



**Framework for the Advancement of Inclusion, Equity, and Justice
in the Weather, Water, and Climate Enterprise**

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“Rainbow seemingly above the clouds observed during Project Cloudline” by C. True, NOAA/AOML/Hurricane Research Division, via NOAA Photo Library

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Executive Summary

Ethics and justice are central to advancing humanity and the human experience. An ethical and just world is the best possible world. Active effort encompassing all aspects of society, including the sciences, is almost certainly needed in order to achieve such a world. Moreover, the rate and breadth of scientific advancement and the societal benefits that result from science also depend on the promotion of inclusion, equity, and justice (IEJ). The weather, water, and climate (WWC) enterprise has the opportunity to become a leading example: ensuring that everyone everywhere is able to participate in and benefit from the science and services of the enterprise is key to ensuring that these sciences and services are impactful, meaningful, and ethical. Therefore, if we hope to advance science and the benefits of science to humanity as effectively as possible, the enterprise must be inclusive, equitable, and just.

Efforts must be comprehensive, intensive, informed, and sustained over time in order to effectively increase participation and success of groups underrepresented in and communities underserved by the WWC enterprise. Solutions will almost certainly depend on broadly distributed efforts championed by individuals, groups, organizations, and entire sectors that adapt as necessary to meet evolving needs. Therefore, making science truly inclusive and beneficial to all people will be an enterprise-wide endeavor. *An enterprise-wide cultural change will be needed to confront systems of oppression and enable contributions from all people and organizations of the enterprise.*

The framework developed here aims to 1) affirm the need for urgent cultural change toward a more inclusive, equitable, and just community; 2) honor, welcome, and serve all; 3) recognize and dismantle racist and inequitable systems and structures that have excluded, marginalized, or ignored people and communities; 4) promote a shared vision of success in IEJ for the WWC enterprise; 5) promote the inclusion of people from all groups within the enterprise and the equitable sharing of the benefits from science among all people; 6) inspire and enable all members of the enterprise to actively advance IEJ; 7) provide guidance, support, and resources to enable efforts across all levels of organization to advance IEJ; and 8) demonstrate a commitment to progress over the long term.

Inclusion is the active and deliberate pursuit of creating a society where all are welcome, respected, and able to participate and contribute. Inclusion means all participants feel they can bring their full and authentic selves to their work without pressure to assimilate to any dominant culture. The building of inclusion will effectively support diverse backgrounds and identities across all levels and scales of the enterprise.

Equity is the fair opportunity for all people to fully benefit from and contribute to the insights, applications, and services of the enterprise.

Justice is the fair treatment of all, including with respect to opportunity, accountability, and restitution. This includes, to the extent possible, making amends for past wrongs and repairing relationships with those who have been negatively impacted by past actions.

As is evident in these definitions, there is some overlap between inclusion, equity, and justice. All demand the dismantling of barriers to opportunities, resources, and services within the enterprise and confronting the underlying systemic contexts that create and perpetuate such barriers.

Developing a shared **definition of success** with respect to IEJ is critical. This framework presents a broad vision of success in IEJ that includes enabling 1) a welcoming environment, 2) culture change, and 3) WWC science and services that benefit all people. This vision, along with specific outcomes, can be used to guide and inspire comprehensive efforts to promote IEJ.

Success in promoting IEJ depends on taking **actionable steps**. Which actionable steps are appropriate and most effective is likely to vary among specific individuals, groups, teams, cohorts, organizations, sectors, or enterprises. Several overarching **principles**, such as promoting anti-racism and rooting efforts in allyship and service to others, guide these actionable steps, although best practices and specific needs will also almost certainly evolve over time. This framework identifies a variety of actionable steps and outcomes, including the following:

1. Committing to enthusiastic and continuous advancement of IEJ including through personal education, adoption of best practices, and active effort.
2. Critically examining existing structures of power and privilege.
3. Determining what practices for advancing IEJ are appropriate within specific contexts.
4. Creating space for training in and discussion of IEJ-related topics.
5. Achieving equity and accessibility in design of online and physical spaces and gatherings.
6. Engaging meaningfully with communities, including through participation in community-based science efforts.
7. Establishing open and frequent communication regarding IEJ.
8. Creating IEJ-focused career development and support.

Metrics of IEJ are valuable tools to establish baselines, encourage efforts, evaluate progress, assess and refine specific actions, and enable accountability. There can, however, be challenges or even antagonism in connecting what can be measured (i.e., a readily available metric) and a desirable outcome (e.g., an enterprise where all people can contribute their knowledge, skills, abilities, and energy to their full potential). Consequently, careful attention must be given during the development of metrics for IEJ in order to ensure they align most effectively with desired outcomes.

The American Meteorological Society (AMS) is committed to IEJ and the cultural change that is needed to achieve IEJ. This framework concludes with a look at **AMS's ongoing and future efforts** to advance IEJ as an illustration of the implementation of the outlined principles and approaches. Most notably, AMS will conduct a comprehensive Equity Assessment of the organization and its activities to understand our successes, failures, shortcomings, and opportunities. We will use the insights that result to develop a Strategic Plan that provides the goals, actionable steps, benchmarks, and metrics needed as we move through the process of cultural change.

1. Introduction

1.1 Background

The weather, water, and climate (WWC) enterprise provides science and services critical to the future of society. Making these sciences and services truly inclusive and beneficial to all people is necessary to ensure that they are impactful, meaningful, and ethical. Solutions will depend on efforts that are comprehensive, intensive, informed, and sustained over time (Bianchini 2013). These efforts must be broadly distributed and championed by individuals, groups, organizations, and entire sectors that adapt as necessary to meet evolving needs—in short, an ongoing enterprise-wide commitment is needed. Effectively increasing the participation and success of groups underrepresented in and communities underserved by the WWC enterprise is a key component of this endeavor (Waitzer and Paul 2011). *A collective cultural change will be needed to confront systems of oppression and enable contributions from all people and organizations of the enterprise.*

The American Meteorological Society (AMS) is committed to enabling a positive culture shift with respect to inclusion, equity, and justice (IEJ). As part of this effort the AMS Policy Program has initiated this project to develop an IEJ framework for the WWC enterprise. Here, we present a set of principles, actionable steps, and metrics to support and outline this shift towards a more inclusive, equitable, and just culture within and beyond the enterprise. This framework represents the collaborative effort of a diverse working group drawn from the enterprise’s public, private, academic, and nonprofit communities. The group met virtually throughout 2020 and 2021 to discuss the opportunities and challenges inherent to advancing IEJ within the enterprise, including within AMS. The AMS Policy Program and Diversity, Equity, and Inclusion (DEI) Program¹ have together synthesized the ideas and perspectives raised during these discussions into this document. This framework is intended to continually develop with time, encouraging and expecting alterations as the broader conversation around the notions of inclusion, equity, and justice evolves.

