BAMS Article

Bridging the COSMOS: How the Inclusion of and Collaboration with Faith-Based Understandings and Indigenous Knowledges Can Transform the Weather, Water, and Climate Enterprise

Carlos J. Martinez,[a,b] Debanjana Das,[c,d,b] Emma Frances Bloomfield,[e,b] James D. Abraham,[f,b] John A. Knox,[g,b] Ricardo Simmonds,[h,b] Douglas C. Hilderbrand,[i,b] Jason Giovannettone,[j,b] Arvin M. Gouw,[k,b] and Abhishek RoyChowdhury[l,b]

KEYWORDS: Climate change; Adaptation; Communications/decision making; Education; Indigenous knowledge; Resilience

ABSTRACT: Climate change is a global existential threat with far-reaching implications for natural ecosystems, biodiversity, and human societies. Adapting to and mitigating climate change require global cooperation and participation from all mindsets and belief systems, including the traditionally western weather, water, and climate enterprise (WWCE), faith-based understandings (FBUs), and Indigenous Knowledges (IKs). Epistemological differences and language barriers between knowledges and the historical marginalization and exploitation of IKs by western ideologies and some FBUs make coproduction and relationship building challenging. Acknowledging their historical tensions and distinctions, there is meaningful overlap between the WWCE, FBUs, and IKs on environmental stewardship, justice, and mental health. This article highlights three themes at the intersection of FBUs, IKs, and environmentalism: 1) increasing faith-based and Indigenous community resilience to weather extremes; 2) developing kindergarten through grade 12 (K-12) and collegiate weather, water, and climate education that weaves FBUs and IKs; and 3) increasing communication flows between weather, water, and climate science, and faith-based and Indigenous communities. These initiatives aim to foster relationships and trust between the WWCE, faith-based, and Indigenous communities; transform the WWCE into a multiknowledge enterprise; and promote a climate-resilient society. The American Meteorological Society's Committee on Spirituality, Multifaith Outreach, and Science (COSMOS) plays a pivotal role in facilitating dialogue and collaboration on these themes while acknowledging distinctions and historical tensions between FBUs, IKs, and the WWCE. Collaborative efforts between the WWCE, faith-based, and Indigenous communities hold immense potential for addressing climate challenges, fostering resilience, and building a more inclusive and sustainable future grounded in mutual respect and understanding.

DOI: 10.1175/BAMS-D-23-0047.1

Corresponding author: Carlos Martinez, carlos.martinez@columbia.edu

Manuscript received 6 March 2023, in final form 26 June 2024, accepted 15 July 2024

SIGNIFICANCE STATEMENT: This article addresses how weaving faith-based understandings (FBUs) and Indigenous Knowledges (IKs) into the weather, water, and climate enterprise (WWCE) can effectively tackle climate change, extreme weather, and other environmental challenges. Emphasizing the need for a shift in mindset and community dialogue, the path to adaptation begins with raising awareness and fostering discussions that bridge science and societal values. This includes acknowledging the historical tensions that exist between FBUs, IKs, and western science and being honest about the challenges and distinctions that arise from these tensions. Through partnerships highlighted between the American Meteorological Society (AMS), Indigenous groups, and multifaith organizations, we see practical outcomes: enhanced weather preparedness, improved mental well-being, holistic environmental solutions, and informed policymaking. These collaborations are crucial for building a resilient and sustainable future by connecting community strengths through a multiknowledge scientific and cultural approach.

AFFILIATIONS: [a] National Center for Atmospheric Research, Boulder, Colorado; [b] Committee on Spirituality, Multifaith Outreach, and Science, American Meteorological Society, Boston, Massachusetts; [c] NOAA/Cooperative Science Center in Atmospheric Sciences and Meteorology, Howard University, Washington, D.C.; [d] Center for Ocean-Land-Atmosphere Studies, George Mason University, Fairfax, Virginia; [e] Department of Communication Studies, University of Nevada, Las Vegas, Las Vegas, Nevada; [f] Canadian Meteorological and Oceanographic Society, Ottawa, Ontario, Canada; [g] Department of Geography, The University of Georgia, Athens, Georgia; [h] University of Colorado Boulder, Boulder, Colorado; [i] National Weather Service Headquarters, Silver Spring, Maryland; [j] Department of Climate and Sustainability, Sisters of Mercy of the Americas, Inc., Silver Spring, Maryland; [k] Faculty of Divinity, Cambridge University, Cambridge, United Kingdom; [l] Environmental Science and Natural Resources, School of Science, Navajo Technical University, Crownpoint, New Mexico

1. Introduction

Our changing climate presents an urgent, global, and existential threat with profound implications for natural ecosystems, biodiversity, and human societies worldwide (IPCC 2022). The urgent need to confront climate change requires a multifaceted approach that draws upon various sources of knowledge and expertise. While global collaboration is necessary to develop overarching policies and strategies for managing climate risks, it is equally important to recognize the value of grassroots initiatives and local actions that can have immediate impacts on building resilience and mitigating the effects of climate change. In this context, faith-based understandings (FBUs) and Indigenous Knowledges (IKs) offer unique perspectives and insights that can complement western scientific and policy-driven approaches on environmentalism.

FBUs encompass belief structures, doctrines, and practices rooted in organized religions, drawing authority from sacred texts, religious leaders, and institutionalized teachings (Hill and Pargament 2003; Koenig 2008). These systems provide frameworks for understanding the nature of existence, morality, and the divine, shaping individual and communal identities through adherence to religious doctrines and traditions and participation in rituals. However, alongside adherents to traditional faiths, there exists a growing demographic of people who identify as spiritual but not religious (SBNR); these individuals emphasize personal rather than institutional spirituality drawing from diverse sources such as philosophy, nature, and

personal experiences, while challenging conventional notions of FBUs (Zinnbauer et al. 1997; Wixwat and Saucier 2021). For the purposes of this article, we refer to the following definitions when discussing FBUs and SBNR communities, institutions, and knowledges.

IKs are intergenerational understandings, observations, beliefs, practices, and wisdom that are deeply rooted in cultural traditions and interactions with the environment (Bruchac 2014; Whyte 2017; Lazrus et al. 2022). These experience-based ways of knowing encompass a holistic understanding of the interconnectedness between humans, the environment, and spiritual realms, guiding Indigenous peoples in sustainably navigating their lives and surroundings. For thousands of years, IKs have guided Indigenous peoples to understand how nature is tightly connected with their culture and why it is important to respect and protect natural resources (Wildcat 2009). For example, in the Navajo tradition, it is believed that all living bodies are made of six sacred elements: Nahasdzáán Shima (Mother Earth), Yádiłhił Shitaa' (Father Sky, Sun, Moon, and Star), Kǫ' (Fire), Tó (Water), Niłch'í (Air), and Tádidíín (Pollen), and it is of the utmost importance to respect these sacred elements (Wilson 1992). Indigenous communities and peoples use "ways of knowing" or "knowledges" in the plural form to emphasize the variety of traditional knowledges that are unique to each Indigenous community and knowledge holder [Climate and Traditional Knowledges Workgroup (CTKW) 2014]. It is important to understand that tribes may choose not to share IKs with outsiders as they warrant cultural privacy due to sacredness (CTKW 2014) and thus may practice ethnographic "refusal" (Simpson 2007).

The history between IKs and FBUs is complex and multifaceted. Historically, colonialism and the imposition of western ideologies and science often led to the suppression, marginalization, and erasure of IKs by imposing foreign religious beliefs and institutions such as the Christian mission (Chidester 2013) and the Doctrine of Discovery (Lind 2020). This imposition disrupted traditional social structures and undermined Indigenous self-governance, contributing to intergenerational trauma and the erosion of Indigenous communities' cultural identities. Moreover, the complicity of some religious institutions in colonial land grabs and exploitation further deepened the suffering and marginalization experienced by Indigenous peoples (Seed 1995; Chidester 2013). The legacy of forced education in boarding schools, facilitated by some religious entities, further perpetuated the erasure of native belief systems and exacerbated collective trauma (Evans-Campbell et al. 2012; Feir 2016). Consequently, including any western scientific technology in engagement with Indigenous communities will likely be met with resistance and a lack of trust. In recent years, there has been a growing recognition within some faith communities of the need to confront historical injustices and engage in meaningful reconciliation efforts with Indigenous peoples. This includes acknowledging the harms inflicted by colonialism, supporting Indigenous rights and self-determination, and honoring Indigenous spiritual traditions and knowledges (Gaspar 2010; Allen et al. 2017; Moyer 2018; Del Vecchio 2018; Kibiten 2019; Michaelson and Durrant 2020).

While understanding the complexities and tensions of their history, both IKs and FBUs offer perspectives and values that stem from a deep reverence for the natural world. Most eastern FBUs emphasize the connection between humans and nature (Sachdeva 2016). Although several western FBUs have religious components (e.g., dominion orientation) that historically disconnected or separated human and natural systems (Sachdeva 2016; Fletcher et al. 2021), communities of these FBUs have recently reinterpreted or refuted those components and reinforced, introduced, or highlighted beliefs and principals (e.g., care for creation) that emphasize the interconnectedness of all living beings and advocate for the stewardship of Earth (Sachdeva 2016). A common IK is Traditional Ecological Knowledge (TEK), which encompasses observations, oral and written knowledges, practices, and beliefs that promote responsible stewardship of natural resources through the harmonious relationship between humans and the environment (Rattling Leaf 2022). Indigenous and faith-based respective

motivations and understandings of human–nature relationships and systems are the reasons there are growing dialogues and partnerships between both communities that are focused on addressing environmental issues (Moyer 2018; Del Vecchio 2018; Kibiten 2019; Boorse and Jablonski 2024).

Therefore, there is an inherent intersection between FBUs, IKs, and the weather, water, and climate enterprise (WWCE), which has been historically dominated by western knowledge systems. This overlap is underscored by shared values of environmental stewardship, environmental justice, and mental health (see Fig. 1).

Both the WWCE and Indigenous and faith-based communities prioritize the responsible usage and protection of the natural environment through conservation, sustainable practices, and mitigation and adaptation to climate change (Chapin et al. 2011). The WWCE recognizes the importance of responsible management and conservation of natural resources and ecosystems to ensure a sustainable future. This is achieved through activities such as researching and monitoring weather patterns, water resources, and climate change impacts; developing sustainable practices at local institutions; collaborating with various sectors to address environmental challenges collectively; and creating educational and outreach programs that promote environmental literacy and informed decision-making (Feldman and Ingram 2009; Uccellini and Ten Hoeve 2019; Monaco et al. 2021; Lanicci and McCorrison 2023). For many Indigenous and faith-based communities, environmental stewardship is not just a matter of practicality; it is a cosmic, sacred, and ethical imperative. This imperative has motivated many communities to take grassroots-to-international actions, such as reducing their carbon footprint, adopting environmentally friendly energy sources and transportation, restoring natural ecosystems, and engaging in training programs, resources, and campaigns that support sustainable practices and environmental advocacy (Maldonado et al. 2013; Del Vecchio 2018; Arias-Bustamante and Innes 2020; Miller Hesed et al. 2020; Hendershot 2021; Harper 2021; Bock 2022).

