Article

Ten Lessons for Effective Place-Based Climate Adaptation Planning Workshops

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Abstract: Community efforts to consider climate change within local planning processes are increasingly common. Place-based climate adaptation workshops are commonly employed tools within these larger processes. Research to-date on these phenomena has yielded mixed results, and empirical evidence regarding what makes these workshops more or less effective has been mostly based on small samples in disparate contexts. In an effort to seek consensus regarding what factors lead to effective workshop outcomes, including participant learning and motivation to take action; improved adaptation planning processes and implementation; and the development or strengthening of positive relationships between participants, twenty-two experienced climate adaptation workshop facilitators participated in a Delphi study involving iterative surveys, followed by focus groups. In this short report, we present a synthesis of consensus-based recommendations resulting from the Delphi study for enhancing place-based climate adaptation workshop outcomes. These recommendations address recruitment; fitting the local context; adequately preparing participants; clarifying objectives; facilitation strategies; promoting local leadership, efficacy, and accountability; and providing post-workshop support. We discuss the role of these strategies in developing feelings of collective efficacy, local leadership, and accountability through social learning.

Keywords: Climate change adaptation; Delphi study; facilitation; local champions; workshop

1. Introduction

Communities across the United States are contending with a wide range of climate change impacts, including more frequent and extreme wildfires, storms, floods, and droughts. The severity of these impacts is projected to increase over the coming decades (Pörtner et al., 2022). Climate adaptation—defined as "the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities" (Pörtner et al., 2022, p. 5)—is, thus, crucial to maintaining and enhancing societal wellbeing (Wilson et al., 2020). In recognition of this fact, communities are investing in climate adaptation planning to better understand, prepare for, and respond to threats posed by climate change (Bierbaum et al., 2013; Shi et al., 2015).

Within the wide range of approaches and tools to support adaptation planning (Nordgren et al., 2016; Stein et al., 2014), place-based climate adaptation workshops are increasingly employed to bring together diverse groups of community members and rep-

resentatives from local non-profit and government agencies to facilitate learning, collaboration, and collective action around adaptation goals (Alpízar et al., 2019). These workshops are generally structured to assess climate risks, identify vulnerabilities from climate change, and develop adaptation strategies for a specific place. They can help advance a range of outcomes, including enhancing participants' understanding of climate change, helping participants identify and prioritize potential adaptation actions, informing other planning processes, and facilitating formal management decisions, policy actions, and project development (Picketts et al., 2012; Schmitt et al, 2021; Tuler, Dow, and Weber, 2020).

Prior research on climate adaptation workshops has yielded mixed results (e.g., Alpízar et al., 2019; Cross et al., 2013; Langsdale et al., 2009; Picketts et al., 2012; Schmitt et al., 2021). Claims about effective (or ineffective) practices within these workshops largely rely on self-reported experiences of workshop attendees and/or authors' speculation based on their observations. Key elements noted in prior studies for enhancing workshop outcomes include pre-workshop preparation with local partners; setting clear objectives; aligning workshop objectives, materials, and activities with pre-existing work of participants; ensuring representation of diverse sectors and stakeholders; engaging organizations that can span across sectoral boundaries; designing all elements to focus on local or organizationally specific challenges; incorporating small group work; employing visualization tools or other workbook-type activities that lead participants through assessment and planning processes; building trusting relationships; understanding and addressing barriers for participation for underserved groups; and longer-term follow-up or repeated engagements by the facilitation team (Bartels et al., 2013; Cross et al., 2013; Langsdale et al., 2009; Longman et al., 2022; McEvoy et al., 2018; Phadke, Manning, and Bulrager, 2015; Picketts et al, 2012; Schmitt et al., 2021; Tuler et al., 2020).

The literature on broader climate adaptation planning processes, which often include place-based climate adaptation workshops, reflects similar claims, and also stresses additional elements including the importance of transparency, engaging and supporting local champions, and establishing formal agreements with government agencies (Al-Kodmany, 1999; Andersson et al., 2013; Byers et al., 2014; Dwamena, Banaynal and Kemausuor, 2011; Pearce et al., 2012; Plate et al., 2020). Similar to the literature on climate adaptation workshops, most claims made in these papers are based on authors' observations or on self-reports from participants. One exception involved a convening of 80 climate adaptation practitioners to reflect upon what had worked for them to date in their diverse planning approaches (Brunner and Nordgren, 2012). Again, similar factors emerged as influential to these processes, with the addition of contextual factors outside the control of process facilitators, such as acute climate impact events and adverse political contexts.

