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TOWARDS COMMUNITY-DIRECTED CLIMATE ADAPTATION RESEARCH (C-DAR)

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ABSTRACT

The disconnection between humans and their surrounding ecologies, intensified since the industrial revolution and often described as the "metabolic rift," has profoundly influenced dominant research practices as enterprises of knowledge production. As such, much research today, including climate change research, is disconnected from the land and the communities who depend on and steward it. This paper starts by briefly tracing a response to this disconnection, the emergence of community-engaged approaches to action research. Turning on the urgency of community adaptation under the climate emergency, we point to how this trajectory has seeded a paradigm shift to what we are referring to as community-directed research (C-DAR). Drawing on dialogues with three Indigenous community partners in Brazil—the Tremembé, Mundurukú, and Guaraní—we theorize how C-DAR could navigate four critical boundaries to bridge the rift between researchers and the land: The rift between western science and Indigenous and local knowledges; the rift between natural and social sciences; the rift between institutional (university) and community contexts; and the rift between the Global South and the Global North. We conclude with an observation that the acronym "C-DAR" is phonetically identical in Brazil to the Portuguese reflexive verb "se dar" which can mean "to give oneself to something." In this spirit of "se dar," we offer our paper as a call for experiments in reparative approaches to research, inviting scholars to reflect on their willingness to engage with this ethos.

KEY WORDS: Climate change; Land-based communities; Locally-led adaptation; The Metabolic Rift; Reconnecting with the land; Reparative research

INTRODUCTION: CLOSING THE RIFT BETWEEN THE LAND AND THE ACADEMY?

> Universities need to establish a responsible and committed dialogue with Indigenous territories and traditional communities who are facing the climate emergency. [...] Research collaborations must benefit these peoples and their lands, while also following the guidelines and sentiments of those who care for Mother Earth and all of nature. - Mateus Tremembé

Land-based communities live in reciprocal relation with their ecosystems and possess deep knowledge about the waters and soils that sustain their ways of life (Berkes et al., 2000; Whyte, 2013). As is often the case for those who have contributed the least to global emissions, these communities are among the most vulnerable to the accelerating impacts of climate change, forcing them to *adapt* to new eco-hydrological realities (IPCC, 2023). Despite the growing recognition of the critical role that land-based communities play in climate action research (Nóbrega et al., 2024), as the above quote by Mateus Tremembé implies, climate change research often falls short of following "the guidelines and sentiments of the communities who care for Mother Earth and all of nature."

In this paper, we start with the argument that, in general, the academic world is increasingly separated from "life on the ground," especially for communities on the frontlines of the climate crisis. Ontologically, this is a symptom of a wider separation that has its roots in the onset of mass urbanization around the time of the Industrial Revolution and has been described as the "metabolic rift" by critical environmental social scientists (Foster, 1999; Moore, 2000). The concept of the metabolic rift originates with Karl Marx's observation that feeding cities without returning nutrients back to agricultural lands in the countryside would impoverish the soil and undermine the foundations of modern society. In Marxist theorizing, it has been extended as a form of separation that describes disruptions in the relationship between humans and the natural systems that sustain them (Bowness & Wittman, 2021). The implications of this metabolic rift extend beyond ecological degradation, creating not only a physical disconnect between humans and their surrounding ecosystems, but also sowing conceptual separation within western thought about nature and humanity's place in it (McClintock, 2010; Schneider & McMichael, 2010). The same logic can describe some layers of disconnection within and caused by the university as an institution tasked with the role of producing knowledge about the world around us (McGeown & Barry, 2023; Stein, 2019; Stein & Bowness, 2025).

This paper joins a growing contingent within academia in exploring the ways in which climate action research might begin to close these rifts. First, we outline our methodological approach for this paper. We then position climate action research in relation to the metabolic rift. We propose an orientation that we are calling "Community-Directed Adaptation Research," or C-DAR, which we frame as a methodological ethos. We position C-DAR as an emerging variant of action research aimed at bridging *four rifts*: i) between western science and traditional land-based knowledge, ii) between the natural and social sciences, iii) between university and community contexts, and iv) between the Global North and Global South. This analysis is grounded in ongoing C-DAR projects at different stages of development. Finally, we conclude by offering an invitation to grapple with the discomfort

of letting go of the expectation for control that defines the usual research design process in academic settings. We relate this to the Portuguese reflexive verb se dar, which is pronounced the same as C-DAR and carries meanings including *to give oneself to something*. We take up this spirit of *se dar* as a speculative orientation for reparative approaches to research on the climate and nature emergency (Stein & Bowness, 2025).

METHODOLOGICAL APPROACH

A "Plantar, Cuidar, Colher" Cycle

This paper emerged from conversations between the two non-Indigenous authors (Bowness and Nehemy) and three Indigenous leaders in Brazil; Mateus Tremembé, Davi Timóteo Martins (Guaraní), and Domingos dos Santos Corrêa (Mundurukú), from three community-university relationships. We use a "plantar, cuidar, colher" cycle as a metaphor for the non-linear C-DAR research process lifecycle, and make references to experiences drawn from academic-community relationships at different points in the cycle. We do not present the "plantar, cuidar, colher" cycle as a definitive or linear model of C-DAR, but rather as a metaphor that helps us imagine what community-directed research might look like in practice. The cycle provides a relational orientation that emphasizes reciprocity, temporality, and care in research collaborations, aligning with the ethos we propose for C-DAR. The three relationships we describe in this paper are not examples of C-DAR already realized. Instead, they are collaborative relationships at different stages of development that we draw on to illustrate how aspects of the cycle resonate with our community experiences and aspirations for adaptation research that is community directed. In this sense, the cycle offers a heuristic for thinking with these projects, while C-DAR remains a broader speculative ethos and call for experiments in reparative approaches to research. The "plantar" (to plant) phase involves laying the groundwork for the research relationship and project by prioritizing mutual understanding and trust-building. This starts as an initial connection between the researchers and community members to slowly co-construct goals and research questions and to start to understand how together the group may define methodologies and objectives that reflect both academic rigor and community relevance. Critical to this phase is a "diagnosis," or the definition of problems and taking stock of community assets and resources. The "cuidar" (to care) phase represents the ongoing phase of collaboration and care, where the emphasis is on sustaining relationships through open communication and responsiveness to emerging needs or challenges, recognizing the evolving nature of community contexts and priorities. The "colher" (to harvest) phase centers on ensuring that the benefits of the research are equitably shared and create meaningful, long-term impact.