Environmental justice[1] holds paramount importance in the WWCE and within Indigenous and faith-based communities

[1] There are many definitions of environmental justice. For the purposes of this article, the definition section 2 of U.S. Executive Order 14096 is used: https://www.federalregister.gov/documents/2023/04/26/2023-08955/revitalizing-our-nations-commitment-to-environmental-justice-for-all.

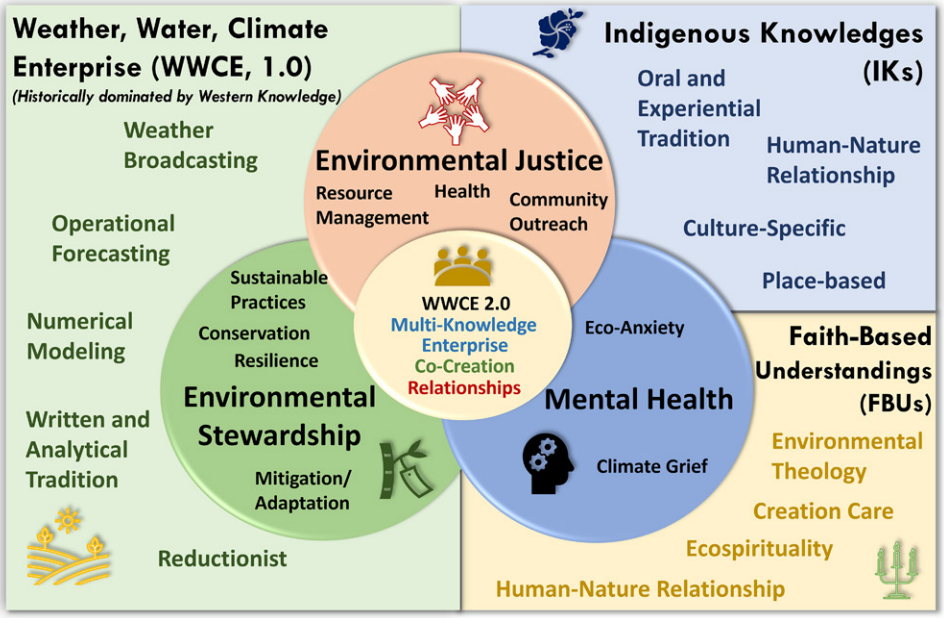

Fig. 1. Schematic of the overlap between the historically western WWCE, FBUs, and IKs. The shared values of environmental stewardship, environmental justice, and mental health may promote a multiknowledge method in Earth science that is cocreated and built on relationships, thereby transforming the WWCE into a multiknowledge enterprise.

because it addresses the disproportionate impact of environmental degradation, extreme weather events, and climate change on communities that have been, and continue to be, overburdened. A perspective of environmental justice ensures swift and accurate dissemination of disaster risk information, preparedness and response strategies, environmental health considerations, community outreach, and resource management for all communities by the WWCE (Tripati et al. 2024). Many faith-based communities are driven by principles of justice and compassion and possess a deep awareness of the needs of the local communities, particularly for some that are considered vulnerable, thus allowing them to serve as vital spaces for disaster risk management, resiliency, and response (Gaillard and Texier 2010). Often, faith-based communities are the first responders, providing shelter, food, water, and medical care in the aftermath of a disaster (Ferris 2005). Indigenous environmental justice is inevitably tied to the combination of changing environmental conditions and decolonization (Schlosberg and Carruthers 2010; McGregor et al. 2020). Indigenous communities have been and continue to be disproportionately affected by disasters and climate change compounded by historical machinations of settler colonialism (Whyte 2017). Many Indigenous communities are leading environmental justice efforts and movements focused on providing sufficient clean water, renewable energy, and wildlife protection (Mason et al. 2012; Huffman 2013), while also promoting Indigenous self-governance on environmental management (Ranco et al. 2011).

Moreover, the impacts of climate change extend beyond the physical realm and have significant psychological and emotional consequences, resulting in climate grief and eco-anxiety (Doherty and Clayton 2011). Communities and professionals within the WWCE are deeply affected as witnesses of the impacts of extreme weather events, changing ecosystems, and the loss of livelihoods in their neighborhoods and communities (Bodnar 2008; Gillespie 2016; Moser 2013; Pihkala 2018; Clayton 2020; Pihkala 2020; Coffey et al. 2021; Ojala et al. 2021). WWCE professionals, who study, inform, and forecast disasters, are particularly attuned to these challenging emotions and mental states. Recognizing this, the WWCE has made efforts to provide resources, initiate conversations, and implement initiatives focusing on mental health for students, scientists, and professionals (Bolton et al. 2018; Clayton 2018; Bolton and Ault 2020; Bolton et al. 2020; Renouf 2021). Indigenous and several faith-based communities have long understood the connection between individual well-being and the health of the natural environment and, as such, are also significantly affected by environmental degradation. Through practices of solace, meditation, and community support, these communities foster resilience and promote mental health in the face of climate-related challenges (Pihkala 2018; Bellehumeur et al. 2022).

Despite these inherent connections, there is a significant gap in initiatives, relationships, and collaborations between the WWCE and communities who subscribe to IKs or FBUs. Furthermore, the inclusion of scientists and professionals within the WWCE who hold IKs (e.g., Van Cooten 2014; Lazrus et al. 2022) or FBUs is often overlooked. Scientists and professionals who are part of Indigenous or faith-based communities have the potential to serve as trusted dialogue brokers, drawing on their own experiences to bridge the gap between western science and their way of knowing (Nisbet 2018).

In light of the aforementioned gaps and opportunities, this article sheds light on the often-unexplored role of FBUs and IKs in the WWCE and explores potential initiatives for collaboration (Dasgupta and Ramanathan 2014). We emphasize the importance of including FBUs and IKs in climate change, weather, water, and other environmental discourses. This includes fostering faith-based and Indigenous community mitigation to weather extremes (e.g., Weather-Ready Nation), developing kindergarten through grade 12 (K-12) and collegiate weather, water, and climate education programs that weave these knowledges while maintaining their unique distinctivenesses, and identifying strategies to enhance communication

flows between WWCE science and faith-based or Indigenous communities and organizations. Finally, we examine the significant steps taken by the American Meteorological Society (AMS) through its Committee on Spirituality, Multifaith Outreach, and Science (COSMOS) to bridge these gaps. Through this interdisciplinary exploration, we hope to contribute to a more holistic and inclusive approach to addressing climate change, weather-related challenges, water management, and other environmental issues. By transforming the WWCE, we can help build a more sustainable and climate-resilient future for communities.

2. Addressing the FBUs, IKs, and WWCE gap

a. Optimizing the resilience of faith-based and Indigenous communities to weather extremes. The National Academies of Sciences defines resilience as "the ability to prepare and plan for, absorb, recover from, or more successfully adapt to actual or potential adverse events" (National Research Council 2012). Faith-based organizations and places of worship often serve as recovery locations after high-impact weather events. Their roles include distribution locations of essential services (e.g., food, water, and clothing), emotional support, and information. In addition, many faith-based organizations and houses of worship play a positive role in pre-event preparedness as well as during extreme weather events as community shelters. The potential for greater faith-based engagement is essentially exponential and is currently a focus of NOAA's Weather-Ready Nation Ambassador (WRNA) program (www.weather.gov/wrn). Faith leaders are the trusted sources in the communities they serve and are effective "force multipliers."

There are several papers demonstrating the impact faith-based organizations have on community resilience. Religiosity has been shown to help not only heal those who have been physically and emotionally impacted by extreme weather events (Tausch et al. 2011) but also increase the likelihood of physical action (Lim et al. 2019). Faith leaders also serve as examples for others to emulate, with many houses of worship offering up virtual services during expected hazardous travel conditions. Houses of worship, such as churches, synagogues, and mosques, are often well-constructed buildings and may be the best option as a tornado or severe weather shelter. Houses of worship are also convenient meeting places for weather preparedness activities such as hosting National Weather Service (NWS) SKYWARN training or preparedness fairs. Faith-based organizations and houses of worship serve multiple influential roles related to weather preparedness, responsiveness, and recovery within their communities. The NWS's local office in Brownsville, Texas, for example, has been active in engagement with faith-based organizations (Goldsmith et al. 2017), particularly in Hispanic communities. On a larger scale, Trujillo-Falcón et al. (2024) highlight how faith-based community organizations have established resilience within Hispanic/Latinx immigrant populations.

However, not all engagements, especially those related to disaster recovery efforts, have historically been positive. Goldsmith et al. (2022) illustrated that due to bias in disaster response and the role of faith-based organizations in disaster recovery, lesbian, gay, bisexual, transgender, queer + (LGBTQ+) people receive less support and are more vulnerable after disaster. Some faith-based leaders have gone so far as to blame the LGBTQ+ community for the disaster and, as such, excluded them from their disaster recovery efforts (Dominey-Howes et al. 2014).

As many Indigenous communities are on the receiving end of the climate crisis, they often are the early proposer of Indigenous climate adaptation plans (Maldonado et al. 2013). Use of prescribed burn to control wildfire and use of fire to manage lands are few lessons that western scientists adopted from Indigenous communities (Mason et al. 2012; Huffman 2013). When it comes to extreme weather impacts, the NWS is strengthening its partnerships with tribal communities as part of its Weather-Ready Nation strategic initiative. For example, the

NWS Weather Forecast Office in Flagstaff, Arizona, is partnering with neighboring tribal nations. Tribal communities, longstanding keen observers of weather, are utilizing rain gauges and portable weather stations to support their observations, and the NWS has hosted educational programs and created tribe-specific graphics as part of their suite of products (https://www.weather.gov/fgz/OurOffice).

b. Developing K-12 and collegiate WWCE education that weaves FBUs and IKs. Education at the precollege and collegiate levels is largely segregated across the United States when it comes to Indigenous peoples, or Native Americans, and especially so in the geosciences. For example, while Native American students are scarce at most institutions, they represent a large majority of students at the 35 tribal colleges and universities (TCUs) across the United States. For example, Navajo Technical University (NTU), where 95% of its students were Native Americans in 2022, is only one of the two universities present in the Navajo Nation, the largest federally recognized tribe by population and tribal land in the United States and being roughly equal in areal extent to the state of West Virginia. NTU's mission is to provide value to the Diné (Navajo) community through research, community engagement, service learning, and activities designed to foster cultural and environmental preservation and sustainable economic development.

