

Expert engagement in setting a climate adaptation research agenda

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Abstract

In order to initiate the actionable science needed to support effective conservation under climate change, we engaged researchers and other experts in refining and prioritizing a climate adaptation research agenda that was originally developed via dialogue with natural resource managers. Experts identified topics that were missing or underrepresented in an initial practitioner-defined list of science topics, and then scored topics according to the state of knowledge, the feasibility of research, and the potential that research might change management. Our process capitalizes on the complementarity between the expertise of practitioners and the expertise of researchers and other non-practitioners, improves the transparency and legitimacy of the agenda-setting process, and reveals the challenges public agencies have in focusing on some research topics.

KEYWORDS

academic-government partnerships, actionable science, climate change adaptation, research agenda

There is an abundance of research topics that could better inform natural resource management under climate change, and relatively little time and few resources to put towards this task. Here we describe two methods to engage experts in refining and prioritizing a climate adaptation research agenda. We argue that combining practitioner consultation with evaluation by researchers and other non-practitioners can generate productive research agendas that accelerate actionable adaptation science. Our effort presupposes that adaptation research planning and prioritization efforts can successfully focus research attention (Ling & Hobday, 2019), and that more actionable science is needed to support natural resource management under climate change.

The Midwest Climate Adaptation Science Center (MW CASC) is a collaboration between a consortium of research-focused academic, Tribal, and non-profit

organizations and the U.S. Geological Survey (USGS), and its purpose includes pursuing actionable science on climate change adaptation for natural resource management (mwasc.umn.edu, see Supporting Information S1 for details). In this context, “adaptation” refers to actions that reduce the harms of (or enable benefits from) climate change, and “adaptation science” refers to research to help inform those actions. The MW CASC's science agenda specifies major climate issues and adaptation approaches relevant to the region, and provides a list of topics for the MW CASC's annual research proposal solicitations.

Here we report on an evaluation and prioritization process leading to the science agenda (for detailed methodologies, see Skikne et al., 2022 and MW CASC, 2023). The first step in this process was the development of an initial list of ~50 science topics via dialogue with federal,

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state, and tribal natural resource managers (see Supporting Information S1 and Northeast CASC, 2020). The initial list rightfully centered the concerns of natural resource managers and practitioners, who are the primary intended users of the science. However, an agenda based solely on input from natural resource managers and practitioners may miss important topics that are not yet well known to them; further, such a process may result in too many topics for a single research entity to tackle and no obvious way to prioritize them.

To overcome these limitations and generate a richer process for setting a research agenda, we implemented two methods to use expert ideas to refine the science agenda. We define experts broadly to include university, state, tribal, and federal researchers, as well as those with traditional ecological knowledge or relevant experience gained via data analysis or study of the literature. For the purposes of this essay, this definition typically excludes natural resource managers and practitioners. These experts may not have authority for natural resource management decisions, but they have knowledge of the literature and ecosystems, understanding of research methods, and ideas about future research in adaptation science. As we demonstrate, this knowledge can complement that of the practitioners who contributed to the initial list of science topics.

Our second step was to survey experts to identify topics that were missing or underrepresented in the initial list of science topics. A total of 68 experts, mostly from higher education, completed our survey. Many of the topics they identified as missing or underrepresented crossed ecosystems, sectors (e.g., agriculture, human settlement), and disciplines (e.g., decision science, traditional ecological knowledge, MW CASC, 2023), which aligns with the findings of others (Ahlering et al., 2020). Such topics may be missed by practitioners working in agencies with narrow mandates, demonstrating the value of experts' complementary perspectives. The academic lead of the MW CASC (Hellmann) conveyed survey findings to the USGS lead (LeDee). For the most part, LeDee adopted edits and additions, except for cases where suggestions fell outside the USGS mission reach, or where revisions or rewording could capture suggestions while maintaining the overall number of science topics.

