

U.S. Geological Survey Risk Research Community of Practice 2021 Workshop Report—Workshop on Considering Equitable Engagement in Research Design

Open-File Report 2023–1072

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By Emily Brooks, Alice Pennaz, and Matthew Jurjonas

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**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Geological Survey, Reston, Virginia: 2023

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Suggested citation:

Brooks, E., Pennaz, A., and Jurjonas, M., 2023, U.S. Geological Survey risk research community of practice 2021 workshop report—Workshop on considering equitable engagement in research design: U.S. Geological Survey Open-File Report 2023–1072, 25 p., <https://doi.org/10.3133/ofr20231072>.

ISSN 2331-1258 (online)

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Abbreviations

BIPOC	Black, Indigenous, and People of Color
CoP	community of practice
DEIA	diversity, equity, inclusion, and accessibility
EDGE	equipment development grade evaluation
IRB	Institutional Review Board
NGOs	non-government organizations
OPM	Office of Personnel Management
OSQI	Office of Science Quality and Integrity
RGE	research development grade evaluation
Risk CoP	risk research and applications community of practice
STEM	science, technology, engineering, and mathematics
TK	traditional knowledge
USGS	U.S. Geological Survey

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Abstract

The U.S. Geological Survey (USGS) Risk Research and Applications Community of Practice (Risk CoP) is a bureau-wide forum to share resources and discuss issues relevant to “conducting and applying scientific research in hazards—the dangerous processes or phenomena that may cause damage—to enhance the reduction of risk—the potential for societally relevant losses caused by hazards” (Ludwig and others, 2018). In 2021, this group held a workshop entitled “Considering Equitable Engagement in Research Design” as a part of its annual meeting. This report is a result of the workshop findings and includes additional input from the Risk CoP, other communities of practice, and subject matter experts across the USGS. The resources described in this report are intended to help guide USGS scientists aiming to include equity into their risk research but can apply to all USGS scientists, regardless of their research focus. This report shares key considerations for equitable engagement as identified by workshop participants, a discussion of the spectrum of engagement in equity-related research, and a toolkit that can help USGS scientists consider how to integrate equity into their work. Although this report is not comprehensive, it does seek to fill a gap that exists at the USGS; at the time of writing, there is no guidance on how to integrate equity into research design. The authors of this report believe that this document can serve as a foundation for future equity-related work at the USGS.

Background

The U.S. Geological Survey (USGS) Risk Research and Applications Community of Practice (Risk CoP) is a bureau-wide forum to share resources and discuss issues relevant to “conducting and applying scientific research in hazards—the dangerous processes or phenomena that may cause damage—to enhance the reduction of risk—the potential for societally relevant losses caused by hazards” (Ludwig and others, 2018). On August 19, 2021, the Risk CoP hosted a workshop on “Considering Equitable Engagement in Research Design”

as part of its 2021 annual meeting (app. 1). This workshop explored several commonly used approaches for thinking about equity in USGS science and invited participants to share experiences, lessons learned, and challenges. The workshop was organized as part of a special focus on diversity, equity, inclusion, and accessibility (DEIA) during the Risk CoP 2021 annual meeting and is part of a larger portfolio of DEIA-focused activities supported by the Risk CoP following the Black Lives Matter protests of 2020 and the Biden-Harris Administration’s focus on combating racial inequity (Biden, 2021). Focusing on equity is of particular importance to the Risk CoP as equity, vulnerability, and risk are all intimately intertwined. Vulnerability to hazards is shaped by economic, racial, and other disparities, leading to certain groups of the population shouldering disproportionate risk to hazards (for example, Bullard, 1994; Santos-Hernández and Morrow, 2013; Tierney, 2014; Stough and Kelman, 2018; Benach and others, 2019; Jerolleman, 2019). Considering equity when assessing hazard exposure and vulnerability can inform how the USGS designs, performs, and delivers its science.

This report documents workshop presentations, materials used, key discussion points, and participant reflections, ideas, and additional resources (app. 2). The draft report was circulated among members of the Risk CoP as well as with members of the Unlearning Racism in the Geosciences community for feedback and suggested additions to references or approaches. The compiled materials are summarized in the following three sections: Key Challenges, a sample Spectrum of Stakeholder Engagement, and Tools in the Equity Toolkit. This report is designed to be a starting point for research teams seeking ideas for how to integrate equity into their work. It is not meant to be a comprehensive or authoritative guide for the USGS nor an exhaustive literature review. While its origins are in the Risk CoP, many of the resources and suggestions presented here can be applied across USGS research, regardless of discipline. Included in this report are some basic tools for equitable engagement with research team members, collaborators, and stakeholders; key concepts for equity in the context of research design and implementation; and terminology for adding equity considerations into research and proposals. These activities will hereafter be referred to as “equity

work.” Some of the suggestions that follow may require the work of a trained and experienced expert in research ethics, social science, Tribal engagement, or related fields.

To understand the impetus for (and context of) the workshop and subsequent report, understanding the demographics of the larger scientific fields (such as geology and ecology) from which the USGS tends to draw its research workforce is important. The makeup of these fields is disproportionately white and male compared to the broader American public (Dutt, 2020; O’Brien and others, 2020). As with any group that is largely socially and culturally homogenous (meaning, many scientists at the USGS share similar backgrounds, privileges, and professional and personal experiences), there is a risk of assuming one’s individual experiences or opinions are shared by all. With this assumption comes the risk of excluding, minimizing, or simply failing to account for differing perspectives, experiences, and challenges. All of this can affect the USGS’s ability to nurture an inclusive workplace and scientific community; to incorporate new perspectives into USGS work; and to produce equitable, culturally appropriate, and effective scientific products and tools to reduce risk. This report has been written with these challenges in mind and is intentionally tailored for those at the USGS who may have limited personal experience with inequities related to scientific research, and, perhaps, have a greater need for resources and guidance.

Section 1. Key Challenges and Considerations for Equitable Engagement Identified by Workshop Participants

Risk CoP facilitators led a workshop (app. 1) that covered the spectrum of engagement shared in this report (fig. 1) and delivered a presentation on tools in the equity and risk toolkit (fig. 2). The discussion that followed included participants sharing suggested additions or revisions to these concepts. It also included participant discussion of challenges faced in their attempts to better incorporate equity into risk research and applications. While the workshop focused on research design and product development, participants took this opportunity to emphasize the connections between equity in research and DEIA efforts within the USGS more broadly.

This section summarizes the workshop participants’ discussion in the form of high-level key considerations and challenges. The following considerations and challenges are not ranked and are based on the issues shared by workshop participants.

- *Compensating collaborators and participants in research studies.*—Workshop participants noted that compensating research collaborators and participants is an important way to ensure that everyone who wants to contribute to a USGS research project can do so,

instead of just those who have the ability to take time off work or pay for childcare to participate. Workshop participants noted some mechanisms currently exist to compensate collaborators, including partnering with academic organizations who are able to compensate collaborators and working with collaborators as contractors. Workshop participants also noted that these approaches can be expensive (partner overhead), impractical (lack of experience with establishing contracts or established processes within the appropriate offices at the USGS), and (or) can suffer from months of delays in the contracting process.

- *Effectively engaging with collaborators.*—Workshop participants observed that barriers to interacting with the public, like the Paperwork Reduction Act (44 U.S.C. § 3501[8]) which requires a lengthy review and approval process that is beyond the timelines of many research projects, can inhibit engagement and exchange with all communities, including those that are underserved. While these policies are important and well-intended, their strict interpretation in a research and engagement context can create hurdles that many researchers may find difficult to overcome or even insurmountable without proper support.
- *Encouraging and rewarding relationship building and maintenance.*—Workshop participants noted that to engage with underserved communities effectively, relationships with these communities need to be established and maintained. Workshop participants acknowledged that the work of building and maintaining relationships with key partners, collaborators, and communities requires a substantial investment of time from USGS staff. Workshop participants suggested that to advance equity, USGS could better compensate (in other words, ensure such work is completed on paid time and as part of normal job duties), recognize, and reward employees for this investment in relationships, regardless of whether it results in a publication or other products. Participants noted that maintaining good relationships based on trust and accountability is best treated as a goal and (or) desired outcome in and of itself.
- *Increased recognition and support of research that incorporates equity by USGS leadership.*—Workshop participants suggested that for equity to move forward at a faster pace at the USGS, support and pressure to engage in equity-related work from the top down and from the grassroots would be most effective. Participants noted that more liaison activity is needed between senior leadership at headquarters (those who operate more on a broad policy and administrative level) and staff at science centers (those who are developing and implementing guidance and projects). For such activities to be effective, workshop participants

suggested that, to better support their staff, supervisors, program managers, and leaders may need training on DEIA principles and approaches. A few workshop participants shared their impression that, currently, USGS science centers are ahead of headquarters in the implementation of equity-related principles in their work, which is partly because science centers have the flexibility to move more quickly and responsively. While this ability to be proactive can be beneficial, workshop participants noted that it can also mean that staff feel as though they are taking risks because they are unsupported by headquarters and (or) lack bureau guidance.

