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**Waking from Paralysis: Revitalizing Conceptions of Climate Knowledge and Justice for more Effective Climate Action**

*<sup>i</sup> corresponding author*

1. Kimberly R. Marion Suiseeya,<sup>i</sup> Department of Political Science, Environmental Policy and Culture Program, Northwestern University, [kimberly.suiseeya@northwestern.edu](mailto:kimberly.suiseeya@northwestern.edu)  
Kimberly R. Marion Suiseeya is an environmental social scientist who specializes in global environmental politics, environmental justice, and political ecology. She is also a Faculty Fellow with the Center for Native American and Indigenous Research, co-leads the Presence to Influence project, and co-leads the Buffett Institute's Working Group on the Disproportionate Impacts of Environmental Change.

2. Margaret G. O'Connell,\* Department of Chemical and Biological Engineering, Northwestern University, [margaretoaposconnell2025@u.northwestern.edu](mailto:margaretoaposconnell2025@u.northwestern.edu)  
Margaret is a PhD student in the Department of Chemical and Biological Engineering at Northwestern University. She uses life cycle and technoeconomic analyses to study water systems and is interested in conducting transdisciplinary work that integrates the connections between issues of water, climate change, and justice into these analyses.
3. Edith Leoso, Tribal Historic Preservation Officer, Bad River Band of the Lake Superior Tribe of Chippewa Indians, [THPO@badriver-nsn.gov](mailto:THPO@badriver-nsn.gov)  
Edith Leoso is a member of the Bad River Band of Lake Superior Tribe of Chippewa in Wisconsin and has worked as the Tribal Historic Preservation Officer (THPO) since 2005.
4. Marvin Shingwe Biness Neme DeFoe, Tribal Historic Preservation Officer, Red Cliff Band of Lake Superior Chippewa, [marvin.defoe@redcliff-nsn.gov](mailto:marvin.defoe@redcliff-nsn.gov)  
Marvin DeFoe is a member of the Red Cliff Band of Lake Superior Chippewa, where he also serves as Tribal Historic Preservation Officer.
5. Alexandra Anderson,^ Department of Political Science, Northwestern University, [AlexandraAnderson2022@u.northwestern.edu](mailto:AlexandraAnderson2022@u.northwestern.edu)  
Alexandra Anderson is an undergraduate student studying Political Science and Environmental Policy and Culture at Northwestern University. She is a Farrell Fellow and research assistant with the Presence to Influence project.
6. Megan Bang, Department of Learning Sciences and Psychology, Northwestern University, [megan.bang@northwestern.edu](mailto:megan.bang@northwestern.edu)

Megan Bang is a Professor of the Learning Sciences and Psychology at Northwestern University and is currently serving as the Senior Vice President at the Spencer Foundation. She is of Ojibwe and Italian descent.

7. Pete Beckman, Northwestern-Argonne Institute of Science and Engineering,  
[beckman@anl.gov](mailto:beckman@anl.gov)

Pete Beckman is a Distinguished Fellow at Argonne National Laboratory and the Co-Director of the Northwestern University / Argonne Institute for Science and Engineering. Beckman received his Ph.D. in computer science from Indiana University.

8. Anne-Marie Boyer,\* School of Communication, Northwestern University,  
[annemarie@u.northwestern.edu](mailto:annemarie@u.northwestern.edu)

Anne-Marie Boyer is a Ph.D. candidate in the Media, Technology, and Society Program at Northwestern University's Department of Communication Studies. She is a Graduate Assistant with the Buffett Institute's Working Group on the Disproportionate Impacts of Environmental Change.

9. Jennifer Dunn, Department of Chemical and Biological Engineering, Northwestern University, [jennifer.dunn1@northwestern.edu](mailto:jennifer.dunn1@northwestern.edu)

Jennifer Dunn holds a Ph.D. and B.S. in Chemical Engineering from the University of Michigan and Purdue University, respectively. Dunn co-leads the Buffett Institute's Working Group on the Disproportionate Impacts of Environmental Change.

10. Jonathan Gilbert, Great Lakes Indian Fish and Wildlife Commission, [jgilbert@glifwc.org](mailto:jgilbert@glifwc.org)  
Jonathan Gilbert is the Director of Biological Services Division (BSD) of the Great Lakes Indian Fish and Wildlife Commission, providing technical advice to member tribes on

subjects such as fish and wildlife management, forestry, invasive species, wild rice, climate change, pipelines and mining.

11. Josiah Hester, Electrical and Computer Engineering, Northwestern University,  
[josiah@northwestern.edu](mailto:josiah@northwestern.edu)

Josiah Hester is Assistant Professor of Computer Engineering at Northwestern University. He works toward a sustainable future for computing informed by his Native Hawaiian heritage.

12. Daniel E. Horton, Department of Earth & Planetary Sciences, Northwestern University,  
[daniel.horton@northwestern.edu](mailto:daniel.horton@northwestern.edu)

Dr. Daniel E. Horton is an Assistant Professor in the Department of Earth & Planetary Sciences at Northwestern University.

13. Dylan Bizhikiins Jennings, Native American Studies and Environmental Studies,  
Northland College; Nelson Institute for Environmental Studies, University of Wisconsin,  
[djennings2@wisc.edu](mailto:djennings2@wisc.edu)

Dylan Bizhikiins Jennings is a Professor at Northland College and a Bad River Tribal Member.

14. Philomena Kebec, Bad River Band of the Lake Superior Tribe of Chippewa Indians,  
[babiwash@gmail.com](mailto:babiwash@gmail.com)

Philomena Kebec is the Community Development Officer for the Bad River Band of the Lake Superior Tribe of Chippewa Indians. She is a Bad River Tribal member.

