Improving a framework for evaluating participatory science

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In the spirit of reconciliation, we acknowledge the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

ABSTRACT

This paper proposes improvements to an open framework for evaluating participatory science, including projects framed as citizen science. An original proposed framework, while valuable in its comprehensiveness, used problematic language that makes it unworkable in many international contexts. In countries like Australia where Indigenous data sovereignty (IDS) matters profoundly, language about "target groups" and "easing access" to knowledge can harmfully perpetuate colonial discourses. The original proposed framework is sufficiently useful that it is worth constructively revising, so critique in this paper is aimed towards collaborative progression of an open framework more suitable for international use. As well as replacing "target groups" with partnership approaches, we argue that "easing access" to knowledge for exploitation is a frame perpetuating the colonial doctrine of discovery, proposing recovery as an alternative aligned with several international movements for social justice and sustainability.

KEYWORDS: PARTICIPATORY, SCIENCE, EVALUATION, CITIZEN SCIENCE, INDIGENOUS DATA SOVEREIGNTY, DECOLONIZATION

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1. INTRODUCTION

This paper aims to improve a proposed framework for evaluating participatory science, framed specifically as citizen science. While valuable in its comprehensiveness, in some sections the proposed framework (Kieslinger et al. 2018) used problematic language that, in its current form, makes it unworkable in many international contexts. For many populations, the language of "target groups" shown in Table 1, as well as "easing access" to knowledge and "cooperation for exploitation" detailed later is problematic. This paper positions critique and constructive suggested changes from Indigenous and non-Indigenous perspectives in the land now known as Australia, drawing on international research and practice relevant to participatory science overlooked in the original framework. In countries like Australia, where Indigenous data sovereignty (IDS) matters profoundly (Cram 2018; Kukatai & Taylor 2016; Lovett et al. 2020), language about target groups and "easing access" to knowledge can continue the perpetration of harmful colonial discourses. The framework is sufficiently useful that it is worth constructively revising, so critique in this paper is aimed towards collaborative progression of a framework that might become suitable for broader international use. As well as replacing 'target groups' with partnership or Indigenous-led approaches (Cram 2018; Janke 2021), we argue that "easing access" to knowledge for exploitation is a frame perpetuating the colonial doctrine of discovery (Miller et al. 2010), proposing recovery (Laenui 2000; Smith 2012; Walker et al. 2013) as an alternative.

Table 1. Original citizen science evaluation framework

(from Kieslinger et al. 2018)

Dimension	Process and feasibility	Outcome and impact
Scientific	+ Scientific objectives + Data and systems + Evaluation and adaptation + Collaboration and synergies	+ Scientific knowledge and publications + New research fields and structures + New knowledge resources
Participant	+ Target group alignment + Degree of involvement + Facilitation and communication	+ Knowledge and science literacy + Behaviour and ownership + Motivation and engagement
Socio-ecological and economic	+ Target group alignment + Active involvement + Collaboration and synergies	+ Societal impact + Ecological impact + Wider innovation potential

Participatory science typically involves citizen science and sustainability science elements, intersecting environmental and human health issues. It often falls short of transformative potential by avoiding confrontation about "the production of environmental injustice and political exclusion, including the knowledge hierarchies that shape how the environment is understood and acted upon, by whom, and for what ends" (Burke and Heynen 2014, p. 7). Inequalities are produced by valuing some natures, knowledges, and peoples, while others are devalued. In proposing a global framework for evaluation for citizen science without incorporating relevant principles of international law, such as free, prior and informed consent of Indigenous peoples specifically, as agreed internationally in the United Nations Declaration on the Rights of Indigenous People (UNDRIP 2007), such evaluation frameworks risk continuing to perpetrate colonial harms.