In this short communication, we update and expand upon Brunner and Nordgren's (2012) and other efforts to identify consensus-based valued practices of practitioners for enhancing the outcomes of climate adaptation workshops. We consider these practices through the lens of social learning—a process in which people learn together, develop shared understandings, and, ideally, develop or strengthen interpersonal relationships to take meaningful action (Reed et al., 2010). The resulting contribution is a set of recommendations for practitioners and researchers for improving future workshops to achieve desired outcomes.

2. Methods overview

The study involved a four-round Delphi process, culminating in an online workshop that included four focus-group discussions of the central Delphi results. A Delphi study involves iterative surveys about a particular subject with a sample of experts (Hasson et al., 2000; Hsu and Sandford, 2007). In this manuscript we focus on areas of consensus regarding valued practices for enhancing the desired outcomes of place-based climate adaptation workshops in the United States. These include participant learning, empowerment, and motivation to take action; improved adaptation planning processes and actions;

and the development or strengthening of positive relationships between participants (see Supplementary Materials for the full report).

The first Delphi survey, administered online in February 2019, contained open-ended questions, asking participants to opine on the most effective practices for motivating attendance, communicating science, facilitating learning, promoting collaboration, and catalyzing post-workshop action. The research team qualitatively coded these insights to create statements for use in the second round of the Delphi study, which asked facilitators to rate and rank statements associated with each question and to provide a rationale for their scores. The second-round survey was administered online from May to June 2019. In the third round, each facilitator received a summary of the ratings and rankings from Round 2 and was asked to explain the extent to which they agreed or disagreed with the overall scores and to provide additional comments and insights. The third-round survey was administered online from September to October 2019. The fourth round of the Delphi study coincided with a virtual workshop held on March 27, 2020. In the fourth round, participants were given the opportunity to fine-tune the wording of statements from the third round and provide final ratings of each item. Consensus in strategies occurred when over 70% of respondents agreed that a practice was either "always helpful" or "necessary."

The workshop included four concurrent focus groups. The focus groups reviewed key emergent themes from the first three rounds of the Delphi study, and participants were asked to share specific examples from their own work. Transcripts were qualitatively coded for additional emergent themes by the research team. The themes reported in this research note were synthesized from all of the data listed above.

We recruited 22 experienced climate adaptation workshop facilitators from a pool of facilitators identified in the Climate Adaptation Knowledge Exchange (CAKE) directory (EcoAdapt, 2023). Each participant had more than three years of experience facilitating climate adaptation workshops in the United States and had led more than three workshops for at least 50 total participants. The sample included representation from various levels of government, academia, and private (either non-profit or business) sectors. Collectively, these facilitators had over 210 years of experience and had run more than 460 climate adaptation workshops for more than 12,000 people prior to the start of the Delphi study. The March 2020 workshop involved 17 of the Delphi participants and two additional climate adaptation workshop facilitators who did not participate in the longer Delphi process. The two additional experts met the same criteria as Delphi participants and were invited to discuss, challenge, interpret, and augment the findings of the Delphi group. A complete report of the full study, including more details on study methods, is available in the Supplemental Information.

3. Key findings

Below we share ten themes reflecting consensus-based recommendations that emerged from the Delphi process. We then outline a set of practical strategies for implementation in Table 2.

3.1. Get the right people in the room.

Study participants emphasized the importance of including (1) those with power to make decisions about and/or implement adaptation projects and (2) those most heavily impacted by those projects. They also emphasized the importance of ensuring that a wide array of professional or disciplinary sectors are present – for example, experts working in housing, utilities, conservation, public health, and other relevant domains, as well as both governmental and non-governmental representatives. Facilitators recognized the importance of considering diversity, equity, and inclusion (DEI) when planning and conducting these workshops. However, they varied in their opinions on valued DEI practices and agreed that this represents an area for improvement within adaptation in general.

3.2. *Understand the local context and design all workshop components around it.*

Facilitators emphasized the importance of working with local partners to develop a baseline knowledge of the local context to guide workshop design. This includes understanding the history of the community, key actors, dynamics among participants, and the range of social and cultural norms. Such knowledge can also bring to light hot-button issues, allowing facilitators to strategically assign participants to breakout groups, identify language to use or avoid, and ensure certain voices are heard. Clear consensus also emerged on the importance of focusing on local climate projections and impacts rather than basic climate science. This approach can sidestep controversies about climate change, remove jargon that may alienate some audiences, and help to avoid patronizing attendees who are already familiar with the basics of the greenhouse effect and related processes.