15. Nancy Loeb, Pritzker School of Law, Northwestern University, [n-loeb@northwestern.edu](mailto:n-loeb@northwestern.edu)

Nancy C. Loeb is a Clinical Professor of Law and the Director of the Environmental Advocacy Clinic at Northwestern Pritzker School of Law.

16. Patricia Loew, Medill School of Journalism, Northwestern University,

[patricia.loew@northwestern.edu](mailto:patricia.loew@northwestern.edu)

Patty Loew, a citizen of Mashkiiziibii—the Bad River Band of Lake Superior Ojibwe—is a journalism professor and the inaugural director of Northwestern University's Center for Native American and Indigenous Research.

17. William M. Miller, Department of Chemical and Biological Engineering, Northwestern University, [wmmiller@northwestern.edu](mailto:wmmiller@northwestern.edu)

William M. (Bill) Miller is professor of Chemical and Biological Engineering and director of the Center for Engineering Sustainability and Resilience at Northwestern University.

18. Katie Moffitt,<sup>^</sup> Department of Political Science, Northwestern University,

[kathrynmoffitt2021@u.northwestern.edu](mailto:kathrynmoffitt2021@u.northwestern.edu)

Katie Moffitt is a graduate of Northwestern University (2021) where she worked as a Farrell Fellow and research assistant on the Presence to Influence team.

19. Aaron I. Packman, Department of Civil and Environmental Engineering, Northwestern University, [a-packman@northwestern.edu](mailto:a-packman@northwestern.edu)

Aaron Packman is a Professor of Civil and Environmental Engineering at Northwestern University and the Director of the Northwestern Center for Water Research.

20. Michael Waasegiizhig Price, Great Lakes Indian Fish and Wildlife Commission,

[mwaasegiizhig@glifwc.org](mailto:mwaasegiizhig@glifwc.org) '

Michael Waasegiizhig Price is the Traditional Ecological Knowledge Specialist at the Great Lakes Indian Fish and Wildlife Commission headquartered in Odanah, WI.

21. Beth Redbird, Department of Sociology, Northwestern University,  
[redbird@northwestern.edu](mailto:redbird@northwestern.edu)

Beth Redbird is an Assistant Professor in the Department of Sociology at Northwestern University. She is also a faculty fellow with the Institute for Policy Research and the Center for Native American and Indigenous Research.

22. Jennie Rogers, Department of Computer Science, Northwestern University,  
[jennie@northwestern.edu](mailto:jennie@northwestern.edu)

Jennie Rogers is an associate professor at Northwestern University's Department of Computer Science.

23. Raj Sankaran, Northwestern-Argonne Institute of Science and Engineering,  
[rajesh@anl.gov](mailto:rajesh@anl.gov)

Rajesh Sankaran is a staff researcher with the Mathematics and Computer Science Division, Argonne National Laboratory, the NAISE Fellow with Northwestern University and a senior CASE Fellow with the University of Chicago.

24. James Schwoch, School of Communication, Northwestern University, [jschwoch@northwestern.edu](mailto:jschwoch@northwestern.edu)

James Schwoch is a Professor in the School of Communication and the Science in Human Culture Program at Northwestern University. His most recent book is *Wired Into Nature: The Telegraph and the North American Frontier* (Illinois, 2018.)

25. Pam Silas, Center for Native American and Indigenous Research, Northwestern University, [pamala.silas@northwestern.edu](mailto:pamala.silas@northwestern.edu)

Pam Silas has a B.S. in Economics from DePaul University and is a Certified Association Executive (CAE). She is an enrolled member of the Menominee Tribe of Wisconsin and descendant of the Oneida Tribe of Wisconsin.

26. Weston Twardowski,\* School of Communication, Northwestern University,  
[jamestwardowski2021@u.northwestern.edu](mailto:jamestwardowski2021@u.northwestern.edu)

Weston Twardowski is the program manager of Diluvial Houston at Rice University where he develops transdisciplinary environmental partnerships. He is an adjunct professor in Rice's Center for Environmental Studies and Theatre Department.

27. Nyree Zerega, Plant Biology and Conservation, Northwestern University, and the Negaunee Institute for Plant Conservation Science and Action, Chicago Botanic Garden, [n-zerega@northwestern.edu](mailto:n-zerega@northwestern.edu). Nyree Zerega is Professor of Instruction in Plant Biology and Conservation, Herbarium Director, and Conservation Scientist at Northwestern University and the Chicago Botanic Garden.

**Abstract:** Despite decades of climate science research, existing climate actions have had limited impacts for mitigating climate change. Efforts to reduce emissions, for example, have yet to spur sufficient action to reducing the most severe effects of climate change. We draw from our experiences as Ojibwe knowledge holders and community members, scientists, and scholars to demonstrate how the lack of recognition of traditional knowledges (TK) within climate science constrains effective climate action and exacerbates climate injustice. Often unrecognized in science and policy arenas, TK generates insights into how justice-driven climate action rooted in relational interdependencies between humans and older-than-human relatives can provide new avenues for effectively addressing climate change. We conclude by arguing for a shift toward meaningful and respectful inclusion of plural knowledge systems in climate governance.

**Keywords:** climate justice; traditional ecological knowledge; climate change; science; Indigenous Peoples; climate governance



Our discussion of climate change began with music.<sup>1</sup> In front of a Zoom room of community members, tribal leaders, scientists, engineers, social scientists, and humanists, three boys—not quite yet teenagers—waited for their grandfather to cue them to begin sounding their drums and singing. Most of us had our cameras on as this song and the Ojibwe prayer that followed forged our new relationships in connection to the past, present, and future. In the prayer that followed, Dylan Biizhikins Jennings called upon our more-than-human relatives, requesting partnership and pity, offering our respect and willingness to listen. These songs and prayers remind us of our connections to those generations who came before, bring us together in the present, and ask us to embrace our obligations to the future. We began each of our listening sessions with these invitations to listen, reflect, and pause from thinking of whatever expectations or goals we might have had for the meeting. Collectively joined together, fully present, we sought to better identify, understand, and confront the complex challenges before us: how should Ojibwe Nations strengthen their resilience in the face of climate change?