These concerns and suggestions to improve the framework must be promptly communicated, as the framework is gathering momentum and being used as a basis for other work. For example, the framework is included in a subsequent book chapter about citizen science evaluation (Schaefer et al. 2021). The subsequent chapter highlighted the question: "What are current practices, and what are we lacking?" We argue that current practices reflected in these works lack language showing respect for many local populations, including Indigenous people and their sovereignty, in data and science contexts. It is essential to address problematic language matters for citizen science and, more broadly, for initiatives supporting sustainable development goals (Shepard et al. 2018). "The ways in which scientific research is implicated in the worst excesses of colonialism remains a powerful remembered history for many of the world's colonized peoples" (Smith 2012, p. 1). Therefore, this is not an issue for citizen science alone, but it is an issue for it, entangled as it is with research. Research specifically about citizen science argues it risks perpetuating neo-colonialism through limiting acceptance of different forms of knowledge (Kinura & Kinchy 2016).

Other researchers have argued against efforts to standardize criteria in citizen science, cautioning that any exclusionary approach will fail to accommodate considerable heterogeneity (Auerbach et al. 2019). They emphasize informed consent about project design and data use transparency as indicators for data quality; this emphasis on informed consent is valuable in introducing our changes to the proposed open framework. However, we argue that it is unrealistic to reject the concept of criteria outright, as funders, as well as researchers and evaluators, will continue to seek criteria against which to assess a project, as will policymakers in assessing the quality of data for evidence (Hecker et al. 2019; Oliver et al. 2021). Thus, we are constructively proposing changes to the framework rather than critiquing it as unworkable.

In recent decades Indigenous scholars have attempted to represent Indigenous perspectives in Western scientific traditions (Rigney 2001). This means that Indigenous scholars can articulate Western scientific traditions and Indigenous standpoints (Foley 2003), bringing more lenses to issues that isolated Western approaches have failed to address. This brings a positionality lacking in the original framework we seek to improve. Language in the framework reflects naïve positivist traditions (Coburn et al. 2013; Smith 1999), which persist in making Indigenous scholars position their work differently to that of Western scientists (Foley 2003), even if they are experts in the latter as well (Rigney 2001). Scholars have expressed concern that citizen science is being co-opted by corporate interests in ways incompatible with sustainability, for example, to "assuage customers' guilt about vacationing in an ecologically fragile place" (Blacker et al. 2021, p. 5). Similarly, we express concern

that citizen science is likewise being co-opted to assuage settlers' guilt about being and collecting data on First Nations lands through the frame of helping science.

To successfully engage with Indigenous people, we suggest that the framework needs to include a decolonizing approach. The original framework excludes extensive decolonizing research theory and Indigenous methodology, developed for research to be conducted in culturally safe ways to benefit Indigenous people. Decolonizing research is not a new concept, whether working with Indigenous people in Australia or globally. Decolonizing methodologies developed last century (Laenui 2000; Smith 1999) challenge Western approaches to research grounded in positivism. Culturally responsive methods (Bowman et al. 2015; Hood et al. 2015) for evaluation have gathered momentum; this paper focuses explicitly on those partnering with or led by Indigenous people. Indigenous evaluation frameworks and lessons relevant to participatory science have been situated in several continents (Cram 2018; Kawakami et al. 2008; LaFrance & Nichols 2008; Waapalaneexkweew 2018). While this paper focuses on Indigenous research and practice relevant to the framework, further marginalized populations such as migrants, refugees and/or gender diverse populations may have related or unique considerations that the existing framework overlooks or ignores. We intentionally do not define this paper as Indigenous-focused, to emphasise that these considerations are relevant to any evaluation framework claiming to be internationally applicable. This is not a niche area; it is relevant to everyone seeking to design or evaluate participatory science initiatives claiming global relevance.