First, the Tremembé da Barra do Mundaú community is in Ceará, in northeastern Brazil, a region with diverse coastal ecosystems including mangroves, sand dunes, rivers and semi-arid *caatinga* forest, an endemic biome of Brazil. As rainfall becomes increasingly variable and unpredictable, the community have undergone an agro-ecological transition (Tremembé et al., 2025). This has included the creation of collective plantation spaces where the community grows root crops such as cassava and sweet potatoes as well as beans and other staples, the establishment of agro-forestry sites, and the elimination of the use of agro-chemicals, bolstered by a resurgence of traditional food practices through cultural festivals

and building extensive partnerships with local NGOs and universities, including Canadian universities. The community has formalized their territorial knowledge in a Territorial and Environmental Management Plan (PGTA), local food inventory, and through training programs for youth as environmental agents. Many community members attend the local university as undergraduate students, and this partnership has been ongoing since August of 2022, and as such is currently defined both by "plantar" (to plant) and "colher" (to harvest). Second, in the southern state of Santa Catarina in the Atlantic rainforest, a network of Guaraní communities in collaboration with the Centre for the Promotion and Study of Agriculture in Groups (CEPAGRO), is developing agro-ecological education initiatives focused on resurgence of traditional knowledges as a means of building resilience to climate change. This project is primarily defined by "cuidar" (to care) characteristics, with the partnership currently actively seeking additional resources and planning, showing elements of "plantar." Finally, in Pará, the eastern-most state in the Brazilian Amazon, the Mundurukú community are in the initial conversations around a potential project about climate adaptation planning and drought response. This relationship is entirely defined by "plantar" dimensions. In this region, an extreme drought unfolded in 2023 and 2024. Cacique Domingos remarked, "I have never seen a drought like this in 70 years." This drought was the longest and most severe on record with the lowest stream water levels within the Amazon (Espinoza et al., 2024). The drought has severely impacted fish and traditional fruit availability (e.g., açaí, cashew fruit) and poses a severe threat to community food security and traditional ways of life. While the community has had negative experiences in engaging with academics in the past, the hope is this new project following C-DAR fundamentals will support territorial management and adaptation planning for the community.

Author Positionality

Our author team comes together through intersecting relationships built across different territories, institutions, and community projects. We position the Indigenous leaders first, recognizing their central role in shaping the directions and aspirations of the work we describe here. Mateus Tremembé is an Indigenous leader of the Tremembé da Barra do Mundaú community, where he has long been engaged in agroecology, cultural revitalization, and youth education. His decision in 2022 to focus more directly on traditional food systems and climate resilience opened pathways for collaboration with the academic authors. Davi Timóteo Martins (Guaraní) has been an educator and community leader for nearly two decades, advancing culturally relevant schooling and agroecological resurgence within Guaraní territories. He first met Evan Bowness in 2023, through a SSHRC-funded exchange facilitated by the NGO CEPAGRO, which connected Guaraní and Tremembé communities. Domingos dos Santos Corrêa (Mundurukú), not an author on this paper but a key contributor to the ideas contained herein, is chief of the Bragança community in Pará. He has led community initiatives to respond to the intensifying impacts of drought and climate disruption. Domingos began collaborating with Magali Nehemy in 2021 through shared work that resulted in a co-authored publication (Nóbrega et al, 2023). Later, Domingos welcomed Nehemy, Tremembé, and Bowness to his territory, where their conversations became the foundation for this manuscript. This encounter seeded ongoing collaborations around territorial management and climate adaptation. Magali Nehemy, a Brazilian eco-hydrologist working in Canada, and Evan Bowness, a Canadian-born social scientist, are both

early-career racialized settler academics. Nehemy's hydrological expertise and prior collaboration with Domingos shaped her entry into this collective work. Nehemy and Bowness approach this manuscript as opportunities to learn from and with Indigenous partners, and to orient their research toward community priorities. Together, our relationships have grown unevenly and provisionally across time and place, and continue to be oriented towards future possibilities for collaboration. None of us claim that our work together already represents C-DAR in practice. Rather, we situate ourselves within contexts that inspire our collective theorizing of C-DAR as an aspirational ethos and a call for experiments in reparative research.

Testimonio and Social Cartography

Through conversations in the context of these three community-university relationships described above, we draw on two methodologies in envisioning some guidelines for what C-DAR could entail: *Testimonio* (Delgado Bernal et al., 2012; Pérez Huber, 2012; Pérez Huber & Aguilar-Tinajero, 2024; Reyes & Curry Rodríguez, 2012) and *social cartography* (Paulston, 1996; Suša & de Oliveira Andreotti, 2019). Testimonio is a qualitative research approach, used extensively in education research, which is rooted in Latin American traditions of resistance and social justice that centers first-person narratives of marginalized peoples or communities, often to shed light on dimensions of oppression, resilience, collective struggle, and social change. Following an overview of C-DAR and how it relates to knowledge systems and action research, we engage with four 'rifts' which C-DAR is positioned to bridge. In discussing each rift, we start with individual quotes, or testimonial statements, from co-authors with unique positionalities: two Indigenous community leader co-authors from Brazil, one Tremembé and one Guaraní, and two early-career racialized settler academics based in the Global North, one Brazilian natural scientist and one Canadian-born social scientist. Then, reflecting on each of these statements. Social cartography is a visual and conceptual methodology that maps different perspectives, assumptions, and relationships around complex issues. Emerging from critical pedagogy and education research (Paulston, 1996), it provides tools to situate knowledge claims in relation to one another. In practice, social cartography involves identifying key tensions, positions, or tendencies and arranging them in ways that make visible how different epistemologies, ontologies, and methodologies intersect, diverge, or remain incommensurable. Rather than resolving these differences, social cartography emphasizes their coexistence, offering a heuristic for dialogue and reflection. We use social cartography not as a definitive classification but as an experimental way to sketch how C-DAR could navigate the multiple rifts in climate action research. The resulting map (Table 1) is intended as a provisional guide to spark further experimentation and conversation. In doing so, we engage with emerging literature to conceptually map a spectrum of ontological, epistemological, and methodological issues within climate action research.