One of the largest confederations of Indigenous Peoples in the United States, Ojibwe Nations in the Lake Superior region exercise tribal sovereignty on reservations and throughout their ceded territories spanning three U.S. states (Michigan, Wisconsin, and Minnesota; Figure 1). Like other tribal nations, Ojibwe Nations are leading climate actors in environmental stewardship and adaptation, including granting rights to species like *manoomin* (wild rice, *Zizania palustris*), an annual aquatic grass that produces highly nutritious seed en masse each fall, whose existence is threatened by the changing climate.<sup>1</sup> Decades of Ojibwe work generating knowledge on how climate change impacts *manoomin*, long overlooked by scientific community, now drives and leads new scientific research into climate change in the Great Lakes region, like

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the University of Minnesota's wild rice research initiatives (Cusick 2020).<sup>2</sup> Yet like other Indigenous communities around the world, Ojibwe Nations today are among the groups most vulnerable to the negative effects of climate change (UN Special Rapporteur 2017).<sup>3</sup> These include threats to food, water, and cultural security that are rooted in Ojibwe relationships to place and their relationships with *manoomin*.

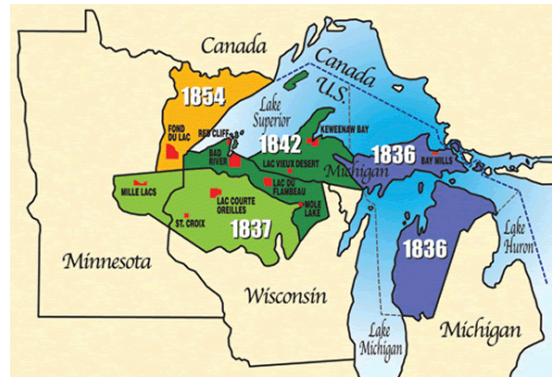


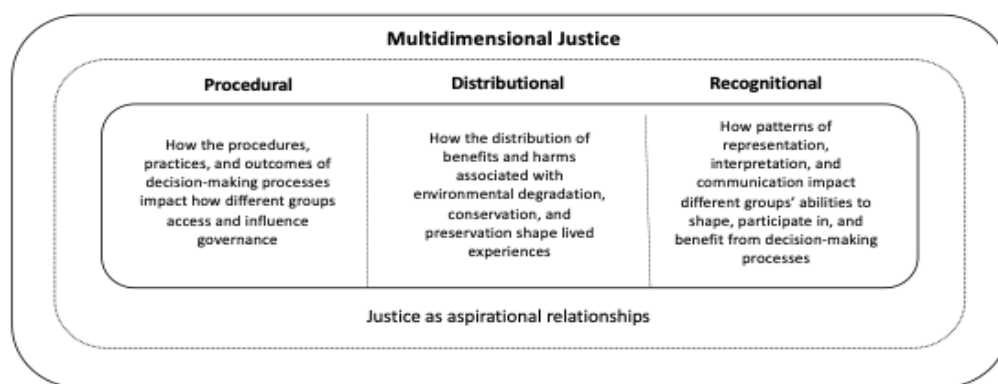
Figure 1: GLIFWC member tribes and their ceded territories and reservations. Source: Great Lakes Indian Fish and Wildlife Commission

Specifically, climate change, habitat loss, and degraded water quality pose increasingly dire threats to the well-being of *manoomin*, the “food the grows on water” that brought the Ojibwe to the Upper Great Lakes. Threats to *manoomin* manifest as multiple, cascading modes of climate injustice that undermine Ojibwe political, social, economic agency, and especially epistemic agency, which challenges Ojibwe Nations’ abilities to generate effective, practical solutions (e.g. Whyte 2020). *Manoomin* extirpation in the Upper Great Lakes would not simply be a loss of a traditional food source or sentinel species. Its loss would precipitate the displacement and ultimate decline of Ojibwe identities, lifeways, ways of being, and ways of knowing, the very existence and practices of which are spiritually rooted in *manoomin*: how can the Ojibwe peoples exist if *manoomin* no longer exists?

Referring to the ways in which climate change, its drivers, and its solutions disproportionately affect different communities, both human and older-than-human, climate justice is a phenomenon that includes three core dimensions: distributive, procedural, and recognitional (see Figure 2; Schlosberg and Collins 2014). To understand the role that climate justice plays in shaping our collective abilities to effectively address climate change, we draw from our ongoing collaborations working with Ojibwe partners. By examining Ojibwe climate knowledge, environmental governance, and experiences of climate change in the northern Great Lakes region of the United States, we demonstrate how multimodal climate injustice is one of the greatest threats to addressing climate change in two interconnected ways: first, by marginalizing and devaluing Indigenous knowledge, dominant climate science and policy arenas artificially circumscribe the range of potential solutions; and, second, by extricating the problem of climate change from the lived experiences of climate change, climate scientists and policy-makers institutionalize climate injustice.

FIGURE 2

### Multiple Dimensions of Climate Justice



SOURCE: Marion Suiseeya (2021).

