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RESEARCH: A RELATIONAL TURN IN SUSTAINABILITY

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Chagga women´s connections with nature: fostering relationality through arts-based methods

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ABSTRACT

Relational approaches in research are now recognised as a potential pathway to fostering transformations in sustainability research. Drawing on insights from Chagga women at Mount Kilimanjaro, Tanzania, we demonstrate how relationality can inform research methods used in sustainability science by uncovering more holistic understanding of how people relate with, connect to, and value nature. Guided by a feminist ethos of care, participatory arts-based activities were held with Chagga women during focus group discussions to elicit a deeper understanding of their connections to nature. The findings reveal in-depth, contextual and embodied expressions of how Chagga women connect to nature through agricultural practices, culinary traditions, emotional experiences and shared instrumental and relational values of aesthetics, culture, reciprocity and stewardship. We advocate for relational and arts-based approaches in sustainability science that practice critical reflexivity, foster creative freedom and unravel human emotions. Such approaches can be harnessed to strengthen human-nature connectedness and promote nature's diverse values in pursuit of sustainability transformations.

KEY POLICY HIGHLIGHTS

- Creative and innovative methods such as arts-based methods can unravel in-depth, contextual, and embodied accounts of how people connect with nature in diverse ways.
- Relational approaches and feminist caring practices should be harnessed to promote marginalised voices in conservation policy and practice.
- Deeper understanding of how people connect with and value nature can reveal insights into how we can strengthen such connectedness for sustainability transformations.

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Introduction

Relationality represents a shift from a mechanistic paradigm towards a more holistic understanding of the world as an interconnected and adaptive socio-ecological system comprising dynamic relations within and between human and non-human entities (Walsh et al. 2020, 2021; Böhme et al. 2022). This understanding is consistent with many Indigenous worldviews, and ways of being that are embedded in more-than-human relational ontologies (Donald 2009; Watts 2013; Todd 2015; Dudgeon and Bray 2019; Adams 2021; Tynan 2021). Relational approaches move away from the idea of distinct entities to portray reciprocally constituted aspects unfolding in broader assemblages (West et al. 2020). In sustainability science, relational approaches leverage ethics and culture to promote human – nature coexistence (Foggin et al. 2021) which can lead to more nuanced, ethical, and effective pathways to sustainability transformations (West et al. 2018, 2020). Adopting a relational approach means that researchers must carefully trace the empirical relations in their context of study by engaging with the people and groups who are most affected by decisions and acknowledging the unique characteristics of place that form the space where human and non-human relationships develop through time (Martín-López et al. 2020; West et al. 2020; Foggin et al. 2021). Relational approaches in sustainability science can be harnessed through concepts such as 'relational values' and 'human-nature connectedness' (Chan et al. 2018; West et al. 2020), applied research methods that foster the embodiment of relationality such as arts-based methods (Muhr 2020) and by implementing a research approach that is

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inherently relational, such as the feminist ethos of care (Staffa et al. 2022).

It is well-documented in the literature and global sustainability agreements (e.g. the Sustainable Development Goals) that stronger human-nature connections are needed for sustainability transformations (Abson et al. 2017; Ives et al. 2017; Klaniecki et al. 2018; Riechers et al. 2021). Studies have shown that connections between people and nature can have positive influences on human health and wellbeing (Martin et al. 2020; Pritchard et al. 2020) and can lead to pro-environmental behaviour and conservation actions (Martin et al. 2020). This calls for more research on how we can inspire and strengthen human-nature connectedness, and therefore, promote better caretaking of nature. To identify opportunities for strengthening connections between people and nature, we need to first understand how connections to nature arise (Petersen et al. 2019). Ives et al. (2018) propose a framework with five categories of how nature connectedness: material, experiential, cognitive, emotional, and philosophical connections. Empirical insights on how nature connectedness influences values may help to identify 'seeds' of change for sustainability transformations (Ives et al. 2017).