- *Investment in skillsets and capacity required to appropriately implement equity-focused research.*—Workshop participants suggested that increasing the USGS capacity to engage in equity-related topics will require investment in specific skillsets that are not currently well-represented within the Bureau, such as community engagement; human subjects research ethics; DEIA in the workplace; and social science fields like sociology, anthropology, demography, and communication science. Participants suggested that doing so will enhance the ability of all researchers to integrate equity into their study design and implementation without having to become experts in fields and processes that are new to them. Most equity-related research requires the expertise of social scientists, although not all of it does (and not all social scientists are experts on equity in research). Workshop participants observed that building relevant social science capacity within the USGS can help guide the meaningful and ethical integration of diverse perspectives, knowledge, and ideas into the work of USGS scientists.
- *Linking workforce planning and research design.*—Workshop participants emphasized that equity in workforce planning and equity in research design are connected. While this workshop did not focus on hiring, participants noted that the ways the USGS hires and retains staff affects their ability to push equity work forward in research design. The following is a list of issues that workshop participants raised based on their observations and experiences:
 - The USGS lacks diversity in existing staff, particularly in leadership positions (Preston Ford, USGS, unpub. data, March 17, 2022). Workshop participants observed that this lack of diversity is partly (but not entirely) because of existing hiring and promotion processes, and norms that make it difficult to implement equity-related best practices to hire and retain a more diverse workforce.
 - Equity-related research is sometimes performed by contractors or term appointees without long-term job security. In other words, when equity work is done by staff members who have the least power and protection within the agency, they may worry about losing career opportunities if that work is challenging, unpopular, or time consuming.
 - More opportunities, community building, peer mentoring, and other activities are needed to increase retention and create better pathways to leadership roles for staff members who hold underrepresented or marginalized identities (for example, Black, Indigenous, and People of Color [BIPOC] scientists).
- USGS hiring processes could be more holistic and revised with an eye towards equity. The following is a list of possible revisions to the process:
 - Requiring all staff involved in hiring to take anti-bias training, identifying additional evaluation tools beyond a candidates' self-assessments, and (or) requiring all hiring managers use a rubric for all job series and grades.
 - Revising aspects of position classification and applicant review process to enable access to a broader and more diverse pool of applicants with skillsets that are not well-represented in the current workforce by removing outdated or mismatched educational requirements, using carefully tailored position descriptions, classifying interdisciplinary staff scientist and project management positions consistently according to the specific experience and education required, and valuing cultural knowledge and lived experience as applicant strengths equal to technical skillsets.
 - Hiring offices could develop more relationships with minority-serving institutions and advertise jobs to a wider network through science organizations focused on reaching diverse groups such as Society for Advancement of Chicanos/Hispanics and Native Americans in Science, Earth Science Women's network, Black in Geoscience.
- *Development of formal guidance on the incorporation of equity into USGS research.*—Workshop participants noted that currently there is a lack of USGS guidance related to participatory research and, more specifically, equity or justice-focused research. While the USGS has an instructional memo—IM OSQI 2022-01—on quality management systems for laboratories (U.S. Geological Survey, 2022), it lacks a corollary for human subjects data. An instructional memo that establishes a core set of standards to ensure high-quality,

ethical, and equitable collection of human subjects data would be an important first step the USGS could take towards producing more equitable research.

- *Addressing concerns about equity-related research within the USGS workforce.*—Workshop participants noted that there is a need for a broader USGS conversation on assumptions about equity work and the place of equity within the USGS scientific culture. Workshop participants noted that some USGS scientists, especially those within natural and physical science fields, may be uncomfortable incorporating equity into their research because of concerns about perceived bias or adopting an advocacy role. Such concerns could be addressed through clear guidelines on equity-related research. Workshop participants also observed that among USGS researchers there can be an assumption that all scientific research that increases our shared understanding is either value-neutral or inherently ethical. The USGS can address these assumptions by offering education, discussion, and formal guidance on these topics. Workshop participants suggested that giving scientists tools to understand that scientific research is a social process done by social actors and that it can be made more equitable via specific interventions could advance equity at the USGS.

Section 2. Participatory Research Methods and Stakeholder Engagement

Stakeholder engagement and participatory research methods are often the tools that are first considered when bringing equity into research. These tools are useful for things like integrating new and different voices into research; identifying priorities of historically underrepresented groups; understanding whether those priorities are being met through research and resulting informational products; and collaborating with indigenous knowledge holders. This section discusses participatory research methods, stakeholder engagement, and considerations USGS researchers may wish to take into account when thinking of incorporating these methods into their work.

Stakeholder engagement and participatory research methods may mean different things to different people. The workshop discussion clarified the relationship between the two. First, “stakeholder engagement” and “participatory [research] methods” are often used interchangeably. Workshop facilitators pointed out that the term stakeholder engagement can connote a less in-depth engagement in the project process itself than the term participatory methods. In a research context, participatory methods suggest community involvement at many (or all) stages of the research process, from idea formation and design to completion, while engagement could mean as little as information sharing at the end of a project. In addition, when using the term stakeholder, workshop facilitators

encouraged participants to consider what is meant by the term, when it is appropriate to use it, and who may be included or left out of this group and how. Given that naming stakeholders often means naming whose voice and opinion counts on a particular matter and whose do not, researchers might consider asking themselves the following questions: what does it mean to have a stake, a legal right, an interest, or to be impacted in this specific context? Is the research team reaching out to everyone who might see themselves as having a stake or being a stakeholder for a particular issue, or are they making assumptions? These questions can also be helpful guides for those embarking on participatory research as well. Workshop facilitators noted that it is helpful to remember that not all those interested in participating in the research process may be stakeholders. For example, those who contribute to citizen science endeavors may not be invested stakeholders in a decision, plan, or issue linked to the science they are conducting.

Second, using participatory methods does not inherently make research more equitable. Adopting participatory research methods alone only increases participation; it does not automatically lead to more equitable participation or more equitable science or science products. The groups or individuals that research teams engage with, and how they engage with them, is what makes the difference. For example, a USGS team may be collaborating with a group of scientists from a state geological survey, which increases public participation in the USGS project. However, this group of people may not represent a cross-section of society, nor might it offer a representative, local, or longer-term perspective that could make the work more equitable and add value to the project. That USGS team might consider including community groups (for example, local clubs, churches, or non-government organizations [NGOs]) or traditional knowledge scholars into their research alongside those state geologists to ensure that the research they are doing is meeting the needs of all groups in the community, and that numerous perspectives are incorporated into their research.

Figure 1 outlines potential levels of engagement, their benefits, and drawbacks. Workshop facilitators noted that a project can begin with one level of engagement and move to another. For example, outreach may spur deeper connections with community members that can lead to higher levels of engagement such as the coproduction of research and knowledge. Workshop facilitators encouraged participants to ensure that equity is considered in a project holistically and at all stages of its lifecycle—from development to data, product dissemination to communication. Some projects may include deep engagement in the development or dissemination phase only, while others will have participation throughout. Conducting research without engaging or sharing results with stakeholder communities can perpetuate or exacerbate existing inequities.

Workshop facilitators shared that in all research projects, ensuring that teams have the appropriate expertise and support to incorporate engagement can help avoid stretching project staff too thin or damaging relationships with communities.

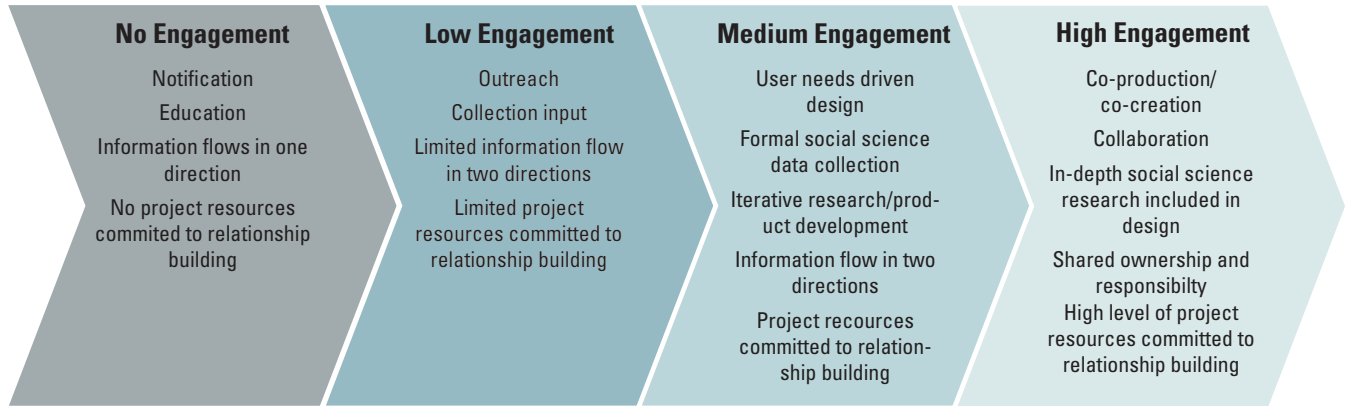


Figure 1. The spectrum of engagement outlines four levels of community engagement ranging from none to high with guiding principles and example activities for each level. Relationship building often results from repeated interventions with a given individual or group across multiple projects. Individual projects may have a low level of resources committed to relationship building, but if they are working from an established partnership, this may still result in actionable results for those involved.

Under-resourced and poorly executed engagement can cause more harm and broken trust than no engagement at all. Successful engagement includes proceeding with care and a realistic sense of available resources, consulting with experienced colleagues and community leaders, and focusing on what interventions and design choices will best provide tangible value and benefits to underserved communities.

This spectrum of engagement was created by workshop facilitators who drew from multiple sources on community participation in planning processes and community

engagement guidance (see “Resources Related to Participatory Research”). Below, the figure describes each level of engagement, an example of that engagement, the target audience or people engaged, the known benefits and drawbacks, and a sense of what it takes to implement that type of engagement (table 1). When potential benefits or drawbacks to relationship building are discussed, this is in reference to individual projects. Relationships are often forged over the course of multiple projects. Thus, a project that has little engagement may still be building on relationships formed during past interventions.

Suggested Resources Related to Participatory Research

Ball, D., Clayburn, R., Cordero, R., Edwards, B., Grussing, V., Ledford, J., McConnell, R., Monette, R., Steelquist, R., Thorsgard, E., and Townsend, J., 2015, A guidance document for characterizing Tribal cultural landscapes, OCS Study BOEM 2015-047: Camarilla, Ca., U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, 32 p., accessed October 5, 2022, at <https://sanctuaries.noaa.gov/tribal-landscapes/>.