In what follows, we examine the ways in which knowledge systems shape both our understanding of the climate change problem and the range of policy solutions available to address the problem. Knowledge systems refer to the diverse ways in which knowledge is produced. One such system is knowledge that comes through the scientific method; another is knowledge produced in a context of application; and yet another is embodied knowledge generated through multiple generations of experience (Berkes 1993; Hessels and van Lente 2008). In this article, *science* refers to knowledge produced through the scientific method and *traditional knowledge* (TK) refers to knowledge produced through direct application and experience. TK is embodied and, like science, is built on the generations of experiences leading up to the present. To identify the role of knowledge systems in climate action, we begin by reviewing the differences in how TK and science conceptualize the climate change problem. While scientific consensus exists that anthropogenic climate change is happening, there is neither consensus on *how* to address it nor widespread recognition that historical and ongoing climate injustices act as the *fundamental cause* of climate change and continued climate inaction. By exploring holistic understandings of climate change and placing lived experience at the forefront of climate action, we examine how inclusion of plural ways of knowing can overcome the current limitations to effective climate policy generated by dominant scientific paradigms. Through a multidimensional justice framework, we demonstrate how climate justice is a driver—not simply an outcome—of climate action.

### **The Climate Change Problem**

Recognized as perhaps the most salient “super-wicked” problem we confront, climate change has generated a massive scientific enterprise to understand and address it (Levin et al. 2012).

Reflecting consensus among climate scientists that greenhouse gas emissions drive climate change, policy-makers have focused most of their attention on reducing emissions. Despite these efforts, climate policy responses remain weak (Nordhaus 2020). As the most recent Intergovernmental Panel on Climate Change (IPCC) report noted, we are already beyond the point of significantly avoiding the consequences of climate change (IPCC 2021). Nationally determined contributions to emissions reductions made under the Paris Agreement do not bring us close to a level of emissions that would limit global temperature rise to 2°C (UNFCCC Secretariat 2021). Moreover, while many of the technologies needed to drastically reduce emissions already exist and continue to be developed, most remain largely unimplemented at the scale required to make a difference (Wilkinson et al. 2020).

Conventional explanations for this ineffective policy response often point to climate change denial and the proliferation of mis- and malinformation campaigns; this politicization of science, scholars argue, makes it harder to generate actionable climate information and implement climate solutions (McCright and Dunlap 2011). Other scholars suggest that the incentives currently in place are unable to generate the types of behavioral and structural changes required to address climate change, and policy-makers face political challenges to overcoming the scalar mismatch between their own shorter-term horizons and the extended time frame required to see the effects of any climate policy (Chakrabarty 2014). The broad consensus in this literature is that politicization of climate change results in the suppression of science in policy arenas, limiting opportunities for effective climate action (e.g., Kahan et al. 2012; Bolsen and

Druckman 2018). The implications suggest that addressing climate change requires first its depoliticization by drawing on communication strategies that reframe the climate problem to better align with peoples' interests and values (e.g., Moser 2016).

For many communities experiencing the effects of climate change, emissions reductions and depoliticization of climate change are not only insufficient for addressing climate change but may reproduce and entrench climate injustice (Whyte 2020). Depoliticization, in effect, advances a narrower understanding of the issue area, actively suppressing certain knowledge systems, such as Indigenous Peoples' extensive knowledge and understandings of the Earth and Creation that emerge from their interdependent relationships with older-than-human relatives. Conventional approaches see climate change as an emissions problem, instead of approaching climate change as a problem of the erosion of relationships and relational integrity with older-than-human beings. The Ojibwe worldview identifies the root cause of climate change itself as injustice—injustice inflicted on all human and older-than-human relatives by dominant science and policy arenas that fail to include such relational perspectives. The distinction here is significant: a relational understanding of climate change considers the underlying and multidimensional forms of injustice that drive climate change, whereas a focus on depoliticization and emissions reductions direct attention only to the symptoms, rather than complex drivers, of climate change (e.g. Hulme 2019).

### **Four Orders and Climate Change**

The urgency with which climate science has developed in the past 30 years belies the extensive, centuries-long knowledge of climate change developed in many Indigenous communities (e.g., Smith and Sharp 2012). Menominee elders in the Great Lakes region, for example, have kept

historic records of weather patterns going back to the mid-1800s, showing how more rapid and extreme cycling of temperature impact sugar maple production (Loew 2013). And, in contrast to most climate science that views climate change as a problem *for* society, Indigenous communities across the world have for centuries approached the problem of climate change as a problem *of* society (Belfer, Ford, and Maillet 2017). In 1854, Chief Si’ahl of the Duwamish Tribe (n.d.) and leader of a six-nation confederacy in central Puget Sound, well known for his leadership and advocacy, was already frequently drawing attention to how settler-colonizers’ disrespect and disregard of Creation would wreak havoc on the Earth, suggesting that European colonizers were “numb to the stench” of the fouled air that resulted from their industrialized exploitation of the Earth (Si’ahl in Smith 1887).<sup>4</sup> Chief Si’ahl and other Indigenous leaders pointed out that settlers approached the Earth as distinctly separate from and subordinate to humans, allowing them to continue polluting without consideration for the short- and long-term effects on their older-than-human relatives. This contrasted sharply with Duwamish views of Creation as all beings—living and nonliving—that compose the Earth:

*This we know; The earth does not belong to man; man belongs to the earth. This we know, all things are connected like the blood which unites one family. All things are connected.* —Chief Si’ahl, Namesake of the City of Seattle<sup>5</sup>