3.3. *Prepare participants for effective engagement.*

Facilitators described the value of sharing basic climate information and setting clear expectations before the workshop. While this strategy is recommended for all workshops, sharing basic climate science, local climate projections, and community vulnerabilities ahead of the workshop can be particularly valuable for shorter workshops. In these cases, participants can come prepared to ask questions, share concerns, and brainstorm ideas for adaptive action.

3.4. Clarify objectives.

Clear and specific objectives should bound the scope of the workshop, enabling a focus on realistic and meaningful actions tailored to the local context. They can also help to identify who should be invited (i.e., decision-makers, topical experts, impacted groups). Objectives should be directly related to addressing climate vulnerabilities so that workshop attendees can envision potential adaptive actions. Without clear, adaptation-focused objectives, attendees often have difficulty in prioritizing actions.

3.5. Enable peer-to-peer learning and cross-sector dialogue through small group work.

Facilitators stressed the importance of dedicating a significant part of the workshop to small group work. Working in small groups enables peer-to-peer information sharing and can increase meaningful cross-sectoral communication. Such interactions deepen participants' understanding of challenges and potential solutions and often serve as the basis for what facilitators called "ah-ha moments," when key realizations advance learning, relationship-building, and/or action. Facilitators' opinions about ideal sizes for small groups ranged from three to ten participants, with eight as the modal response and six as the average.

3.6. *Plan for flexibility and respond to local needs.*

Several facilitators recalled experiences where initial plans failed to resonate with participants, and the workshops were salvaged by quickly retooling the agenda. The need to be responsive and flexible in these situations was deemed important by all study participants. Some stressed the value of having backup plans ready, while others noted the unpredictability of challenges and a general need to adapt agendas in real time.

3.7. Identify and support local champions.

Local champions—defined as people who are committed to bringing others together to get work done toward a shared goal (Hanleybrown et al., 2012)— are critical for initiating the workshop process, identifying and recruiting participants, diffusing ideas, and maintaining motivation and commitment over time. Local champions are generally widely trusted within their communities, share common characteristics with the people in their network, and have the commitment, time, and energy to ensure success. They are also typically charismatic, persistent, and proactive (Rogers, 2003). Local champions can serve different roles, depending on their identity and position in the community (see Table 1). The importance of finding multiple champions across different sectors, particularly

early in the process, emerged to enhance the likelihood of building broader networks with higher levels of participation. Consensus also emerged around the importance of identifying local champions within government agencies *and* non-government organizations. Non-governmental organizations often have considerable expertise and resources to contribute to projects. Oftentimes, they may fill similar roles to what are known as "backbone support organizations" in the collective impact literature, in that they can help to articulate and communicate a common vision, facilitate dialogue and coordinate work between partners, lead specific projects, and build external support for the overall effort (Kania and Kramer, 2011). They can also push government agencies when inertial roadblocks are a problem. Some facilitators also noted the critical importance of champions within local government, particularly for enhancing the public accountability of an initiative, providing resources, and clearing political or bureaucratic roadblocks associated with climate adaptation.

Table 1. Summary description and typical roles played by the different types of local champions identified by facilitators.

	Network Champions	**Organizational Champions**	**Political Champions**
Description	Highly connected individuals from any sector who are embedded in the community/network	Individuals who can build support within their own organization	Elected officials or others with access to resources or other forms of influence*
Roles	• Make connections and facilitate dialogue between people within the network • Communicate vision and a strategic direction • Keep projects moving forward • Coordinate work between partners • Lead specific projects • Seek broader support for the work externally	• Build organizational support for the group's work • Counter organizational constraints • Empower others in organization	• Can engage as full participants, presenters, or panel members • Alternatively, can be engaged as advocates after the workshop • Can build/signal legitimacy in adaptation planning networks and processes

*The role individual political champions play in the workshop itself depends on the consensus of local conveners regarding whether they might stifle or enrich the participation of others.

3.8. Promote feelings of efficacy.

The magnitude of the challenges presented by climate change can cause feelings of hopelessness or being overwhelmed. Workshop activities that promote a sense of self- and collective- efficacy can counteract some of these negative feelings. Self-efficacy refers to an individuals' belief that they can undertake an action and that their effort will lead to desired outcomes (Bandura, 1982). Collective efficacy refers to the same beliefs, but in the context of the coordinated actions of a larger group (Bandura, 2000). Strategies for enhancing efficacy included emphasizing feelings of togetherness throughout, highlighting community strengths, practicing with specific planning tools, and focusing on actions within the control of participants.