Bamzai-Dodson, A., Cravens, A.E., Wade, A., and McPherson, R.A., 2021, Engaging with stakeholders to produce actionable science—A framework and guidance: Weather, Climate, and Society, accessed March 2, 2023, at <https://doi.org/10.1175/WCAS-D-21-0046.1>.

Hawaii Conservation Alliance, 2018, Making the case for community-based adaptive collaborative management in Hawaii, accessed March 2, 2023, at https://www.hawaiiconservation.org/wp-content/uploads/HCACoManagementPositionPaper_Adopted.pdf.

Tribal Adaptation Menu Team, 2019, Dibaginjigaadeg Anishinaabe Ezhitwaad—A Tribal climate adaptation menu: Odanah, Wisconsin, Great Lake Indian Fish and Wildlife Commission, 54 p., accessed March 2, 2023, at <https://glifwc.org/ClimateChange/TribalAdaptation-MenuV1.pdf>.

U.S. Geological Survey, 2013, Yukon River Basin Indigenous Observation Network: U.S. Geological Survey Climate Adaptation Science Centers web page, accessed June 22, 2023, at <https://www.usgs.gov/programs/climate-adaptation-science-centers/science/yukon-river-basin-indigenous-observation>.

U.S. Geological Survey, [undated], Office of Tribal Relations: U.S. Department of the Interior web page, accessed October 5, 2022, at <https://www.usgs.gov/office-of-tribal-relations>.

Table 1. A description of the types of engagement shared in figure 1, including what groups typically are involved in those engagements, what benefits or drawbacks to doing this type of engagement may be, and what is required of U.S. Geological Survey researchers to perform these types of engagement.

Attribute	Engagement			
	None	Low	Medium	High
Example	Public meeting to announce a product or results of a study. May include education on how to use a product. No stakeholder input collected.	Hold a listening session or workshop to collect input or understand needs for product development. Hold a report-back meeting after product is released with the same group. Develop generic outreach materials about research findings.	Collect information on stakeholder needs and challenges using an online survey prior to research and (or) product development. Hold workshops or virtual meetings to discuss and prioritize the needs expressed in the survey results. Share product designs and beta test web-tools with group to refine products.	Science-driven stakeholder engagement that can be held to a peer-reviewed social science and (or) interdisciplinary research standard. Methodologies at this level of engagement can fall under a co-production model where community members who have stake in the research are able to shape the research process alongside USGS scientists with equal or shared decision-making authority.
People engaged	Known groups and (or) the public are targeted in a broad or general sense.	Generally known, self-selecting, or pre-identified groups.	Known groups, but assessment done to ensure all necessary voices are represented; additional engagement pursued, as needed.	Known groups, but assessment done to ensure all necessary voices are represented; additional engagement pursued, as needed.
Benefit	Low time commitment, generally does not require additional expertise on project team.	Relatively low time commitment, may not require additional expertise on project team.	Systematically collected information to inform product and (or) research design; broad range of views and needs represented, leading to potential innovation in research or product design. Can support stronger relationships based on trust and accountability.	Systematically collected information to inform and improve product and (or) research design; broad range of views and needs represented, leading to potential innovation in research or product design. Potential for shared ownership and investment in project and outcomes. Facilitates long-term, sustainable relationships based on trust and accountability that can be built upon in future.
Drawbacks	Lost opportunity to understand the effect of the work being performed; lost opportunity for creative design or functionality; potential lost opportunity to forge new relationships or build accountability in existing ones. Information or products may not be used by intended audiences because they were not engaged in their production or delivery.	Assumptions may be confirmed uncritically if only working with known groups and (or) individuals; lost opportunity for creative design or functionality; relationships can be transactional and temporary; lost opportunity to build trust and accountability in relationships.	Time intensive, requires specialized expertise. Relationships may still be more transactional or client and (or) provider in nature.	Time intensive, requires specialized expertise, hard to transfer at the end of an individual's tenure.
What it takes	Meeting and workshop planning skills.	Workshop facilitation and planning, collaborative notetaking, design thinking.	Expertise in survey instrument design; thematic analysis; workshop and (or) focus group facilitation; stakeholder identification and engagement.	Expertise in survey instrument design; thematic analysis; workshop and (or) focus group facilitation; stakeholder identification and engagement; co-production of research.

Section 3. Tools in the Equity Toolkit—What Can You Consider?

This section discusses how USGS researchers can incorporate best practices related to equity into the work of research teams, as well as how to approach research with outside partners more equitably. Workshop facilitators reminded participants that there is no one way to incorporate equity into research. The tools below represent broad, frequently recommended approaches. Most projects can incorporate multiple tools, and most tools can integrate with and provide reinforcement for each other (app. 2).

The toolkit shared below is a combination of materials developed for the August 2021 workshop, as well as tools that were suggested by Risk CoP members and reviewers after the workshop took place. For each tool in the toolbox, a few suggested resources are included. What is offered here is in no way exhaustive—whole bodies of literature focus on these topics. Instead, the report’s authors have attempted to highlight those issues that are most pertinent or relevant to USGS research approaches. The list below is also not to be viewed as a mandatory checklist that will automatically yield an equitable project. Instead, these tools are meant to offer opportunities for critical reflection of team composition, approaches, and overall project design and implementation.

3.1. Project Teams, Partners, and Collaborators

Ensuring Diversity in Project Teams

Building a cadre of researchers who represent different communities, cultures, social and economic backgrounds, ways of knowing, lived experiences, and geographical regions—as well as various scientific specializations—is critical to expanding and enriching the scientific questions asked, and the groups of people served (see “Suggested Resources for Ensuring Diversity”).

Potential Actions

- Develop a diverse project team. Keep in mind that identities are complex, and everyone is part of multiple social and cultural communities. True diversity considers whole persons (lived experience and professional expertise), values their input, and recognizes multiple ways of knowing. “Ways of knowing” refers to the multiple theories of what knowledge is and how it is produced. Western science is one example of a line of inquiry used to produce knowledge. However, there are also indigenous and local ways of knowing that produce knowledge by drawing from direct experience with a particular phenomenon or from cultural resources like oral histories. In the context of a project

or team building effort, finding explicit ways to value multiple ways of knowing can (a) help advance equity efforts by acknowledging that people have always learned in multiple ways, (b) allow inclusion of the different ways communities produce and share knowledge, and (c) help avoid reinforcing inequitable power structures that prioritize one way of knowing over another.

- Develop mechanisms to retain and support diverse project teams. This includes considering the benefits of participation (and potential drawbacks) for team members.
- Ensure researchers from underrepresented groups lead and direct projects and initiatives, not just support them.
- Make key concepts like accessibility and inclusion a central focus within the research team, just as they would be when planning an external meeting with stakeholders. Facilitator’s tools like a shared mission statement or code of conduct may help.
- Work together within the team to promote a culture of empathy, respect, and support. Being open and explicit about this aim is a great first step. Make renewing workplace commitments to equity like the Department

Suggested Resources for Ensuring Diversity

Barnhardt, R., and Kawagley, A.O., 2005, Indigenous Knowledge systems and Alaska Native ways of knowing: *Anthropology & Education Quarterly*, v. 1, no. 36, 16 p., accessed June 22, 2023, at https://www.uaf.edu/ankn/publications/collective-works-of-ray-b/02Barnhardt-Kawagley_08-23.pdf.

Kohl, E., and Knox, J.A., 2016, My Drought is Different from Your Drought—A Case Study of the Policy Implications of Multiple Ways of Knowing Drought: *Weather, Climate, and Society*, v. 8, no. 4, p. 373–388, accessed June 22, 2023, at <https://doi.org/10.1175/WCAS-D-15-0062.1>.

Nature, 2020, Achieving diversity in research: *Nature*, accessed June 22, 2023, at <https://www.nature.com/collections/qsgnptdgr>.

Shaw, H., Leading for generations: Leading Authorities web page, accessed February 23, 2023, at <https://www.leadingauthorities.com/speakers/video/haydn-shaw-leading-generations>.

U.S. Geological Survey, [undated], Diversity Council: U.S. Geological Survey Human Capital Office web site, accessed February 23, 2023, at <https://www.usgs.gov/human-capital/diversity-council>.

of the Interior Office of Diversity, Inclusion, and Civil Rights Pledge an annual event in the research group, office, or center.

Ensuring Team Safety in the Field

When embarking on field work, consider whether anyone on the team may face identity prejudice in the area where they may be working (see “Suggested Resources for Ensuring Team Safety in the Field”). Identity prejudice may be based on race, sexual orientation, disability, gender identity, and (or) religion (Demery and Pipkin, 2020). Identity prejudice can manifest as a threat to researcher psychological or physical safety, discomfort, and (or) an inability to complete data collection or work. While the USGS has safety protocols related to potential field or equipment related injuries, the topics discussed here are not currently included in those resource materials.

Potential Actions

- Develop project-specific field and workplace safety plans as a team, incorporating an inclusive understanding of what safety means to different members of the team.
- Include considerations of identity prejudice as part of routine safety evaluations when planning and preparing for field work. Keep in mind that this may require having sensitive one-on-one conversations with team members, and that team members may be reluctant to share concerns they feel have not been taken seriously in their past experiences.
- Consider developing a comprehensive field safety plan (including safety when interacting with the public as well as natural hazards and equipment) for each project, soliciting input from all employees involved in the project and having team members sign the final plan.
- Work continuously with team members to ensure everyone feels safe and comfortable while completing their work. This may include using strategies like working in larger teams, adjusting the research sites, requiring additional check-ins, and (or) modifying the length or strenuousness of time spent in the field.
- Encourage teams to take unconscious bias and bystander intervention training. Consider making these trainings part of mandatory safety training at the office and (or) center level.
- Have field leaders model appropriate, safety-conscious behavior for their teams.