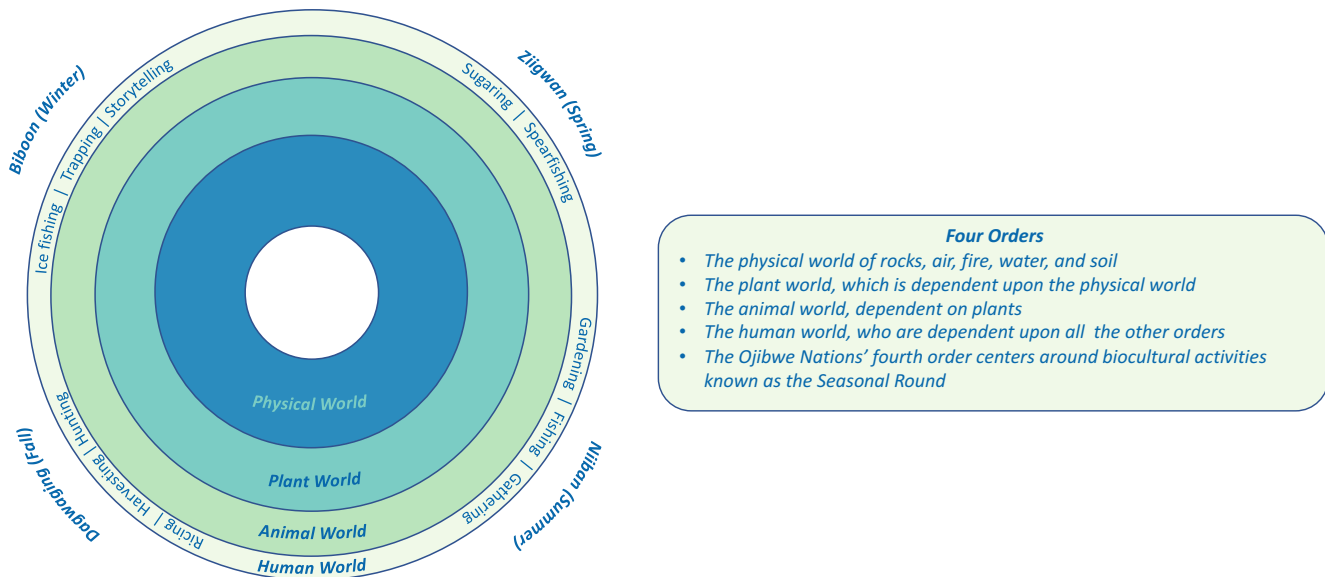
Here Chief Si’ahl elucidates a *relational* lens to guide how humans should know, experience, and steward the Earth as a being of interconnected, interdependent relationships that span time, space, and scale. Relational understandings of the world draw insights from knowledge that is embodied, rooted both in place and lived experience. They also center on

responsibilities and reciprocities—those commitments of care for other beings that constitute relationships. Such forms of knowledge are often referred to as traditional ecological knowledge (TK). As a knowledge framework, TK offers guiding questions for examining worldly relationships, responsibilities, and reciprocities (TAMT 2019; Kirkness and Barnhardt 1991). Examples of climate change TK include the long-term observations of variations in sea ice and weather predictability that Arctic Indigenous Peoples generate and share that illuminate the connections between global climate change and adverse local impacts (ACIA 2004; Martello 2008). For these communities, the problem of climate change is not simply one of greenhouse gas emissions; rather, it is a problem of injustice. Approached through a relational lens, climate change is neither a surprising nor new phenomenon: it is the inevitable result of human disregard for other relatives.

Ojibwe conceptualizations and experiences of climate change are best understood within the relational framework of the Four Orders, a worldview rooted in a “hierarchy of dependence” that is fundamental to Ojibwe beliefs and practices (Johnston 1976; Figure 3). These orders include the Physical World, the Plant World, the Animal World, and the Human World, with the Physical, Plant, and Animal Worlds each comprising relatives that are older and wiser than the humans that depend on them. The Worlds are connected through interdependencies that link their material and spiritual needs required for well-being. These relationships are sacred, and humans—belonging to the newest world—are obligated to learn from the other worlds and steward relationships with older-than-human relatives.



FIGURE 3

**The Four Orders and the Seasonal Round**

SOURCE: Visual developed by authors from knowledge shared by Ojibwe Elders. Defoe and Leoso 2021.

Manoomin—the “food that grows on water” that brought Ojibwe peoples to the northern Great Lakes—illuminates these interdependent relationships. The only cultivated grain native to the Great Lakes region, manoomin requires weather and water conditions conducive to reseeding (Physical World), balance with perennials that can easily outcompete manoomin (Plant World), stewardship by rail birds that feed on plant-damaging insects (Animal World), and seasonal harvesting that facilitates reseeding (Human World) (Loew 2013). Similarly, Ojibwe Nations rely on *Manidoo Gitiganning*, spirit garden or wild rice beds, to provide sustenance, maintain cultural practices, and connect Ojibwe communities across ancient, present, and future relations. Manoomin is prepared as an essential food at every Ojibwe ceremony, where it is offered as part of a spirit dish to the people and the spirits. The increasingly dire threats that climate change,

habitat loss, and degraded water quality pose to the well-being of manoomin are also existential threats to all its human and older-than-human relatives.

### **Multimodal Climate (In)Justice**

In one of our first conversations together, Ojibwe leaders, including authors of this article, talked about the accumulated, adapted, and disseminated knowledge related to climate change that Anishinaabeg (the peoples of Ojibwe Nations) have generated and maintained for centuries. Marvin Shingwe Biness DeFoe (Tribal Historic Preservation Officer for the Red Cliff Band of Ojibwe) coined the term *Anishinology* to describe these centuries of knowledge accumulation, which he explained is a process of learning from elders and life, and what academics might refer to as *embodied knowledge* (DeFoe 2021; see also Bang and Medin 2010; Haraway 1988). DeFoe explained how the experiential, active knowledge acquisition that comes from a life attached to a place allows those who listen—and know—that when frogs’ croaks change it means the walleye are spawning on a lake 60 miles away. When fish biologists could not understand why, given the lake temperatures, the walleye were not yet spawning, DeFoe and other tribal members explained they had to wait until the cadence of the frog songs let them know the spawning had begun. Weeks later, the frogs were singing at the right cadence and, even though the lake temperature for spawning had been reached weeks prior, they had only just begun spawning. Ojibwe tribes draw from this knowledge to inform governance of different fisheries, ensuring that human fishing activities do not threaten their sustainability.