There have been numerous critiques, and a growing awareness, that science education at all levels implicitly and explicitly excludes perspectives from communities who have been historically overburdened (e.g., Tsurusaki 2020; Todd et al. 2023). The geosciences, furthermore, are one of the least diverse of all science disciplines at all university degree levels; the percentage of Native American undergraduate students who complete a degree in geoscience is less than 1%, which is lower relative to other subdisciplines in STEM, and has remained flat or even decreased over the last decade (Bernard and Cooperdock 2018; Huntoon et al. 2015). McKinley et al. (2023) surveyed the literature of geoscience education programs that relate to Indigenous students and IKs, assessed their implementation of multiple epistemologies and centering of Indigenous culture, and provided recommendations for current and future education programs. The relatively small number of articles surveyed (27 over a 31-yr period) is a measure of the gap in weather, water, and climate education to be filled. In comparison, TCUs hold an advantage over mainstream universities as they offer place-based STEM education to local Native American students and provide a balance between IKs and western science education. This helps demonstrate the fact that the WWCE has ground to make up relative to other scientific fields in most dimensions of diversity. However, this gap is also an opportunity to design curricula and programs that avoid the pitfalls of earlier efforts and that are cocreated with educators and others from the overburdened communities themselves.

As a first step toward moving forward, the engagement and weaving of scientific evidence and IKs through curriculum development at these institutions would likely have the widest impact. For example, two-eyed seeing, a learning technique where an individual learns through their Indigenous and western knowledge together (Bartlett et al. 2012), has been implemented in integrated science education (Michie et al. 2018). This approach has been successful when culture and community are connected alongside a colearning philosophy that avoids dominion of any singular knowledge (western or Indigenous) by recognizing the best from both knowledges (Hatcher et al. 2009). This and other culture-inclusive approaches to learning have been successful in many schools around the world (Onwu and Mufundirwa 2020; Zidny et al. 2020; Hanum et al. 2023).

At the K-12 level in the United States, Cho (2023) notes that while 75% of public school teachers do address climate change in their teaching, this may amount to no more than 1 or 2 h yr^{-1}. The lack of national science standards in the United States places the focus on

individual states, whose standards with respect to climate change can vary widely. Many southern states, where at least some forms of faith are culturally accepted, lag behind in climate change education because of a combination of politics and a lack of relevant content in textbooks. Though Cho (2023) identifies New Jersey and Connecticut as being in the vanguard of precollege climate education, even these states lack any emphasis being placed on the intersections between climate and FBU or IKs. As such, these states may provide the most opportunity for extensions of weather, water, and climate education to weave these aspects into K-12 education in the United States.

On a positive note, curricula relating to climate change and faith are growing at private universities with religious ties or heritages. The Yale University Forum on Religion and Ecology (FORE; https://fore.yale.edu/), for example, contains links to degree or certificate programs at 19 different institutions in North America and the United Kingdom. Many of these programs are at the graduate/seminary level; however, The University of the South (also known as Sewanee), a university in Tennessee founded and governed by dioceses of the Episcopal Church, offers an undergraduate minor in religion and environment. The curricular gap, and therefore opportunity for improvement, exists most acutely at the undergraduate level and at public colleges and universities, where over 70% of all U.S. college students attend.

Finally, the weaving of FBUs and IKs in weather, water, and climate education promotes mental health for students and educators alike. Numerous FBUs and IKs have mindful and meditative practices that may be beneficial when considering contemplative approaches to education. These practices and the development of a meditation or quiet room in K-12 and collegiate institutions may promote the well-being of all students and educators while also increasing the accessibility for students with IK/FBU the opportunity to practice their way of knowing (King and Chantler 2002; Arthurson 2015); this may serve as a great example for the WWCE to replicate to navigate eco-anxiety and climate grief.

c. Increasing communication flows between WWCE science and faith-based and Indigenous communities and organizations. Communication is a key first step to collaboration and community building. In the case of religion and climate change in the United States, increasing communication between faith-based groups and the WWCE may seem like a particularly difficult task due to the perceived relationship between Christianity, the largest faith group in the United States, and their apparent opposition to climate mitigation (e.g., Barker and Bearce 2013). However, many faith groups are strong environmental advocates, even within Christianity, meaning that opposition is not the full picture of faith-based environmental beliefs (e.g., Berry 2022; Bloomfield 2020; Ellingson 2016; Veldman et al. 2013; Vogel 2001; Whyte 2018). Studies demonstrate that the antagonistic relationship between FBUs and climate skepticism tracks primarily for white evangelical populations and can be attributed more accurately to political leanings than religious teachings (e.g., Veldman 2019). Even when drawing from the same texts and tenets, people interpret them differently to inform disparate attitudes on the environment and climate change (Bloomfield 2019).

The practice of interpretation also occurs within scientific content, where people may cherry pick scientific information, selectively reference scientific outliers, or draw a conclusion antithetical to scientific ones about the reality and severity of climate change (Bloomfield 2019; Ceccarelli 2011). For example, when considering the material reality of climate-driven disasters, such as extreme heat, sea level rise, and fire weather, faith-based communities such as the Evangelical Environmental Network interpret increases in storm intensity and frequency as evidence for a changing climate, while skeptical groups such as the Cornwall Alliance view them solely as evidence of Earth's natural cycles and not anthropogenic disruptions to the environment (Bloomfield and Bock 2023).

To connect with public audiences, especially faith-based communities, environmental sciences should be aligned with audiences' values and priorities (Bloomfield 2019). Instead of letting science "speak for itself," communication strategies can help bridge gaps between potentially skeptical or apathetic audiences and climate action. Increasing communication flows means attending to both quantity and quality. In terms of quantity, we can create more pathways for open communication between interested parties in faith-based spaces and official scientific organizations. Dudman and DeWit (2021) argue that scientific organizations, such as the Intergovernmental Panel on Climate Change (IPCC), focus solely on "speaking" when their emphasis should be on "listening" and actively incorporating feedback. In communication theory, this is called engaging in "dialogue," which means that the speaker views their audience as a respected equal worthy of autonomy (Johannesen 1974). Incorporating a dialogue approach into scientific–public communication can help foster collaborative efforts where all parties feel valued instead of dismissed or overlooked (Patenaude and Bloomfield 2022). These practices can be applied to both faith-based communities and Indigenous groups to weave their knowledges and lived experiences into scientific processes and decision-making. For example, the seventh-generation philosophy refers to how Indigenous thinking prioritizes moving through the world "with the next seven generations in mind" (Fish et al. 2023, p. 2). Instead of short-term, western-driven technological fixes, Indigenous philosophies can orient us to long-term impacts, "intergenerational healing," and sustainable futures (Fish et al. 2023, p. 2).

In terms of quality, we can tailor communication messages to faith-based audiences and create actionable results based on that communication. The weather offers a potentially valuable opportunity for communicating climate messages because it is more tangible than long-term climatic changes (Bloomfield 2024). In the case of climate-driven disasters, scientific voices can emphasize the influence of human actions on making these weather events more severe, frequent, and likely. Making these connections for audiences can help people see the impacts of our changing climate in their own backyards. Wildcat (2009) argues that climatic changes are already affecting Indigenous communities, who are more attuned to environmental change than western populations. Attending to these changes more closely and listening to Indigenous voices can help reorient us toward escalating weather patterns, changing water systems, altering plant growth, and disrupting animal migration already happening. Extreme weather events can also connect to faith-based audiences' values of charity and justice, such as by emphasizing how overburdened communities are experiencing flooding or drought despite contributing the least to carbon pollution (Holifield et al. 2017; Sultana 2022). By locating common values held by faith-based and Indigenous audiences and attending to the specific, varying needs of those communities, our communication can be more effective, higher quality, and lead to more productive WWCE collaborations.

3. Future plans and areas of focus

This article proposes numerous concrete actions and initiatives that will contribute to increased collaboration and engagement between faith-based and Indigenous communities and the WWCE. As a result, they foster a more holistic and inclusive approach to addressing climate change, weather-related challenges, water management, and other environmental issues to help build a more sustainable and climate-resilient future. Proposed actions address 1) community resilience to weather extremes, 2) policymaking, 3) education, 4) communication flows, and 5) international dialogue.

a. Community resilience to weather extremes. In addition to overall community resilience, there is a stark need to prioritize the resilience of Indigenous communities. For example, one recommendation would be to include the category "Indigenous" in the WRNA, which

would demonstrate the willingness of the NWS to engage with Indigenous communities. Environmental justice not only drives a quick and efficient response in the aftermath of an extreme event affecting an overburdened community but also demands proactive measures be taken to increase the resilience of said communities to future events, particularly in the face of climate change. Much of the infrastructure (e.g., energy, drinking water and wastewater, transportation, and flood prevention) serving Indigenous communities is not resilient against the current spectrum of extreme events and much less toward the amplifying effects of climate change. This lack of resiliency increases the risk of infrastructure failure within one or more sectors due to one event, leading to the potential for cascading failures within and across sectors. Enhanced engagement with faith-based and Indigenous communities can facilitate identifying these high-priority communities and their infrastructure needs, which, along with the knowledge available through the WWCE, would represent a crucial step toward establishing some level of infrastructure equity.

b. Policymaking. FBUs and IKs may also inform the WWCE through collaboration as a central hermeneutic or disruptor, with consequences for concrete policy outcomes that affect all of society. Consider, for example, the Bolivian government's disruptive request for the IPCC to recognize the concept of "Mother Nature" in its 2014 Summary for Policymakers (Petersen 2023) or the Colorado Court of Appeals Decisions 2018 that affirmed land access to citizens based on communal Spanish and Indigenous informed conceptions of land and water rights (Lindner 2013). Scientific and technical knowledges are thoroughly informed by values, politics, and cultural influences (Douglas 2009; Ascher et al. 2010; Latour 2012), including climate and weather (Hulme 2009). Therefore, WWCE may benefit not only from including FBUs and IKs through collaboration but also by granting such knowledge an equal seat at the knowledge-making table.