Suggested Resources for Ensuring Team Safety in the Field

Converge, [undated], Training Modules, Understanding and ending gender-based violence in fieldwork: Natural Hazards Center, University of Colorado Boulder, accessed February 23, 2023, at <https://converge.colorado.edu/resources/training-modules/>.

Demery, A.-J.C., and Pipkin, M.A., 2020, Safe field-work strategies for at-risk individuals, their supervisors and institutions: *Nature Ecology & Evolution*, v. 5, no. 1, p. 5–9, accessed March 2, 2023, at <https://doi.org/10.1038/s41559-020-01328-5>.

Kelly, A., and Yarincik, K., 2021, Report of the workshop to promote safety in field sciences: Zenodo, accessed June 22, 2023, at <https://doi.org/10.5281/zenodo.5604956>.

National Academies of Sciences, Engineering, and Medicine, 2023, Leading practices for improving accessibility and inclusion in field, laboratory, and computational science—A conversation series: National Academy of Sciences web page, accessed February 23, 2023, at <https://www.nationalacademies.org/our-work/leading-practices-for-improving-accessibility-and-inclusion-in-field-and-laboratory-science-a-conversation-series>.

U.S. Geological Survey, 2022, Safety office—Frequently asked questions: U.S. Geological Survey Safety and Health Management internal web page, accessed June 22, 2023, at <https://internal.usgs.gov/ops/safetynet/safetyfaqs.html>.

Partnerships and Collaborations

Who we partner or collaborate with can either amplify underrepresented voices or continue to subvert them. While USGS research aims to be broadly applicable, partnering specifically with underserved communities (including community-based organizations and other boundary organizations that represent the interests of particular communities) to understand the questions and priorities important to community decision-making can lead to a more equitable distribution of resources and expertise overall. Collaborating with institutions or individuals associated with underrepresented groups can also ensure that new and different voices are brought into larger conversations about risk and community resilience, and that the priorities of those communities are addressed adequately (see “Suggested Resources for Partnerships and Collaborations”).



Figure 2. The Equity Toolkit contains 15 strategies or approaches (tools) that can be leveraged to incorporate equity into the work of research teams. There is no one way to incorporate equity into your work; these tools represent broad, frequently recommended approaches. This list is not meant to be sequential and is not prioritized. Instead, it is intended to show that there are many tools that can be employed in the pursuit of a higher degree of equity in USGS research. This list is by no means exhaustive.

Potential Actions

- Consider what communities or groups are currently partnered with to determine research questions. Use the following list to consider how these groups might be expanded:
 - Reach out to historically underserved communities to ask about their priorities and needs.
 - Tap into local organizations or non-profits already working in underserved communities to facilitate engagement and provide continuity after the project is complete.
- Consider what organizations or groups are currently drawn from to create review panels, conference panels, or advisory committees. Consider how these groups might be expanded to be more inclusive.
- Consider what organizations and institutions are currently drawn from to recruit student interns or applicants for positions. Consider how these groups might be expanded to be more inclusive.
 - For example, create a contact list of minority-serving universities, organizations, and scholarly societies to reference when advertising new positions and internships.
- Consider which individuals or groups are currently invited to participate in panels at conferences or workshops. Consider how these groups might be expanded to be more inclusive.

- Respect community collaborators as full partners and experts on their own experience and ensure that they benefit from collaborating with USGS teams in ways that are meaningful to them.

Suggested Resources for Partnerships and Collaborations

Converge, [undated], Training Module, Cultural competence in hazards and disaster research: Natural Hazards Center, University of Colorado Boulder, accessed February 23, 2023, at <https://converge.colorado.edu/resources/training-modules/>.

Converge, [undated], Training Module, Reciprocity in hazards and disaster research: Natural Hazards Center, University of Colorado Boulder, accessed February 23, 2023, at <https://converge.colorado.edu/resources/training-modules/>.

National Academies of Sciences, Engineering, and Medicine, 2022, Engaging socially vulnerable communities and communicating about climate change: National Academy of Sciences web page, accessed June 22, 2023, at <https://nap.nationalacademies.org/resource/26734/interactive/>.

U.S. Geological Survey, [undated], Partners and cooperators: U.S. Department of the Interior, accessed February 23, 2023, at <https://www.usgs.gov/about/doing-business/partners-and-cooperators>.

- Consider whether assumptions are being made about underserved community partners that may limit their ability to speak for their own experience, as well as limit the scope and quality of the partnership.
- For example, a science team might assume that their community partner only has needs (as opposed to both strengths and needs) or that the community's needs can be addressed solely with new scientific data or tools from the USGS (as opposed to other resources, partnerships, or processes).
- Come ready to explain tangible results or benefits that a community can expect if they decide to work with USGS researchers. If no immediate benefit to the community is anticipated, help the community understand how this research may benefit them or communities like them over time.
- Periodically check in with community participants. Ask if their participation level feels manageable or whether it has become burdensome, and what can make participation easier. Make sure that participants are aware that they can stop participating if that is what is best for them.

Participant Fatigue

Some underserved and (or) disaster-affected communities are repeatedly asked to participate in research, engagement, and planning activities. These asks can quickly become a burden if community members are required to invest substantial time without seeing benefits of participation. These asks can be a further burden if communities are balancing more immediate priorities related to their safety and security, and (or) if community members are asked to reshare sensitive or traumatic experiences of disasters. Therefore, consider whether the proposed research is necessary (see “Suggested Resources for Participant Fatigue”). If it is necessary, consider the burden or cost of engagement for participants and whether engagement with these groups will be mutually beneficial, offering tangible results. Be aware of other projects that are, or have been, operating in an area and to coordinate engagement, if possible. Understanding ongoing research may be particularly critical for researchers and teams new to a particular study site. Requests for participation may be poorly received if they are made by people who are perceived to have parachuted into an area or event without a relationship with the individuals or community where they are working.

Potential Actions

- Research whether other groups have, or are currently, doing work in the community where a research team intends to work. If possible, find ways to coordinate with, or build upon, past, planned, or ongoing work. This coordination may involve scaling down project scope and relying more on collaborating with and citing the work of others.
- When scoping work, ask communities that may be engaged if they are interested in working with the USGS research team and (or) whether they have been contacted by other researchers already.
- Ensure that the needs and priorities of communities (for example, shelter, food, and safety in a post-disaster context) take precedence over USGS research needs.

Suggested Resources for Participant Fatigue

Fleming, S., Sedano, E., Carlin, M., Tracy, R., and Walker, J., 2018, The ethics of volunteered geographic information for GEOINT use: Trajectory, accessed June 22, 2023, at <https://trajectorymagazine.com/ethics-volunteered-geographic-information-geoint-use/#:~:text=Current%20Thinking%20on%20the%20Ethical%20Use%20of%20VGI,legal%20liability%2C%20responsible%20use%2C%20and%20data%20quality%20considerations>.

Gaillard, J.C., and Peek, L., 2019, Disaster-zone research needs a code of conduct: *Nature*, v. 575, no. 7783, p. 440–442, accessed June 22, 2023, at <https://doi.org/10.1038/d41586-019-03534-z>.

Jerolleman, A., 2019, Disaster recovery through the lens of justice: Palgrave Pivot Cham, 108 p. accessed June 22, 2023, at <https://doi.org/10.1007/978-3-030-04795-5>.

Compensating and Supporting Collaborators

When working with citizen scientists, community members, and (or) decision-makers, recognize that these groups are potentially making sacrifices to engage in the collaboration. Taking time off work, finding and (or) paying for childcare and transportation can represent serious financial burdens and (or) impediments to participation. Scientists may also be asking collaborators to provide work (including sharing important local knowledge and information) for free that would otherwise cost the science team time, money, or both. Failing to compensate collaborators for their time and effort can limit participation from underserved community members or exclude them entirely (see “Suggested Resources for Compensating and Supporting Collaborators”). However, USGS staff are bound by important Federal ethics and acquisitions laws that can make this work difficult (Office of the General Council, 2022).

Potential Actions

- Explore options for compensating research participants or collaborators for their time, effort, expertise, and (or) expenditures for participating in USGS research. Identifying viable options can be tricky because of Federal ethics and acquisition guidelines. In research that USGS may be doing in collaboration with an academic partner or non-governmental organization, it may work best for compensation to come from those institutions. Otherwise, the USGS researchers can explore bringing on research participants or collaborators as contractors which allows them to be paid for their time.
- Explore ways to offset burdens felt by research collaborators or participants through nonmonetary compensation such as childcare, sharing food, or transportation.
- Federal ethics guidelines make this type of compensation difficult. Partner organizations may be better positioned to provide these types of services.
- When more tangible means of compensation are not possible, explore how USGS researchers can share tokens of appreciation with research participants in ways that are meaningful for them (for example, letters of recognition).
- If research participants are compensated, consider how to address the fact that people who have not participated may feel left out, denied the opportunity to gain such compensation, or may feel obligated to participate. For example, consider less-intensive means of participation and (or) different kinds of compensation to be more inclusive.

Recognizing Collaborators as Co-Authors

Co-authoring research papers with people who are not formally trained in Western sciences but who contribute substantively to USGS research is one way to contribute to epistemic justice. This approach acknowledges that knowledge production happens outside of formal Western scientific arenas and that people who have key lived experience, local cultural knowledge, and traditional knowledge can also offer significant contributions to USGS science. Co-authorship with all types of experts can give voice to individuals or groups who may not typically have the power to inform decision making and can bring new perspectives to USGS science. Such collaborations can emphasize the value and depth of knowledge about the natural world that is produced by people who have not been formally trained in (and have not benefitted from the prestige and authority associated with) the Western sciences. Co-authorship can be one way to ensure that such exchanges

Suggested Resources for Compensating and Supporting Collaborators

Hutson, B., 2021, Paying community members for their time: Montclair, N.J., Shelterforce, accessed June 22, 2023, at <https://shelterforce.org/2021/02/26/paying-community-members-for-their-time/>.