TOWARDS COMMUNITY-DIRECTED ADAPTATION RESEARCH (C-DAR)

To differing degrees, action research approaches aim to address the marginalization of local knowledge in academia and the inequity in who ultimately benefits from academic collaborations. Originating in the early 20th century (Orland-Barak & Maskit, 2017), the term 'action research' was popularized by Kurt Lewin in the 1940s, who described it as a

process involving planning, action, and fact-finding to address social issues; his work aimed to support minorities in addressing their 'problems' (Adelman, 1993; Okoko, 2023). By the 1950s, action research had gained recognition as a distinct methodology (Feldman, 2017). Theoretically, action research is rooted in democratic principles of participation and social change through collaborative inquiry, which has been described as having seven cornerstones: contextuality, commitment, communication, collaboration, criticality, collegiality, and community (Edwards-Groves & Rönnerman, 2022). For the most part, action research is grounded in *community participation*, with a common methodology found throughout the social sciences often under the banner of "participatory action research" or community-based PAR (Baum et al., 2006; McIntyre, 2008).

Despite its emphasis on equity through participation, several issues have arisen in practice that have, at times, exacerbated rather than alleviated the problems faced by community partners. We want to highlight two issues in particular. First, a major critique of action research lies in imbalances of power and decision-making. While action researchers today advocate for collaboration and shared leadership, academic institutions often retain disproportionate control over the research agenda, resource allocation, and the dissemination of findings (Narendorf et al., 2023; Pratt et al., 2022). This dynamic can lead to tokenistic participation, where community partners are included only superficially, undermining the very principles of participation and social justice on which action research is founded, and has resulted in a call for more research that is *led by communities* (Lorenzetti & Dhungel, 2019). Second, ethical concerns also arise when academic timelines and funding cycles dictate the pace and scope of action research projects, especially in highly neoliberalized academic spaces (Lake & Wendland, 2018; Millar et al., 2024). These constraints can pressure researchers to prioritize short-term outcomes over the needs of community partners. While there continues to be a range of contexts in which community-engaged action research is being developed to address these issues and move action research forward, we argue that two trends are colliding that both threaten and provide a pathway forward for the advancement of the field: First, action researchers must confront the reality that to deliver on the goals for social justice at the root of action research, they must move beyond community-engagement to creating research that is *community-directed.* Second, the climate emergency necessitates finding new ways to support land-based communities in *adapting* to new climate realities and fulfilling their responsibilities to protect their territories.

Our main intention in this paper is to propose an emergent and provisional definition for what we are calling Community-Directed Adaptation Research or C-DAR. We envision C-DAR as fundamentally *community-directed*; this means that intellectual leadership, and to the extent possible administrative leadership of resources, is held by community partners. It could be imagined as a type of transdisciplinary research collaboration working with land-based communities. As such, C-DAR would be inherently place-based, focusing on the creation of knowledge and tools that empower communities to assert their territorial sovereignty and fulfill their responsibilities to protect and nurture the lands and waters that sustain them. C-DAR as envisioned here would involve environmental data collection and analysis, with a strong emphasis on community capacity building for monitoring, as well

protocols for developing a shared understanding through modelling and forecasting capacity to anticipate and respond to environmental changes. Additionally, C-DAR collaborations would involve social scientists deepening their understanding of the unique socio-political contexts that both limit capacities and support communities in adapting to change.

As we argue in this paper, and as is theorized and presented in Table 1, metabolic rifts express themselves in climate research in at least four ways: 1) as a division between western science and Indigenous/local knowledges; 2) as a division between the natural and social sciences, which often creates a separation between the ecological and the social; 3) as a division between community and academic institutional spaces, where norms and inequities exist regarding who is recognized as an expert and how resources flow; and 4) as a division between the Global North and South, where the Global North disproportionately benefits from resource extraction, including knowledge extraction, from the Global South, recognizing also that the Global North includes marginalized communities and exploited lands and that the Global South is also characterized by deep inequities.

1 - Between Western Science and Indigenous/Local Knowledge

This rift speaks to the longstanding epistemic hierarchies between western science and Indigenous/local knowledge. The following reflections from Mateus Tremembé and Davi Timóteo Martins emphasize the relational, spiritual, and place-based grounding of Indigenous knowledge, setting up the challenge of how C-DAR could be imagined to rebalance these dynamics.