This framework is intended to do the following:

1. Affirm the need for an urgent culture change towards a more inclusive, equitable, and just community.
2. Honor, welcome, and serve all.
3. Recognize and dismantle racist and inequitable systems and structures that have excluded, marginalized, or ignored people and communities.
4. Present a shared vision of success in IEJ for the WWC enterprise and identify steps towards achievement of this vision.
5. Promote the inclusion of people from all groups within the enterprise and the equitable sharing of the benefits from science among all people.

¹ “DEI” is the term primarily used within AMS as an organization while the working group for this framework chose to use “IEJ” in order to explicitly place attention on the issue of justice. However, the two terms, and the underlying motivation behind their use, are complementary.

6. Inspire and enable all members of the WWC enterprise to actively advance IEJ through imparting a sense of ownership, responsibility, and accountability.
7. Provide guidance, support, and resources to enable efforts across all levels of organization (e.g., individuals, institutions, sectors, the enterprise as a whole) to advance IEJ.
8. Demonstrate a commitment to: a) progress over the long term; b) continuously developing our own understanding of and dedication to IEJ; c) the sharing of lessons learned; d) the revising and updating of ideas and efforts as new opportunities to advance IEJ emerge; and e) encouraging similar commitment among all people, organizations, sectors, etc., within the enterprise.

1.2 IEJ Definitions

The definitions here, derived from discussions within the working group, provide a shared meaning of what the concepts of inclusion, equity, and justice might represent within the context of the WWC enterprise.

What is IEJ?

Inclusion is the active and deliberate pursuit of creating a society where all are welcome, respected, and able to participate and contribute to the extent that they choose. Inclusion means all participants feel they can bring their full and authentic selves to any space within the enterprise without pressure to assimilate to any dominant culture. The building of inclusion will effectively support diverse backgrounds and identities across all levels and scales of the enterprise. Diversity of all kinds is a cornerstone of inclusion but not the sole component; an inclusive enterprise will facilitate diversity through the intentional and sustained creation of environments in which members are valued as their authentic selves.

Equity is the fair opportunity for all people to fully benefit from and contribute to the insights, applications, and services of the enterprise. Equity seeks equal outcomes for all people while acknowledging that because not everyone has the same needs or starts on equal footing, equal outcomes are not necessarily the same as equal treatment. As such, an equitable enterprise supports people and organizations with what they individually need to be successful.

Justice is the fair treatment of all, including with respect to opportunity, accountability, and restitution. This includes, to the extent possible, making amends for past wrongs and repairing relationships with those who have been negatively impacted by past actions. Justice includes the dismantling of barriers to opportunities, resources, and services within the enterprise as well as recognizing, acknowledging, and confronting the underlying systemic contexts that create and perpetuate such barriers. Reconciliation is also a key part of justice and works to build or rebuild relationships so that all parties can co-create the present and future with mutual dignity. In working to eliminate systemic barriers and their harmful legacies, a just enterprise will actively mobilize its science to address weather, water, and climate-related damage and risks faced by communities worldwide.

Figure 1: Definitions of IEJ

As is evident in these definitions, there is some overlap between inclusion, equity, and justice. All demand the dismantling of barriers to opportunities, resources, and services within the enterprise and confronting the underlying systemic contexts that create and perpetuate such barriers.

1.3 Rationale

A world that is ethical and just is the best possible world. It is the world that all people should get to live in, that all people of conscience want, and that this framework is working toward. The promotion of an ethical and just society is central to the advancement of humanity and the human experience (Haacker et al. 2022). No further justification is needed for this effort.

And yet, it is also the case that societal advancement (in general) and scientific advancement (in particular) will be greatest if everyone has the opportunity to contribute to the fullest extent. No society is a monolith: people and communities everywhere have unique sets of experiences, talents, needs, and priorities. Scientific advancement is most reflective of and most applicable to these needs when individuals from all groups, backgrounds, and points of view are fully able and encouraged to contribute their questions, insights, and capabilities. It is also more robust: a diversity of backgrounds, life experiences, and viewpoints enhance the creativity, innovation, and problem solving abilities of teams (Saxena 2014). Maximizing the speed and effectiveness of scientific advancement is therefore directly dependent on widespread participation from all communities.

Furthermore, the benefits of scientific advancement are fully realized only when they are widely and fairly available to all people. The WWC enterprise is no exception: ensuring that everyone everywhere benefits from the science and services of the enterprise is key to ensuring that these sciences and services are impactful and meaningful. As the justification for investments in science in a democracy rests with the benefit those investments create for the public, the wide and equitable distribution of societal benefits is also imperative for the future of WWC science and for the broader society the scientific community serves.

The great and largely untapped strength of the WWC community lies in the fact that it is universally relevant. People experience weather every day, children learn about weather, water, and climate in school, and broadcast meteorologists are widely recognized and highly respected professionals. Furthermore, all communities face multiple complex challenges and opportunities relating to WWC. We all need to reduce existing vulnerabilities, manage future changes, and respond to opportunities and risks that may emerge. All people must cope with an ever-changing, increasingly human-influenced Earth system that remains subject to large natural variations. Every social and economic sector must decide how to invest most effectively in long-term projects that will persist for decades. The universal impact that WWC has on the human population and human experience means that there is an abundance of opportunities to make enterprise science and services more inclusive, equitable, and just; moreover, the benefits of these efforts have the potential to reverberate far beyond the enterprise.

2. The Scope and Scale of the Challenge

Societal policies and practices have historically driven, and continue to perpetuate (directly or indirectly), inequality based on race, gender, sexual orientation, disability, socioeconomic status, nationality, religious views, and/or political preferences, among other factors. These policies and practices exist throughout society and remain a major problem within the WWC enterprise, creating barriers to individual and community success, and delivery and receipt of services. Moreover, a legacy of inequality remains—and can continue to cause harm—even after policies and practices that drive inequality are eliminated.

Without intervention, individuals, institutions, and structures will continue to perpetuate patterns of exclusion, intentionally or otherwise. For example, systemic racism persists throughout society in the provision of resources for education; in access to education, banking and legal services, and voting; in wealth accumulation and home ownership; and in policy and policing among other processes and practices. Within the WWC enterprise it may be reflected, for example, in academic admissions practices, hiring and recruitment, and implicit and explicit biases in the production and distribution of our science and services. Actions that promote anti-racism and equity-centered design are necessary to eliminate these systemic inequities. The WWC enterprise has the responsibility to undertake such actions in order to advance our science and help create an inclusive, equitable, and just society.