Kelly, A.B., Gupta, C., 2014, Social relations of fieldwork—Giving back in field research: *Journal of Research Practice*, v. 10, no. 2, accessed June 22, 2023, at <https://jrp.icaap.org/index.php/jrp/issue/view/22>.

Northwestern University, 2019, Northwestern University IRB guidance on research participant payments: Northwestern University, 4 p., accessed February 23, 2023 at <https://cpb-us-e1.wpmucdn.com/sites.northwestern.edu/dist/2/2819/files/2020/01/Research-Participant-Payments-GENERAL-1902.pdf>.

U.S. Geological Survey, [undated], Office of Acquisition and Grants.: U.S. Department of the Interior, accessed February 23, 2023, at <https://www.usgs.gov/office-of-acquisition-and-grants>.

U.S. Geological Survey, 2023, USGS Ethics Team: U.S. Geological Survey Office of Science Quality and Integrity web page, accessed February 23, 2023, at <https://www.usgs.gov/office-of-science-quality-and-integrity/usgs-ethics-team>.

are not extractive but collaborative in nature. USGS authors are bound by USGS Fundamental Science Practices and by the “Department of the Interior Code of Scientific and Scholarly Conduct,” which requires that professional standards for authoring and “respect[ing] the intellectual property rights of others” (U.S. Department of the Interior, 2014, p. 11) are followed. Thoughtful approaches to co-authorship can help USGS researchers meet these requirements (see “Suggested Resources for Recognizing Collaborators as Co-Authors”).

Potential Actions

- When working with citizen scientists, communities who hold important traditional knowledge (TK), or with informally trained researchers, consider (and discuss with collaborators) whether their contributions merit co-authorship, contingent on tangible collaboration with USGS researchers, and (or) other forms of recognition such as participating in or leading research presentations. Authorship may also be contingent on the type of publication being put forward—authorship on a formal journal article may rise to a different level than authorship of an online article or fact sheet. People who have not contributed at a level consis-

tent with USGS fundamental science practices but who have shared knowledge can be acknowledged in reports and journal articles.

- When considering co-authorship with a collaborator, explore the potential positive and negative consequences with them (for example, having their name on a potentially controversial finding or gaining recognition as an expert on a topic).

Suggested Resources for Recognizing Collaborators as Co-Authors

Sarna-Wojcicki, D., Perret, M., Eitzel, M.V., and Fortmann, L., 2017, Where are the missing coauthors? Authorship practices in participatory research: *Rural Sociology*, v. 82, no. 4, p. 713–746, accessed June 22, 2023, at <https://doi.org/10.1111/ruso.12156>.

U.S. Department of the Interior, 2014, Integrity of scientific and scholarly activities, 305 DM 3.4: Department of the Interior Departmental Manual, accessed February 8, 2023, at <https://www.doi.gov/scientificintegrity>.

U.S. Geological Survey, 2022a, Fundamental Science Practices—USGS authorship of scientific information products: U.S. Geological Survey Manual, chap. 502.10, accessed June 22, 2023, at <https://www.usgs.gov/survey-manual/50210-fundamental-science-practices-usgs-authorship-scientific-information-products>.

the USGS lacks an IRB. In the absence of an IRB, talking to a social scientist who is familiar with human subjects research ethics and (or) the potential impacts of particular types of research is advisable.

While not all potential ethical considerations can be understood ahead of time, many can be anticipated, mitigated, and addressed. With this perspective in mind, it may be helpful to borrow the standards used to evaluate human subjects research (National Institutes of Health, 2018) and use the following list of questions to think of a research project in terms of potential benefits and potential harms:

- Who benefits most from the work, and how substantial might those benefits be?
- If the work requires some people to be inconvenienced and (or) exposed to potential harms more than others, do those people also benefit in a way that makes that inconvenience or potential harm an acceptable tradeoff for them (for example, a landowner may be reluctant to share private information about their property but may also decide that better understanding their exposure to sinkholes is worth the risk)?
- While research often has positive impacts (for example, a neighborhood now better understands their exposure to landslides and can act accordingly), negative consequences can arise as well (for example, it becomes more difficult to formalize land titles in that area).
- It may also be worthwhile to consider whether the research may disproportionately negatively affect historically underserved communities or groups.

3.2. Research Ethics and Design

Application of Research Ethics

The work that researchers undertake does not happen in a vacuum. Not only can the process of research affect communities and individuals, so can the broader implications of research findings. Conducting ethical research means identifying and mitigating potential negative individual- and community-level effects, as well as larger systemic or cascading effects of scientific work (see “Suggested Resources for Application of Research Ethics”).

In academia, research that involves human subjects is reviewed by Institutional Review Boards (IRBs). These panels offer ethical oversight on an institution’s research program as well as guidance to individual researchers embarking on human subjects research. Currently, the Department of the Interior is not a signatory to the “Common Rule,” which is the Federal Policy for the Protection of Human Subjects (Office for Human Research Protections, 2009). As a result,

Potential Actions

- Consider who within the community might be impacted by the research and how.
- Consider engaging local leaders before beginning research to discuss strategies and understand potential barriers, consequences, and reactions (especially for politically and otherwise sensitive work).
- Begin a research project that involves local participants with a pilot project that includes a small number of community members. Pilot projects can help determine if the approach is appropriate and can help to identify any unanticipated sensitivities or challenges within the community.
- As part of the background research for the project, learn about the broader context of the topic for the communities that might be impacted. Ask questions like the following:

- What is their historical relationship to the topic or area under study?
- What current barriers and inequities might they be facing related to that topic or area?
- Are those barriers part of racism, colonialism, and (or) other forms of structural injustice?
- How can the project avoid perpetuating those barriers, inequities, and injustices? For example, if a USGS researcher is studying flood effects in an urban area, understanding how those effects intersect with the local history of redlining, race-based discriminatory banking and real estate practices that designated certain neighborhoods as hazardous to investment, thus denying services to their residents, will help the researcher better understand the potential benefits and harms associated with their research for residents. Although formal redlining was made illegal by the 1968 Fair Housing Act, its legacy persists for low-income communities of color, and claims of informal or de facto redlining persist.
- Think about research ethics and optics as part of science communication.
 - Consider comportment when discussing research with communities. For example, although USGS scientists may be excited about research on a landslide or flood, appearing excited when sharing that research with people who were affected by the event would be insensitive and inappropriate.
 - As part of discussions with project partners, be prepared for potential traumatic or emotional reactions to exposure to knowledge of risk levels within communities (for example, learning about sea level rise or potential property value effects). Consider science communication and other training for team members to ensure that everyone can engage compassionately with communities while sharing science that affects their lives and livelihoods.
- Consider ways to mitigate potential negative impacts by changing data collection and delivery.
 - For example, consider making data collection more anonymous or less invasive, or consider delivering information in a manner suggested by research participants or community-based organizations.
 - If negative effects can't be mitigated, consider whether the work is necessary.
- Consider how or if the research may affect the spiritual well-being of residents or caretakers of the study site—for example, if collecting sensitive data on culturally significant plants or animals or traversing traditional spiritual sites, consult with community leaders and the appropriate liaisons and offices within the USGS to ensure everyone on the team understands and can follow all applicable guidelines.
 - If effects to spiritual well-being or cultural resources are possible, the team may be required to conduct a formal review and (or) consultation according to the National Environmental Policy Act, National Historic Preservation Act, and (or) other laws and Executive Orders.
- Even if formal review or Tribal consultation processes are not required for the project, it is still good practice for team members to educate themselves on any cultural or spiritual significance of the study site and work with the relevant communities to ensure the work is done in a respectful manner.
 - If potential effects are not clear, ask residents or caretakers of the site. It can help to speak in general terms (in other words, don't ask where sacred sites are directly but instead share that the team is considering doing research in a particular area and ask if this work would be disruptive. If the answer is yes, ask which specific areas should be avoided without asking for particulars).
- When in doubt, gain feedback from community members through appropriate mechanisms. Try to understand how the work might affect their lives and what can be done to maximize benefits to them.
- If research is being carried out in partnership with a community, ask whether they have a group that acts like an IRB to review research in the community. Some Tribal Nations and other communities have formal IRBs that review research, while others may have de facto versions of IRBs.
- Remember that participation in research is voluntary. Conducting research in which participants feel obligated or forced to engage is unethical and methodologically problematic. To avoid these pitfalls, researchers can take steps to obtain informed consent any time information is collected from the public (in other words, explaining the research and its purpose to a potential participant and then directly asking “Are you willing to participate in this study?”). A Paperwork Reduction Act clearance may also be necessary for this type of research.

Suggested Resources for Application of Research Ethics

Carter, S.C., Griffith, E.M., Jorgensen, T.A., Coifman, K.G., and Griffith, W.A., 2021, Highlighting altruism in geoscience careers aligns with diverse US student ideals better than emphasizing working outdoors: *Communications Earth & Environment*, v. 2, no. 1, p. 213, accessed June 22, 2023, at <https://doi.org/10.1038/s43247-021-00287-4>.

Converge, [undated] a, Training Modules, Broader ethical considerations for hazards and disaster researchers: Natural Hazards Center, University of Colorado Boulder, accessed February 23, 2023, at <https://converge.colorado.edu/resources/training-modules/>.

Converge, [undated] b, Training Modules, Institutional Review Board (IRB) procedures and extreme events: Natural Hazards Center, University of Colorado Boulder, accessed February 23, 2023, at <https://converge.colorado.edu/resources/training-modules/>.