Before the proposed open evaluation framework was published, researchers argued: "a robust framework for the analysis of citizen science would not only address the ways scientific data is collected and put to a particular use, but also situate the project in relation to broader structural forces of scientization, neo-colonialism, globalization, and neo-liberalization" (Kinura & Kinchy 2016, p. 331). We argue that the original proposed open framework is not robust, as it is not situated within these broader structural forces. We aim to do some of that work here. Specifically, we are focused on changing the framework for compatibility with IDS. IDS has been defined as Indigenous peoples' "right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as their right to maintain, control, protect and develop their intellectual property over these" (Kukatai & Taylor 2016, p. xxii). Indigenous people speak of how Western traditions of science have contributed to processes of colonisation, as well as science's alignment to policies and priorities of the nation/state (Kawakami et al. 2008; Rigney 2001). A proposed global evaluation framework that is not situated within these broader structural forces, risks perpetuating traditions of Western science linked to possessive logic (Moreton-Robertson

2007), or inappropriate displays of knowledge devoid from context or reframed in pejorative contexts.

While highlighting partnership approaches as an option for non-Indigenous evaluators to work with the published framework, to truly incorporate IDS and decolonizing methodologies, we emphasize Indigenous-led frameworks (Cram 2018; Bond, Foley & Askew 2016; Kawakami et al., 2008). Indigenous-led data frameworks have been proposed since the mid-1980s (Davis 2016) and continue to be discussed and reframed in the context of big data and open data (Walters et al. 2020). As well as perspectives focused on data use, Indigenous methodologies for the generation of data are documented (Fredericks et al. 2011; Moreton-Robinson & Walter 2009; Smith 1999). While some non-Indigenous evaluators may see partnership or genuine co-design processes as an unrealistic goal, this reflects on how far those with such perspective are embedded in established colonial constructs, indicating they are the type of "target audience" needing to change understandings, speaking back to problematic language in the original framework. Indigenous-led research agendas can become communicative actions (West et al. 2012), transforming broader research and evaluation, such as this work. Problematic language is unlikely the result of intentional framing, but rather the limited diversity of the authors of the proposed framework. This paper presents an alternative perspective framed within this continent's colonial history, now known as Australia. For the open evaluation framework to be more useful, perspectives on its applicability in other cultural contexts would be valuable. These cultural contexts must not be considered localisation of European norms, but European researchers work to normalise more diverse perspectives within their practices (Martin & Mirraboopa 2003; Walker et al. 2013). As co-authors partnering to produce this article, we present an Indigenous and non-Indigenous perspective, both from the continent now known as Australia. Finlay is an Indigenous person of the Yorta Yorta nation in the lands now known as Australia. Finlay has spent her career working in Indigenous public health, primarily with Indigenous organisations, at a local, state, national and global level. The focus of her work has been health service delivery, health promotion, communications and evaluation. Her PhD sought to understand the impact of the Australian federal governments introduced and managed national key performance indicators for Aboriginal Community Controlled Health Organisations. She currently is leading a National Health and Medical Research Council funded project seeking to improving the commissioning of Indigenous health and wellbeing evaluations. Calyx is a non-Indigenous person born and raised on Kaurna country (Amery & Williams 2002) who has returned to raise children, learning Kaurna language together (Amery & Buckskin 2012). She has European and Mauritian Creole (Boswell 2014) heritage,

with experience working on European research and innovation projects, as well as working with Indigenous communities in the Asia Pacific region. During her time on the Management Committee of the Australian Citizen Science Association, she advocated for greater awareness and inclusion of IDS in several research and practice initiatives, which indicated the need for this research.

2. EXISTING FRAMEWORKS OF RELEVANCE TO PARTICIPATORY SCIENCE EVALUATION

Myriad frameworks could be drawn on to improve the open framework for citizen science evaluation; our suggestions here are not exhaustive. Given the focus of this paper, these concern Indigenous rights related to participatory science and data governance based on the United Nations Declaration on Indigenous People (UNDRIP) (2007). We have highlighted several Articles of the UNDRIP which are relevant to evaluation and citizen science, for the purposes of sharing examples. For each of the highlighted articles we have provided a fictional example of relevance to evaluating participatory science. We have deliberately used fictitious examples of potential participatory science implications, rather than highlighting existing projects, to emphasize the possibilities with IDS. We also note that these examples may be insufficient or different to what an Indigenous community may decide; they are not prescriptive but rather indicative to support readers' thinking about how these articles may apply in practice.