While our backgrounds, experiences, and familiarity with IEJ differ, all can benefit from a deeper understanding of the importance of IEJ and the opportunities for its advancement. It is imperative to simultaneously consider barriers to IEJ that are specific to the WWC enterprise and those that are beyond the immediate control of the enterprise (i.e., the impacts of redlining on housing inequity), as they may interact and reinforce each other. This combination reveals the need for a three-part commitment if we are to effectively advance IEJ within the WWC enterprise: 1) to continually work to ensure that the WWC community is free from obstacles to IEJ and remains actively engaged in overcoming all residual internal factors contributing to diminished IEJ, 2) to understand the impacts of societally ingrained drivers of inequity beyond the WWC and work to dismantle these through WWC efforts, and 3) to include additional efforts within the WWC enterprise that are sufficient for overcoming any remaining/residual barriers to IEJ imposed by society at large.

Inclusion

Members of historically marginalized communities such as Black, Indigenous, Latine/Latinx, Hispanic, and Asian individuals, women, gender nonconforming individuals, LGBTQ+ individuals, first generation college students, and persons with disabilities remain underrepresented in STEM and the geosciences in particular (National Science Foundation 2017; Dutt 2020; Bernard and Cooperdock 2018). Members of such underrepresented groups confront multiple systemic obstacles to inclusion in the geosciences and WWC community beginning with access to K–12 STEM education (Morris and Washington 2017). At the undergraduate and graduate level, members of underrepresented groups often face difficulty obtaining financial support, mentorship, recognition of work, and internship or career support

when pursuing geoscience degrees. Established practices, such as the use of standardized test scores for admissions or scholarships, disproportionately affect those who have less access to preparatory resources than others and create ripple effects throughout the enterprise. Challenges continue at the professional level across all sectors, whether academic, nongovernmental, public, or private. These challenges may include lack of support for “invisible” work (e.g., mentoring, serving on committees, family responsibilities, or other service commitments) and differences in hiring, tenure, and promotion rates, as well as microaggressions and harassment. These factors, individually and in conjunction, may prompt scientists from underrepresented groups to leave the geosciences at higher rates than others.

Inclusion in the enterprise is also a function of perceived credibility. While science, in principle, welcomes contributions from anyone based on scientific merit, highest-degree-earned status is in practice correlated to how an individual’s work is accepted in the enterprise. In particular, the expertise of individuals that work in knowledge systems outside of the Western scientific process, such as Indigenous Traditional Knowledge, has historically been discounted. Only recently have efforts to include and integrate Indigenous Knowledge Systems into interdisciplinary science efforts become more mainstream (Henri et al. 2021).

Fortunately, there are multiple areas where the WWC enterprise is well-positioned to facilitate inclusion. Everyone is affected by weather and climate every day, resulting in numerous paths to engagement with WWC science in a variety of capacities. As the scope, scale, and relevance of the enterprise’s work expands across society, the opportunities for personal involvement, community engagement, and interdisciplinary work increase.

While the issues surrounding IEJ are personal and prevalent for many, the opportunity to engage in conversation about the challenges and advancement relating to IEJ, diversity, and acceptance are not a given for all people of all communities. This framework aims to at least introduce opportunities to partake in these discussions: including all backgrounds in this dialogue is important for sharing and understanding multiple perspectives.

Equity

Many communities have been historically underserved with respect to WWC science and services. Forecasting and observational coverage are often not evenly distributed, especially in poor or rural areas, and communication regarding WWC information may not be accessible to all populations (e.g., language barriers). This imbalance may be exacerbated by the increasing use of technologies such as artificial intelligence (AI) in predictions and modeling. If an AI system is trained to predict hail based on reports of hail from urban areas, its forecasts might subsequently be less accurate in less densely populated areas; if a programming team consisting solely of English-speakers is evaluating responses to hurricane evacuation orders, they may overlook data from Spanish-speaking neighborhoods. As a result, WWC sciences and services tend to disproportionately benefit historically-advantaged populations in areas that are highly-researched and with abundant access to technology.

As not everyone has the same background and needs, it is vital for all WWC science and services to be accessible across geographies, socioeconomic factors, languages, and disabilities.

Furthermore, historically marginalized communities are often the most severely burdened by environmental and climate issues such as air and water pollution, heat, flooding, and extreme weather events. In order to improve equity within and beyond the enterprise, the enterprise must work to increase systemic justice and fairness as well as the distribution of its products and services.

Justice

In an effort to create a truly fair enterprise, historical injustices and inequalities need to be acknowledged, considered, and addressed at all scales of decision-making. Individual or community vulnerabilities to weather, water, and climate events are often compounded by structural injustices in the development, implementation, and enforcement of laws, regulations, and policies at all levels within and beyond the WWC enterprise. These laws, regulations, and policies have shaped where and how people live and work for centuries; however, historically marginalized groups are often excluded from the decision-making, political, and legal processes, and the lack of the excluded voice can lead decision-makers to be blithely unaware of the vulnerabilities of these groups. Whether active or inadvertent, those who are not part of the conversation are vulnerable to unfair treatment. As a result, these groups face disproportionate exposure to negative environmental impacts resulting from industrial, commercial, or municipal operations; increased susceptibility to destruction caused by climate change; and a chronic lack of resources for emergency recovery, mitigation, or adaptation (Hoffman et al. 2020). The WWC enterprise has the opportunity and responsibility to address these structural injustices to ensure that all communities have effective access to resources and are able to make informed decisions on WWC issues.

3. Definition of Success for IEJ in the WWC Enterprise

The WWC enterprise is notable in that it relies upon collaboration at both domestic and international scales between governments, industry, nonprofit organizations, and academia; consequently, enterprise success in advancing IEJ inherently incorporates many perspectives, priorities, and interests. The scope of what success looks like is therefore variable: it is as much progress toward a broad vision that inspires and guides widespread action as it is the achievement of specific outcomes that can be readily observed. Pursuing a broad vision or end goal may guide decisions in a general direction but rarely provides a clearly defined moment of success. Conversely, when success is defined as certain metrics or the completion of set actions, achieving success may be more concrete but short-lived. It may therefore be the case that individuals and entities working toward the goal of advancing IEJ are guided by both a long-term vision and benchmarks that measure progress.

The definition of IEJ success proposed here can be conceptualized as a broad framework of behavioral and environmental elements within which more specific achievements may fall.

Table 1: What does success look like in the WWC enterprise?

Framework for Success	
Welcoming Environment	<ul style="list-style-type: none"> • All people have access, a sense of connection, and feel there is a place for them within the enterprise. • People feel welcome, appreciated, and well served by the enterprise whether they are part of our workforce or among those who we serve. • We are powerful allies of underrepresented groups and underserved peoples (and of the groups/organizations that work alongside these underrepresented and underserved communities). • There is representation throughout all levels of the enterprise that reflects the demographic makeup of the nation. Any discrepancy with the demographic makeup is cause for examination, reflection, and— when illustrative of a problem with inclusion—active development and implementation of solutions. • We have a reputation for success in IEJ internally and externally. • People of all backgrounds and identities are thriving so obviously and compellingly in our community that people of all groups are eager to join us.
Culture Change	<ul style="list-style-type: none"> • Members of the WWC enterprise fully appreciate the importance of IEJ to: a) members of underrepresented groups; b) the advancement of the WWC enterprise (observations, science, and services); c) the societal benefits that our enterprise provides; and d) the well-being of the broader society that we serve.