> *Traditional local knowledge is born from practices and experiences within territories, from collective identities, and in relationship with the land. While dialogue between traditional local knowledge is possible, academic western knowledge needs to rebuild reciprocal respect for traditional knowledge. Academic knowledge must also recognize that it is fed by traditional knowledge, because academic knowledge is always in some way based on 'experiments' that have been carried out over thousands of years and are only now starting to be formally documented as western knowledge.* - Mateus Tremembé

> *Spirituality plays an important role in fostering connections in a fragmented world. Western society often compartmentalizes life into rigid boxes. And as a result, sometimes the academic world ends up taking away spiritual dimensions, since they do not fit into academic "boxes." Academics say, "we are going to leave this out, it is not part of the research, it is a matter of religion, etc." But I think it is possible to bring a spiritual perspective into research that is led by Indigenous, not non-Indigenous, researchers. For Indigenous researchers, for those who live this work, there is no way to turn spirituality off.* - Davi Timoteo Martins (Guaraní)

Table 1
Social Cartography for C-DAR

Rift	Issue	Dominant Western Academic Approaches	Transdisciplinary Approaches	Community-Directed Adaptation Research (C-DAR) Approach
1. Division Between Western Science and Indigenous/ Local Knowledge	**Ontology**	The physical world is the primary object of scientific inquiry; reality is understood through empirical observation.	Recognizes the existence of multiple ontologies but prioritizes western frameworks for understanding the social and natural world.	Reality extends beyond the physical to include cosmological and spiritual dimensions; reality is understood through observation and through traditional practices and intergenerational transfer.
	Epistemology	The most valuable knowledge is universal, objective, and produced through observation. Written documentation is prioritized over oral traditions.	Incorporates multiple ways of knowing but typically filters them through western scientific validation methods.	Knowledge is rooted in place-based experiences, collective wisdom, and oral transmission. Western knowledge can supplement but does not replace community knowledge.
	Axiology	Research values objectivity, neutrality, and detachment, prioritizing scientific advancements over ethical or cultural considerations.	Aims to integrate ethical concerns and cultural values but often remains constrained by institutional priorities and funding structures.	Research prioritizes relationality, reciprocity, and responsibility to the land. Ethical research follows community priorities and protocols.
2. Division Between the Natural and Social Sciences	**Methodology**	The physical world is knowable through scientific instruments and techniques. Natural sciences are considered more valid (more productive of genuine knowledge) than social sciences.	Recognizes the need for interdisciplinarity, integrating social and natural sciences for a more holistic view, while recognizing the complexities and challenges associated with transcending disciplinary norms.	Community knowledge is prioritized. Western methodologies (natural and social science-based) are valued only as tools that supplement community understandings.

	Climate Change Adaptation Research	Climate change is a biophysical phenomenon governed by natural laws. Adaptation is a response to physical environmental changes.	Adaptation is a social-ecological process shaped by physical changes as well as institutions, power, and culture.	Research collaborations, including with western universities, support adaptation and territorial management, with community priorities guiding the process.
3. Division Between Community and Academic Institutional Spaces	**Decision-Making**	Decision-making power rests with the most senior academic team members and their expertise with natural science tools.	Decision-making considers multiple types of expertise but remains institutionally driven.	Key decisions are made by a community-advisory committee or similar structure, prioritizing local spiritual, cultural, and relational protocols.
	Research Practice	Research follows codified norms and policies developed by western universities and funding agencies.	Institutional norms are prioritized but some flexibility is given to community contexts.	Community norms are central, Institutions must adapt policies to align with community needs and priorities.
	Data Collection and Management	Research data is often extracted from Global South communities with limited local participation in analysis and publication. Ethical guidelines prioritize institutional requirements over community needs.	Encourages participatory research but often struggles to implement the redistribution of research control.	Follows OCAP (Ownership, Control, Access, and Possession) principles to ensure local control over research data.
4. Division Between the Global North and Global South	**Analysis**	Data is analyzed primarily through western academic frameworks. Local interpretations are often excluded from final conclusions.	Seeks to include diverse analytical frameworks but often remains constrained by western academic standards of validity.	Capacity-building ensures local communities can conduct research themselves and interpret findings in alignment with their worldviews.
	Dissemination	Publishing and academic recognition are concentrated in Global North institutions. Research from the Global South is undervalued unless validated through western frameworks.	Encourages co-authorship and interdisciplinary collaborations but remains reliant on Global North academic standards. Struggles with open-access dissemination.	Prioritizes Indigenous and local knowledge for audiences that communities identify as important. Dissemination includes oral traditions, community-centered methods, and locally accessible formats.

In *Research Is Ceremony: Indigenous Research Method*s, Opaskwayak Cree scholar Shawn Wilson (2008) outlines four key elements of knowledge systems. These include assumptions about what reality consists of (ontology) and what knowledge is (epistemology), and also the values that guide the pursuit of knowledge (axiology), which together inform decisions around what methods to use to produce knowledge (methodology). In other words, combinations of different ontologies, epistemologies, methodologies, and axiologies give rise to a plurality of knowledge systems. On one hand, many traditional and Indigenous communities are often characterized by their deep connections with the land and their place-based, intergenerational ways of relating to it. This is in stark contrast to the abstraction characteristic of western academic knowledge systems, which typically privileges detachment and universality (Stein et al., 2024). However, different knowledge systems are often positioned in a hierarchy, where some are more valuable than others (Bala & Gheverghese Joseph, 2007). The dominance of western academic knowledge has been historically reinforced through colonialism, industrialization, and associated enlightenment ideals (Akena, 2012), all of which transformed land from a relation to an object of study and commodification (Mrozowski, 1999). This shift not only reshaped material and political realities but also established a hierarchy of knowledge that positioned Western frameworks as superior while marginalizing local and Indigenous knowledges (Dei, 2000; Tuhiwai Smith, 2012). This epistemic hierarchy is also evident in climate action research, where western scientific frameworks are still dominant (Ng, 2023).