Kelly, A., and Yarincik, K., 2021, Report of the workshop to promote safety in field sciences: Zenodo, accessed June 22, 2023, at <https://doi.org/10.5281/zenodo.5604956>.

Office for Human Research Protections, 2009, Federal policy for the protection of human subjects ('common rule'): U.S. Department of Health and Human Services, accessed October 20, 2022, at <https://www.hhs.gov/ohrp/regulations-and-policy/regulations/common-rule/index.html>.

Wilmer, H., Meadow, A.M., Brymer, A.B., Carroll, S.R., Ferguson, D.B., Garba, I., Greene, C., Owen, G., and Peck, D.E., 2021, Expanded Ethical Principles for Research Partnership and Transdisciplinary Natural Resource Management Science: *Environmental Management*, v. 68, no. 4, p. 453–467, accessed March 2, 2023, at <https://doi.org/10.1007/s00267-021-01508-4>.

Site Selection and Research Focus

Acknowledging that there is limited time and resources to engage with many communities or groups, it may be helpful to think about how to prioritize those interactions. Often there is a tendency towards what is termed the “Pareto Efficiency,” a notion that public works (including research initiatives) should do the greatest good for the greatest number or to the greatest economic benefit (Smith and Swallow, 2013). When evaluating where to site research or monitoring efforts, this can often lead to a focus on areas of high property values or densely populated areas. However, this approach may not always be equitable (see “Suggested Resources for Site

Selection and Research Focus”). For example, while helping to mitigate hazard impacts to vacation homes in an exclusive seaside neighborhood would probably have the highest dollar value benefit, the people living in those homes may be more economically resilient than people living in lower cost housing farther inland.

Potential Actions

- When designing research, consider where that research might have the greatest impact using a holistic approach; consider who might have the most to lose (or gain) in a total sense, not just in economic terms. Consider also whether communities already enjoy substantial resources and access to resilience and risk reduction efforts, and which do not.
- When using a social vulnerability index, screening tool, or cost-benefit analysis to aid in site selection and research focus, ensure that team members fully understand the limitations of the chosen tool or analysis. Consult with experts and, if possible, relevant community groups. Do not rely solely on a vulnerability index, map, or model when determining the goals of the project.

Suggested Resources for Site Selection and Research Focus

Craig, R.K., 2019, Coastal adaptation, government-subsidized insurance, and perverse incentives to stay: *Climatic Change*, v. 152, no. 2, p. 215–226, accessed June 22, 2023, at <https://doi.org/10.1007/s10584-018-2203-5>.

Hardy, R.D., Milligan, R.A., and Heynen, N., 2017, Racial coastal formation—The environmental injustice of colorblind adaptation planning for sea-level rise: *Geoforum*, v. 87, p. 62–72, accessed March 2, 2023, at <https://doi.org/10.1016/j.geoforum.2017.10.005>.

Jurjonas, M., Seekamp, E., Rivers, L., III, and Cutts, B., 2020, Uncovering climate (in)justice with an adaptive capacity assessment—A multiple case study in rural coastal North Carolina: *Land Use Policy*, v. 94, p. 104547, accessed March 2, 2023, at <https://doi.org/10.1016/j.landusepol.2020.104547>.

Siders, A.R., 2019, Social justice implications of US managed retreat buyout programs: *Climatic Change*, v. 152, no. 2, p. 239–257, accessed March 2, 2023, at <https://doi.org/10.1007/s10584-018-2272-5>.

Considering Participatory Research Lifecycle

When engaging with new collaborators and communities, it is important for everyone to understand project timelines, as well as when, how, and whether a project may end (see “Suggested Resources for Considering Participatory Research Lifecycle”). While some communities may see their interactions with USGS researchers as transactional and temporary, others may enter relationships with researchers expecting a long-term relationship and commitment for future work. Failing to discuss the expected engagement timelines with collaborators can lead to their feeling abandoned, insulted, or hurt when a project ends. Not only is this problematic from a human perspective, but it can also limit future USGS engagement with that person or group. While the USGS Risk Plan discusses the importance of establishing clear life cycles for risk products like web-based mapping tools, the same is true for participatory research programs (Ludwig and others, 2018).

Potential Actions

- Discuss the project timeline and when and (or) how and (or) whether it will end with collaborators. Ideally, this conversation would occur at the outset of the research and establish a timeline and process for regular updates going forward.
- Work to ensure that the research team and all collaborators share expectations for the work that will be done.
- Work to ensure that the USGS research team has a continuity plan in place for the full lifecycle of the project.
 - For example, what happens if a key USGS team member leaves the agency or their office’s funding priorities shift?
 - Who is responsible for any monitoring equipment left at field sites?
 - Be clear about this plan with participants in the study.

Monitoring and Evaluation

Equitable engagement in research or planning is an intentional process. Specialists spend years developing this skillset as it requires intention and detailed efforts to set goals, establish indicators, and monitor activities to document successes and areas for improvement. Research shows that when justice or equity considerations are not explicitly stated within proposals, grants, or reporting requirements, they can easily be left out of engagement (Fitzgibbons and Mitchell,

Suggested Resources for Considering Participatory Research Lifecycle

Ludwig, K.A., Ramsey, D.W., Wood, N.J., Pennaz, A.B., Godt, J.W., Plant, N.G., Luco, N., Koenig, T.A., Hudnut, K.W., Davis, D.K., and Bright, P.R., 2018, Science for a risky world—A U.S. Geological Survey plan for risk research and applications: Geological Survey Circular, accessed June 22, 2023, at <https://doi.org/10.3133/cir1444>.

Méndez, M., Flores-Haro, G., and Zucker, L., 2020, The (in)visible victims of disaster—Understanding the vulnerability of undocumented Latino/a and indigenous immigrants: *Geoforum*, v. 116, p. 50–62, accessed March 2, 2023, at <https://doi.org/10.1016/j.geoforum.2020.07.007>.

Mercer, J., Kelman, I., Lloyd, K., and Suchet-Pearson, S., 2008, Reflections on use of participatory research for disaster risk reduction: *Area*, v. 40, no. 2, p. 172–183, accessed October 5, 2022, at <https://doi.org/10.1111/j.1475-4762.2008.00797.x>.

2019). When equity is recognized as an important element of a project from its beginning, success is more likely. Determining metrics for success in achieving equitable research outcomes can be a useful part of a discussion with those who might be affected (positively or negatively) by the research at hand (see “Suggested Resources for Monitoring and Evaluating”).

Potential Actions

- Consider developing metrics of success for evaluation with those potentially affected by the research or adopt metrics used for similar studies. This may be best achieved by collaborating with a monitoring and evaluation specialist.
- Consider including a monitoring and evaluation specialist on the team to provide a qualitative evaluation of the project to gather perceptions or feedback from diverse audiences. This feedback could allow for new ideas or even unintended consequences of a project to surface. It can also help the project team to understand if the intended audiences got the necessary information. Because the USGS employs very few monitoring and evaluation specialists, it may be necessary to use a contract to add one to the team.

Suggested Resources for Monitoring and Evaluation

Emanuel, R.E., 2017, Flawed environmental justice analyses: *Science*, v. 357, no. 6348, p. 260, accessed March 2, 2023, at <https://doi.org/10.1126/science.aao2684>.

Fitzgibbons, J., and Mitchell, C.L., 2019, Just urban futures? Exploring equity in “100 Resilient Cities”: *World Development*, v. 122, p. 648–659, accessed March 2, 2023, at <https://doi.org/10.1016/j.worlddev.2019.06.021>.

Spielman, S.E., Tuccillo, J., Folch, D.C., Schweikert, A., Davies, R., Wood, N., and Tate, E., 2020, Evaluating social vulnerability indicators—Criteria and their application to the Social Vulnerability Index: *Natural Hazards*, v. 100, no. 1, p. 417–436, accessed March 2, 2023, at <https://doi.org/10.1007/s11069-019-03820-z>.

Equity in Data Collection

For researchers at the USGS, one approach to collecting data equitably is to ensure that data related to community needs exist and are made available to historically underserved communities (see “Suggested Resources for Equity in Data Collection”). Often without meaning to, scientists perform research in communities that are wealthy and white because baseline data already exist for comparison, or those communities are able to advocate for and attract that research (Lynch and Stretesky, 2013). The lack of similar data for BIPOC communities, rural communities, hidden populations (such as migrant workers or people experiencing homelessness, who may not be accurately represented in census and other survey efforts), and (or) communities of lower socioeconomic status can disadvantage decision-making, preparedness, and mitigation activities, which can subsequently lead to disproportionate impacts from hazards or adverse events (National Academies of Sciences, Engineering, and Medicine, 2022).

Potential Actions

- Consider where research projects are sited. Does the project cover areas that are populated by historically underserved communities? If not, ask why not.
- If the research covers the continental United States, consider expanding the work to the Pacific Islands, Alaska, and Territories and ensuring that places where underserved and underrepresented groups such as Indigenous communities (including Native Hawaiian

and Alaska Native communities) or rural and poor communities live and work are included. Inclusivity in the selection of study sites can help fill data gaps and promote more equitable data collection practices.

- If the project includes working with Tribal communities and (or) on Tribal lands, clarify USGS and Tribal rules, regulations, and expectations around data sovereignty during the project formation stage.

Suggested Resources for Equity in Data Collection

Carroll, S.R., Herczog, E., Hudson, M., Russell, K., and Stall, S., 2021, Operationalizing the CARE and FAIR Principles for Indigenous data futures: *Scientific Data*, v. 8, no. 1, p. 108, accessed June 22, 2023, at <https://doi.org/10.1038/s41597-021-00892-0>.

Native Nations Institute, 2020, Indigenous data sovereignty and governance: The University of Arizona web page, accessed October 5, 2022, at <https://nni.arizona.edu/our-work/research-policy-analysis/indigenous-data-sovereignty-governance>.