An important step for achieving epistemic equality will require demonstrating how FBUs and IKs translate into specific WWCE policy outcomes that improve or complement western approaches. Specifically, this requires the inclusion of communities with IKs and FBUs in regional, national, and international decision-making, such as the experience-based knowledge of Norwegian "snowmen" used to predict avalanche risk by the Norwegian Public Road Administration (Hulme 2023; Solli and Ryghaug 2014), or Pope Francis' and other religious leaders' active advocacy—for spiritual and moral reasons—in support of the Paris Agreement on climate change, and their effect on political actors (Lyon et al. 2018). While metrics tend to drive western knowledge making in multiple contexts, including WWCE, a "tyranny of metrics" can also lead to leveling and destructive outcomes that discount human, ecological, traditional, or aesthetic values (Muller 2018). FBUs and IKs can evidence the gaps and weaknesses of western approaches to WWCE knowledge and policymaking. For example, for Fijians and other Pacific Islanders, the space from the shore to the outer reef of the ocean is subject to a complex and communal form of reef property ownership and fisheries management, whereas a traditional western approach, unattuned to such socioecological complexity, may typically only observe the distinction between land ownership and public oceans (Sloan and Chand 2016).

c. Education. Particularly with regard to Indigenous communities, collaboration with educators will require focused efforts to empower members of these communities through enhanced education efforts at local colleges and universities. For example, NTU offers degrees in environmental science and natural resources, within which a course or program that weaves the intersection between the WWCE and IKs could benefit both communities, especially as students graduate and enter the professional community. The American Indian Higher Education Consortium (AIHEC) provides support to TCUs in all facets of American

Indian higher education. AIHEC is currently working to develop climate change resilience STEM initiatives in TCUs in collaboration with other partners including the Bureau of Indian Affairs Tribal Climate Resilience Program (TCRP), Southwest Climate Adaptation Science Center (SWCASC), and the Native Food, Energy, and Water System Alliance. The Institute for Tribal Environmental Professionals (ITEP) at Northern Arizona University provides culturally relevant education, research, partnerships, and policy-based services and works as a liaison between tribal organizations, researchers, academicians, and governmental entities. Professional societies like the American Indian Science and Engineering Society (AISES) and the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) provide support to Native American students to continue their STEM education in various levels from community college to graduate school. Finally, the Rising Voices Center for Indigenous and Earth Sciences (Rising Voices) at the National Science Foundation (NSF) National Center for Atmospheric Research (NCAR) has for over 12 years brought together Indigenous and non-Indigenous professionals from the WWCE and geosciences and facilitated numerous intercultural and relational approaches for understanding and adapting to extreme weather, climate events, and their impacts on communities (Maldonado and Lazrus 2019; Maldonado et al. 2021). The WWCE would benefit tremendously in establishing partnerships with these organizations in order to develop a multidisciplinary and multiknowledge (e.g., western and Indigenous) approach to develop weather, water, and climate educational programs.

Designing curricula and other educational programs that embrace a multidisciplinary approach and explore intersections with FBUs may be able to navigate potential political resistance/issues related to church/state separation and would likely have the most impact at the undergraduate level at public colleges and universities.

d. Communication flows. Enhancing communication flows between faith-based and Indigenous communities and the WWCE requires proactive engagement of the WWCE with community groups, advocates, and community-based research practices. Engagement efforts can be made to further increase awareness, sensitivity, and knowledge within religious communities who are skeptical or apathetic to environmental issues and create in-roads for collaboration with religious environmental advocacy groups. The WWCE can seek out partnerships with existing groups, such as Interfaith Power and Light (IPL), or create programs and groups within WWCE organizations, such as the National Wildlife Federation's Sacred Grounds program. The WWCE can support collaborative efforts with IKs in formal climate and environmental institutions. For example, the IPCC can support more Indigenous authors and technical contributions in their reports, continue listening to Indigenous communities, and include their insights as scientific contributions in their reports (Ford et al. 2016).

One area where there is much need (and opportunity) for increasing the effectiveness of communication flows is how to collaborate between Indigenous communities and institutionalized scientific groups so that research is not extractive (e.g., Simpson 2007; Tuck 2009). Instead of considering Indigenous communities as a resource to be mined, they must be engaged as collaborative partners, experts, and contributors to scientific knowledge through values such as respect, reciprocity, relationship, and representation (e.g., Kirkness and Barnhardt 1991; Kovach 2010; Montgomery and Blanchard 2022). Community-based participatory research aims to engage community members not only as participants but also as research collaborators and codesigners, which will require a substantial shift in the professional community's view of Indigenous communities toward being a repository of immense knowledge regarding the land and environmental sustainability rather than as an obstacle against progress. Toward this end, implementing community-based participatory

research can create open dialogue, active involvement, and colearning during all levels of the research process with institutionalized research such as WWCE science (e.g., Wallerstein and Duran 2006; Hernandez 2022).

e. International dialogue. As the WWCE benefits immensely from international collaboration (WMO 2023), the WWCE will also benefit from a collective understanding of strategies to "bridge the cosmos" in other countries. This includes lessons learned and partnership development with international multifaith organizations and Indigenous nations and peoples as a means for collaboration in discussing environmental issues and providing tools and resources that would be mutually beneficial for them.

Engaging in dialogue across various faiths on the topic of climate change presents both challenges and opportunities. Numerous organizations serve as exemplary models for effective multifaith collaboration in this realm. For instance, the National Religious Partnership for the Environment (http://www.nrpe.org/) collectively represents over 100 million Christian and Jewish adherents. Similarly, the Norwegian Interfaith Climate Network brings together members from diverse religious backgrounds, from major religions to others like Sikh. The Inter Faith Network for the United Kingdom (https://www.interfaith.org.uk/) looks at the relationship between climate and ocean within a context of religious diversity. The global Interfaith Rainforest Initiative (https://www.interfaithrainforest.org/) invites religious leaders, Indigenous communities, and businesses to combat deforestation. The United Nations is also involved in a larger scale through various global programs such as the United Religions Initiative and the Parliament of the World's Religions.

There are also a number of examples of international organizations within the WWCE that are considering different ways of knowing in early warning and disaster reduction programs. The Regional Integrated Multi-Hazard Early Warning System (RIMES 2023) for Africa and Asia ensures that religion/faith, cultures, traditions, Indigenous livelihood practices, and coping mechanisms are considered in the development of climate applications and warning systems. In the New Zealand MetService, engagement with Māori (MetService 2022) is a key part of their broad business plan, in terms of being informed by the traditional knowledge of Māori and improving the reach and utility of warnings for Indigenous communities. In Australia, Veland et al. (2010) discuss evacuations of Indigenous communities during Tropical Cyclone Monica in 2006, ensuring that local, state, and national authorities develop strong relationships, and offering recognition and understanding of IKs is a recognized priority. In another study, Howitt et al. (2011) advocate an approach to disaster risk assessment, preparation, and recovery that prioritizes partnerships based on recognition and explicit commitment to a just system that respects Indigenous rights and knowledges.

Given the increased economic and transportation activities in polar regions, and the associated risks from a changing climate, the World Meteorological Organization's (WMO) World Weather Research Programme (WWRP) established the decade-long Polar Prediction Project (PPP) (Jung et al. 2016). In particular, the PPP's Societal and Economic Research and Applications (PPP-SERA) task team examined diverse user needs and showcased the need for transdisciplinary collaborations and coproduction approaches to ensure that improved weather/water/ice/climate forecasting contributes to long-term societal benefits (Dawson et al. 2017; Lamers et al. 2018; Stewart et al. 2020). For example, PPP-SERA member Gita Ljubicic (McMaster University, Hamilton, Canada) led a survey collaboratively developed with academic, Inuit, and government partners that was facilitated by 19 local research coordinators in their home communities between 2020 and 2023 (Carpenter et al. 2022; Ljubicic et al. 2023), including community-specific and Nunavut-wide reports of feedback received from 360 Nunavummiut (people of Nunavut). An ArcticNet-funded and PPP-endorsed project was undertaken to learn about Inuit uses of and needs for weather, water, ice, and climate

information and services across eight communities in Nunavut, including Arviat, Cambridge Bay, Clyde River, Coral Harbour, Gjoa Haven, Iqaluit, Pond Inlet, and Sanikiluaq (https://straightupnorth.ca/community-wwic-uses-and-needs/). Other examples that combine Inuit and scientific observations to assist in decision-making include the development of human-relevant environmental variables in Clyde River, Nunavut (Fox et al. 2020; also, see https://ittaq.ca/), Inuit climatologies (K. Wilson et al. 2021), sea ice safety adaptation strategies (K. J. Wilson et al. 2021; also, see https://smartice.org/) in Pond Inlet, Nunavut [also, see Year of Polar Prediction (YOPP) Summit Special Session on Societal and Economic Applications, Canada, at https://youtu.be/l0YyC0ZQIfk], and delivering bilingual (English/Inuktitut) forecasts and warnings in Pond Inlet, Nunavut (Simonee et al. 2021).

The Canadian Meteorological and Oceanographic Society (CMOS) has been collaborating with partners on equity, diversity, inclusion, and accessibility (EDIA) initiatives (Canadian Meteorological and Oceanographic Society 2023), with funding assistance from Environment and Climate Change Canada (ECCC) (Environment and Climate Change Canada 2022). Within the context of EDIA, there is still only a limited amount of CMOS involvement in faith-based initiatives, such as Faith and the Common Good (https://www.faithcommongood.org/). Given the priority in Canada related to Indigenous reconciliation, the WWCE in Canada is focused on developing relationships and bridging western and IKs with Indigenous communities. For example, several large Canadian academic research networks have established important joint research activities with Indigenous communities, including the Ocean Frontier Institute (2023), Marine Environmental Observation, Prediction, and Response (2022), Global Water Futures (2019), and ArcticNet (2023).

4. COSMOS

The gaps and opportunities mentioned in sections 2 and 3 led to the establishment of AMS COSMOS[2] in late 2021 as a subcommittee under the AMS Board on Representation, Accessibility, Inclusion, and Diversity (BRAID; https://www.ametsoc.org/index.cfm/eec/boards/board-on-representation-accessibility-inclusion-and-diversity-braid/), formerly the Board on Women and Minorities. BRAID strives to address workplace issues and enhance workforce, educational, and professional development opportunities within the WWCE, particularly for groups who have been unrepresented in the atmospheric, oceanic, and hydrologic sciences. These activities are coordinated across the various committees within BRAID, such as the Committee on Hispanic and Latinx Advancement (CHALA; Morales et al. 2023); Coriolis, which serves the LGBTQ+ community; the Women's Committee; and the Accessibility Committee.

[2] For more information on COSMOS, including access to the community listserv for networking, idea sharing, and promotion of initiatives, please visit here or https://www.ametsoc.org/index.cfm/eec/boards/board-on-representation-accessibility-inclusion-and-diversity-braid/cosmos/.

Additionally, AMS COSMOS was motivated by the 2020 AMS membership survey conducted by BRAID. The survey was developed to gather input from the AMS community regarding its culture, membership benefits, and demographics. Among the survey questions, respondents were asked about the accommodations they would utilize if available at AMS events. Table 1 illustrates that respondents expressed the need for multiple accommodations for spiritual/faith-based reasons, including a quiet and meditation room, dietary accommodations, and religious needs (Porter and Chu 2020).

COSMOS is dedicated to including perspectives based on faith, religion, or spirituality in the WWCE. It aligns with the AMS Code of Conduct (https://www.ametsoc.org/index.cfm/ams/about-ams/ams-organization-and-administration/ams-code-of-conduct/) by not favoring any spirituality or faith tradition. COSMOS commits to fostering dialogue and initiatives related to environmentalism and its intersections with spirituality and faith. It facilitates dialogues among various collaborators, including AMS, scientific and professional societies, academic institutions, government agencies, the public and private sectors, nonprofits, and

Table 1. Adapted from section goal 2 of the AMS 2020 Membership Survey (Porter and Chu 2020). Text in bold denotes areas highlighted that express accommodations for spiritual or faith-based reasons. Note that respondents could choose multiple options, which is why the results do not add up to 100%. Seventeen percent of the respondents chose more than one option.