The updated list of ~50 science topics was similar in size to the outputs of other agenda setting efforts (Sutherland et al., 2011). Given the MW CASC's limited budget and time constraints, our third step was to help prioritize this list to highlight topics for immediate attention. We asked experts to score topics along three axes: (1) the state of knowledge on the topic ("uncertainty"), (2) the feasibility of researching the topic ("feasibility"), and (3) the extent that addressing the topic might change management ("potential impact"). Prioritizing topics with high

uncertainty, high feasibility, and high potential impact should maximize the return on public research investment. To generate scores on these axes, we invited experts to first independently score science topics, and then participate in live, facilitated sessions to determine final group scores (Skikne et al., 2022). Our methods in this third stage were qualitative and subjective, and we faced similar challenges to those described in "horizon scanning" methods to identify priority research questions (Sutherland et al., 2011). Nevertheless, the combination of structured, defined criteria and a live, consensus-building process made this approach preferable to other options (see Supporting Information S1 for details). Uncertainty and feasibility are areas where researchers' expertise is particularly complementary to that of practitioners (e.g., practitioners might not know what is already known in the peer-reviewed literature, nor the limitations of current research methods). In contrast, potential impact may be best evaluated by practitioners. To that end, practitioners' input was incorporated early on in the creation of the initial list of science topics; nonetheless, future efforts should consider asking practitioners to also score the potential impact of the final list of topics.

Experts did not score any topics "high" across all three variables, but two topics scored as high feasibility, high potential impact, and "somewhat uncertain" (the second level of uncertainty): "Determine optimal design and placement of culverts and fish passage structures to protect aquatic habitat and connectivity under future precipitation patterns" and "Assess and predict changes in future abundance and distribution of high-value fish species and at-risk aquatic organisms". In addition, 12 topics scored "high" for one of the three variables, and the second highest level for the other two (see Supporting Information S1). Finally, experts scored one topic ("Evaluate the efficacy of in-lake, landscape, and watershed management to protect the quality and function of wetland, stream, and lake ecosystems") as high uncertainty and high potential impact, but somewhat unfeasible, suggesting it might be worthwhile to consult with experts on a more feasible version of this research topic. A report with expert scores was delivered to the USGS and the committee responsible for advising the agency on its annual call for research proposals.

There were barriers to incorporating some expert recommendations into the science agenda. For example, survey respondents emphasized a need for research on the intersections of natural resource management and other fields (e.g., public health, agriculture), but these topics were only indirectly referenced, or not referenced at all, in the updated science priorities because they extend outside of agency mandate. This suggests that for government-led adaptation science, integrative issues

that fall between agencies or require complex collaboration among them may be overlooked. The inability to readily take on such topics illustrates one of the many challenges facing institutions that weren't built to deal with such multi-disciplinary, cross-sector issues. Additionally, longer-term (>10 years) concerns solicited in the survey were not adopted by the USGS because of a focus on nearer-term management concerns. Expanding the time horizon of the science agenda could help ensure research is developed and underway ahead of evolving management needs.

There were also co-benefits to our approach, both for the lead agency and public interest at large. Typically, research agendas are set in private by an advisory board; in contrast, the survey responses and written justifications of expert scores created a traceable process and included others in a structured deliberation, increasing transparency and legitimacy. In addition, our collaborative engagement exposed researchers—the primary audience for grant solicitations—to the MW CASC and its goals, and allowed them to understand and participate in the formulation and justification of solicitation topics.

Our process led to a refined, prioritized research agenda informed by both management and science, completing a cycle of iteration between knowledge users and producers (Dilling & Lemos, 2011, see also Ahlering et al., 2020) and meeting calls for more interactive approaches to public science solicitations and funding (Arnott et al., 2020). Our emphasis on incorporating expert feedback in a practitioner-defined agenda complements pleas for researchers to pay more attention to practitioner needs. We highlight expert participation in the process of setting a research agenda to inspire other, similar efforts. Because the need for adaptation science is pressing, the time for pursuing adaptation science is short, and the community of people and ecosystems impacted by climate change is vast, the process of rapid and thoughtful agenda-setting is particularly important. By focusing on the shared setting of an adaptation research agenda, we have the greatest hope of gathering evidence that leads to more successful adaptation actions and outcomes.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data are available in aggregated form in the reports cited herein. Our methods were determined to be “not human research” by the University of Minnesota's Institutional Review Board.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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