Wilkinson, M.D., Dumontier, M., Aalbersberg, I.J.J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L.B., Bourne, P.E., Bouwman, J., Brookes, A.J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C.T., Finkers, R., Gonzalez-Beltran, A., Gray, A.J.G., Groth, P., Goble, C., Grethe, J.S., Heringa, J., 't Hoen, P.A.C., Hooft, R., Kuhn, T., Kok, R., Kok, J., Lusher, S.J., Martone, M.E., Mons, A., Packer, A.L., Persson, B., Rocca-Serra, P., Roos, M., van Schaik, R., Sansone, S.-A., Schultes, E., Sengstag, T., Slater, T., Strawn, G., Swertz, M.A., Thompson, M., van der Lei, J., van Mulligen, E., Velterop, J., Waagmeester, A., Wittenburg, P., Wolstencroft, K., Zhao, J., and Mons, B., 2016, The FAIR Guiding Principles for scientific data management and stewardship: *Scientific Data*, v. 3, no. 1, p. 160018, accessed March 2, 2023, at <https://doi.org/10.1038/sdata.2016.18>.

Honoring Traditional Knowledge

Traditional Knowledge (TK), in its most expansive definition, describes knowledge held by Indigenous and non-Indigenous peoples who are long-term residents and caretakers of a certain place. Through generations of lived experience and intimate use of the land around them, community members can possess a detailed understanding of the plants, animals, minerals, and natural phenomena in the

areas where they live and work. This knowledge can parallel, overlap, or complement USGS earth sciences research. Often TK incorporates spiritual connections between humans and the environment, including living and non-living beings. There is not universal agreement on the definition of Traditional Knowledge; in some circles, TK is narrowly defined as held only by Indigenous peoples.

Respecting this knowledge by citing and collaborating with TK scholars (who are generally academics) and knowledge holders (who may be community leaders, resource managers, or others) is one way to include multiple ways of knowing and understanding the world (see “Suggested Resources for Honoring Traditional Knowledge”).

Potential Actions

- Consider collaborating with TK scholars and knowledge holders as part of research projects. Explore these collaborations in the planning stages of the research rather than after the research agenda has been determined.
- Keep in mind that TK scholars or knowledge holders may be hesitant to work with Federal agencies. If TK scholars or knowledge holders do not wish to work with a particular team or agency, it’s best to respect their wishes and consider finding ways to create avenues for future collaborations, were they to become interested in collaboration later.
- When working with TK scholars or knowledge holders, asking them what their scientific interests, priorities, or needs may be. The interests of these groups may expand USGS research in innovative ways, and (or) can lead to mutually beneficial investigations.
- Consider seeking out studies, consulting with experienced colleagues, and researching best practices for working respectfully with TK holders and scholars, especially if working with TK for the first time.
- Working with a Federally recognized Tribe may require engaging in a formal consultation process. USGS Tribal Liaisons can help scientists determine if this is needed and guide teams through the process. Remember that consultation is a technical term for a process of negotiation, and a Tribal Nation agreeing to engage in consultation does not necessarily mean consent to the project.
- Work to ensure that all applicable USGS guidelines and requirements around specific topics like data management are understood by everyone on

the project team from the outset of a collaboration. Share this information with team members and potential collaborators and be ready to develop creative solutions for concerns that may arise.

- Expectations about TK and its uses will vary from community to community. Team members are encouraged to check any assumptions they may be making about information sharing, authorship, publication, and so forth, based on their experience with other kinds of scientific collaborations.
- Remember that a single individual cannot speak for a community and (or) Tribal Nation. Unless the community and (or) Tribal Nation has given its collective consent, be sure to represent the TK shared as that of the individual rather than the community and (or) Tribal Nation itself.

Suggested Resources for Honoring Traditional Knowledge

Biden, J.R., 2021, Executive order 13985—Executive order on advancing racial equity and support for underserved communities through the Federal Government: White House Briefing Room presidential actions, accessed February 8, 2023, at <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>.

Gewin, V., 2021, How to include Indigenous researchers and their knowledge: *Nature*, v. 589, no. 7841, p. 315–317, accessed March 2, 2023, at <https://doi.org/10.1038/d41586-021-00022-1>.

National Park Service, 2020, Overview of TEK—Traditional ecological knowledge: U.S. Department of the Interior, accessed October 20, 2022, at <https://www.nps.gov/subjects/tek/description.htm>.

Sidik, S.M., 2022a, For better science, increase Indigenous participation in publishing: *Nature*, accessed March 2, 2023, at <https://doi.org/10.1038/d41586-022-00058-x>.

Sidik, S.M., 2022b, Weaving Indigenous knowledge into the scientific method: *Nature*, v. 601, no. 7892, p. 285–287, accessed March 2, 2023, at <https://doi.org/10.1038/d41586-022-00029-2>.

3.3. Information Delivery

Ensuring Accessibility

Information can never advance equity unless the populations for whom it may be most relevant can access it easily and make sense of it for real-world decisions. Accessibility is defined by Executive Order 13985 as “the design, construction, development and maintenance of facilities, information and communication technology, programs, and services so that all people, including people with disabilities, can fully and independently use them” (Biden, 2021). Accessibility is a cross-cutting concern and a critical component of meeting stakeholders where they are. Products can be made more accessible by thinking about language (including technical talk or jargon), preferred media and formats, integration with assistive technologies like screen readers, and any logistical barriers to entry, such as requiring the use of a smartphone or high-speed internet. Community engagement activities like meetings can be made more accessible by working with partners to understand how, where, and when community members prefer to meet and what expectations they might have for the meeting (for example, that food will be provided). In-person meetings also have the following unique considerations for accessibility: the time of day, day of the week, location, primary language(s), and the way recruitment is performed will affect who is at the table for engagement. When possible, designing products and activities in partnership with the people served can help improve the likelihood that community needs and priorities will be met (see “Suggested Resources for Ensuring Accessibility”).

Potential Actions

- Instead of defaulting to inviting stakeholders to USGS-organized meetings, identify places and ways to meet stakeholders where they are. Consider different physical locations close to their homes or places of work (for example, coffee shops, community centers), pre-existing meetings (for example, interest group meetings, neighborhood block parties), and engaging both online (for example, social media platforms, message boards) and through traditional outlets that many communities rely upon (for example, local newspapers and radio stations).
- Presenting research at conferences hosted by societies for BIPOC scientists—for example, the Society for Advancement of Chicanos/Hispanics and Native

Americans in Science, the American Indian Science and Engineering Society, and the National Association of Black Geoscientists—can help scientists raise awareness of their work, better understand the concerns of BIPOC communities, and connect with broader stakeholder groups.

- Consider providing information in the language(s) spoken by the people for whom it may be relevant or useful. (See ‘Incorporating Inclusive Language’ below).
- Consider whether the USGS research team has taken the appropriate steps to ensure information accessibility for people with disabilities. For example, could someone using a screen reader access all parts of a report or functions of a product? Is the product 508 compliant?
- Think about how different people may want to use project information. For example, will they require additional software or technical expertise to understand or do something with it? If so, is there another (or an additional) way to present it? If the research team is unable to easily answer these questions, it may be worth conducting a user needs assessment.
- If interacting with digital information is a barrier for individuals or communities who may wish to use project information, consider whether non-digital options may be best for reaching groups who do not have reliable access to technology or internet connectivity (for example, paper maps instead of online tools).
- Consider how to make accessibility a central focus when planning activities and meetings with community partners. Ask how the research team can make sure everyone is informed about the meeting and is comfortable, able to attend, and able to participate.
- Identify ways to show community partners and collaborators that the team is intentionally creating an inclusive space, such as sharing the USGS’ equity-related goals and commitments and having speakers share their preferred pronouns during introductions.
- Use assessment and evaluation to understand whether products or activities are reaching intended audiences in ways that meet their needs and priorities.

Suggested Resources for Ensuring Accessibility

Gornish, E.S., McCormick, M., Begay, M., and Nsikani, M.M., 2021, Sharing knowledge to improve ecological restoration outcomes: *Restoration Ecology*, p. e13417, accessed March 2, 2023, at <https://doi.org/10.1111/rec.13417>.

Nolan, K., 2021, In weather emergencies, a lack of Spanish-language information endangers the public: *The Washington Post*, accessed June 22, 2023, at <https://www.washingtonpost.com/weather/2021/05/30/spanish-weather-language-gap/>.

U.S. Geological Survey, 2019, Implementation and administration of Section 508 of the Rehabilitation Act: *U.S. Geological Survey Manual*, chap. 600.6, accessed June 22, 2023, at <https://www.usgs.gov/survey-manual/6006-implementation-and-administration-section-508-rehabilitation-act>.

U.S. Geological Survey, 2020, Bridging the language barrier during the Puerto Rico earthquake: U.S. Geological Survey Office of Communications and Publishing web page, accessed October 20, 2022, at <https://www.usgs.gov/news/science-snippet/bridging-language-barrier-during-puerto-rico-earthquake>.

Incorporating Inclusive Language

Using language that is accessible to a wide array of audiences and backgrounds can help deliver information to the most people (see “Suggested Resources for Incorporating Inclusive Language”). Using idioms, jargon, or acronyms that may be unfamiliar to certain audiences can create barriers that exclude those audiences from the core messages a product is trying to convey. Such language can also make people who do not share the authors’ background feel unwelcome, excluded, or unacknowledged.

Potential Actions

- Avoid idioms that require specialized knowledge.
- For example, instead of using the term “above par,” which may not be understood by audiences unfamiliar with golfing terms, one could say “better than expected” which conveys the same message.
- Use gender-neutral language when referring to groups of people or teams.