Accommodations that AMS survey respondents would use at AMS-sponsored events	
All-gender restrooms	17%
Quiet rooms or meditation rooms	**16%**
Dietary accommodations for health, intolerances, or disabilities	13%
Dietary accommodations for religious, environmental, or other reasons	**9%**
Lactation rooms	4%
Space for prayer or other religious needs	**3%**

Indigenous, SBNR, and faith-based organizations and communities. In alignment with the commitment to inclusivity and equity within the WWCE, COSMOS actively pursues partnerships with other subcommittees under BRAID to ensure COSMOS' activities, initiatives, and dialogues encompass participants from communities who have been untapped in the WWCE. Figure 2 provides an overview of these initiatives and activities. Here, we share several of the activities COSMOS has been involved with to address the gaps and opportunities mentioned in sections 2 and 3.

COSMOS is working together with the NWS's WRNA program to enhance community resilience from high-impact weather and climate events. As of this writing, there are over 100 faith-based organizations recognized as WRNAs. These organizations have the shared goal of greater community resilience to extreme weather, help the NWS share safety information, and encourage others to become better prepared. As part of COSMOS' Finding Common Ground among Science, Spirituality, and Environmentalism Webinar Series, COSMOS brought IPL, the U.S. Department for Homeland Security Federal Emergency Management Agency (FEMA) Center for Faith-Based and Neighborhood Partnerships (https://www.fema.gov/about/offices/faith), and the National Weather Service to promote WRNA and instill new

Fig. 2. Summary schematic of the activities and partnerships of the AMS COSMOS.

partnerships on weather and climate resiliency. During a COSMOS-led 2023 AMS session in Denver, a suggestion from the audience resulted in changes to the WRNA process (https://www.weather.gov/wrn/amb-tou) adding "faith based" as a choice in the application as to what type of organization the submitter is representing. COSMOS is also working with the NWS to prioritize a WRNA process for Indigenous communities.

At AMS in 2024, COSMOS hosted in partnership with IPL, the American Geophysical Union Thriving Earth Exchange (Pandya et al. 2014), and the American Association for the Advancement of Science (AAAS) Dialogue on Science, Ethics, and Religion (DoSER; Wiseman and Arveson 2014) a community gathering with place-based and faith-based organizations on weather and climate resilience (American Meteorological Society 2024). This was the first time a community gathering with place-based and faith-based partners has ever occurred in AMS annual meeting history. The event fostered a constructive dialogue between professionals in the WWCE and these leaders on addressing community resiliency from high-impact weather and climate disasters in the mid-Atlantic region and nationally and fostered new relationships between both communities.

COSMOS has also worked to broaden IKs and FBUs in WWCE education and mental health. For example, COSMOS partnered with the University of Delaware to develop the Inclusive and Creative Climate Education (ICCE) Workshop (Siders and Veron 2024). The ICCE workshop aimed to establish a multiknowledge approach to climate science education for K-12 and collegiate levels, weaving perspectives from western science, FBUs, and IKs. Additionally, the workshop focused on devising strategies to address eco-anxiety and climate grief experienced by both students and educators (Siders and Veron 2024). COSMOS also developed quiet and meditation rooms at AMS events, such as the annual meetings and student conferences, fostering environments where professionals in the WWCE can engage in mental and physical self-care. Professionals in COSMOS have also been a part of numerous speaking engagements at theological seminaries through the AAAS DoSER Science for Seminaries program to educate students and educators on the spiritual-climate nexus. Finally, COSMOS seeks to engage TCUs, AIHEC, SACNAS, and AISES to promote STEM education and WWCE opportunities for Indigenous students and professionals.

COSMOS has created numerous networking opportunities to establish sustainable communication flows between the WWCE, Indigenous, and faith-based organizations and communities. For example, COSMOS has a listserv for its community partners and the WWCE to exchange ideas and resources, discuss initiatives, and participate in events that are hosted by the WWCE and by the community partners. COSMOS also developed a networking pod at AMS Annual Meetings for Indigenous professionals. These networking opportunities have fostered greater participation and sustainable partnerships from multifaith organizations [e.g., GreenFaith (Harper 2021), Creation Justice Ministries, and IPL] and professional societies [American Geophysical Union (AGU) and AAAS]. In a significant milestone, COSMOS partnered with the NSF NCAR Rising Voices to organize a town hall (https://ams.confex.com/ams/103ANNUAL/meetingapp.cgi/Session/62801) and presidential session (https://ams.confex.com/ams/103ANNUAL/meetingapp.cgi/Session/63248) on Indigenous Knowledge and Earth System Science collaborations at the AMS 2023 Annual Meeting. This marked the first time such a session was included in the AMS Annual Meeting, and it is not the last, as a Symposium on Indigenous and Earth Sciences is now a permanent part of the AMS Annual Meetings (e.g., AMS Annual Meeting 2024, https://ams.confex.com/ams/104ANNUAL/meetingapp.cgi/Program/1759; and AMS Annual Meeting 2025, https://annual.ametsoc.org/index.cfm/2025/program-events/conferences-and-symposia/heather-lazrus-symposium/).

Finally, COSMOS is partnering with the International Association of Emergency Managers (IAEM; https://www.iaem.org/) on multifaith and Indigenous dialogues toward hurricane and disaster preparedness. COSMOS also promotes events, initiatives, and

discussions pertaining to the United Nations Conference of the Parties on Climate with GreenFaith, IPL, and other international multifaith organizations. COSMOS welcomes international dialogues and collaborations with the AMS and WWCE on the goals and objectives of COSMOS, including opportunities to weave FBUs and IKs into policy decision-making. Recognizing the importance of raising awareness about its activities and the specific topics of dialogue, COSMOS uses a multifaceted approach, including academic (e.g., Siders and Veron 2024) and nonacademic (e.g., Martinez 2024) publications, to reach diverse audiences. Through these efforts, COSMOS endeavors to catalyze transformative discussions and initiatives that address the interconnected challenges of climate change, disaster preparedness, and environmental stewardship on a global scale.

5. Conclusions

The intersection of the traditionally western WWCE, IKs, and FBUs remains a largely unexplored territory. This article has preliminarily explored this intersection, emphasizing its potential for addressing the complex challenges posed by climate change, extreme weather events, and other environmental issues. Three key areas of collaboration have been illuminated:

1) Community Resilience to Weather Extremes: Faith-based communities often serve as bastions of safety, volunteerism, and crisis management during disasters. Indigenous communities are affected directly by weather and climate disasters and have for generations developed numerous measures to combat these hazards and promote their community resilience. By recognizing their roles and working in partnership, the WWCE can enhance community preparedness and response efforts among these and other communities.
2) K-12 and Collegiate WWCE Education: Weaving FBUs and IKs into WWCE education fosters a sense of community belonging, supports mental health, and advocates holistic approaches to addressing environmental challenges. This inclusive approach equips future generations with a more comprehensive understanding of environmental issues.
3) Communication Flows Between Western Science, FBUs, and IKs: Embracing the diversity of belief systems, rituals, and practices within multifaith and Indigenous communities is essential for fostering inclusive engagement. Having increased communication flows also encourages opportunities to weave together scientific evidence and faith-based or Indigenous perspectives and facilitates meaningful dialogue/collaboration while maintaining the unique distinctiveness of each way of knowing. By respecting these differences, we can build bridges between diverse ways of knowing and decision-making.

This article has also shed light on the multitude of local-to-international initiatives dedicated to promoting multifaith and Indigenous collaboration and dialogue. These efforts underscore the importance of fostering cooperation to address the pressing challenges of climate change and environmental sustainability.

COSMOS plays a pivotal role in advancing these collaborative efforts. Through its facilitation of dialogue and collaboration between the WWCE and faith-based and Indigenous communities and organizations, it is driving progress in these key areas and consequently developing a multiknowledge WWCE.

In conclusion, the untapped potential for collaboration between the WWCE, FBUs, and IKs across cultures and nations offers a promising avenue for addressing the multifaceted challenges of our time. By embracing these opportunities and taking concrete actions, we can work toward a more inclusive, resilient, and sustainable future that respects and weaves

diverse ways of knowing. This collaboration is not only a path to addressing climate change but is also a testament to the power of unity in the face of global challenges.

Acknowledgments. The authors would like to express their gratitude to the American Meteorological Society (AMS), the AMS Board on Representation, Accessibility, Inclusion, and Diversity (BRAID), and members of the AMS Committee on Spirituality, Multifaith Outreach, and Science (COSMOS) for their support of this article. We extend gratitude to all of our multifaith and Indigenous partners who provided valuable insights that led to the development of this article. We also express thanks to the reviewers for their extensive guidance and assistance through their written comments and feedback. We also would like to thank AMS BAMS editor Jeff Walstreicher for his feedback that helped with the article.

Data availability statement. Data regarding the American Meteorological Society 2020 Membership Survey can be found in Porter and Chu (2020). Otherwise, no datasets were generated or analyzed in this study.

References

Allen, M., S. Bird, S. Breslow, and N. Dolšak, 2017: Stronger together: Strategies to protect local sovereignty, ecosystems, and place-based communities from the global fossil fuel trade. *Mar. Policy*, **80**, 168–176, https://doi.org/10.1016/j.marpol.2016.10.019.

American Meteorological Society, 2024: Bridging spirituality, faith, and science for weather and climate resilience: A community gathering. *104th AMS Annual Meeting*, Baltimore, MD, Amer. Meteor. Soc., https://annual.ametsoc.org/index.cfm/2024/program-events/networking-and-events/events/cosmos-community-gathering/.

ArcticNet, 2023: Working together in a changing Canadian Arctic. Accessed 21 August 2023, https://arcticnet.ulaval.ca/.

Arias-Bustamante, J., and J. Innes, 2020: Mapuche spirituality and its contribution to climate change mitigation. *Handbook of Climate Change Management: Research, Leadership, Transformation*, W. L. Filho, J. Luetz, and D. Ayal, Eds., Springer International Publishing, 1–32.

Arthurson, K., 2015: Teaching mindfulness to year sevens as part of health and personal development. *Aust. J. Teach. Educ.*, **40**, 27–40, https://doi.org/10.14221/ajte.2015v40n5.2.

Ascher, W., T. A. Steelman, and R. G. Healy, 2010: *Knowledge and Environmental Policy: Re-imagining the Boundaries of Science and Politics.* MIT Press, 260 pp.

Barker, D. C., and D. H. Bearce, 2013: End-times theology, the shadow of the future, and public resistance to addressing global climate change. *Political Res. Quart.*, **66**, 267–279, https://doi.org/10.1177/1065912912442243.