3.9. Promote accountability.

Facilitators recommended creating mechanisms during the workshop to foster accountability among participants to move work forward post-workshop. This often involves asking participants to commit to specific actions during the workshop, such as engaging others in adaptation planning within their areas of expertise or volunteering to

organize a subsequent meeting with a subset of workshop attendees to pursue a specific strategy. Assigning specific responsibilities for post-workshop reporting and monitoring can also enhance accountability.

3.10. Provide post-workshop support

Facilitators agreed that they should continue to provide support after the workshop if welcomed by the community. This support may be especially important in communities with no plan/project in mind before the workshop, or those that lack a plan for moving forward by the end of the workshop, lack local climate experts, or need additional buy-in from stakeholders post-workshop. Committing to this support before the workshop can enhance trust in the facilitators and feelings of efficacy in attendees, thus enhancing the workshop overall.

Table 2. Consensus-based strategies associated with each of the ten recommendations for enhancing the outcomes of place-based climate adaptation workshops.

Key recommendations	Consensus-based strategies
1. Recruit the right people	• Enable broad participation by recruiting as early as possible, scheduling workshops at convenient times for as many people as possible, and providing stipends, food, and childcare. • Provide a table or matrix containing each relevant sector (e.g., public health, local businesses, NGOs, etc.) and work with local conveners to fill in each box with who they think should attend. • Have local partners send out initial invitations, then check in periodically pre-workshop to ensure they have successfully recruited representatives across sectors.
2. Fit the local context	• Use surveys, interviews, or meetings to capture preexisting knowledge and/or perceptions of participants beyond the core group of conveners. • Align communication styles with local norms (e.g., use familiar/culturally appropriate language and imagery; communicate via commonly used channels). • Provide examples of climate adaptation projects in similar settings to help attendees imagine possibilities in their own context. Otherwise, focus entirely on local climate projections and adaptation strategies.
3. Prepare participants	• Hold pre-workshop calls or send out reports or factsheets to share local climate science information and/or vulnerabilities. • Share a complete agenda ahead of the meeting.
4. Clarify objectives	• Make initial objectives specific, achievable, and consensus based. • Use questions to move from high-level objectives (e.g., future desired conditions) to actionable objectives (e.g., what actions might align with current initiatives; what is within the power of attendees). • Be prepared to revisit/revise objectives throughout the process.
5. Include small group work	• Include representatives from multiple sectors or organizations within each small group. • Designate a facilitator for each small group with a clear facilitation guide. • Consider alternatives to traditional verbal report-outs, such as curated summaries or written reports that can be shared later in the process.
6. Plan for flexibility	• Be open to abandoning the agenda for a discussion about what participants feel they most need in the moment. • Consider convening local partners between sessions to keep workshop goals aligned with the needs of the community.
7. Identify local champions	• Leverage the knowledge and pre-existing connections of local conveners to identify champions. • Train committed individuals to become local champions when pre-existing champions cannot be identified. • Seek champions in ***both*** government and non-governmental organizations.

8. Promote efficacy	• Begin with an activity (e.g., word cloud exercise; visioning session) that reveals what participants value and care about most in their community or organization. • Stress commonalities between participants. • Help participants fit adaptation into their organizational realities by discussing how actions fit within current workflows and focusing on actions within their control. • Use gallery walks, facilitated discussions, and brainstorming sessions to highlight personal assets, community strengths, and relevant ongoing efforts. • Practice with specific planning tools and frameworks, including databases, visualizations, and step-by-step processes for assessing vulnerabilities and potential solutions.
9. Promote accountability	• Encourage specific and detailed commitments prior to the close of the workshop. Even minor actions can set things in motion (e.g., sending an email to five specific people, committing to a subsequent small meeting). • Arrange for participants to report back to the group through regular catch-up calls or shared documents. Alternatively, convene a smaller core group to meet regularly to advance the work. • Designate an entity (e.g., external facilitators, local conveners, or other local champions) for monitoring post-workshop progress.
10. Provide post-workshop support	• Be available post-workshop to answer questions and provide technical support. • Commit to this support upfront, before the workshop, to enhance trust and feelings of efficacy.