Table 2. Elements of UNDRIP (2007) relevant to the framework

UNDRIP article	Potential participatory science implications
Article 3 Indigenous peoples have the right of self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development.	An Indigenous community funds an evaluation in which researchers codesign an application to help map the range of a culturally significant species.

Article 4
Indigenous peoples, in exercising their right to self-determination, have the right to autonomy or self-government in matters relating to their internal and local affairs, as well as ways and means for financing their autonomous functions.

An Indigenous community establishes a research institute to progress their own research priorities to inform service delivery to their people.

Article 8.1
Indigenous peoples and individuals have the right not to be subjected to forced assimilation or destruction of their culture.

An Indigenous person opts out of their data being used for machine learning while permitting its use for another defined research purpose in a participatory science project.

Article 11
1 Indigenous peoples have the right to practice and revitalize their cultural traditions and customs. This includes the right to maintain, protect and develop the past, present and future manifestations of their cultures, such as archaeological and historical sites, artefacts, designs, ceremonies, technologies and visual and performing arts and literature.
2 States shall provide redress through effective mechanisms, which may include restitution, developed in conjunction with indigenous peoples, with respect to their cultural, intellectual, religious and spiritual property taken without their free, prior and informed consent or in violation of their laws, traditions and customs.

An Indigenous community declines permission for people to photograph a significant site and works with researchers to identify and return documentation of the site already taken.

Article 23
Indigenous peoples have the right to determine and develop priorities and strategies for exercising their right to development. In particular, Indigenous peoples have the right to be actively involved in developing and determining health, housing and other economic and social programmes affecting them and, as far as possible, to administer such programmes through their own institutions.

Indigenous people decide on their priorities for research based on community needs and invite researchers to respond to an expression of interest to collaborate in designing research addressing these needs.

Article 31.1
Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.
2. In conjunction with indigenous peoples, States shall take effective measures to recognize and protect the exercise of these rights.

A citizen science application wants to include a local Indigenous language in showing names for species; developers seek permission from those who speak the language, who take an amount of time undetermined by the science project to decide, through their customary processes, whether to grant permission for use of the language in the application. The language holders decide that before the citizen science application may use the language, there must be changes to the ownership structure of the application and where the data is stored.

Another well-established framework of relevance to evaluating participatory science are the CARE principles of Indigenous data governance. This summary presented in Table 3, by Walter et al. (2020), adapted from the Research Data Alliance International Indigenous Data Sovereignty Interest Group.

Table 3. CARE principles of Indigenous data governance

(summarised in Walter et al. 2020*)

CARE principle	
C = Collective Benefit:	C1: Inclusive Development and Innovation
	C2: Improved Governance and Citizen Engagement
	C3: Equitable Outcomes
A = Authority to Control	A1: Recognising Indigenous Rights and Interests
	A2: Data for Governance
	A3: Governance of Data
R = Responsibility	R1: For Positive Relationships
	R2: For Expanding Capability and Capacity
	R3: For Indigenous Worldviews
E = Ethics	E1: For Minimising Harm/Maximising Benefit
	E2: For Justice
	E3: For Future use

These CARE principles are typically linked with the FAIR scientific data principles (findable, accessible, interoperable, reusable) to form the phrase 'be FAIR and CARE'. There is diversity in perspectives between these priorities and those of the original framework. Collective benefit may be contrasted with prioritising scientific objectives, related to ethics and values. Authority to control – Indigenous authority to control – is in tension with 'target group alignment'. Responsibility – for positive relationships, expanding capability and capacity, and Indigenous worldviews are relationally different to 'collaboration and synergies'. Ethics within IDS highlights minimising harm and maximising benefit to communities for justice and future use, rather than situating ethics within any given university committee, or promoting scientific objectives as neutral.