Western epistemologies, as applied to climate action research, typically involve studying the impacts of climate change and developing strategies to respond to its effects, particularly focusing on vulnerable populations and on translating climate information into actions that address climate risks (Alston & Whittenbury, 2013; Meinke et al., 2006; Steg, 2018; Wamsler et al., 2021). Like climate policy, climate action research has historically prioritized mitigation over adaptation, particularly in international climate negotiations, leading to inadequate attention and support for adaptation strategies. This has resulted in a perception of adaptation as a marginal policy option, often treated as a "poor cousin" to mitigation (Ayers & Huq, 2009; Pielke et al., 2007). However, given the accelerating rate in which climate catastrophes are unfolding and the ever-diminishing likelihood of keeping global temperature increases below a threshold that would ensure a stable climate system (Bossy et al., 2024; Silvy et al., 2024), it is no surprise that climate action research increasingly takes into account adaptation alongside mitigation (Currie-Alder et al., 2021; Khojasteh et al., 2024). Climate action research therefore usually combines both a focus on mitigation efforts to "avoid the unimaginable," but also adaptation, recognizing the need to address the unavoidable (Sovacool, 2021), especially given the impact that climate change is already having on marginalized communities.

While climate action research increasingly involves transdisciplinary approaches that extend beyond the academy to include other sectors, including policy actors and industry partners, community perspectives have been largely omitted (David-Chavez & Gavin, 2018). As outlined in Table 1, Community-Directed Adaptation Research (C-DAR) would be grounded in an axiology that prioritizes the perspectives and needs of land-based communities. It would aspire to move beyond western ontological and epistemological

assumptions, engaging instead with what Levis et al. (2024) describe as a cosmopolitical network, which recognizes the interwoven relationships among human and non-human beings and their differing agencies. It would also engage with both natural and social sciences, prioritizing research methodologies that benefit communities directly and on their terms. Testing this orientation would not resolve these rifts, but could open new lines of inquiry into what becomes possible when research is organized around a commitment to deference to community priorities and to relationships that are difficult to perceive through a western lens.

2 - Between the Natural and Social Sciences

This rift concerns the disciplinary divides that shape how knowledge is produced and valued. The following quotes highlight the importance of relationality between humans and the more-than-human world, and of bringing natural and social sciences into dialogue with community priorities. These perspectives point to how C-DAR might experiment with bridging across disciplinary boundaries.

> *In our case, everything in interconnected. Any conversation, any meeting needs to have music and singing, both at the opening and closing. We have to do this, because we are not alone, we are together, together with nature. While nature is being observed, there is also the question of nature itself, which is observing us -- the animals, the birds, they are observing us too. So, everything you see, and even that which you cannot see, it is observing you. Just as we listen to nature, nature is also listening to us.* - Davi Timoteo Martins (Guaraní)

> *Natural science research is pivotal in addressing climate issues, yet it often unfolds in isolation from those with deep, place-based-knowledge—particularly local and Indigenous communities. Developing new theoretical knowledge is critical, but without incorporating the rich historical and experiential insights from these communities, we risk missing key elements that are essential for a comprehensive understanding of environmental changes and repair. Rather than positioning local communities as 'informants,' we are called to recognize them as collaborators with rich epistemologies of their own. Engaging in collaborative inquiry with community members and social science researchers can build valuable knowledge bridges and mutual respect. Together, we can co-develop research processes that respect and honour local knowledge systems, thus enhancing the relevance and impact of our collective efforts in tackling environmental challenges.* - Magali Nehemy (Brazilian Settler in Canada and Early Career Natural Scientist)

> *In interdisciplinary research teams, social scientists are often positioned as 'brokers' between natural science and community perspectives. Given the urgent needs of communities on the frontlines, our task should go beyond listening to communities, to ensure that the research itself is shaped by their priorities, protocols, and ways of knowing.* - Evan Bowness (Canadian-Born Racialized Settler and Early Career Social Scientist)

In academia, few structural differences are as pronounced as the division between natural and social sciences. Most universities have a Faculty of Science, and another separate faculty that houses the social sciences. Natural sciences have a tradition grounded in positivist paradigms, emphasizing empirical observation, experimentation, and universal laws governing the material world. In the natural sciences, there is an understanding that monitoring of environmental conditions is the responsibility of public institutions (e.g., primarily government agencies, but also NGOs), whereas researchers are tasked with the goal of noticing and understanding patterns. Social sciences, on the other hand, engage with human behavior, culture, and society, frequently employing interpretive, critical, and constructivist approaches to understanding how people understand and relate to the world around them.

In traditional climate change research, despite the fact that climate scientists consider societal decision-making in their scenarios, making them, as Wainwright (2010) suggests, "ipso facto, social scientists," (p. 984) a hierarchy persists in which natural science is regarded as the pinnacle of western scientific thought. Social sciences, by contrast, have often been dismissed as 'soft' or lesser sciences (Cole, 1983; Fanelli & Glänzel, 2013). However, this is starting to change, as evidenced by the recent shift towards interdisciplinary and transdisciplinary approaches in the sustainability sciences broadly and climate action research in particular (Bhaskar et al., 2010; Cundill et al., 2019; Schipper et al., 2021; West et al., 2019).

Efforts to transcend disciplinary silos are fraught with complexities, often leading to "scientific imperialism," (Persson et al., 2018, p. 1) where the methods and assumptions of a dominant discipline are imposed onto others. While this interdisciplinary engagement encourages reflection on how social and natural sciences can complement one another in climate action research, it fails to challenge the deeper epistemological division between the natural and social worlds, itself a western construct (Latour, 1993). Even transdisciplinary climate action approaches can reproduce this artificial separation by failing to recognize the relational nature of ecological and social phenomena. We propose that a key goal of C-DAR therefore would be to develop methodological approaches, guided by community knowledge and protocols that do more than simply acknowledge traditional knowledge while slightly modifying existing western methods. Instead, C-DAR should adapt both natural and social science tools in ways that first support communities' self-determined decision-making and deepen their relationship with their territories, and second, aim to advance the body of academic knowledge useful to the participating communities and other communities facing similar socio-ecological challenges. Such efforts would not dissolve the long-standing divide between natural and social sciences, but they could generate new questions about what becomes possible when communities themselves determine which tools, practices, and forms of evidence are most relevant. C-DAR invites inquiry into how different disciplinary tendencies might be revised when oriented by community priorities.