4. Discussion

Our findings are largely consistent with the literature on what leads to better climate adaptation workshops (Bartels et al., 2013; Cross et al., 2013; Langsdale et al., 2009; Longman et al., 2022; McEvoy et al., 2018; Phadke, Manning, and Bulrager, 2015; Picketts et al, 2012; Schmitt et al., 2021; Tuler et al., 2020), suggesting a general consensus among those most engaged in facilitating these workshops and other adaptation practitioners working in a wide array of contexts. Climate adaptation workshops are often just one piece of a much larger effort within a specific place. Our findings suggest that these workshops can contribute to these larger efforts by boosting social learning.

Social learning refers to group processes in which people learn together and build relationships that enable collective action (Cundill and Rodella, 2012). Numerous factors have been identified to support social learning in natural resource management contexts, including facilitated processes that promote skills development, trust-building, open deliberation, and collective visioning -- as well as ongoing cycles of collaborative action, monitoring, and reflection (Butler et al., 2015; Cundill and Rodella, 2012; Fernandez-Gimenez, 2008; McCrum et al., 2009; Suškevičs et al., 2018; Tam et al., 2021). Learning in these contexts has been linked to enhanced natural resource management and policy actions through various mechanisms, with a recent systematic review highlighting the particular importance of processes that support skills-building and multi-level (across organizations and scales) interactions (Suškevičs et al., 2018).

Our study suggests that climate adaptation workshops can catalyze social learning by bringing together diverse and multi-level actors working on place-based climate adaptation and promoting an enhanced sense of community, increased interactions, and mutual understandings among participants. We discuss how place-based climate adaptation workshops can be designed such that social learning contributes to feelings of collective efficacy, the emergence or strengthening of local leadership, and the establishment of accountability mechanisms to enhance the likelihood of follow-through on adaptation-related planning and action.

Prior work has found that feelings of collective efficacy can be especially effective at motivating action when coupled with the strengthening of bonds between the people involved (Suškevičs et al., 2018; Stern, 2018; Wilson et al., 2020). In climate adaptation workshops, strategies that link workshop content to the local context; establish clear, achievable objectives; highlight community strengths; encourage practicing with specific planning tools; focus on actions within the control of participants; and align actions with ongoing initiatives can make potential subsequent actions feel more obtainable and likely to achieve meaningful outcomes.

Strengthening relationships between people working on these issues can provide an additional sense of motivation through at least two separate mechanisms. The first involves an expansion of the knowledge, skills, abilities, and connections available to make meaningful change. These expanded sources of capital can enhance feelings of collective efficacy (Bandura, 2000; Waverijn, Groenewegen, and de Klerk, 2017). The second involves the power of identifying as a group with a common purpose. When people come to see themselves in this way, as members of a community, they may begin to develop feelings of commitment to the group, and even shared social norms, that can enhance members' accountability to each other (Fielding and Hornsey, 2016; Merton, 1968; Stern and Coleman, 2015). In one study of a collaborative natural resource management network, commitments to the group emerging from the development of intragroup trust helped members to bring new ideas back to their home organizations and make meaningful changes to organizational policies and initiatives – in essence, balancing one's preexisting accountability with a newly found accountability to the network (Coleman and Stern, 2018). Ensuring wide representation across sectors, skills, and communities at the workshops; facilitating small group dialogues; and focusing on building feelings of efficacy can help these types of relationships flourish and eventually build a sense of collective identity and accountability for actions moving forward.

Accountability for actions can also be strongly related to leadership within the network of people working on climate adaptation. Here, the power of local champions was strongly emphasized by participants in the study. People who are willing and able to make commitments during the workshop, to build bridging connections across organizations or other communities, and to keep initiatives moving forward can serve as invaluable engines for future work. As noted in prior research on collective impact (e.g., Hanleybrown et al., 2012; Kania and Kramer, 2011), these champions can also hold people accountable, at least informally, for any commitments they have made and coordinate communications both within and outside the network. Longer-term follow-up by the workshop facilitators can also help to bolster ongoing accountability and further support the work of local champions.

Each of these mechanisms for promulgating climate adaptation relies not only on effective facilitation, but also on who is invited to the workshops in the first place. The Delphi study yielded no consistent lessons regarding exactly how and when to address power differentials and equity issues in climate adaptation. Rather, general consensus was reached regarding the importance of including participants who are the most likely to carry out adaptation planning or implementation as well as those most likely to be impacted by those initiatives. Our review of the literature and the results of our focus group discussions indicate that issues of justice, equity, and inclusion in climate adaptation planning merit additional consideration in future research (e.g., Byskov et al., 2021; Fiack et al., 2021; Klinsky et al., 2017; Shi et al., 2016).