The extensive TK that has long guided Ojibwe relationships informs how Ojibwe Nations understand and respond to climate change (TAMT 2019). Climate change–induced warming and increasing frequency and severity of extreme weather events, for example, are threatening

manoomin and its habitat. As waters warm, invasive species are increasingly able to outcompete manoomin, reducing its abundance in traditional locations, while also pushing it northward (David et al. 2019). Large storm events, especially those early in the “floating leaf” season, can rip the rice out of the muck bottom and disrupt an entire season of manoomin. The resulting decline in manoomin threatens not only future manoomin yields but jeopardizes the entire system of relationships that constitute Creation: declines in water quality that supports multiple socio-ecological systems, impacts on rail birds that feed on manoomin-damaging insects, and the loss of cultural practices and identities that emerge from relationships with manoomin are all climate-driven impacts. These consequences, in turn, can have cascading effects on other relationships that ultimately undermine Ojibwe ways of knowing and being. Manoomin decline, for example, impacts the food sources and habitat for seventeen species of wildlife, including the muskrat. According to the Ojibwe Creation story, the muskrat is a sacred animal: when a great flood destroyed most animals and all of the Anishinaabeg people, the muskrat dove deep under water to grab a handful of Earth so that it could begin anew, dying as he resurfaced with a pawful of mud (Cooper 2009). The soil was placed on the back of a turtle and Earth, or Turtle Island, was reborn. Without the muskrat, the Ojibwe would not exist. Stewarding these sacred relationships is essential to Ojibwe lifeways. Climate change is a dire threat to the relationships of the Four Orders: manoomin decline impacts all Ojibwe relations and well-being, and as Ojibwe well-being declines, so too do the relationships they steward.

To address climate change, Ojibwe Nations have co-developed a Tribal Climate Adaptation Menu that aims to achieve parity for all relatives—human and older-than-human—and adopts principles of respect, reciprocity, responsibility, and relationships to guide decision-making (TAMT 2019). This approach diverges from more conventional, Western approaches

that emphasize exploration, domination, exploitation, and extraction—principles that seek to control and change the environment rather than adapting to it (TAMT 2019, 9). It also diverges from the sense of urgency that dominates Western decision-making around climate change and instead prioritizes dedicating time to generate more complete and holistic understandings of socio-ecological change. The Ojibwe view time differently—climate change is not just an issue to be addressed with climate action targets for 2030, 2040, 2050, not just an issue to be addressed election cycle by election cycle. Climate change is an issue of generations, with generations in the future threatened by generations of injustices in the past. Ojibwe worldviews have a seven-generation focus on a responsibility to the Four Orders that extends seven generations into the future, and a responsibility to understand the relationships between three generations of the past, three generations of the future, and the generation of now (Loew 2013). This, in turn, can generate dynamic and responsive climate change solutions that attend to both subtle and major changes in the near- and long-term.

Examples of these include Strategies 9 and 10 of the Tribal Climate Adaptation Menu that focus on increasing ecosystem redundancy and landscape connectivity, and maintaining and enhancing genetic diversity, respectively. Strategy 9 tactics include managing habitats and access opportunities across a range of sites and conditions, expanding the tribal land base by re-acquiring lands, reducing fragmentation, and creating habitat corridors (TAMT 2019, 19). Strategy 10 tactics include using seeds and other biological materials from relatives of beings across a greater geographic range, favoring local beings whose traits are better adapted to future conditions, and collecting and preserving seeds from at-risk beings (TAMT 2019, 19). Additionally, in 2018 the White Earth Band of Ojibwe enacted the “rights of manoomin,” the first rights of nature law now being used in tribal courts against the Enbridge 3 pipeline in the

first rights of nature case, a groundbreaking illustration of the rights of older-than-human relatives to exist and thrive (White Earth Band 2018). We note these here as examples to demonstrate how TK integrates with other knowledge systems to support climate action (see Box 1). Addressing climate change by simply reducing emissions, the dominant strategy among most climate scientists, neglects to consider the deeper complexities of responsibility and reciprocity in global climate change and, at this stage, will not reverse the current trajectory of climate change.

## BOX 1

### Four Orders and Climate Science<sup>6</sup>

#### Box 1: Four Orders and Climate Science

- *The Physical World* of rocks, air, fire, water, and soil are the oldest relatives that provide the foundation upon which all other worlds rely. Climate science drawing on the Physical World focuses on the effects of anthropogenic greenhouse gas emissions that are substantially changing the composition of the atmosphere, causing an increase in the Earth's temperature, exacerbating droughts, fires, and floods, and intensifying extreme weather events.
- *The Plant World* of trees, grasses, shrubs, bushes, flowers, algae, and fungi relies on the Physical World for life. Additionally, as plants take in carbon dioxide, produce oxygen, and decay and release nutrients and organic carbon to the soil, they replenish the Physical World as well. Climate science related to the Plant World focuses on examining how climate change increases vulnerability to disease and pests, impacts life cycles, and alters the habitability of the Physical World that may both weaken and strengthen relationships between different plant relatives and the Physical World. Plants like manoomin, for example, are struggling as plants like the hybrid cattail, arrowhead, and lily pads are growing more abundant in shared waters.
- *The Animal World* of the invertebrates, birds, reptiles, amphibians, fish, and mammals also has reciprocal relationships with each of the other worlds. Animals rely on the Physical and Plant Worlds to provide life; the Physical World relies on the Animal and Plant Worlds to filter the air and water and aerate the soil; and the Plant World relies on the Animal World to propagate. Climate science related to the Animal World focuses on how climate change increases the vulnerability of many animals, especially those already under pressure, to shrinking habitats, greater nutrient competition, and, for many animals, poses an existential threat. For example, sea lampreys introduced through the release of ballast waters from ships traveling through the Great Lakes from the Atlantic Ocean prey on trout, sturgeon, whitefish, and others, weakening their abilities to survive.
- *The Human World* of people is the newest of the Four Orders. Humans therefore rely on the Physical, Plant, and Animal Worlds for both life and learning, needs that are both physical and spiritual. Like the reciprocal relationships between the Animal, Plant, and the Physical Worlds, humans also have responsibility to care for and consider their impact on all human and older-

