioecological Systems

Mediterranean “climates” occur across the southern EU and northernmost Africa, South Africa, the coastal parts of the Middle East, Chile, southern Australia, and California. These settings are regions where human and ecological communities alike depend on mountain snowpacks, catchments, forests, and other resources to survive the precipitation-free summers that broadly define Mediterranean landscapes. They also are home to a significant percentage of world population and food production (e.g., California provides 13% of global agricultural production). The Sierra with its downstream California and Nevada watersheds is a prototypical extended-Mediterranean landscape; “extended” in the sense that most parts of the two state depend on areas with Mediterranean climates for water, energy, and other ecosystem services, even if they do not themselves fit that particular climatic description. Mediterranean ecosystems will be among the most impacted of any ecosystem by climate change, due to their shared dependence on disappearing snowpacks and precipitation regimes that are projected to be the most likely to decline of any land regions globally. In spite of their importance, the risk to them and humanity is remarkably unrecognized, outside of a narrow roster of international scientific institutions focused on forestry aspects of these issues (European Forest Institute, ICUN, International Association for Mediterranean Forests, etc.).

Minimum Viable Strategy

GLOBAL MEDITERRANEAN SOCIOECOLOGICAL SYSTEMS

— minimum viable strategy

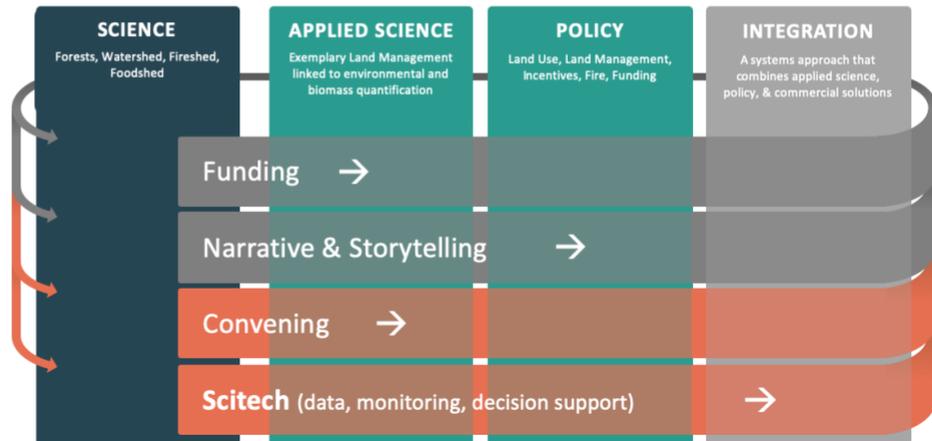
OPPORTUNITY:

Move abundant Mediterranean ecosystem science to integrated applied science and policy initiatives, shaping policy around proven, exemplary land management.

Scitech and convening are foundational to success.

PURPOSE: Global Mediterranean Landscapes are the most at risk ecosystem in the face of climate change, have the largest combined biodiversity, support the largest human population, and are most critical to the global food system. The Natural Climate Solutions Center at Tahoe will galvanize and support science, policy, and ecosystem management actions to protect global Mediterranean landscapes.

VISION: Maintain or improve ecosystem services provided by global Mediterranean landscapes in the face of climate change, through science-driven ecosystem management and monitoring, and effective communications and collaboration.



(Fig. 3) Despite the lack of attention to the shared nature of these coming challenges, in fact because of that lack of integration across regions, there is an important opportunity for an institution that aims to bridge the global Mediterranean socioecological systems “science to action” challenges in partnership with a few key institutions globally. At minimum, the Center should play this role, aiming for California to provide leadership regarding this global challenge, and leveraging exemplary applied science practices, tested within the state and worldwide, to drive policy change. Leading, exporting, and collaborating globally on scitech solutions is an obvious addition with a Center based near Silicon Valley, and fills a global gap. Joining in other convenings, and hosting convenings of its own, will be crucial to moving science to action.

Maximum Impact Strategy

GLOBAL MEDITERRANEAN SOCIOECOLOGICAL SYSTEMS

maximum impact strategy

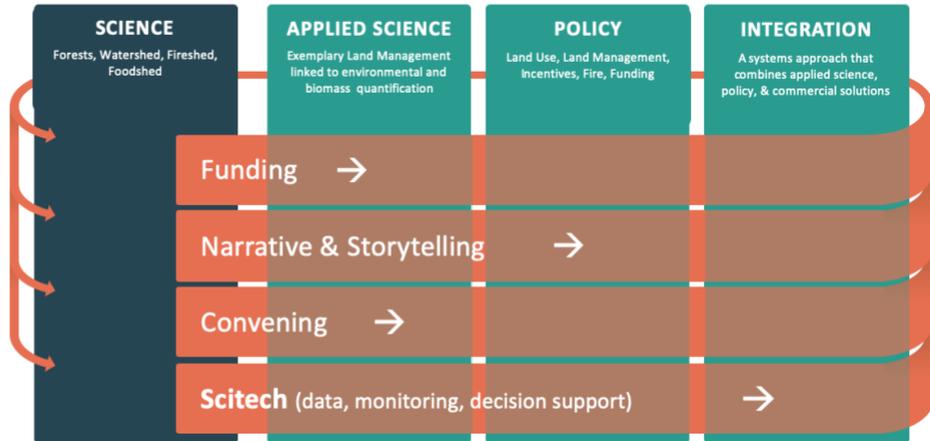
OPPORTUNITY:

Move abundant Mediterranean ecosystem science to a systems approach that connects science-driven land management to policy and a carbon-negative biomass industry.

Scitech and convening are foundational to success, as is establishing the public narrative RE: what's at stake for Mediterranean ecosystems in the face of climate change, and moving funding to solutions.

PURPOSE: Global Mediterranean Landscapes are the most at risk ecosystem in the face of climate change, have the largest combined biodiversity, support the largest human population, and are most critical to the global food system. The Natural Climate Solutions Center at Tahoe will galvanize and support science, policy, and ecosystem management actions to protect global Mediterranean landscapes.

VISION: Maintain or improve ecosystem services provided by global Mediterranean landscapes in the face of climate change, through science-driven ecosystem management and monitoring, and effective communications and collaboration.



(Fig. 4) In the Maximum Viable Strategy, the “Integration” pillar turns on. The EU in particular is far ahead of the US on developing environmental markets and biomass industries. The Center could build upon what the EU and other nations have learned to drive national/global environmental markets (e.g. carbon, water) and a truly carbon negative biomass industry, along with creating economic flows through technological innovation and investments. In addition, the “narrative and storytelling” cross function turns on with the goal of galvanizing the global public and international institutions (e.g. The UN’s Conference of the Parties; IPCC) around innovative solutions. Finally, the “funding” cross function also turns on, making the center a strategic funder of applied science, policy change, regional/global nonprofit and commercial endeavors.

The ambition of the Center will drive its level of funding and vice versa. Per our broader recommendations, we believe the Center should strive for a big vision and as much integration as its leader can achieve and funding allows, even if it doesn’t take on every pillar or crossfunctional area at the start.



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