5. Conclusion

Place-based adaptation workshops can provide the knowledge, tools, and collective momentum to advance critical adaptation work in communities. The ten recommendations that emerged from this study, and associated consensus-based strategies, largely align with existing literature on adaptation planning processes. They offer direction for

researchers studying these initiatives and practitioners working to mobilize effective adaptation action and can help practitioners to advance collective efficacy, local leadership, and accountability.

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References

1. Adger, V. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, 79(4).
2. Al-Kodmany, K. (1999). Using visualization techniques for enhancing public participation in planning and design: Process, implementation, and evaluation. *Landscape and urban planning*, 45(1), 37-45.
3. Alpízar, F., Bernedo Del Carpio, M., Ferraro, P. J., & Meiselman, B. S. (2019). The impacts of a capacity-building workshop in a randomized adaptation project. *Nature Climate Change*, *9*(8), 587-591.
4. Andersson, L., Wilk, J., Graham, L. P., & Warburton, M. (2013). Design and test of a model-assisted participatory process for the formulation of a local climate adaptation plan. *Climate and Development*, 5(3), 217-228.
5. Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current directions in psychological science*, *9*(3), 75-78.
6. Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist*, *37*(2), 122.
7. Bartels, W. L., Furman, C. A., Diehl, D. C., Royce, F. S., Dourte, D. R., Ortiz, B. V., ... & Jones, J. W. (2013). Warming up to climate change: A participatory approach to engaging with agricultural stakeholders in the Southeast US. *Regional Environmental Change*, 13(1), 45-55.
8. Bierbaum, R., Smith, J. B., Lee, A., Blair, M., Carter, L., Chapin, F. S., ... & Verduzco, L. (2013). A comprehensive review of climate adaptation in the United States: more than before, but less than needed. *Mitigation and adaptation strategies for global change*, *18*(3), 361-406.
9. Bormann, H., Ahlhorn, F., & Klenke, T. (2012). Adaptation of water management to regional climate change in a coastal region–Hydrological change vs. community perception and strategies. *Journal of Hydrology*, 454, 64-75.
10. Brunner, R., & Nordgren, J. (2012). Climate Adaptation as an Evolutionary Process: A White Paper Based on the Kresge Grantees and Practitioners Workshop on Climate Change Adaptation. *Portland, OR. http://kresge. org/library/climate-adaptation-evolutionary-process-white-paper*.
11. Butler, J. R. A., Wise, R. M., Skewes, T. D., Bohensky, E. L., Peterson, N., Suadnya, W., ... & Rochester, W. (2015). Integrating top-down and bottom-up adaptation planning to build adaptive capacity: a structured learning approach. *Coastal Management*, *43*(4), 346-364.
12. Byers, A. C., McKinney, D. C., Thakali, S., & Somos-Valenzuela, M. (2014). Promoting science-based, community-driven approaches to climate change adaptation in glaciated mountain ranges: HiMAP. *Geography*, 99(3), 143-152.
13. Byskov, M. F., Hyams, K., Satyal, P., Anguelovski, I., Benjamin, L., Blackburn, S., ... & Venn, A. (2021). An agenda for ethics and justice in adaptation to climate change. *Climate and Development*, *13*(1), 1-9.
14. Coleman, K., & Stern, M. J. (2018). Boundary spanners as trust ambassadors in collaborative natural resource management. *Journal of Environmental Planning and Management*, *61*(2), 291-308.
15. Coleman, K., & Stern, M. J. (2018). Exploring the functions of different forms of trust in collaborative natural resource management. *Society & Natural Resources*, 31(1), 21-38.
16. Coleman, K., Stern, M. J., & Widmer, J. (2018). Facilitation, coordination, and trust in landscape-level forest restoration. *Journal of Forestry*, *116*(1), 41-46.
17. Cross, M. S., McCarthy, P. D., Garfin, G., Gori, D., & Enquist, C. A. (2013). Accelerating adaptation of natural resource management to address climate change. *Conservation Biology*, 27(1), 4-13.
18. Cundill, G., & Rodela, R. (2012). A review of assertions about the processes and outcomes of social learning in natural resource management. *Journal of environmental management*, *113*, 7-14.
19. Dirks, K. T. (1999). The effects of interpersonal trust on work group performance. *Journal of applied psychology*, 84 (3), 445.