	<ul style="list-style-type: none"> • Everyone in the enterprise sees themselves as an active player in advancing IEJ, rather than merely a spectator or someone not impacted by the issues. • We enable understanding of the importance of IEJ and how all of us can promote it. • We effectively nurture good behavior and deter bad behavior. • There is accountability for those who create hostile, unwelcoming, or abusive environments. • There is awareness that prevents unintentional hostility or denigration.
<p>WWC Science and Services that Benefit all of Society</p>	<ul style="list-style-type: none"> • The way WWC science is conducted, communicated, and viewed incorporates and values the priorities and knowledge of the communities we serve. • Our products and services equitably benefit all people (i.e., irrespective of which groups they are part of).

4. Principles for IEJ Efforts

The vision of success for the WWC enterprise informs a set of key principles for designing and implementing IEJ efforts in order to make meaningful progress. These principles are intentionally broad so as to encourage reflection and customization, with an overall objective of helping to establish credibility and facilitate broad participation and partnership in advancing IEJ.

- Root efforts in allyship and service to others, centering the needs of historically marginalized and underrepresented groups.
- Promote anti-racism. Anti-racism is the active, purposeful practice of pushing back against racial inequities large and small, obvious and covert. There is no singular set of anti-racist behaviors; rather, engaging in anti-racism involves conscious choice and reflection to change personal racial biases as well as confront both acts and systems of racial discrimination.
- Integrate IEJ efforts into all aspects of the enterprise with responsibility for these efforts widely shared across all levels of organization and leadership (i.e., do not conduct IEJ efforts within a vacuum).
- Ensure the responsibility for advancing IEJ is widely shared across the enterprise rather than positioned as an additional burden for members of underrepresented groups; efforts should not incur additional labor on the part of the people intended to be supported (e.g., expecting people of color to educate their white peers on racial injustices or hosting evening community meetings without providing childcare).
- Address IEJ with explicit intent and transparency at all stages; it should be immediately clear what any given action is intended to achieve and why. However, good intentions do not automatically yield positive impact: outcomes matter more than intentions.
- Account for and regularly re-examine the capabilities of different organizations and levels of leadership. While all have the responsibility to advance IEJ, resources and influence may vary.
- Efforts must reflect a commitment to progress over the long term, with a willingness to learn from mistakes.

5. Actionable Steps for Progress

5.1 Actionable Steps

This section presents examples of specific, actionable steps that may be taken in order to advance IEJ through a variety of means including raising awareness, educating members of the enterprise, encouraging good practices and behaviors, discouraging or preventing poor behaviors, and otherwise following up on the principles of IEJ efforts. The list in Table 2 is a snapshot of possible steps but is by no means exhaustive. Best practices and specific needs will also almost certainly evolve over time.

Decisions and actions can be the efforts and products of one person, a couple, or many, and can be influenced by the hierarchical nature of groups or the power and influence they have access to. Table 2 indicates four scales at which action can be taken: individual, organization, cohort, and enterprise. Steps that **individuals** can take often revolve around independent abilities and will to align with IEJ principles. **Organizations** can take actions that result in broader outcomes for a larger group of people and often involve more than one person in the decision-making process. These are steps that a group of people may follow when acting as representatives of the organization and are set by the tone of the organization. As groups that have common interests but may span multiple organizations or classes of organizations, **cohorts** can take steps to foster discussion and consolidate efforts across organizations. The **enterprise** as a whole can take steps that likely are not dictated by one person but are agreed upon by many organizations for a community-wide approach. These steps are not strict rules for every individual or entity within the enterprise but represent best or preferred practices to foster meaningful culture change.

Table 2: Example actionable steps

Outcome	Scale	Steps
<p>Commit to enthusiastic and continuous advancement of IEJ including through personal education, adoption of best practices, and active effort.</p> <p>As cultural norms and available knowledge shift, new ideas and opportunities may emerge.</p>	Individual	Allocate a portion of your skills and creative energy to the development of new opportunities to advance IEJ.
	Individual	Engage with a variety of media sources, including media created by BIPOC or underrepresented individuals or groups.
	Individual; Organization; Cohort	Remain cognizant of the language one uses, ensuring that terms, phrases, and words used reflect inclusivity and

<p>perceptions, and solutions relating to IEJ. The opportunity to partake in IEJ-centered discussions should be accessible and a welcoming space to all, including individuals who have not previously had opportunities for such conversations.</p>	<p>Individual; Organization; Cohort</p> <p>Organization</p> <p>Organization</p> <p>Organization</p>	<p>Enable people to ask questions without fear of repercussions.</p> <p>Support or require implicit bias training for committee chairs and session leads of professional organizations; support implicit bias training for all employees/volunteers; explicitly connect these trainings to the workplace/organization.</p> <p>Provide context for implicit or unconscious bias trainings: training in a vacuum is not as effective. Include follow ups to these conversations.</p> <p>Embed training and action as a scaffolding of the workforce and frame as a lifelong endeavor.</p>
<p>Achieve inclusion and equity in composition and design of spaces and gatherings both physical and virtual</p> <p>Our work is at its strongest when individuals of all identities and abilities are fully able to contribute their questions, insights, and capabilities</p>	<p>Individual; Organization; Cohort; Enterprise</p> <p>Individual; Organization; Cohort; Enterprise</p> <p>Individual; Organization; Cohort; Enterprise</p>	<p>Encourage diverse and inclusive panels at conferences, symposiums, and other professional gatherings</p> <p>Encourage web content and tool developers to adhere to the Web Content Accessibility Guidelines (WCAG).</p> <p>Host professional gatherings in spaces that are actively user-friendly (e.g., offer hearing induction loops, unassisted barrier-free routes, tactile guidance, step-</p>

		free access to rooms, low ambient noise, changing stations and gender-neutral restrooms that are readily reachable)
<p>Engage meaningfully with communities</p> <p>In order for our science and services to equitably benefit all people it is vital to understand and incorporate community priorities and knowledge</p>	<p>Individual; Organization; Enterprise</p> <p>Individual; Organization; Enterprise</p> <p>Individual; Organization; Enterprise</p> <p>Individual; Organization; Cohort; Enterprise</p>	<p>Engage with communities early and often in the exploration/research/planning process, as well as in the dissemination of results</p> <p>Engage with communities across diverse and various neighborhoods, cultural groups, etc.</p> <p>Follow preferred practices of co-production of knowledge, including respecting when communities do not wish to engage in a partnership</p> <p>Enable participation over spectatorship and performance. Individuals should be enabled to contribute in the ways they best see fit. Those who receive the enterprise’s services and sciences should similarly be interacted with as participants instead of individuals with whom information is simply shared. For inclusion, a pivot towards ensuring understanding of the information and preparing for action based on the contextual knowledge is necessary.</p>
<p>Establish open and frequent communication regarding IEJ</p> <p>Keeping IEJ centered in our missions and endeavors is easier when we talk about it</p>	<p>Organization; Cohort</p>	<p>Report diversity within leadership positions in a transparent manner (i.e., freely and clearly available).</p> <p>Acknowledge and appreciate good work that advances IEJ efforts. If establishing</p>