Bartlett, C., M. Marshall, and A. Marshall, 2012: Two-eyed seeing and other lessons learned within a co-learning journey of bringing together Indigenous and mainstream knowledges and ways of knowing. *J. Environ. Stud. Sci.*, **2**, 331–340, https://doi.org/10.1007/s13412-012-0086-8.

Bellehumeur, C. R., C. Bilodeau, and C. Kam, 2022: Integrating positive psychology and spirituality in the context of climate change. *Front. Psychol.*, **13**, 970362, https://doi.org/10.3389/fpsyg.2022.970362.

Bernard, R. E., and E. H. G. Cooperdock, 2018: No progress on diversity in 40 years. *Nat. Geosci.*, **11**, 292–295, https://doi.org/10.1038/s41561-018-0116-6.

Berry, E., Ed., 2022: *Climate Politics and the Power of Religion.* Indiana University Press, 298 pp.

Bloomfield, E. F., 2019: *Communication Strategies for Engaging Climate Skeptics: Religion and the Environment.* Routledge, 188 pp.

——, 2020: The reworking of evangelical Christian ecocultural identity in the creation care movement. *The Routledge Handbook of Ecocultural Identity*, T. Milstein and J. Castro-Sotomayor, Eds., Routledge, 195–207.

——, 2024: *Science v. Story: Narrative Strategies for Science Communicators.* University of California Press, 288 pp.

——, and S. Bock, 2023: Divergent weatherlore in Christian hermeneutics: Climate change and vernacular rhetoric in our current environmental crisis. *Wait Five Minutes: Weatherlore in the Twenty-First Century*, S. Ingram and W. G. Mullins, Eds., University Press of Mississippi, 10–27.

Bock, C., 2022: Faith communities as hubs for climate resilience. *The Palgrave Encyclopedia of Urban and Regional Futures*, R. Brears, Ed., Palgrave Macmillan, 1–8.

Bodnar, S., 2008: Wasted and bombed: Clinical enactments of a changing relationship to the Earth. *Psychoanalytic Dialogues*, **18**, 484–512, https://doi.org/10.1080/10481880802198319.

Bolton, M. J., and L. K. Ault, 2020: Weathering the storms: Workplace well-being, mental health, and the U.S. meteorologist. *Int. J. Undergrad. Res. Creat. Act.*, **12**, 4, https://doi.org/10.7710/2168-0620.0293.

——, ——, D. M. Greenberg, and S. Baron-Cohen, 2018: Exploring the human side of meteorology: A brief report on the psychology of meteorologists. *J. Oper. Meteor.*, **6**, 23–32, https://doi.org/10.15191/nwajom.2018.0603.

——, A. E. Stewart, and H. M. Mogil, 2020: An integrationist, meteorologist-oriented perspective on trauma and mental health coping. PsyArxiv, https://doi.org/10.31234/osf.io/wfntj.

Boorse, D. F., and L. M. Jablonski, 2024: Strengthening partnerships for the Sustainable Development Goals: Engaging faith-based organizations and scientists in youth climate change learning and action. *Sustainable Earth Rev.*, **7**, 7, https://doi.org/10.1186/s42055-024-00077-8.

Bruchac, M. M., 2014: Indigenous knowledge and traditional knowledge. *Encyclopedia of Global Archaeology*, C. Smith, Ed., Springer, 3814–3824.

Canadian Meteorological and Oceanographic Society, 2023: Equity, Diversity, Inclusion and Accessibility (EDIA) initiative. Accessed 21 August 2023, https://www.cmos.ca/site/activities/projects/EDIA.

Carpenter, J., G. Ljubicic, N. A. Carter, and T. Bell, 2022: How Iqalungmiut use weather, water, ice and climate information and services to inform safe travel decision-making. Year of Polar Prediction Final Summit, https://youtu.be/MToT7rQJRUQ.

Ceccarelli, L., 2011: Manufactured scientific controversy: Science, rhetoric, and public debate. *Rhetoric Public Aff.*, **14**, 195–228, https://doi.org/10.1353/rap.2010.0222.

Chapin, F. S., III, S. T. Pickett, M. E. Power, R. B. Jackson, D. M. Carter, and C. Duke, 2011: Earth stewardship: A strategy for social–ecological transformation to reverse planetary degradation. *J. Environ. Stud. Sci.*, **1**, 44–53, https://doi.org/10.1007/s13412-011-0010-7.

Chidester, D., 2013: Colonialism and religion. *Crit. Res. Religion*, **1**, 87–94, https://doi.org/10.1177/2050303213476103.

Cho, R., 2023: Climate change in the U.S.: Where it stands, and why it matters. Accessed 28 August 2023, https://news.climate.columbia.edu/2023/02/09/climate-education-in-the-u-s-where-it-stands-and-why-it-matters/.

Clayton, S., 2018: Mental health risk and resilience among climate scientists. *Nat. Climate Change*, **8**, 260–261, https://doi.org/10.1038/s41558-018-0123-z.

——, 2020: Climate anxiety: Psychological responses to climate change. *J. Anxiety Disord.*, **74**, 102263, https://doi.org/10.1016/j.janxdis.2020.102263.

Coffey, Y., N. Bhullar, J. Durkin, M. S. Islam, and K. Usher, 2021: Understanding eco-anxiety: A systematic scoping review of current literature and identified knowledge gaps. *J. Climate Change Health*, **3**, 100047, https://doi.org/10.1016/j.joclim.2021.100047.

CTKW, 2014: Guidelines for considering traditional knowledges in climate change initiatives. https://climatetkw.wordpress.com.

Dasgupta, P., and V. Ramanathan, 2014: Pursuit of the common good. *Science*, **345**, 1457–1458, https://doi.org/10.1126/science.1259406.

Dawson, J., W. Hoke, M. Lamers, D. Liggett, G. Ljubicic, B. Mills, E. Stewart, and R. Thoman, 2017: Navigating weather, water, ice and climate information for safe polar mobilities. WWRP/PPP No. 5 - 2017, 84 pp., https://www.polarprediction.net/fileadmin/user_upload/www.polarprediction.net/Home/Organization/Task_Teams/PPP-SERA/WWRP_PPP_No_5_2017_11_OCT.pdf.

Del Vecchio, K., 2018: Interreligious environmentalism: Pragmatic projects and moral competencies that address climate change. *J. Interreligious Stud.*, **22**, 46–63.

Doherty, T. J., and S. Clayton, 2011: The psychological impacts of global climate change. *Amer. Psychol.*, **66**, 265–276, https://doi.org/10.1037/a0023141.

Dominey-Howes, D., A. Gorman-Murray, and S. McKinnon, 2014: Queering disasters: On the need to account for LGBTI experiences in natural disaster contexts. *Gender Place Cult.*, **21**, 905–918, https://doi.org/10.1080/0966369X.2013.802673.

Douglas, H., 2009: *Science, Policy, and the Value-Free Ideal.* University of Pittsburgh Press, 210 pp.

Dudman, K., and S. de Wit, 2021: An IPCC that listens: Introducing reciprocity to climate change communication. *Climatic Change*, **168**, 2, https://doi.org/10.1007/s10584-021-03186-x.

Ellingson, S., 2016: *To Care for Creation: The Emergence of the Religious Environmental Movement.* University of Chicago Press, 203 pp.

Environment and Climate Change Canada, 2022: Indigenous science. Accessed 21 August 2023, https://www.canada.ca/en/environment-climate-change/services/science-technology/indigenous-science.html.

Evans-Campbell, T., K. L. Walters, C. R. Pearson, and C. D. Campbell, 2012: Indian boarding school experience, substance use, and mental health among urban two-spirit American Indian/Alaska natives. *Amer. J. Drug Alcohol Abuse*, **38**, 421–427, https://doi.org/10.3109/00952990.2012.701358.

Feir, D. L., 2016: The long-term effects of forcible assimilation policy: The case of Indian boarding schools. *Can. J. Econ.*, **49**, 433–480, https://doi.org/10.1111/caje.12203.

Feldman, D. L., and H. M. Ingram, 2009: Making science useful to decision makers: Climate forecasts, water management and knowledge networks. *Wea. Climate Soc.*, **1**, 9–21, https://doi.org/10.1175/2009WCAS1007.1.

Ferris, E., 2005: Faith-based and secular humanitarian organizations. *Int. Rev.*, **87**, 311–325.

Fish, J., B. Uink, A. Wiglesworth, M. Tsethlikai, D. A. Him, and V. O'Keefe, 2023: For the next seven generations: An indigenous strengths-based developmental science. https://doi.org/10.31234/osf.io/hr28s, preprint.

Fletcher, M. S., R. Hamilton, W. Dressler, and L. Palmer, 2021: Indigenous knowledge and the shackles of wilderness. *Proc. Natl. Acad. Sci. USA*, **118**, e2022218118, https://doi.org/10.1073/pnas.2022218118.

Ford, J. D., L. Cameron, J. Rubis, M. Maillet, D. Nakashima, A. C. Willox, and T. Pearce, 2016: Including indigenous knowledge and experience in IPCC assessment reports. *Nat. Climate Change*, **6**, 349–353, https://doi.org/10.1038/nclimate2954.

Fox, S., E. Qillaq, I. Angutikjuak, D. J. Tigullaraq, R. Kautuk, H. Huntington, G. E. Liston, and K. Elder, 2020: Connecting understandings of weather and climate: Steps towards co-production of knowledge and collaborative environmental management in Inuit Nunangat. *Arct. Sci.*, **6**, 267–278, https://doi.org/10.1139/as-2019-0010.

Gaillard, J. C., and P. Texier, 2010: Religions, natural hazards, and disasters: An introduction. *Religion*, **40**, 81–84, https://doi.org/10.1016/j.religion.2009.12.001.

Gaspar, K., 2010: The story behind the indigenous Peoples' Sunday. MindaNews, accessed 28 April 2024, https://www.mindanews.com/around-mindanao/2010/10/the-story-behind-the-indigenous-peoples-sunday/.

Gillespie, S., 2016: Climate change imaginings and depth psychology: Reconciling present and future worlds. *Environmental Change and the World's Futures: Ecologies, Ontologies and Mythologies*, J. P. Marshall and L. H. Connor, Eds., Routledge, 181–195.

Global Water Futures, 2019: Indigenous community water research projects. Accessed 21 August 2023, https://gwf.usask.ca/projects-facilities/indigenous-projects.php.

Goldsmith, L., V. Raditz, and M. Méndez, 2022: Queer and present danger: Understanding the disparate impacts of disasters on LGBTQ+ communities. *Disasters*, **46**, 946–973, https://doi.org/10.1111/disa.12509.

Goldsmith, S., B. M. Torres, L. Wasserman, and W. Donner, 2017: Integrating faith-based leaders into hazardous communications for highly vulnerable neighborhoods in the Rio Grande Valley of Texas. National Weather Service, 6 pp., https://www.weather.gov/media/bro/research/pdf/5WRN_Goldsmith_P887EA_IntegratingFaithBasedLeaders.pdf.