3. PROBLEMATIC FRAMINGS AND LANGUAGE

Three divisions by which the original criteria were sorted risk perpetuating systemic knowledge generation and use problems, particularly given northern colonial histories of knowledge appropriation (Miller et al. 2010). The three dimensions for evaluation were delineated as (i) scientific impact, (ii) learning and empowerment of participants and (iii) impact for wider society; the latter labelled as "socio-ecological and economic" in Table 1. Given that any attempt to delineate areas of impact from each other can be easily critiqued, this problem alone may not have warranted a response, depending on how these dimensions were then further compartmentalised for evaluation. For example, references to joint knowledge creation and data ownership and access rights within the science dimension were promising. However, the final criteria within the science dimension make it unworkable. For the final criteria, "new knowledge", a guiding question is offered: Does the project ease access to traditional and local knowledge resources? (Kieslinger et al. 2018, p. 90.)

The framing of "easing access" to traditional and local knowledge resources suggests an ignorance of the IDS movement (Lovett et al. 2020), as does failure to demonstrate awareness of the many academic contributions Indigenous people have made about data management in recent years (Carroll et al. 2020; Lovett et al. 2019; Nakata 2002), including in response to the open science movement (Hudson et al. 2020). A question unaddressed in the initially proposed framework is: easing access for whom? Indigenous scholars have criticised the possessive logic (Moreton-Robertson 2007) of understanding from its meaning-making contextual relations, reabsorbed into commodity form as "intellectual property" (Coburn et al. 2013; Miller et al. 2010; Simpson 2001). Rich meanings of relational and situational knowledge are inherently not easily accessed, as relationships take time and context may be inalienable from land. This has been acknowledged by researchers of citizen science who used an example of the limitations of geographical information systems (GIS) in representing connections between species and across time (Kinura & Kinchy 2016).

In the third dimension of the framework, problematic language re-emerges. In the socio-ecological and economic dimension, the final criteria "economic potential, market opportunities" was with the supporting question: "does the project foster cooperation for exploitation (e.g. with social entrepreneurs)?" The added detail of an example for this criterion, unlike many others, suggests this may have been a controversial criterion, or one for which the authors anticipated misunderstanding. We note the possibility of Indigenous social entrepreneurship being represented in this example but

emphasise the importance of *self-determined* enterprise activities (Tedmanson & Guerin 2011; Pearson & Helms 2013), which is not congruent with the 'cooperation for exploitation' frame.

"Target groups" are repeatedly discussed in describing various criteria across the dimensions, but without any evident consideration of the different rights of stakeholder groups, such as Indigenous peoples' rights to free, prior and informed consent to developments using their lands or knowledge (Janke 2019; Mahanty & McDermott 2013; UNDRIP 2007). A criterion on the participant's dimension asks, "does the project have an involvement plan that considers specifics of different target groups?" (Kieslinger et al. 2018, p. 90). Some may argue that Indigenous peoples' rights could be represented in this criterion. However, framing as a question for consideration within a separate dimension to scientific or socioeconomic impacts, risks perpetuating false narratives about science, modern societies, and their relationships to first societies (Aikenhead & Ogawa 2007; Miller et al. 2010). This criterion, evidenced through the example of this problematic sub-question, does not align with the IDS principles. Indigenous scholars function within these structures, not by choice (Rigney 2001). The concept of self-determination is key to understanding why elements of the original framework are problematic.

If a plan does incorporate specific Indigenous groups without actively engaging with the specific groups, it may perpetuate the naming and claiming of Indigenous peoples (Coburn et al. 2013; Smith 2012). It may perpetuate the creation of 'authenticating experts' (Hemming & Rigney 2010) speaking on behalf of Indigenous people rather than decentring non-Indigenous people, so Indigenous researchers and knowledge holders are valued firsthand. The original framework and its references to 'target groups' reflects issues articulated in research related to 'southern epistemologies' (Santos 2012); interconnectivity of southern and northern thinking recognised by southern scholars, often neglected by northern scholars. Considering how scientific development helped construct 'race' and the 'other' for inquiry has been related to Indigenous participation in science (Rigney 2001). "The European desire to know its others, its projection of itself onto the rest of the world, is fundamentally reliant on the belief that only Europe is theoretically knowable" (Johnson 2002, p. 33). This perception of Europe as one knowable entity is as limited as perceptions of Indigenous knowledges as static; they may be creative, contested, gendered, changing and contextual (Hemming & Rigney 2010). This cannot be represented in knowledge extracted from a 'target group'. Limited context around possessed data risks perpetuating damaging stereotypes. "Historically, scientific inquiry has engineered an overwhelming collection of so-called 'facts' and 'half-truths' about