	Organization; Cohort; Enterprise	incentives and rewards to encourage such work, reflect the fact that to engage in IEJ efforts solely for the recognition should not be the core purpose.
<p>Create IEJ-focused career development and support</p> <p>IEJ is vital to the attraction and retention of a robust and diverse workforce that will enhance our sciences and services</p>	Individual; Cohort	Engage in formal or informal mentorship: provide mentees with connections, resources, or other forms of support
	Organization; Enterprise	Incorporate inclusive hiring and promotion practices: Write job descriptions that use gender-neutral language; emphasize job responsibilities rather than requirements; standardize job interview processes; bring awareness to and accommodate for potential bias in recruitment technology; offer opportunities for internal and external mobility.
	Organization	Establish procedures to increase anonymity in proposal review processes.
	Organization	Create and promote financial aid opportunities to support historically underrepresented groups at all levels of career development.

5.2 Imperative Questions

Alongside the definitions of success and the principles established in Sections 3 and 4, the process of developing robust IEJ efforts may be aided by the consideration of certain imperative questions (Figure 2 below). These broad questions are intended to encourage assessment of challenges to, as well as opportunities for, advancement of IEJ present at all levels of organization.

- What barriers and challenges do I/we see to advancing IEJ within and beyond the WWC enterprise?
- How can I/we/this organization/the enterprise eliminate these barriers?
- What additional efforts may be needed to overcome the legacies of removed barriers?
- What are the best practices that I/all can/must adopt to promote IEJ?
- What skills do I need to develop in order to effectively implement these practices?
- How can creative energies and unique abilities of every member of the enterprise be harnessed in the advancement of IEJ?
- How should responsibilities (or use of the plan) change with organizational hierarchy?
- What organizations/people do we need to engage with (to learn from or partner with)? How are we involving these individuals/organizations?
- When and how do I/we engage with individuals of various backgrounds/life experiences?

Figure 2: Imperative Questions

6. Metrics

Even the most well-intentioned policies and programs can fall short of long-lasting and meaningful change without a mechanism through which to evaluate performance—i.e., metrics. Metrics may serve a number of potential roles in advancing IEJ initiatives within the enterprise. They can establish baseline information for an area of interest—whether the number of women graduating with a degree in atmospheric sciences or the coverage of weather radars—which in turn can be used to set targets or goals. Metrics also serve to assess progress toward set goals, ideally encouraging accountability. Through the use of metrics, it may be easier for an individual or organization to identify successes for emulation or recognize failures to be learned from, as well as areas where barriers to success might be more or less prevalent. Metrics additionally serve as a reflection of values: what people count, they care about or are interested in addressing. In short, what is measured matters. Incorporating metrics designed to measure progress in IEJ efforts can signal a dedication to these issues.

Though important, metrics are not universal, particularly within a system as complex as the WWC enterprise. Metrics that are useful for the public sector component of the enterprise are not necessarily useful for the academic, nonprofit, or private components; metrics that work for a large organization may not be as applicable to a small program; and so on. However, when determining appropriate metrics for a situation or endeavor there are several broad characteristics that may provide guidance:

a) *Purpose*

A robust metric will reflect a specific objective or outcome that is tied to an effort's overarching goals. As such, there are several key questions that should be answered when evaluating purpose: What is the metric intended to measure? Why is it important for that particular outcome to be measured? Why is this metric a good way to measure it?

b) *Scale of application*

Is the metric intended for individuals, groups, programs, organizations, or the overall enterprise? A metric may be applicable to a single category, multiple categories, or even all of these categories.

c) *Longevity/robustness over time*

Different metrics are likely to be applicable over different timescales. Some metrics might be helpful while taking stock of a situation but are slow to reflect change; others may be highly responsive and well-suited to evaluating experiments. However, the most useful metrics for assessing continued progress tend to be those that remain relevant over long periods of time.

d) *Integrability*

One potential function of metrics is to enable comparison, whether between individuals, programs, groups, organizations, or sectors. It may be useful to consider if and how selected metrics integrate with those of partners and allies (e.g., do the chosen metrics promote or allow comparison to those used by other groups?).

After choosing relevant, applicable, and reliable metrics, there is additional consideration needed for their meaningful implementation. Developing metrics and creating evaluations to assess them takes expertise. It is advisable to reach out to practitioners (social scientists, evaluation experts, etc.) who have familiarity with techniques and tools to inform the process. Several factors that may help guide implementation include the following:

a) *Data collection*

Metrics rely upon robust data collection, which may be qualitative or quantitative in nature. It is important to have the metric in mind when deciding how to collect the necessary data: while quantitative data is often favored due to the relative ease of applying statistical analysis, there are instances where qualitative data is more appropriate. Some types of demographic data may be more routinely collected than others; moreover, data applying to the WWC community may be aggregated with other STEM fields, making it difficult to ascertain relevance.

b) *Monitoring*

A monitoring process is necessary to update reported metrics to reflect new data, as well as to enable analysis and suggest action. As with many data-gathering exercises, intentional follow-up over time can add value to the dataset.

c) *Collaboration, responsibility, and accountability*

Metrics may encourage broader participation and collaboration within and between organizations. Cross-organization, cross-sector, or cross-enterprise efforts may improve data collection and relevance, as well as spread awareness of particular issues. However, designations of responsibility and accountability are needed, including for metric reporting, analysis, implementation, and subsequent inspired actions in order to facilitate success.

d) *Transparency*

The rationale for the publication of any given metrics, as well as details of the data collection process, should be made readily available in order to facilitate engagement and understanding. A lack of transparency may result in lack of trust in the efforts. At some organizations, approval from the Institutional Review Board (IRB) or similar review boards may be needed to collect demographic or other types of data sets.

e) *Consistency and replicability*

Metrics presented in a common format, measuring the same variables, and consistent over time are hallmarks of reliable and replicable studies. However, the ability to update or refine the goal, application, or collection of metrics over time may allow for the incorporation of nuances or changes that occur or are made aware over time.

f) *Differentiation*

Metrics that are too broad may be unable to capture nuances in the experiences of individuals throughout temporal, spatial, departmental, or other stages in their careers. The ability to recognize different stages or factors that make up the work environment of the WWC enterprise is important to understanding how IEJ efforts are succeeding or not.