than-human relatives across the Four Orders.<sup>2</sup> Climate science focused on humans examines how climate change may exacerbate conflict, spur mass migration, weaken the economy, put resources at risk, and make both social and built infrastructures and systems more vulnerable to the effects of climate change on Animal, Plant, and Physical Worlds.

In recent years, a growing recognition has occurred of the importance of TK for addressing climate change and for generating knowledge that connects global and local climate phenomena (e.g., Petzold et al. 2020; Ford et al. 2016; Bohensky and Maru 2011). The most recent reports from the IPCC, for example, note that TK can enhance resilience and reduce risks of maladaptation (IPCC 2021). The UN Framework Convention on Climate Change (UNFCCC) established a mandate to include TK (see Box 2). Yet, despite this acknowledgement in global policy arenas, TK has been largely excluded from large-scale research and policy solutions to environmental problems; many climate scientists (including social scientists) and policy-makers continue to treat TK as folklore or anecdote, rather than the different knowledge system that it is (Berkes 1993; Whyte 2013). Such disregard for other ways of knowing is in itself a form of injustice that produces other injustices.

## BOX 2

### **Local Communities and Indigenous Peoples' Platform**

#### **Box 2: Local Communities and Indigenous Peoples' Platform**

In 2015, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) signed the historic Paris Agreement, which, among other commitments, established the foundation for the Local Communities and Indigenous Peoples' Platform (LCIPP). From 2016 to 2020, Parties and representatives from civil society, local community, and Indigenous Peoples' organizations worked to develop the scope,

<sup>2</sup> The Ojibwe Creation story introduces the "original treaty," an agreement in which animal relatives agreed to take care of the Anishinaabeg by providing food, clothing, and shelter. In exchange, animals expected respect and recognition. Today, Anishinaabeg continue the practice of aasema offerings before each hunt as part of fulfilling their obligations to their older-than-human relatives (Cooper 2009).

goals, and objectives of the LCIPP, culminating in an initial two-year work plan. The LCIPP intends to serve as a space for bringing together diverse knowledge systems to help strengthen our collective responses to climate change through knowledge and best practice exchanges. It is also intended to facilitate deeper engagement of local communities and Indigenous Peoples in UNFCCC processes by helping build capacity and integrating diverse knowledge systems, practices, and innovations in design and implementation of climate actions across multiple levels of governance.

*Source: <https://unfccc.int/LCIPP>*

While the overlay of the Four Orders onto climate science interventions in Box 1 illustrates some synergies with Ojibwe knowledge, scientific efforts that assume that “individuals can be distanced, or separated, from the physical environment” effectively and actively exclude Indigenous knowledge from informing policies (Tuhiwai Smith 2012, 58). For example, in one of our first conversations together, Ojibwe leaders, including authors of this article, expressed a common frustration about the lack of respect that policy-makers and scientists have for their knowledge. DeFoe described the recent wolf hunt authorized in Wisconsin that is now expected to cause a dangerous decline in the Grey Wolf population (Wisconsin Green Fire 2021). The Anishinaabeg consider Maa’ingan (the wolf) a brother who also helps to maintain forest ecosystems by controlling the deer population and other sick relatives, contributing to climate adaptation and well-being. In early 2021, the Ojibwe Nations warned the Wisconsin Department of Natural Resources that opening a wolf hunt in February—when many female wolves would already be carrying pups—would be disastrous for the wolf population and their Plant, Animal, and Human relatives. Without, however, longitudinal population studies to show the potential impacts of hunting during breeding season that would legitimize their knowledge in the eyes of the State, their concerns went unheeded. Within four days of opening the hunt, 218 wolves were killed, nearly double the allowable quota of 119, of an estimated total population of 1,100. The quota for the November 2021 hunt is 300 wolves, more than double the state biologist’s recommendation of 130. In less than one year, more than half of the 2020 wolf population in

Wisconsin could be killed (Treves, Santiago-Ávila, and Putrevu 2021).<sup>7</sup> The short- and long-term effects of this loss on the Four Orders is not yet fully known, but based on Ojibwe knowledge, this loss will produce an imbalance of different beings, impacting socio-ecological resilience and effective climate adaptation.