We also acknowledge a further rift, only implicit in our discussion so far: that between human and more-than-human knowledge systems. Indigenous perspectives often affirm that the natural world is full of agency, awareness, and wisdom, yet these are not simply reducible

to human interpretations of nature's voice. While this paper cannot address the issue fully, we see this as an important horizon for future experiments in reparative approaches, including C-DAR, to consider how research might attend more directly to more-than-human relations and knowledges.

3 - Between University and Community Norms

This rift centers on tensions between institutional norms and community priorities. The following statements by Davi Timóteo Martins and Domingos dos Santos Corrêa highlight differences in communication, decision-making, and participation that help shape collaborations. They set the stage for considering how C-DAR could experiment with shifting authority and aligning academic practices with community norms.

> *In collaborations, we must transform this language in a way that the community can understand. So, that's why we also have internal meetings where we talk only to the community, explaining what is happening in our words—what it is, what would happen, what the non-Indigenous people said. At least for us, the Guarani, our culture is more oral, more spoken. For Indigenous people who live only the Indigenous community, who graduated from Indigenous schools, they have a different way of communicating from those in the academy.* **-** Davi Timoteo Martins (Guaraní)

> *We are looking to the future, thinking about how to reforest degraded areas. This is something we can do together (i.e., academia and the community), but it is important that it be a collective decision taken by the community as a whole with inclusive participation.* - Domingos dos Santos Corrêa (Mundurukú)

Academic institutions often prioritize scholarship and theory-building, rewarding researchers for academic outputs such as publications, grants, and citations, whereas community contexts focus on actionable outcomes that address pressing local issues (Nelson et al., 2015). This divergence can create challenges in establishing genuine collaborations, as university-based researchers may require significant time and effort to align their objectives with community priorities (Brown-Luthango, 2013). Additionally, academic institutions tend to emphasize hierarchical structures and formal authority, which can create power imbalances in community-university collaborations (Strier, 2014). Differences in communication styles and resource accessibility further complicate collaboration. Academic researchers often have access to institutional funding, training, and digital tools, while community partners may lack the institutional support necessary to fully participate. In some cases, this disparity can lead to exclusion, particularly when community members require capacity-building in data management and research methodologies to meaningfully engage in academic collaborations (Klein et al., 2011). These differences extend to how benefits are understood and realized in that academic institutions may prioritize knowledge production and scholarly outputs, while communities focus on tangible, context-specific outcomes that address immediate needs. These goals can be at odds with the requirements established in university or funder policies and requirements and the timelines imposed by pre-defined research projects.

A further dimension of this rift involves language. Communities often work within local and Indigenous languages, while academic researchers operate primarily in national or disciplinary languages. Even when translation is attempted, meanings cannot always be made fully interoperable across these contexts. C-DAR must therefore be imagined as an ethos that acknowledges such limits of interpretability, rather than assuming that all knowledge can be seamlessly transferred between linguistic and epistemic systems.

Despite often being organized around an explicit commitment to prioritizing community needs, action research is not exempt from western-centric norms can impede the development of good relationships with marginalized communities. Researchers can impose, consciously or unconsciously, their own cultural biases and prejudices into the work (Levitan, 2019). Bridging this divide therefore requires not only recognizing these disparities but also translating academic knowledge in both natural and social sciences into forms that are meaningful and accessible within community contexts. It also requires learning to recognize diverse types of benefits as legitimate outcomes of academic work and collaboration, and working against maintaining a false sense of division, or a false sense of harmony, between the community and the researchers. It also requires establishing structures within the community through which research direction can be provided to the academic-based members of transdisciplinary research teams.

While transdisciplinary approaches to climate action research represent a step toward more inclusive, cross-sectoral collaboration, they often remain institutionally driven, with decision-making still centered within universities, research institutions, and funding agencies. These approaches acknowledge the value of multiple forms of expertise—including social and natural sciences, and local and Indigenous knowledge—but tend to integrate them within existing western frameworks rather than fundamentally reshaping how research is governed and practiced. As a result, community voices may be included without having actual decision-making power, leaving key research priorities and methodologies ultimately defined by university-based researchers.

In contrast, C-DAR would expand beyond transdisciplinary approaches by shifting power over decision-making to the community itself. Rather than simply incorporating diverse perspectives into institutionally led research, C-DAR would be guided by a community-advisory committee or equivalent governance structure, with decision-making processes grounded in local spiritual, cultural, and relational protocols. For instance, a C-DAR orientation might combine hydrological monitoring with oral histories of drought, placing equal weight on both forms of knowledge. This approach not only elevates historically marginalized knowledge systems but also challenges the hierarchical structures that typically govern research collaborations, making community priorities, not academic institutional requirements, the foundation of adaptation research. C-DAR would place community norms at the center, inviting researchers, especially more established scholars who are later in their career, to challenge academic institutions to adapt their policies and methodologies to align with community needs, rather than the other way around.

4 - Between the Global South and North

This rift addresses structural inequities in knowledge production across geopolitical contexts. The reflections from Mateus Tremembé and Domingos dos Santos Corrêa point to the disproportionate role of Global North institutions in driving crises, but also to the importance of maintaining strong alliances. They frame the challenge of envisioning C-DAR as a reparative practice across "Norths" and "Souths."