Metrics of IEJ are valuable tools to establish baselines, encourage and evaluate progress, assess and refine specific actions, and enable accountability. However, as with all tools, metrics are

subject to drawbacks and limitations depending on their application. There can be challenges or even antagonism in connecting what can be measured (i.e., a readily available metric) and a desirable outcome (e.g., an enterprise where all people can contribute their knowledge, skills, abilities, and energy to their full potential). Consequently, careful attention must be paid during the development and deployment of metrics for IEJ in order to ensure their suitability for a given situation:

a) *Metrics can become focus of efforts when not helpful or appropriate*

Numbers and statistics can be an appealing means of communication; however, there is a risk that a focus on “improving numbers” may detract from the real experiences of people or communities. Indeed, over-emphasizing the measurable outcomes of an endeavor can reflect characteristics of white-supremacy culture (Okun 2021). Metrics should not cloud the voices, ideas, and messages of individuals, especially marginalized or historically underrepresented individuals. Moreover, demographic comparisons should be carefully deployed with consideration of what the information actually conveys and whether it leads to taking the most effective steps. The ability to measure social, emotional, or personal growth within the context of the workforce may be forgotten or seen as “secondary” if there is undue focus on metrics as benchmarks of progress.

b) *Selection bias*

Metrics are only as good as the data that informs them and data, in turn, is inherently a reflection of presence. The enterprise can gather demographic data on its members or the recipients of its services; it can publicize the results of a round of funding or survey the satisfaction of employees. However, it is more challenging to incorporate those who are not present—those who have left the enterprise, those who are not served by the enterprise, or those who may not have had the chance to join or participate in enterprise work.

c) *It can be difficult to measure what matters most*

Although the ability to measure certain means of progress and illustrate baselines and the results of actionable steps with metrics is helpful to characterize IEJ efforts there are inherent limits to quantitative descriptors. Survey tools such as scales or rankings may help respondents express feelings on issues such as belonging to some extent; however, these feelings are inherently subjective and may also be difficult for people to quantify. Qualitative questions may provide more flexibility in obtaining perspectives on IEJ; however, analyzing qualitative data requires additional effort to identify important trends and findings. Additionally, metrics can only measure how much progress is being made toward a goal, not the robustness of the goal or the intention behind it.

d) *Ensuring that information is being collected for a specific purpose*

Any collaboration with communities to collect metrics or data must be done in a manner that establishes trust between participants and data collectors. Relevant data may contain private information and any effort on the participant’s behalf to engage with the study or survey will require their time and sometimes resources: if there is no tangible purpose or outcome from this data, trust may be lost.

e) *Ensuring metric collection mechanism is inclusive of everyone*

Metrics are helpful when they reflect the true makeup or measurement that was intended to be collected. Metric collection mechanisms need to be inclusive of everyone and

should be designed to reach all participants regardless of obstacles that may make responses more difficult to obtain. Barriers such as internet connection, time, language, or other obstacles can be addressed to ensure that the quantitative outcome reflects reality.

f) *Scale*

Metrics can be limited by their scale of applicability, or the idea that not all metrics will work at all scales—hierarchical, geographical, temporal, etc.

7. AMS Efforts in IEJ and Next Steps in Implementing the IEJ Framework

7.1. AMS Efforts to Advance IEJ

Many groups and individuals within AMS have actively worked to advance IEJ throughout the society. Here we emphasize two particularly significant efforts.

BRAID (formerly BWM)

In 1975, AMS formed the Board on Women and Minorities (BWM) to create a space for women and ethnic minorities to address representation and workplace issues. In 2020, the BWM officially changed its name to the Board on Representation, Accessibility, Inclusion, and Diversity ([BRAID](#)) to encompass all underrepresented and minoritized backgrounds in STEM (e.g., women, BIPOC, LGBTQ+ individuals, those with disabilities, etc.). BRAID is a community of AMS members who are historically underrepresented in STEM and advocates who are working to create an inclusive culture at AMS. BRAID has numerous committees and ad-hoc teams that attend to a variety of equity topics. These committees have a long record of addressing equity and inclusion issues in the weather, water, climate enterprise.

CIC

In January 2020, AMS Council stood up the Culture and Inclusion Cabinet ([CIC](#)). The CIC was established to catalyze an inclusive, just, equitable, and accessible culture across AMS. It is a cross-cutting leadership body that advises the strategic direction of AMS to promote equity, inclusion, and justice, increase access, and foster accountability. Based on recommendations from the CIC, AMS hired a Director of Diversity, Equity & Inclusion (DEI) in August of 2021. The Director of DEI serves as a link among members, volunteers, and staff to amplify and integrate DEI efforts into all AMS activities and adapt to evolving needs. The CIC and Director of DEI collaborate with boards and committees, such as BRAID.

In addition, AMS has several ongoing initiatives that support the creation of an inclusive and welcoming environment:

Building a More Inclusive Community across Departments, Programs, Boards and Committees

- The [Early Career Leadership Academy](#) (ECLA) is a collaboration between BRAID and the Board on Early Career Professions. ECLA brings together early career individuals—in particular, women and underrepresented groups—for an immersive experience in building leadership skills.
 - Through an NSF-funded program, DEIBA STARS (Diversity, Equity, Inclusion, Belonging, and Accessibility Skill-building and Transfer in the Atmospheric and Related Sciences), the ECLA program has been able to include IEJ-related

content across its curriculum by incorporating IC and other DEIBA experts, such as UCAR's UNEION, to expand course content. Additionally, this grant has enabled ECLA to increase staff support to connect ECLA alumni with AMS boards and committees to increase leadership diversity and impact the greater AMS community culture.

- BRAID administers an [AMS membership survey](#) collecting and sharing data on respondents' demographics and diversity, develops recommendations on accessibility at AMS meetings, and leads relevant DEI sessions and networking events at AMS Annual Meetings.
- Over the past year, and in coordination with the [Board on Early Career Professionals](#), BRAID has also hosted webinar series [The World Through My Eyes](#) which highlights AMS members with varying accessibility needs, including hearing, sight, and mobility impairments, and chronic illnesses.
- AMS currently supports a [Minority Scholarship](#) for incoming college first-years, awarding funds to minority students who have been traditionally underrepresented in the sciences, especially Hispanic, Native American, and Black/African American students.
- In 2021 AMS conducted implicit bias training for staff and volunteers, including those involved in the awards process and peer-reviewed journals, Council members, and other leadership roles. This effort was supported by an AIP Diversity Action Fund grant and a partnership with outside facilitators.
- The AMS Education Program offers nationwide professional development courses to teachers, with an emphasis on those serving a large population of underrepresented or minority students.
 - The AMS Education/NOAA Cooperative Program for Earth System Education (CPESE) supports the Advancing Minority Participation in Science (AMPS) effort, a push to make DataStreme courses available to teachers at schools with a large minority student population. Through this, the Education Program supports course mentor teams in regions of the country such as New York City, Philadelphia, and Honolulu.
 - To reduce the "accumulation of privilege" in the Project Atmosphere summer teacher Professional Development Course, the Education Program has made changes to the selection process. Instead of focusing on resume accomplishments, the Program focuses on aspirational goals and has also changed the selection rubric to increase participation by more early-career teachers.
- The AMS Education Program also conducted NSF-supported Diversity Projects for its Weather, Ocean, and Climate Studies introductory course from 2001 to 2019. Faculty from MSI participated in a five-day workshop and then were invited to participate in the AMS Annual meeting. From this effort, AMS provided professional development for faculty at over 251 MSIs.
- The AMS Policy Program promotes a diverse group of participants in the Summer Policy Colloquium (www.ametsoc.org/spc) by providing opportunities for funding (supported by NSF) for faculty at MSIs and HBCUs.