Hanum, L., M. Hasan, A. Ulfa, T. Pada, H. Rahmatan, R. Fazlia, and I. Rahmayani, 2023: Development of learning devices based on ethnoscience project based learning to improve student's critical thinking skills. *Indones. J. Sci. Educ.*, **11**, 288–305, https://doi.org/10.24815/jpsi.v11i2.28294.

Harper, F., 2021: GreenFaith. *World Scientific Encyclopedia of Climate Change*, World Scientific, 241–245.

Hatcher, A., C. Bartlett, A. Marshall, and M. Marshall, 2009: Two-eyed seeing in the classroom environment: Concepts, approaches, and challenges. *Can. J. Sci. Math. Technol. Educ.*, **9**, 141–153, https://doi.org/10.1080/14926150903118342.

Hendershot, S., 2021: The regeneration project, interfaith power and light. *World Scientific Encyclopedia of Climate Change*, World Scientific, 235–240.

Hernandez, J., 2022: *Fresh Banana Leaves: Healing Indigenous Landscapes through Indigenous Science.* North Atlantic Books, 256 pp.

Hill, P. C., and K. I. Pargament, 2003: Advances in the conceptualization and measurement of religion and spirituality: Implications for physical and mental health research. *Amer. Psychol.*, **58**, 64–74, https://doi.org/10.1037/0003-066X.58.1.64.

Holifield, R., J. Chakraborty, and G. Walker, 2017: *The Routledge Handbook of Environmental Justice.* Routledge, 696 pp.

Howitt, R., O. Havnen, and S. Veland, 2011: Natural and unnatural disasters: Responding with respect for indigenous rights and knowledges. *Geogr. Res.*, **50**, 47–59, https://doi.org/10.1111/j.1745-5871.2011.00709.x.

Huffman, M., 2013: The many elements of traditional fire knowledge: Synthesis, classification, and aids to cross-cultural problem solving in fire-dependent systems around the world. *Ecol. Soc.*, **18**, 3, https://doi.org/10.5751/ES-05843-180403.

Hulme, M., 2009: *Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity.* Cambridge University Press, 392 pp.

——, 2023: *Climate Change Isn't Everything: Liberating Climate Politics from Alarmism.* 1st ed. Polity Press, 208 pp.

Huntoon, J. E., C. Tanenbaum, and J. Hodges, 2015: Increasing diversity in the geosciences. *Eos*, **96**, https://doi.org/10.1029/2015EO025897.

IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* H.-O. Pörtner et al., Eds., Cambridge University Press, 3056 pp., https://doi.org/10.1017/9781009325844.

Johannesen, R. L., 1974: Attitude of speaker toward audience: A significant concept for contemporary rhetorical theory and criticism. *Commun. Stud.*, **25**, 95–104, https://doi.org/10.1080/10510977409367774.

Jung, T., and Coauthors, 2016: Advancing polar prediction capabilities on daily to seasonal time scales. *Bull. Amer. Meteor. Soc.*, **97**, 1631–1647, https://doi.org/10.1175/BAMS-D-14-00246.1.

Kibiten, G., 2019: Laudato Si's call for dialogue with indigenous peoples: A cultural insider's response from the Christianized indigenous communities of the Philippines. *Solidarity*, **8**, 4.

King, A., and Z. Chantler, 2002: Focus on practice: The Western Primary School 'Quiet Room' project. *Br. J. Spec. Educ.*, **29**, 183–188, https://doi.org/10.1111/1467-8527.00267.

Kirkness, V. J., and R. Barnhardt, 1991: First nations and higher education: The four R's – Respect, relevance, reciprocity, responsibility. *J. Amer. Indian Educ.*, **30** (3), 1–15.

Koenig, H. G., 2008: Concerns about measuring "spirituality" in research. *J. Nerv. Ment. Dis.*, **196**, 349–355, https://doi.org/10.1097/NMD.0b013e31816ff796.

Kovach, M., 2010: *Indigenous Methodologies: Characteristics, Conversations, and Contexts.* University of Toronto Press, 207 pp.

Lamers, M., P. Duske, and L. van Bets, 2018: Understanding user needs: A practice-based approach to exploring the role of weather and sea ice services in European Arctic expedition cruising. *Polar Geogr.*, **41**, 262–278, https://doi.org/10.1080/1088937X.2018.1513959.

Lanicci, J., and S. K. McCorrison, 2023: Why K-12 education is important to achieving a Weather-Ready Nation. *J. Geosci. Educ.*, **71**, 266–277, https://doi.org/10.1080/10899995.2022.2138725.

Latour, B., 2012: *We Have Never Been Modern.* Harvard University Press, 157 pp.

Lazrus, H., J. Maldonado, P. Blanchard, M. K. Souza, B. Thomas, and D. Wildcat, 2022: Culture change to address climate change: Collaborations with Indigenous and earth sciences for more just, equitable, and sustainable responses to our climate crisis. *PLOS Climate*, **1**, e0000005, https://doi.org/10.1371/journal.pclm.0000005.

Lim, J. R., B. F. Liu, M. Egnoto, and H. A. Roberts, 2019: Individuals' religiosity and emotional coping in response to disasters. *J. Contingencies Crisis Manage.*, **27**, 331–345, https://doi.org/10.1111/1468-5973.12263.

Lind, D., 2020: Doctrines of discovery. *Wash. U. Jur. Rev.*, **13**, 1, https://openscholarship.wustl.edu/law_jurisprudence/vol13/iss1/5.

Lindner, K. W., 2013: The Struggle for La Sierra: Sovereignty, property, and rights in the San Luis Valley. *Political Geogr.*, **33**, 11–20, https://doi.org/10.1016/j.polgeo.2012.12.001.

Ljubicic, G., and Coauthors, 2023: Understanding Inuit uses and needs for weather, water, ice and climate information and services in Nunavut, Canada. Year of

Polar Prediction Final Summit, https://straightupnorth.ca/community-wwic-uses-and-needs/.

Lyon, A. J., C. A. Gustafson, and P. C. Manuel, 2018: *Pope Francis as a Global Actor: Where Politics and Theology Meet.* Springer International Publishing, 292 pp.

Maldonado, J., and H. Lazrus, 2019: A story of "rising voices" and intercultural collaboration. *Pract. Anthropol.*, **41**, 34–37, https://doi.org/10.17730/0888-4552.41.3.34.

——, and Coauthors, 2021: Addressing the challenges of climate-driven community-led resettlement and site expansion: Knowledge sharing, storytelling, healing, and collaborative coalition building. *J. Environ. Stud. Sci.*, **11**, 294–304, https://doi.org/10.1007/s13412-021-00695-0.

Maldonado, J. K., R. E. Pandya, and B. J. Colombi, 2013: Special issue: Climate change and indigenous peoples in the United States: Impacts, experiences, and actions. *Climatic Change*, **120**, 509–682.

Marine Environmental Observation, Prediction, and Response, 2022: Eric Oliver connects science and stories. Accessed 21 August 2023, https://meopar.ca/portfolio/eric-oliver/.

Martinez, C., 2024: American Meteorological Society's multifaith project responds to Earth's cry. *National Catholic Reporter*, 24 July, https://www.ncronline.org/earthbeat/science/american-meteorological-societys-multifaith-project-responds-earths-cry.

Mason, L., and Coauthors, 2012: Listening and learning from traditional knowledge and western science: A dialogue on contemporary challenges of forest health and wildfire. *J. For.*, **110**, 187–193, https://doi.org/10.5849/jof.11-006.

McGregor, D., S. Whitaker, and M. Sritharan, 2020: Indigenous environmental justice: Towards an ethical and sustainable future. *Routledge Handbook of Critical Indigenous Studies*, Routledge, 405–419.

McKinley, C., G. M. Showalter, T. Crofoot, and K. Stone, 2023: Systematic evaluation of geoscience education programs that are designed for Indigenous students, or use Traditional Knowledge. *J. Geosci. Educ.*, **71**, 428–441, https://doi.org/10.1080/10899995.2022.2112491.

MetService, 2022: Annual Report. 74 pp., https://about.metservice.com/assets/Annual-Reports/MetService-Annual-Report-2022.pdf.

Michaelson, V. E., and J. E. Durrant, Eds., 2020: *Decolonizing Discipline: Children, Corporal Punishment, Christian Theologies, and Reconciliation.* Vol. 3, University of Manitoba Press, 280 pp.

Michie, M., M. Hogue, and J. Rioux, 2018: The application of both-ways and two-eyed seeing pedagogy: Reflections on engaging and teaching science to post-secondary Indigenous students. *Res. Sci. Educ.*, **48**, 1205–1220, https://doi.org/10.1007/s11165-018-9775-y.

Miller Hesed, C. D., E. R. Van Dolah, and M. Paolisso, 2020: Engaging faith-based communities for rural coastal resilience: Lessons from collaborative learning on the Chesapeake Bay. *Climatic Change*, **159**, 37–57, https://doi.org/10.1007/s10584-019-02638-9.

Monaco, M. E., E. Spooner, S. A. Oakes, C. J. Harvey, and C. R. Kelble, 2021: Introduction to the NOAA Integrated Ecosystem Assessment program: Advancing ecosystem based management. *Coastal Manage.*, **49**, 1–8, https://doi.org/10.1080/08920753.2021.1846109.

Montgomery, M., and P. Blanchard, 2022: Testing justice: New ways to address environmental inequalities. Resilience, https://www.resilience.org/stories/2022-02-17/testing-justice-new-ways-to-address-environmental-inequalities/.

Morales, A., and Coauthors, 2023: Commitment to active Allyship is required to address the lack of Hispanic and Latinx representation in the Earth and atmospheric sciences. *Bull. Amer. Meteor. Soc.*, **104**, E1290–E1313, https://doi.org/10.1175/BAMS-D-22-0075.1.

Moser, S. C., 2013: Navigating the political and emotional terrain of adaptation: Community engagement when climate change comes home. *Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World*, S. C. Moser and M. T. Boykoff, Eds., Routledge, 289–305.

Moyer, J., 2018: Faith-based environmental work in Canada: A profile. *West. Geogr.*, **23**, 60–85.

Muller, J. Z., 2018: *The Tyranny of Metrics.* Princeton University Press, 219 pp.

National Research Council, 2012: *Disaster Resilience: A National Imperative.* The National Academies Press, 260 pp.

Nisbet, M., 2018: Scientists in civic life: Facilitating dialogue-based communication. American Association for the Advancement of Science, 44 pp., https://www.aaas.org/sites/default/files/s3fs-public/content_files/Scientists%2520in%2520Civic%2520Life_FINAL%2520INTERACTIVE%2520082718.pdf.

Ocean Frontier Institute, 2023: Sustainable Nunatsiavut futures. Accessed 21 August 2023, https://www.ofi.ca/research-projects/sustainable-nunatsiavut-futures.