> *Climate change and planetary destruction have been accelerated, in large part, by technologies developed in universities. Universities in the Global North, in particular, should acknowledge their responsibility, as it is primarily these institutions—and the societies they serve—that have benefited from the very "developments" driving the crises in the first place.* - Mateus Tremembé

> *It is important to maintain connections and alliances with universities, both locally and internationally, to ensure that projects aimed at revitalizing and protecting the territory are successful. We need strong partnerships.* **-** Domingos dos Santos Corrêa (Mundurukú)

The metabolic rift in world-historical terms also shows that resources and energy have been extracted from some regions for the enrichment of others., At the global scale, this has been variously described as a division between 'Developed and Developing Nations,' the 'Core and Periphery,' or, the terminology we opt for, the 'Global North and the Global South.' To move beyond the simplistic binary implied in these terms, the concepts of the 'North of the South' and the 'South of the North' have been introduced by the Gesturing Towards Decolonial Futures (GTDF, n.d.) collective as a way provide some nuance to understandings of power within and across the geopolitical inequities. While there is a general division in the global hierarchy whereby the colonial powers of the Global North on average maintain relative wealth over the former colonies of the Global South, there are also inequities within these regions. The 'North of the South' refers to privileged, affluent, and sometimes elite groups within the Global South. Their lifestyles, governance models, and economic priorities often align with those of the Global North, further marginalizing vulnerable populations in their own regions. Conversely, the 'South of the North' describes marginalized, disenfranchised, or oppressed groups within the Global North. These groups, which include Indigenous communities, racialized communities, migrants, and the working poor, experience systemic exclusion and exploitation, akin to the challenges faced by many communities in the Global South. This also suggests that there is a global elite (the 'North of the North') and those living in absolute poverty could be described as the 'South of the South.' C-DAR therefore would aim to be an approach to "reparative research" across these divides (Stein & Bowness, 2025), using the resources in the "Norths" as a form of reparations to the "Souths."

While transdisciplinary research seeks to integrate diverse knowledge systems and disciplines to address climate and sustainability challenges, it often faces structural limitations, particularly within institutions predominantly located in the Global North (Lawrence et al., 2022). Furthermore, transdisciplinary collaborations across the North-South divide are shaped by power dynamics, including conflicting interests, unequal

institutional participation, and the perception of transdisciplinarity as 'extra work' (Schmidt & Pröpper, 2017). These factors collectively hinder equitable relationships in the 'North of the South' where local academic "elites" in the global south benefit from transnational partnerships while marginalized communities remain excluded, as well as in the 'South of the North,' as climate research remains primarily focused on either developing nations or elite policy spaces, often neglecting the struggles of Indigenous and racialized communities within the Global North.

To overcome these challenges and support large-scale adaptation research collaborations, institutional reforms are needed to address power asymmetries and promote inclusive participation. Such reforms can help mitigate the structural biases inherent in Global North-dominated research contexts, ensuring that transdisciplinary research moves beyond tokenistic inclusion toward genuinely equitable knowledge production (Cundill et al., 2019). Unlike traditional transdisciplinary research, which still funnels power and recognition toward Global North institutions, C-DAR would redistribute power and resources to the "souths" within and across geopolitical contexts. While this could take many different forms, at minimum it would mean that communities set the terms for what kinds of data are collected, while researchers contribute technical skills only when invited. Further, we can imagine redistribution taking the form of directing research funds to support local monitoring or governance capacities before academic outputs are prioritized. This would mean communities set the terms of what research activities are useful. In other words, C-DAR would operate on the principle that research must be led by those most affected by climate change, prioritizing community advisory committees and Indigenous governance structures over university-led research teams. This approach de-centers academic authority and challenges the epistemic hierarchies that privilege global north scientific knowledge over place-based expertise. Instead of limiting engagement to "consulting" with Global South researchers and communities, C-DAR would shift the institutional burden, requiring universities in the Global North and funding agencies to align with community priorities rather than the other way around. Furthermore, one key aspect in which C-DAR envisions climate action research as a tool for repairing, rather than reinforcing, historical and ongoing injustices is that resources in C-DAR projects are set aside for capacity-building and data sovereignty, ensuring that research produces direct, tangible benefits for communities rather than just academic outputs.

CONCLUDING THOUGHTS: C-DAR AS "SE DAR"

The three collaborations described earlier do not stand as examples of a fully developed C-DAR methodology in practice. Instead, they have served as provisional spaces through which we can imagine how C-DAR might address the four rifts together. They show, first, that western scientific methods can only be engaged productively when they are invited to supplement, rather than replace, Indigenous and local knowledge systems. They also highlight the difficulty of working across natural and social sciences in ways that refuse disciplinary hierarchies and instead prioritize relational understandings of climate and territory. At the same time, these collaborations underscore the tensions between university timelines, funding structures, and academic recognition on the one hand, and community norms, languages, and priorities on the other. Finally, they draw attention to the persistent

asymmetries between Global North and Global South institutions, which continue to shape access to resources, data, and recognition. While none of these collaborations yet represent C-DAR in practice, taken together they demonstrate how the rifts manifest in lived relationships and how a C-DAR ethos might open space for experimenting with new, reparative forms of research.

In Brazilian Portuguese, C-DAR can be pronounced in the same way as the phrase 'se dar,' a reflexive verb construction with multiple meanings that vary depending on the context. One common usage is to express the idea of getting along with someone, as in 'eles *se dão* muito bem,' meaning 'they get along very well.' Se dar can also describe complete dedication, to give yourself to something, as in 'ela *se dá* completamente ao trabalho,' which translates to 'she dedicates herself completely to her work.' While the approach to adaptation research that we are pursuing in this paper are aligned with several of the various meanings of 'se dar,' we want to conclude by noting the relevance of the meaning of 'se dar' that implies surrendering oneself, because to fully engage in Community-Directed Adaptation Research (C-DAR), we argue that researchers, especially those based in western institutions, must fundamentally rethink their role in knowledge production. This would require both *giving up* certain assumptions and forms of control and *giving themselves to* ('se dar'; or C-DAR) a different way of working.