- The Policy Program has organized this IEJ Working Group and facilitated regular discussions to produce this Framework as well as inform ongoing and future policy studies. Gathering individuals across our community with various perspectives for this Working Group has been synergistic in propelling our IEJ efforts forward as an organization and a community. Additionally, the early incorporation of the AMS DEI Director into these discussions was useful in establishing an inter-organizational partnership that was able to create a strong foundation for upcoming DEI work.

Accessibility and Inclusivity at the Annual Meetings

The [AMS Annual Meeting](#) provides networking opportunities for women and historically underrepresented identities, including the annual Women in Atmospheric Sciences Luncheon and the Coriolis and Colour of Weather receptions. In 2022, the Annual Meeting hosted the [Third Symposium on Diversity, Equity, and Inclusion](#) and conducted a survey to review our accessibility practices and policies.

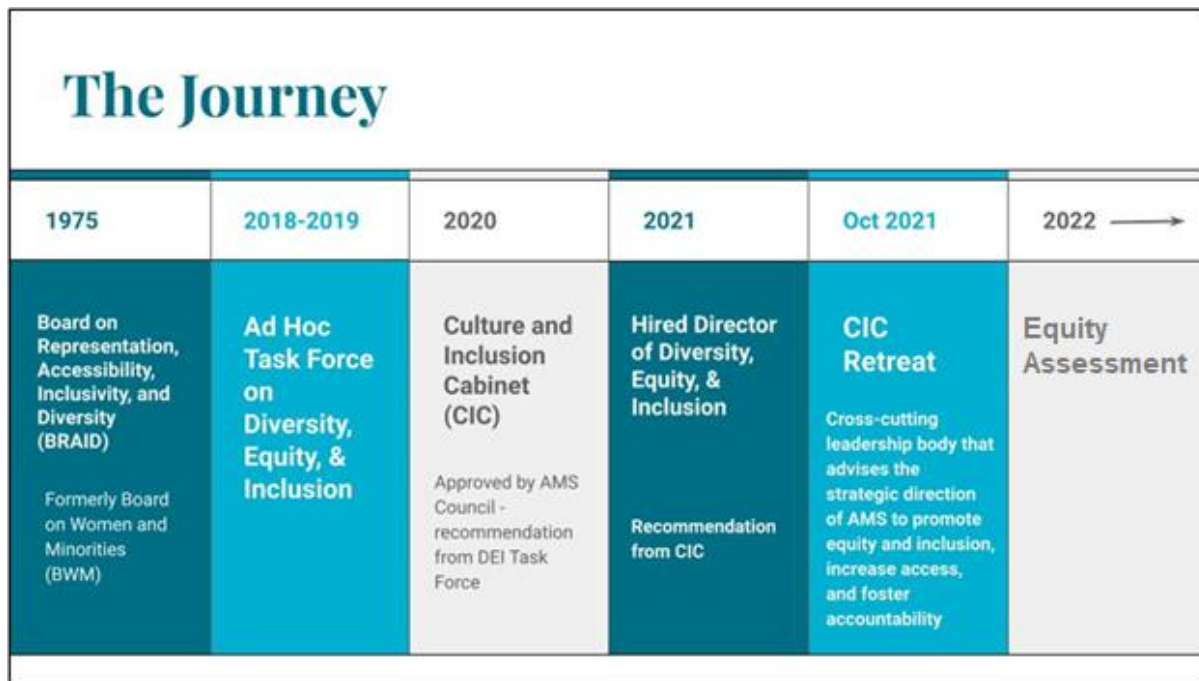


Figure 3: Notable AMS efforts to advance IEJ, 1975–present

7.2. Next Steps: The AMS Equity Assessment

During the January 2022 Council Meeting, the AMS Council supported the CIC and Director of DEI’s recommendation to implement an Equity Assessment (EA). The EA is one of the next steps in AMS’s commitment to create an inclusive and welcoming society. It will work in partnership with our ongoing initiatives, allow us to amplify our successes, and track improvements as well as continued areas of need. AMS is in the initial stages of identifying resources and developing the timeline for the EA.

What is an Equity Assessment?

An Equity Assessment, also known as an Equity Audit, is a systematic process to support and foster equity-centered practices and culture within an organization. It is designed to illuminate an organization's current culture and the experiences of members and staff, as well as provide strategic direction and transparency to create an equitable, inclusive, and just organization.

Specifically at AMS, the Equity Assessment will review policies and practices that impact members and staff relative to their race, ethnicity, gender, national origin, disability, age, sexual orientation, gender identity, or other significant sociocultural identities.