Ojala, M., A. Cunsolo, C. A. Ogunbode, and J. Middleton, 2021: Anxiety, worry, and grief in a time of environmental and climate crisis: A narrative review. *Annu. Rev. Environ. Resour.*, **46**, 35–58, https://doi.org/10.1146/annurev-environ-012220-022716.

Onwu, G. O. M., and C. Mufundirwa, 2020: A Two-Eyed Seeing context-based approach for incorporating indigenous knowledge into school science teaching. *Afr. J. Res. Math. Sci. Technol. Educ.*, **24**, 229–240, https://doi.org/10.1080/18117295.2020.1816700.

Pandya, R., J. Galkiewicz, B. Williams, H. Furukawa, and K. Barry, 2014: Using the Thriving Earth Exchange to advance community science. *Leading Edge*, **33**, 1330–1334, https://doi.org/10.1190/tle33121330.1.

Patenaude, H. K., and E. F. Bloomfield, 2022: Topical analysis of nuclear experts' perceptions of publics, nuclear energy, and sustainable futures. *Front. Commun.*, **7**, 762101, https://doi.org/10.3389/fcomm.2022.762101.

Petersen, A. C., 2023: *Climate, God and Uncertainty: A Transcendental Naturalistic Approach Beyond Bruno Latour.* UCL Press, 298 pp.

Pihkala, P., 2018: Eco-anxiety, tragedy, and hope: Psychological and spiritual dimensions of climate change. *Zygon*, **53**, 545–569, https://doi.org/10.1111/zygo.12407.

——, 2020: Anxiety and the ecological crisis: An analysis of eco-anxiety and climate anxiety. *Sustainability*, **12**, 7836, https://doi.org/10.3390/su12197836.

Porter, A. M., and R. Y. Chu, 2020: Results for the 2020 American Meteorological Society Membership Survey. Accessed 19 November 2023, https://www.ametsoc.org/index.cfm/eec/boards/board-on-representation-accessibility-inclusion-and-diversity-braid/member-survey-results/porter-and-chu-2020/.

Ranco, D. J., C. A. O'Neill, J. Donatuto, and B. L. Harper, 2011: Environmental justice, American Indians and the cultural dilemma: Developing environmental management for tribal health and well-being. *Environ. Justice*, **4**, 221–230, https://doi.org/10.1089/env.2010.0036.

Rattling Leaf, J., Sr., 2022: What is traditional ecological knowledge and why does it matter? *Front. Ecol. Environ.*, **20**, 3, https://doi.org/10.1002/fee.2465.

Renouf, J. S., 2021: Making sense of climate change—The lived experience of experts. *Climatic Change*, **164**, 14, https://doi.org/10.1007/s10584-021-02986-5.

Regional Integrated Multi-Hazard Early Warning System, 2023: Overview. Accessed 26 September 2023, https://www.rimes.int/index.php/aboutus/overview.

Sachdeva, S., 2016: Religious identity, beliefs, and views about climatic change. *Oxford Research Encyclopedias: Climate Science*, Oxford University Press, 1–36, https://doi.org/10.1093/acrefore/9780190228620.013.335.

Schlosberg, D., and D. Carruthers, 2010: Indigenous struggles, environmental justice, and community capabilities. *Global Environ. Polit.*, **10**, 12–35, https://doi.org/10.1162/GLEP_a_00029.

Seed, P., 1995: *Ceremonies of Possession in Europe's Conquest of the New World, 1492–1640.* Cambridge University Press, 199 pp.

Siders, A. R., and D. Veron, 2024: Advancing climate education through integrated activities to promote inclusion, creativity, and mental health. *Bull. Amer. Meteor. Soc.*, **105**, E1022–E1024, https://doi.org/10.1175/BAMS-D-24-0039.1.

Simonee, N., J. Alooloo, N. A. Carter, G. Ljubicic, and J. Dawson, 2021: Sila Qanuippa? (How's the weather?): Integrating inuit qaujimajatuqangit and environmental forecasting products to support travel safety around Pond Inlet,

Nunavut, in a changing climate. *Wea. Climate Soc.*, **13**, 933–962, https://doi.org/10.1175/WCAS-D-20-0174.1.

Simpson, A., 2007: On ethnographic refusal: Indigeneity, 'voice' and colonial citizenship. *Junctures*, **9**, 67–80.

Sloan, J., and K. Chand, 2016: An analysis of property rights in the Fijian *qoliqoli*. *Mar. Policy*, **72**, 76–81, https://doi.org/10.1016/j.marpol.2016.06.019.

Solli, J., and M. Ryghaug, 2014: Assembling climate knowledge: The role of local expertise. *Nord. J. Sci. Technol. Stud.*, **2**, 18–28, https://doi.org/10.5324/njsts.v2i2.2151.

Stewart, E., D. Liggett, M. Lamers, G. Ljubicic, J. Dawson, R. Thoman, R. Haavisto, and J. Carrasco, 2020: Characterizing polar mobilities to understand the role of weather, water, ice and climate (WWIC) information. *Polar Geogr.*, **43**, 95–119, https://doi.org/10.1080/1088937X.2019.1707319.

Sultana, F., 2022: Critical climate justice. *Geogr. J.*, **188**, 118–124, https://doi.org/10.1111/geoj.12417.

Tausch, C., L. D. Marks, J. S. Brown, K. E. Cherry, T. Frias, Z. McWilliams, M. Melancon, and D. D. Sasser, 2011: Religion and coping with trauma: Qualitative examples from Hurricanes Katrina and Rita. *J. Religion Spirituality Aging*, **23**, 236–253, https://doi.org/10.1080/15528030.2011.563203.

Todd, W. K. S., C. R. Cid, and C. Garza, 2023: In our VOICES. *J. Geosci. Educ.*, **71**, 279–280, https://doi.org/10.1080/10899995.2023.2227550.

Tripati, A., and Coauthors, 2024: Centering equity in the nation's weather, water and climate services. *Environ. Justice*, **17**, 45–53, https://doi.org/10.1089/env.2022.0048.

Trujillo-Falcón, J. E., A. R. Gaviria Pabón, J. Reedy, and K. E. Klockow-McClain, 2024: Systemic vulnerabilities in Hispanic and Latinx immigrant communities led to the reliance on an informal warning system in the December 10–11, 2021, tornado outbreak. *Nat. Hazards Rev.*, **25**, 04023059, https://doi.org/10.1061/NHREFO.NHENG-1755.

Tsurusaki, B., 2020: A framework for diversity and equity in K-12 science educational media. GBH, 78 pp.

Tuck, E., 2009: Suspending damage: A letter to communities. *Harv. Educ. Rev.*, **79**, 409–428, https://doi.org/10.17763/haer.79.3.n0016675661t3n15.

Uccellini, L. W., and J. E. Ten Hoeve, 2019: Evolving the National Weather Service to build a weather-ready nation: Connecting observations, forecasts, and warnings to decision-makers through impact-based decision support services. *Bull. Amer. Meteor. Soc.*, **100**, 1923–1942, https://doi.org/10.1175/BAMS-D-18-0159.1.

Van Cooten, S., 2014: Where are the Indigenous scientific leaders? Examining the participation of Native American/Alaska Natives in weather and water academic programs and the federal workforce. *Bull. Amer. Meteor. Soc.*, **95**, 1725–1740, https://doi.org/10.1175/BAMS-D-13-00097.1.

Veland, S., R. Howitt, and D. Dominey-Howes, 2010: Invisible institutions in emergencies: Evacuating the remote Indigenous community of Warruwi, Northern Territory Australia, from Cyclone Monica. *Environ. Hazards*, **9**, 197–214, https://doi.org/10.3763/ehaz.2010.0042.

Veldman, R. G., 2019: *The Gospel of Climate Skepticism: Why Evangelical Christians Oppose Action on Climate Change.* University of California Press, 316 pp.

——, A. Szasz, and R. Haluza-DeLay, 2013: *How the World's Religions Are Responding to Climate Change: Social Scientific Investigations.* Routledge, 344 pp.

Vogel, D., 2001: How green is Judaism? Exploring Jewish environmental ethics. *Bus. Ethics Quart.*, **11**, 349–363, https://doi.org/10.2307/3857753.

Wallerstein, N., and B. Duran, 2006: Using community-based participatory research to address health disparities. *Health Promot. Pract.*, **7**, 312–323, https://doi.org/10.1177/1524839906289376.

Whyte, K., 2017: What do Indigenous knowledges do for Indigenous peoples? *Forthcoming in Keepers of the Green World: Traditional Ecological Knowledge and Sustainability*, M. K. Nelson and D. Shilling, Eds., Cambridge University Press, 1–20.

——, 2018: Critical investigations of resilience: A brief introduction to indigenous environmental studies & sciences. *Daedalus*, **147**, 136–147, https://doi.org/10.1162/DAED_a_00497.

Wildcat, D., 2009: *Red Alert! Saving the Planet with Indigenous Knowledge.* Fulcrum Publishing, 128 pp.

Wilson, A., Jr., 1992: *Foundation of Navajo Culture.* Navajo Community College, 191 pp.

Wilson, K., A. Arreak, Sikumiut Committee, T. Bell, and G. Ljubicic, 2021: The Mittimatalik siku asijjipallianinga (sea ice climate atlas): How Inuit knowledge, Earth observations, and sea ice charts can fill IPCC climate knowledge gaps. *Front. Climate*, **3**, 715105, https://doi.org/10.3389/fclim.2021.715105.

Wilson, K. J., A. Arreak, J. Itulu, Sikumiut Community Management Committee, G. J. Ljubicic, and T. Bell, 2021: "When we're on the ice, all we have is our Inuit Qaujimajatuqangit": Mobilizing Inuit knowledge as a sea-ice safety adaptation strategy in Mittimatalik, Nunavut. *Arctic*, **74**, 525–549, https://doi.org/10.14430/arctic74212.

Wiseman, J., and P. Arveson, 2014: Scientists and religious communities: Investigating perceptions, building understanding. *Zygon*, **49**, 414–418, https://doi.org/10.1111/zygo.12093.

Wixwat, M., and G. Saucier, 2021: Being spiritual but not religious. *Curr. Opin. Psychol.*, **40**, 121–125, https://doi.org/10.1016/j.copsyc.2020.09.003.

WMO, 2023: WMO mandate. Accessed 26 September 2023, https://public.wmo.int/en/our-mandate.

Zidny, J. R., J. Sjöström, and I. Eilks, 2020: A multi-perspective reflection on how indigenous knowledge and related ideas can improve science education for sustainability. *Sci. Educ.*, **29**, 145–185, https://doi.org/10.1007/s11191-019-00100-x.

Zinnbauer, B. J., and Coauthors, 1997: Religion and spirituality: Unfuzzying the fuzzy. *J. Sci. Study Religion*, **36**, 549–564, https://doi.org/10.2307/1387689.