20. Dwamena, E., Banaynal, R., & Kemausuor, F. (2011). Participatory three dimensional model mapping (P3DM): Expanding rural horizons and decision making for food security planning, climate change adaptation and flood risk reduction in Ghana. *Research Journal of Agricultural Science*, 43(4).
21. EcoAdapt. (2023). Climate Adaptation Knowledge Exchange (CAKE). https://www.cakex.org/. *Last accessed January 20, 2023.*
22. Fernandez-Gimenez, M. E., Ballard, H. L., & Sturtevant, V. E. (2008). Adaptive management and social learning in collaborative and community-based monitoring: a study of five community-based forestry organizations in the western USA. *Ecology and Society*, *13*(2).
23. Fiack, D., Cumberbatch, J., Sutherland, M., & Zerphey, N. (2021). Sustainable adaptation: Social equity and local climate adaptation planning in US cities. *Cities*, *115*, 103235.
24. Fielding, K. S., & Hornsey, M. J. (2016). A social identity analysis of climate change and environmental attitudes and behaviors: Insights and opportunities. *Frontiers in Psychology*, *7*, 121. https://doi.org/10.3389/fpsyg.2016.00121.
25. Geurts, J. L., & Joldersma, C. (2001). Methodology for participatory policy analysis. *European Journal of Operational Research*, 128(2), 300-310.
26. Hanleybrown, F., Kania, J., & Kramer, M. (2012). *Channeling change: Making collective impact work* (pp. 56-78). FSG.
27. Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of advanced nursing*, *32*(4), 1008-1015.
28. Hsu, C. C., & Sandford, B. A. (2007). The Delphi technique: making sense of consensus. *Practical assessment, research, and evaluation*, *12*(1), 10.
29. Kania, J., Kramer, M. (2011). Collective impact. *Stanford Social Innovation Review* 9(1):36–41.
30. Klinsky, S., Roberts, T., Huq, S., Okereke, C., Newell, P., Dauvergne, P., ... & Bauer, S. (2017). Why equity is fundamental in climate change policy research. *Global Environmental Change*, 44, 170-173.
31. Langsdale, S. M., Beall, A., Carmichael, J., Cohen, S. J., Forster, C. B., & Neale, T. (2009). Exploring the implications of climate change on water resources through participatory modeling: case study of the Okanagan Basin, British Columbia. *Journal of Water Resources Planning and Management*, 135(5), 373-381.
32. Longman, R. J., Peterson, C. L., Baroli, M., Frazier, A. G., Cook, Z., Parsons, E. W., ... & Giardina, C. P. (2022). Climate Adaptation for Tropical Island Land Stewardship: Adapting a Workshop Planning Process to Hawai 'i. *Bulletin of the American Meteorological Society*, 103(2), E402-E409.
33. Lumosi, C. K., Pahl-Wostl, C., & Scholz, G. (2020). Evaluating trust and shared group identities in emergent social learning processes in the Zambezi river basin. *Humanities and Social Sciences Communications*, *7*(1), 1-13
34. Matthews, K. B., Rivington, M., Buchan, K., Miller, D., & Bellocchi, G. (2008). Characterising the agro-meteorological implications of climate change scenarios for land management stakeholders. *Climate Research*, 37(1), 59-75.
35. McCrum, G., Blackstock, K., Matthews, K., Rivington, M., Miller, D., & Buchan, K. (2009). Adapting to climate change in land management: the role of deliberative workshops in enhancing social learning. *Environmental Policy and Governance*, *19*(6), 413-426.
36. McEvoy, S., van de Ven, F. H., Blind, M. W., & Slinger, J. H. (2018). Planning support tools and their effects in participatory urban adaptation workshops. *Journal of environmental management*, 207, 319-333.
37. Merton, R. K., & Merton, R. C. (1968). *Social theory and social structure*. Simon and Schuster.
38. Moser, S. C. (2007). More bad news: the risk of neglecting emotional responses to climate change information.
39. Nordgren, J., Stults, M., & Meerow, S. (2016). Supporting local climate change adaptation: Where we are and where we need to go. *Environmental Science & Policy*, *66*, 344-352.
40. Pearce, T., Ford, J. D., Caron, A., & Kudlak, B. P. (2012). Climate change adaptation planning in remote, resource-dependent communities: An Arctic example. *Regional Environmental Change*, 12(4), 825-837.
41. Phadke, R., Manning, C., & Burlager, S. (2015). Making it personal: Diversity and deliberation in climate adaptation planning. *Climate Risk Management*, *9*, 62-76.
42. Picketts, I. M., Werner, A. T., Murdock, T. Q., Curry, J., Déry, S. J., & Dyer, D. (2012). Planning for climate change adaptation: lessons learned from a community-based workshop. *Environmental Science & Policy*, *17*, 82-93.
43. Plate, R. R., Monroe, M. C., Friedrichsen, C., Bowers, A. W., & Chaves, W. A. (2020). Recommendations for early phases of engaging communities in climate change adaptation. *Journal of Human Sciences and Extension*, 8(2), 136-164.
44. Pörtner, H. O., Roberts, D. C., Adams, H., Adler, C., Aldunce, P., Ali, E., ... & Birkmann, J. (2022). Climate change 2022: Impacts, adaptation and vulnerability. *IPCC Sixth Assessment Report*.
45. Reed, M.S.; Evely, A.C.; Cundill, G.; Fazey, I.; Glass, J.; Laing, A.; Newig, J.; Parrish, B.; Prell, C.; Raymond, C.; et al. What is social learning? Ecol. Soc. 2010, 15, r1.
46. Rogers, E. M. (2003). Diffusion networks. In Cross, R., Parker, A., & Sasson, L. (Eds.) *Networks in the knowledge economy* (pp. 130-179). Oxford University Press.
47. Schmitt, K. M., Ontl, T. A., Handler, S. D., Janowiak, M. K., Brandt, L. A., Butler-Leopold, P. R., ... & Swanston, C. W. (2021). Beyond planning tools: experiential learning in climate adaptation planning and practices. *Climate*, *9*(5), 76.
48. Shi, L., Chu, E., Anguelovski, I., Aylett, A., Debats, J., Goh, K., ... & VanDeveer, S. D. (2016). Roadmap towards justice in urban climate adaptation research. *Nature Climate Change*, *6*(2), 131-137.