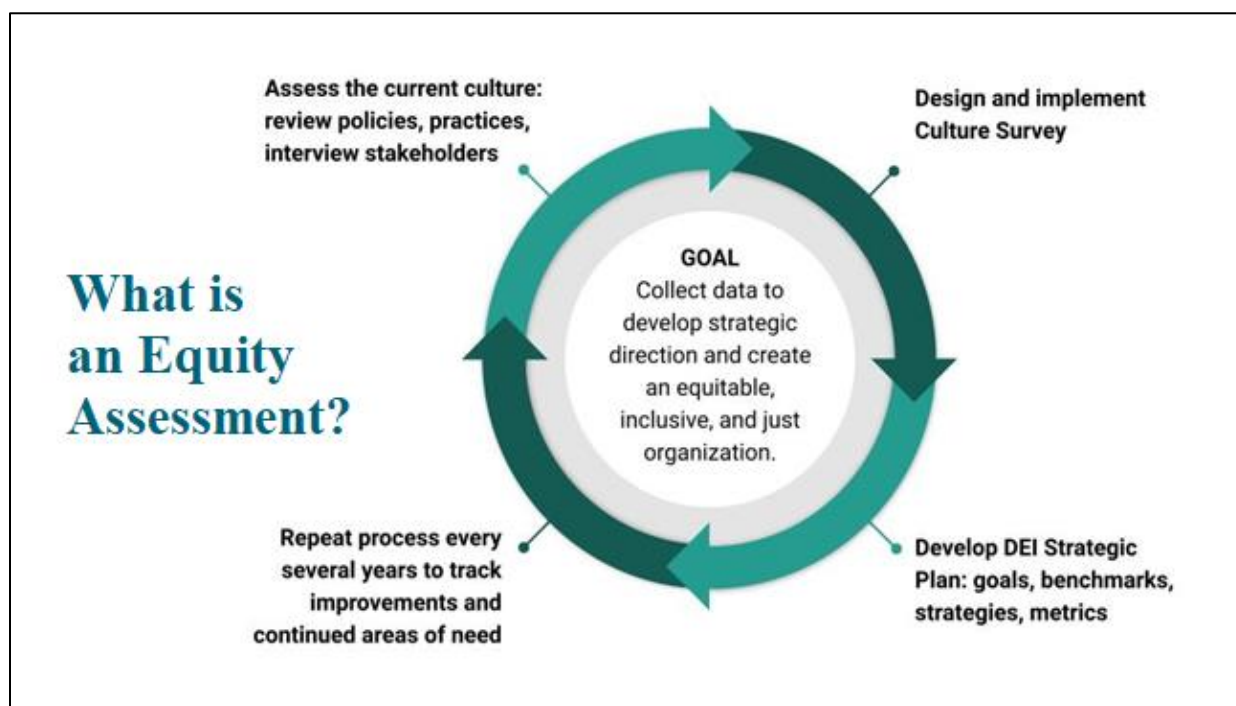


Figure 4: Equity Assessment Process

Why is AMS conducting an Equity Assessment?

Since 1975, AMS has been working explicitly to create a more inclusive society and has several ongoing initiatives that support this work. The Equity Assessment is a next step in this lifelong work. It represents the following:

- Qualitative and quantitative review of our practices, policies, and procedures.
- The establishment of a baseline dataset for measuring the effectiveness of the actions put in place in response to those recommendations.
- A foundation from which to develop an EIJ strategic plan that will guide AMS.
- Opportunity to continually review EIJ work and pivot as needed over the short and long term.
- An additional tool set to complement the work already in place.

8. Additional Resources

Collected below, in no particular order, are a few additional resources that may provide further information, dialogue, programs, funding, or examples of action steps that can be utilized to move toward a more inclusive, equitable, and just WWC enterprise. These resources are not intended as a representation of all thinking on IEJ and do not necessarily reflect the views of AMS or its members and supporters.

Programs:

- [NSF INCLUDES](#): A national initiative focused on broadening diversity and inclusion in STEM; one of NSF's 10 Big Ideas
- [AIP TeamUP](#): A Task Force assigned to better understand how to increase representation of Black undergraduate students in physics and astronomy
- [SEA Change](#): An AAAS initiative focused on advancing diversity, equity, inclusion in STEM (science, technology, engineering, mathematics, and medicine)
- [SOARS](#): A UCAR program that supports the undergraduate-to-graduate bridge for underrepresented students through funding and research opportunities in atmospheric and related sciences
- [SiParCS](#): An NCAR mentoring program in CISL aimed at university students who are interested in pursuing a career in such areas as: Application Optimization, Data Science, Machine Learning, Numerical Methods, Software Engineering, Supercomputing Systems Operations, Visualization
- NOAA's [EEP/MSI](#): A scholarship and internship program that supports students at Minority Serving Institutions
- [Entry Point!](#): An AAAS program that connects STEM students with disabilities with intern positions at partner organizations
- [ADVANCEGeo](#): A primary goal of the project is to improve workplace climate conditions by developing bystander intervention education for department heads, chairs, faculty and grad students to appropriately respond to and prevent harassment, bullying and other exclusionary behaviors in research environments.
- [URGE](#): A program to help geoscientists develop policies and programs meant to improve accessibility, justice, equity, diversity, and inclusion.

Readings, activities, and tools:

- [Anti-racism Resources](#)
- [Avarna Group Resource Archive](#)
- [UCAR Diversity, Equity & Inclusion Strategic Plan](#)
- [XSEDE Terminology List](#)
- [UMass Amherst Readings & Media on Diversity, Equity & Inclusion](#)
- [W3C Guide for Making Content Usable for People with Cognitive and Learning Disabilities](#)

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Appendix A

Statement of Charge to the IEJ Working Group

This is a project to develop an inclusion, equity, and justice (IEJ) framework for the weather, water (fresh and salt), and climate (WWC) enterprise. The breadth of representation in the working group will help ensure the framework presents a compelling vision for the enterprise and provides the expertise, guidance, and insights everyone needs to advance IEJ. The goal is to create a framework that can be applied at all scales of organization: from individuals and small groups; to institutions, sectors, and the enterprise itself.

Our hope is that those who read the framework will come away with:

1. a sense of ownership, responsibility, and accountability for the advancement of IEJ;
 - a. a strong desire to advance IEJ;
 - b. commitment to advancing IEJ through all aspects of their professional lives;
2. the ability to help advance IEJ at any scale of organization;
 - a. a shared understanding of challenges and opportunities;
 - b. clarity of what actions and behaviors are required, prohibited, encouraged, and discouraged;
 - c. awareness of existing practices, tools, and approaches for advancing IEJ;
 - d. eagerness to innovate—to apply talent, skill, knowledge, and effort in the creation of new practices and approaches to enhance IEJ;
3. the commitment to progress over the long-term;
 - a. to continuously develop our own understanding; ability; and commitment to IEJ;
 - b. to encourage and support others' efforts to advance IEJ;
 - c. to the sharing of lessons learned;
 - d. to revise and update efforts as new opportunities to advance IEJ emerge.

The enterprise as a whole has made progress in IEJ but we have a long way to go. Our hope is that the framework should work simultaneously to: 1) promote a sense of belonging among those who have not been fully included, and 2) enable efforts to advance IEJ whether they are made by those who already have considerable experience doing so or those who are in the early stages of developing their understanding. While our backgrounds, experiences, and familiarity with IEJ differ, all can benefit from shared additional understanding of the importance of IEJ, the evidence-based practices that advance IEJ, and the opportunities to work together for its advancement. All of us must continue to develop our understanding and our ability to contribute if we are to be as effective as possible. Therefore, we hope that this collaborative framework serves as a roadmap that can be adapted for use by everyone in our enterprise.

Finally, it is important to recognize that the framework by itself does not have authority over anyone's actions. Rather, the framework's power will lie in the strength and effectiveness of its vision, rationale, approaches, and practices—its ability to inspire its readers to take actions, commit resources, encourage all who read it to commit their energy to IEJ and effectively

integrate IEJ into their work to enable effective efforts when they do. The collaborative nature of the working group will contribute to the credibility, authority, and reach of the framework's conclusions and recommendations.

The imperative of the working group is to encourage and enable all who read the framework to do what they can to make the weather, water, and climate enterprise (and the broader society of which we are part) inclusive, equitable, and just.