Indigenous peoples that has contributed to hegemonic colonial construction of Indigenous identities" (Rigney 2001, p. 3).

As we argue below, a project's "involvement plan" should be, at the very least, codesign or coproduction (Oliver et al. 2021) and ideally led by Indigenous people in line with IDS principles. Any plan in which Indigenous engagement begins after a project is already designed fails to meet principles of free, prior and informed consent (Janke 2021; UNDRIP 2007). The original framework's authors (Kieslinger et al. 2018) highlighted that evaluation should "embrace the diversity and emerging nature of citizen science" - this framing presents diversity as features of different citizen science projects rather than participants. They argued that the open evaluation framework "can be adapted and tailored to the specific goals of citizen science programmes", which again speaks to the project goals rather than those of participating communities. We propose an alternative language for future iterations of the framework; however, as we discuss, these go beyond language to impact processes.

4. PROPOSED CHANGES TO THE FRAMEWORK

The framework implies by using the language "target groups" that populations, such as Indigenous people, may be incapable of leading citizen science, thus perpetuating the idea that Western perspectives are superior. Article 3 of the UNDRIP (2007) states that Indigenous people have the right to self-determination to "freely pursue their economic, social and cultural development". From a participatory science perspective, self-determination means Indigenous people should have the freedom to pursue their own agendas in line with IDS principles. This may require support, such as resourcing, from non-Indigenous people, organisations or governments; however, this support should not hinder Indigenous peoples' rights to self-determination.

Partnerships with non-Indigenous people are appropriate when Indigenous people identify the need. Therefore replacing "target groups" with "prospective partners" may represent appropriate power-sharing. Any partnership, however, is required to take into account international obligations (UNDRIP 2007). Without this, evaluation is likely to overlook unintended consequences (Oliver et al. 2020). This involves cultural humility (Rigney 1999; Tervalon & Murray-García 1998) and reframing roles as the decider of targets: "...giving up the claim to epistemological mastery does not reduce evaluators' ethical responsibility, but if anything makes it more demanding..." (Schwandt 2018, cited in Oliver et al. 2020, p. 72). Ethical responsibility evaluating in the present relates to historical injustices. We

propose replacing 'target groups' with partnerships, building upon "seven Rs of arguments for collaborative practice: reflexivity, relationality, responsibility, recognition, representation, reciprocity, and rights", which have been articulated earlier in this journal (Chouinard & Cousins 2021, p. 1).

European authors proposing an evaluation framework with a final criterion advocating "cooperation for exploitation" reflects an ignorance of global realities we have raised in this paper (Martin & Mirraboopa 2003; Miller et al. 2010). To be constructive rather than critical, we suggest that this be reframed as "does the project foster cooperation for recovery?" This framing reflects scholarship about Indigenous and decolonizing research (Laenui 2000; Smith 2012; Walker et al. 2013), with outcomes for those from whom knowledge has previously been taken (Williams 2002; Wilson 2004; Wilson & Cavender 2005). It helps deconstruct assumptions about Indigenous knowledge as primitive in contrast to modern knowledge and innovation (Coburn et al. 2013; Miller et al. 2010; Moreton-Robinson 2014; Nakata 2002). It also better aligns the framework with disaster response and recovery paradigms (Calyx 2020; Horney et al. 2016; McCormick 2012), increasingly relevant as we respond to climate change and seek to reclaim (Amery & Williams 2002) and recover rather than exploit anew. We deliberately avoid the term 'recycle' given that work with this label has been contrasted with collaborative ethnographies (Hemming & Rigney 2010) in this space. Why recovery is a more inclusive frame is most famously represented in contrasting Western and Indigenous theory, in which a fourth step of 'assimilation' into Western systems is contrasted with 'recovery' (Smith 2012, p. 91). It also features as an early step of decolonisation frameworks (Laenui 2000; Walker et al. 2013). Whereas 'cooperation for exploitation', the language used in the original evaluation framework, may lead to assimilation of knowledge into Western systems, 'cooperation for recovery' may lead to the respect of knowledge in Indigenous systems.