49. Shi, L., Chu, E., & Debats, J. (2015). Explaining progress in climate adaptation planning across 156 US municipalities. *Journal of the American Planning Association*, *81*(3), 191-202.
50. Stein, B. A., Glick, P., Edelson, N., & Staudt, A. (2014). *Climate-smart conservation: putting adaption principles into practice*. National Wildlife Federation.
51. Stern, M. J., & Coleman, K. J. (2015). The multidimensionality of trust: Applications in collaborative natural resource management. *Society & Natural Resources*, 28(2), 117-132.
52. Stott, C., & Huq, S. (2014). Knowledge flows in climate change adaptation: exploring friction between scales. *Climate and Development*, 6(4), 382-387.
53. Suškevičs, M., Hahn, T., Rodela, R., Macura, B., & Pahl-Wostl, C. (2018). Learning for social-ecological change: A qualitative review of outcomes across empirical literature in natural resource management. *Journal of environmental planning and management*, *61*(7), 1085-1112.
54. Tam, J., Waring, T., Gelcich, S., Chan, K. M., & Satterfield, T. (2021). Measuring behavioral social learning in a conservation context: Chilean fishing communities. *Conservation Science and Practice*, *3*(1), e336.
55. Taylor, E. W., Duveskog, D., & Friis-Hansen, E. (2012). Fostering transformative learning in non-formal settings: Farmer-Field Schools in East Africa. *International Journal of Lifelong Education*, *31*(6), 725–742. https://doi.org/10.1080/02601370.2012.713035
56. Tuler, S. P., Dow, K., & Webler, T. (2020). Assessment of adaptation, policy, and capacity building outcomes from 14 processes. *Environmental Science & Policy*, *114*, 275-282.
57. Turner Ii, B. L., Esler, K. J., Bridgewater, P., Tewksbury, J., Sitas, N., Abrahams, B., ... & Mooney, H. (2016). Socio-Environmental Systems (SES) Research: what have we learned and how can we use this information in future research programs. *Current Opinion in Environmental Sustainability*, 19, 160-168.
58. Waverijn, G., Groenewegen, P. P., & de Klerk, M. (2017). Social capital, collective efficacy and the provision of social support services and amenities by municipalities in the Netherlands. *Health & social care in the community*, *25*(2), 414-423.
59. Wilson, R. S., Herziger, A., Hamilton, M., & Brooks, J. S. (2020). From incremental to transformative adaptation in individual responses to climate-exacerbated hazards. *Nature Climate Change*, *10*(3), 200-208.