The multimodal, multigenerational injustices (re)produced through this experience include cultural, spiritual, epistemic, and relational displacement resulting from a lack of recognition of Ojibwe ways of knowing, marginalization of Ojibwe knowledge, and limited ability to participate in and influence decision-making. These exclusions lead to existential impacts on the well-being of current and future generations of human and older-than-human relatives, and constrain Ojibwe efforts to protect their relationships with manoomin and other relatives. Moreover, the process and outcomes of the wolf hunt decisions extend the legacies of violence that have sought to eradicate Ojibwe Nations and their knowledge (e.g., Child 1998). Finally, the devaluing and undermining of TK contributes to broader trends of knowledge hierarchies and exclusions in climate science that impose artificial limitations on what it is possible to know—and thus what it is possible to act on—for innovating climate change responses (Orlove et al. 2010). Such restrictions result in unutilized fields of valuable climate knowledge based on local communities and Indigenous Peoples' proximity with specific environments and ecosystems. In many small or remote communities, for example, there is little or no scientific information to inform policy responses for highly localized environmental issues (Alamgir, Pert, and Turton 2014). In these cases, local knowledge is the only option to identify environmental problems and can be very effective in developing climate change adaptation strategies. An example of this is the Great Lakes Indian Fish and Wildlife Commission's climate change vulnerability assessment that identified specific threats and responses relevant to



manoomin, drawing on scientific and traditional ecological knowledge and enabling Ojibwe Nations to develop targeted climate adaptation strategies (Hansen and Conaway 2015). The injustices of excluding plural forms of knowledge from the broader climate policy landscape generate multimodal, cascading injustices that impact our collective—not just Ojibwe Nations’—abilities to develop and deploy relevant and effective climate action.

### **Conclusion**

Like all politics, climate politics are struggles over ideas about how we can, do, and should organize and govern ourselves, and to what ends. Broad scientific consensus that the root of the climate change problem are the human pursuits that generate greenhouse gas emissions has focused policy response, almost myopically, on reducing emissions. These approaches conceptualize the real danger of climate change as crossing an ecological tipping point at which Earth systems’ functions are severely disrupted and altered (Röckstrom et al. 2009). Many Indigenous Peoples, including Ojibwe Nations, understand the climate change problem as a relational problem in which humans actively exclude the needs and rights of older-than-human relatives and disregard the worldviews, voices, and values of relatives who embrace their obligations to all relations, past, present, and future. The danger, in this view, is in crossing a “relational tipping point” by marginalizing the thousands of years of observations and analysis that emerge from relationships to constitute TK (Whyte 2020). We do not suggest that one knowledge system should emerge victorious. Rather, our intent is to point out that existing scientific and policy efforts operate to oppress other ways of knowing and being, thereby restricting potential solutions to those generated within the same knowledge systems that produced the problem—furthering its super-wickedness (Levin et al. 2012). Relying on climate

science alone will, at best, support continued focus on emissions reductions that are unlikely to effectively address climate change and, at worst, continue to obscure the more systemic, structural drivers of climate change and its impacts, allowing continued reproduction of climate injustices. To solve big, complex problems, we need diverse, plural, and ongoing contestations in both science and policy arenas.

The music that opened our exploration of climate change issues in Ojibwe Nations set the tone for our engagement: relationships, respect, reciprocity, and responsibility would serve as our guiding principles. Good research and effective policy-making requires that we respect all our relations—human and older-than-human; past, present, and future generations. It requires that we honor the relational reciprocities that make our Worlds possible. The Ojibwe Nations have long upheld their responsibility as stewards of these relationships; now, settler-scientists must finally recognize and respect the knowledge systems that have enabled Indigenous communities to act as stewards for their older-than-human relatives. To understand the threats that climate injustice poses to effective climate action and to overcome the policy paralysis that characterizes large-scale climate action, we need to understand the processes by which and implications of how Indigenous ways of knowing are routinely left out of climate science. Additional research needs to help us understand how, why, and with what effects the distance between climate science and the experiences of people most vulnerable to climate change impact climate action. How does the exclusivity of science—marginalization of knowledge systems and extricating climate science from climate change experiences—impact climate action? How might policy arenas facilitate the introduction, deliberation, and circulation of plural worldviews and knowledge systems?

We end with a call to settler-scientists to accept responsibility for abolishing the stench of injustice; to break down our disciplinary traditions, boundaries, and expectations; and to listen. Improving climate action requires democratizing and decolonizing the scientific enterprise. TK connects climate justice and climate science, provides the necessary relational basis for climate action, and overcomes fragmented scientific disciplines with ancient teachings of interconnectedness (e.g., David-Chavez and Gavin 2018). TK, though, is not simply another resource to be extracted and exploited; Indigenous ways of knowing are ways of living and therefore cannot and should not be molded to fit Western scientific norms. Subsequently, the aim is not to merge scientific and TK; rather, the goal is to create space where both forms of knowing can co-exist, a space where these knowledge systems are respected equally and inform each other in ways that are reciprocal instead of extractive.

## Notes

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<sup>1</sup> This is part of the Ojibwe Creation story that has been shared by Ojibwe Elders for generations.

<sup>2</sup> See the University of Minnesota's wild research initiative at: <https://manoominpsin.umn.edu/>

<sup>3</sup> In early 2021, we convened three listening sessions with GLIFWC Staff and Ojibwe Tribal members as part of an NSF-supported initiative to develop tribally-driven research. The work in this article reflects this work. NSF Award No. 2044053.

<sup>4</sup> Although the verbatim texts of Chief Si'ahl's speeches are questioned because they were neither given in English nor in written form, his reputation for drawing attention to European colonizers' relationships to the Earth and the resulting environmental degradation is irrefutable (Clark 1985).

<sup>5</sup> <https://www.duwamishtribe.org/chief-siahl>

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<sup>6</sup> The Ojibwe Creation story introduces the “original treaty,” an agreement in which animal relatives agreed to take care of the Anishinaabeg by providing food, clothing, and shelter. In exchange, animals expected respect and recognition. Today, Anishinaabeg continue the practice of aasema offerings before each hunt as part of fulfilling their obligations to their older-than-human relatives (Cooper 2009).

<sup>7</sup> At the time of writing, the Wisconsin wolf hunt is in ongoing litigation in federal courts.

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