In advocating for recovery as a frame for talking about knowledge, we highlight the importance, at least in the Australian context, of limiting language about protection. In Australia, histories of protectionism followed by assimilation (Hemming & Rigney 2010; Moreton-Robertson 2002) repressed the rights of Indigenous people, reflecting in experiences around the world leading to modern international obligations (UNDRIP 2007). Owners of traditional knowledge and associated resources have rights to use it; regimes of environmental governance focused on protection have in the past alienated Indigenous people from their lands (Ruru 2004). Language of recovery reflects that used by First Nations elders in framing disaster; for example, Kaurna elder Georgina Ngankiburka-Mekauwe Williams spoke at a climate rally in 2021: "so please help me, by giving your voice to our recovery, in recovering our spirituality, and your relationship to where we are now..." (Pillarisety &

Millar 2021). This is an example of how "reflexivity, relationality, responsibility, recognition, representation, reciprocity, and rights'' are called for (Chouinard & Cousins 2021); we argue that recovery as a frame should be an 8th 'R' to help ground collaborative research and practice.

To reach the systemic improvements in engagement, trust, equity and accountability Indigenous researchers call for (Hudson et al. 2020), it is not appropriate for European researchers to assume those from other backgrounds should engage with their findings in good faith. Good intentions in generating criteria within insular networks of researchers can have unanticipated real-world consequences (Martin & Mirraboopa 2003). It is not the responsibility of Indigenous researchers to do all the work in accommodating, given already disproportionate workloads (Thunig & Jones 2020). "Scientific expertise, like all forms of expertise, is established largely

through the delegitimation of other ways of knowing and other knowers," (Burke & Heynen 2014, p. 10), so in asserting scientific or socio-scientific expertise about a framework for evaluation, those claiming this authority may be displacing other voices. This is undoubtedly true in the translation from global to local, where some actors may use a peer-reviewed global framework at the expense of engaging with local communities In codesigning a project or evaluation plan. We encourage the original framework's authors, as well as readers of this work, to consider themselves a "target group" for leaders in Indigenous data sovereignty who seek to change behaviour and language about data governance.

5. CONCLUSION

Given that, as we have discussed in this article, Indigenous people have rights to free, prior and informed consent regarding projects on or for their lands, does this framework for citizen science, as a project, meet these goals? If the original framework was genuinely intended to be used internationally, then meaningful engagement with IDS should have been a precursor to publishing. That was not the case; hence we may ask authors and users of the original work to consider themselves a "target group" for engagement with IDS, as well as decolonisation of research and evaluation. Following this thought process, we invite proponents of such language to consider themselves as potential partners in more inclusive collaborative futures.

For those who may have rejected the original framework given its lack of respect for relevant international obligations, do these suggested modifications open a path forward? How would a codesigned open framework for participatory science be different? If the first framework is imagined as a draft proposal for development proffered to an Indigenous community and rejected as unsuitable, how might an alternative proposal be created collaboratively and with respect for Indigenous sovereignty over lands and data? We highlight recent work in this journal advocating for seven Rs: 'reflexivity, relationality, responsibility, recognition, representation, reciprocity', and we advocate for an eighth: 'recovery' of knowledge as a frame, contrasted with exploitation. Rather than considering this a conclusion, we propose it as a beginning of a more inclusive open framework for evaluating participatory science.

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