First and foremost, researchers must relinquish control—over the research questions, the direction of inquiry, and even the certainty that they know what is important. The traditional academic model assumes that researchers define what is important before engaging with communities. C-DAR challenges this, asking researchers to step back and listen first, recognizing that the most urgent and meaningful questions may emerge from the land and the people who have lived with it for generations. Conventional research structures rely on rigid methodologies and predefined outcomes. However, community-driven research does not fit neatly into these constraints. C-DAR therefore would require flexibility, allowing knowledge to unfold organically rather than forcing it into predefined frameworks. Additionally, as researchers we must develop openness to the unknown, resisting the urge to categorize, codify, or immediately translate knowledge into western scientific terms. We can learn to be open to ways of knowing that, despite not fitting within, or at times conflicting with, conventional academic paradigms, are deeply meaningful to the communities who hold them.

Climate action researchers can therefore give themselves over to a way of working that is guided by the land, by relationships with land-based communities, and by new relationships with time. Among the most profound forms of knowledge about environmental change, adaptation, and sustainability does not come from distant academic institutions but from the lived experiences of those who listen to the land every day. Research must be directed through these communities, centering their voices and experiences rather than treating them as subjects of study. Furthermore, the dominant research model, with its short funding cycles and rigid timelines, does not allow for the slow, patient work of building relationships based in trust, reciprocity, accountability and consent (Whyte, 2020) with communities. C-DAR, if possible in how we are envisioning it here, cannot be rushed. It would require long-

term commitments that extend beyond the duration of a single project or grant. Without this investment in time, research risks becoming extractive, reinforcing the very divides it seeks to bridge. True collaboration means researchers must be accountable to the communities they work with—not just in terms of ethical guidelines but in the ongoing obligations that come with building relationships (Reid et al., 2024). Consent is not a one-time checkbox but a continuous process of mutual agreement, where communities hold real power over how knowledge is produced, used, and shared.

We recognize that academic researchers cannot simply "give themselves" over to community priorities, since they also carry obligations to western institutions and knowledge traditions that remain distinct and sometimes at odds with community ways of knowing. In this sense, the spirit of *se dar* is not about total surrender, but about experimenting with deference in what Ermine (2017) calls an "ethical space" or what Bhabha (1994) has termed a "third space." Here, difference is not erased but negotiated, and C-DAR becomes an invitation to ask what emerges when researchers defer to community and non-western priorities, even when these cannot be fully reconciled with western academic logics. This deference is not only an ethical orientation but also a domain of inquiry in its own right. Ultimately, we have presented C-DAR as an invitation to commit to doing climate action research in ways that are relational, community-led, and emergent rather than predefined, as an aspirational call for experiments in reparative approaches to research. It is also a challenge for researchers to give up control, certainty, and speed in favour of trust, humility, and patience. In a world where research has increased layers of separation—between disciplines, between academia and communities, between the Global North and South—C-DAR offers a path toward reconnection through a process that is led by the land and the people who know it best.

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BIOGRAPHICAL NOTE:

Evan Bowness is an Assistant Professor and Canada Research Chair in Sustainability and Equity at Western University's Department of Geography and Environment. Bowness's research group, the Towards Equitable Sustainability Transitions ("TEST") Lab conducts community-directed research using critical environmental social science and visual methods. Bowness is a racialized settler and early-career scholar who has been working with land-based communities in Brazil since 2018.

Magali Nehemy is a Brazilian Assistant Professor at the University of British Columbia, Okanagan, and principal investigator of the Hillslope Ecohydrology Research ("HER") Lab. HER Lab conducts research that combines water isotope tracing techniques with hydrometric monitoring of water fluxes (e.g., sap flow—tree transpiration, streamflow, groundwater recharge) and storage (e.g., in plants, soil, and groundwater) and plant ecophysiology to understand the ecosystem's hydrological connectivity and drought vulnerability. Nehemy is a racialized immigrant in Canada who has been working in different ecosystems, including the Tapajós Forest, in Amazônia, since 2021.

Mateus Tremembé is an Indigenous leader of the Tremembé da Barra do Mundaú community, located in Itapipoca, Ceará, in northeast Brazil. He is an artist, agroecological farmer, popular educator, and researcher of traditional food culture. Tremembé is a

knowledge keeper of the sacred Torém ritual and organizer of traditional events, such as the Festival of Iemanjá, the Murici and Batiputá Festival, the Farinhada Festival, and the Traditional Food Ritual. He is a founding member of the Indigenous Agroecology Working Group within the National Agroecology Articulation (ANA), and In his role as Project Coordinator for ADELCO (the Association for Co-produced Local Development), he has coordinated several community projects, including the Just Transitions in Food Systems Network, the Tremembé Earth Schools, and the Tremembé Climate Project. He speaks internationally on traditional food systems and climate justice, and was the keynote speaker at the 2025 Living Breath of wəɬəbʔaltxʷ Indigenous Foods Symposium in Seattle, Washington (USA).

Davi Timóteo Martins, also known by his Indigenous name Werá (meaning guardian of lightning) is Guaraní, born in the Chapecó Indigenous Land and now residing in the Guaraní village of Itanhaém, on the coast of Santa Catarina, Brazil. Davi has been an educator for 19 years, focusing on Indigenous school education. He has worked in a Guaraní school for more than 13 years, developing culturally-specific approaches to Indigenous education. In 2017, Davi became a member of the Indigenous School Education Forum and co-founded the Guaraní School Education Forum in 2018. He played a crucial role in launching the Indigenous Educators' Forum for the southern region in 2023, which brings together Kaingang, Xokleng, Xetá, and Charrua peoples. He advocates for community-oriented, bilingual, culturally relevant educational systems for Indigenous schools across Brazil, and has worked with the Centre for the Promotion and Study of Group Agriculture in developing agroecology within his territory since 2018. Davi welcomed Tremembé and Bowness to his community on several occasions since 2023 to collaborate in supporting the community's territorial management and resurgence of traditional land relations.