- Explain jargon or acronyms in plain language if they must be used.
- Consider asking if the language used makes sense to the audiences the team is seeking to connect with.
- Consider partnering with community members to develop and test language for messaging.
- Consider working with a usability expert to hone language for important products and documents.
- Consider using tools like the Hemmingway App (Long and Long, 2021) to check whether writing is clear, simple, and at the appropriate reading level for the intended audience.
- If someone suggests revisions to wording, listen and ask questions. Be adaptive. If comments or feedback are requested on written documents, make sure a record is kept to document how all reviewers’ comments are seen and acknowledged.

Suggested Resources for Incorporating Inclusive Language

Long, A., and Long, B., 2021, Hemmingway App makes your writing bold and clear: 38 Long web page, accessed October 20, 2022, at <https://hemingwayapp.com/>.

U.S. General Services Administration, Content Guide 18F—Inclusive language: General Services Administration Technology Transformation Services website, accessed February 27, 2023, at <https://content-guide.18f.gov/our-style/inclusive-language/>.

Weigel, L., and Metz, D., 2018, The language of conservation—Updated recommendations on how to communicate effectively to build support for conservation: *The Nature Conservancy*, 10 p., accessed June 22, 2023, at https://conservationtools.org/library_items/1319-The-Language-of-Conservation-Updated-Recommendations-on-How-to-Communicate-Effectively-to-Build-Support-for-Conservation.

Woodley, L., Pratt, K., Bakker, A., Bertipaglia, C., Dow, E., El Zein, R., Johns, B., Kuwana, E., Lower, E., Roca, A., and Santistevan, C., 2021, CSCCE Glossary—Inclusive language in community building: Zenodo, accessed March 2, 2023, at <https://doi.org/10.5281/zenodo.5718783>.

3.4. Institutional Practices

Amplifying Voices of Underrepresented Researchers

Supporting and elevating the work of colleagues from groups that are underrepresented within science, technology, engineering, and mathematics (STEM) fields is a critical part of advancing equity and inclusion in research.

Potential Actions

- Cite relevant work of underrepresented scholars in project proposals and publications.
- Signal boost by amplifying work by underrepresented STEM scholars, especially for products, presentations, and communications that reach a large audience in person or online.
- Share or applaud relevant articles or work from underrepresented scholars at conferences, workshops, or staff meetings; re-post underrepresented scholars on social media.
- Cultivate awareness of and encourage training on biases like ageism, sexism, or racism that can affect the ability to hear underrepresented voices.
- Attempt to ensure equity among invited speakers, especially for high profile, prestigious, and (or) paid speaking engagements. For example, does the list of speakers include people who are early career researchers, BIPOC, or people with nontraditional professional backgrounds?

Recognizing and Rewarding Equity-related Work

Identifying and working with community partners, stakeholder groups, and co-producers of knowledge with the objective of more equitable research engagements and products takes time. This work may also yield fewer research products at the outset and may result in fewer single-author publications. These efforts also generally prioritize more qualitative and sometimes fewer tangible goals such as relationship building and process improvement over quantitative goals like publications and products. Currently, many approaches to making USGS research more equitable are perceived to conflict with Research or Equipment Development Grade Evaluation (known as RGE and EDGE) criteria for scientists at the USGS. The RGE and EDGE evaluation criteria are determined by the Office of Personnel Management (OPM; Office of Personnel Management, 1968; Office of Personnel Management, 2006). The USGS cannot add to or change these criteria in its evaluation process. As a result of the 2017 review of the RGE and EDGE program, the Office of Science Quality and Integrity

Suggested Resources for Amplifying Voices of Underrepresented Researchers

Ball, D., Clayburn, R., Cordero, R., Edwards, B., Grussing, V., Ledford, J., McConnell, R., Monette, R., Steelquist, R., Thorsgard, E., and Townsend, J., 2015, A guidance document for characterizing Tribal cultural landscapes, OCS Study BOEM 2015-047: Camarilla, Ca., U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, 32 p., accessed October 5, 2022, at <https://sanctuaries.noaa.gov/tribal-landscapes/>.

Bamzai-Dodson, A., Cravens, A.E., Wade, A., and McPherson, R.A., 2021, Engaging with stakeholders to produce actionable science—A framework and guidance: Weather, Climate, and Society, accessed March 2, 2023, at <http://doi.org/10.1175/WCAS-D-21-0046.1>.

Hawaii Conservation Alliance, 2018, Making the case for community-based adaptive collaborative management in Hawaii, accessed March 2, 2023, at https://www.hawaiiconservation.org/wp-content/uploads/HCACoManagementPositionPaper_Adopted.pdf.

Tribal Adaptation Menu Team, 2019, Dibaginjigaadeg anishinaabe ezhitwaad: A Tribal climate adaptation menu: Odanah, Wisconsin, Great Lakes Indian Fish and Wildlife Commission, 54 p., accessed March 2, 2023, at <https://glifwc.org/ClimateChange/TribalAdaptationMenuV1.pdf>.

U.S. Geological Survey, 2023 Research grade evaluation: U.S. Geological Survey Office of Science Quality and Integrity web page, accessed June 22, 2023, at <https://www.usgs.gov/office-of-science-quality-and-integrity/research-grade-evaluation>.

U.S. Geological Survey, [undated], Office of Tribal Relations: U.S. Department of the Interior web page, accessed October 5, 2022, at <https://www.usgs.gov/office-of-tribal-relations>.

(OSQI) has worked to interpret the OPM guidance more broadly to recognize community engagement and collaborative research. Because of the review intervals (4–7 years) for RGE and EDGE, it may take time for these perceptions to change at USGS. These perceptions have led to scientists interested in performing equity-based work doing so as a collateral duty or leaving this work to USGS staff who are not RGE or EDGE. Better socializing the changes implemented by OSQI may help encourage equity work amongst RGE and EDGE employees at USGS. Finding other ways to recognize and reward this work so that researchers are encouraged to engage with underserved communities, undertake co-produced research projects, and include participatory research methods

into their work can also advance USGS relationships with underserved communities, as well as strengthen and expand the bureau's research initiatives (see "Suggested Resources for Amplifying Voices of Underrepresented Researchers").

Potential Actions

- Socializing OSQI's new interpretation of RGE and EDGE factors to help researchers understand that community engagement and collaborative research can be recognized in the evaluation process.
- Include social scientists and experts in stakeholder engagement and equity-related topics in peer evaluation panels of scientists working on equity-related topics and projects.
- Recognize excellence in equity-focused research and applications with the Rufus D. Catchings Diversity Outreach Award, Shoemaker Award, or develop a new award focused on incorporating equity into research activities.
- For researchers who work with communities and stakeholders, include outcomes like relationship building and process improvement in performance evaluation metrics and performance plans.
- Include equity work as a critical element or item in employee annual performance reviews.

Conclusion

The goal of this document is to give readers a place to start thinking about how to incorporate equity into their risk-related research. We have provided a short introduction to some of the tools in the equity toolkit and a reference for reflecting about past, present, and potential future equity-related work. In addition, the resources provided throughout offer ways for readers to continue deepening their knowledge about equitable research practices. In this report, emphasis has been placed on community engagement and participatory research. While these are important tools in the equity toolbox, such engagement is not a requirement of equitable research. Simply considering where sensors or monitoring equipment are placed, what languages information is disseminated in, or how information is delivered can make USGS research more equitable as well.

This report draws on resources and information shared at a 2021 USGS Risk Research and Applications Community of Practice workshop, with additional reflections and references

shared after that meeting. However, this is ultimately only a snapshot of a much larger and continually evolving conversation within the Risk Community of Practice and across the USGS.

Acknowledgments

We would like to thank the participants of the 2021 Risk Workshop, as well as those who have contributed early reviews, thoughts, and resources to this report including the following: Shaleene Chavarria, Dan Opstal, Eleanor Snow, Anne Wein, Aimee Devaris, and several anonymous reviewers. We would also like to acknowledge the excellent feedback of our two formal reviewers, Aparna Bamzai-Dodson and David Ramsey.

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Glossary

accessibility The design, construction, development, and maintenance of facilities, information and communication technology, programs, and services so that all people, including people with disabilities, can fully and independently use them (Biden, 2021).

boundary organization Organizations that offer institutionalized space for exchanges among scientists, policy makers, and political or community groups (Guston, 1999).

diversity The practice of including the many communities, identities, races, ethnicities, backgrounds, abilities, cultures, and beliefs of the American people, including underserved communities (Biden, 2021).

equity The consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment (Biden, 2021).

inclusion The recognition, appreciation, and use of the talents and skills of employees of all backgrounds (Biden, 2021).

underserved community Populations sharing a particular characteristic, as well as geographic communities, who have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life (Biden, 2021).

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Appendix 1. Agenda of 2021 Risk Community of Practice Workshop on Considering Equitable Engagement in Research Design

August 19, 2021 (all times ET)

12:00–12:15 Introduction to the Day

12:15–1:30 Part 1: Diversity, Equity, and Inclusion Initiatives at Department of the Interior and USGS

Speakers:

Ryan Hathaway, Environmental Justice Coordinator, DOI

Regina Neal-Mujahid, Chief, USGS Office of Diversity and Equal Opportunity

1:30–2:00 Break

2:00–2:15 Part 2: Equity in Risk Research and Applications Strategic Plan Initiative Emily Brooks, USGS Natural Hazards Mission Area

2:15–4:30 Mini-Workshop: Considering Equitable Engagement in Research Design Emily Brooks and Alice Pennaz, USGS Natural Hazards Mission Area

This knowledge sharing mini-workshop will share tools (including a spectrum of participatory methods), success stories, and troubleshoot common challenges around increasing equitable engagement in risk research design. Our goal is for participants to walk away with concrete ideas and strategies for better engaging partners and collaborators and incorporating equity into their work at multiple levels.

Appendix 2. Additional References and Resources

In addition to the example resources provided in the report, below are additional resources that may be informative.

Additional References and Resources

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