The IPBES framework conceptualises three value types: nature as a means to achieving human wellbeing (i.e. instrumental value); nature as an end in and of itself (i.e. intrinsic value); and the importance of meaningful relationships between people and nature and among people through nature (i.e. relational value) (Díaz et al. 2015; IPBES et al. 2022; Pascual et al. 2023). The latest IPBES Values Assessment Report (2022: 14) states that 'recognising the diversity of nature's values in relevant and robust valuation' is a key leverage point for transformative change in sustainability science. The recognition of nature's diverse values is often considered an essential element of 'plural valuation' which intends to elicit diverse values given actors' unique worldviews, knowledge systems and power (Pascual et al. 2017). Transformative change will only become possible once plural valuation is a standard approach in mainstream nature valuation (Jacobs et al. 2020; Zafra-Calvo et al. 2020). While most nature valuation studies have focused for decades on instrumental and intrinsic values (Muraca 2011; Himes and Muraca 2018), relational values are now recognised as a valuable tool for widening understandings about how people relate and value nature, particularly when qualitative methodological approaches are applied (Chan et al. 2018; Gross et al. 2023). People construct their relational life in ways that are situated, unique, and embodied – characteristics that are challenging to measure through traditional Western scientific methods that have long dominated sustainable development assessment (Moriggi et al. 2020). Consequently, many sustainability scholars are calling for the application of relationality in sustainability research, including the design of new and innovative applied research methods.

Arts-based methods are one such qualitative approach that can tap into emotions, foster embodied experiences, and support sustainability transformations (Eisner 2008; Muhr 2020; Biggs et al. 2021; Riechers et al. 2021; Martin et al. 2022). Here, we define arts-based methods as research that '*uses artistic forms and expressions to explore, understand, represent, and even challenge human experiences*' (Wang et al. 2017, p. 6). They can be used at any point in the research process to generate, interpret or communicate knowledge about a diverse range of research topics such as health, psychology, education, anthropology and social-ecological systems (Knowles and Cole 2008). Such methods are largely participatory and collaborative (Matarasso 2019) and can be categorised into multiple forms such as visual art, sound art, literary art, performing art and new media (Wang et al. 2017). During data collection, outputs such as paintings, sculptures or performances can serve as a substitute for traditional interview responses or, alternatively, as a basis for dialogue and reflection (Coemans and Hannes 2017). Arts-based methods are particularly conducive for addressing the subjective, non-material and tacit aspects of sustainability science, such as relationality, that are often neglected in traditional methodologies (Heinrichs and Kagan 2019; Leavy 2020; Heindorf et al. 2024). Some examples include using poetic inquiry to elicit relational values of a peat landscape (Heindorf et al. 2024), drawings to unravel refugees' connections between nature, wellbeing and belonging (Haswell 2023), and photo elicitation to understand relational and non-material expressions of tourist experiences in mountain ecosystems (Kou et al. 2024; Pearson et al. 2024). One of the main reasons that art is such an effective tool for exploring relationality is because it goes beyond the narrative, centering the body, affect, and emotions throughout the research process (van Wolvelaer et al. 2022). Muhr (2020) adds that arts-based methods have the potential to be a 'powerful system intervention' by evoking and reinforcing deep emotional connections to nature.

One of the many benefits of arts-based methods is that they encourage more equitable participation during the research process (O'Neill 2010). Creative expression through art can provide an avenue for centering the voices of marginalised people, such as Indigenous Peoples and local communities, who are often left out of key decision-making processes (Gifford and Wilding 2013; Lenette and Boddy 2013; Wilson 2018). Across many Indigenous societies, art has been utilised

for countless generations for the purpose of storytelling and passing down knowledge (Twance 2019). Art-based methods have been used in many studies involving Indigenous and local communities across research topics such as health, environment and food security (Hammond et al. 2018). In 2018, a global scoping review found that arts-based methods with Indigenous peoples were successful in building mutual trust, respect and power (Hammond et al. 2018). Some Indigenous scholars even argue that arts-based methods can act as a form of decolonisation in research by fostering Indigenous solidarity, pride and healing through creative expression (see Whitlow et al. 2019). When a cultural and/or language barrier is present, visual art can bridge understanding, since illustrations are often understandable without words (Bridges et al. 2023). Such methods are also more inclusive of people with low literacy skills or have difficulties expressing themselves through verbal communication (Richards et al. 2019).

By giving participants control over what information they share with researchers, arts-based approaches can reduce power imbalances between researchers and the researched (Nunn 2010; O'Neill 2010; Coemans and Hannes 2017; Lenette 2017). Arts-based methods can influence power relations by fostering participants' agency in how they decide to construct and share their stories, especially when presented with the choice of controlling representations through a wide range of artistic methods. In this way, the participant is the 'author and director of their own stories' (van Wolvelaer et al. 2022, p. 38). Art that is created during the research process should always belong to participants, ensuring the outputs are owned, valued, and shared by them and their communities (Whitlow et al. 2019). Not only is reducing power imbalances essential for promoting the autonomy and empowerment of research participants, it can also help to build trust and rapport amongst all parties involved. Such approaches challenge traditional applied research methods of mainstream Western science by offering alternative ways of understanding narratives and advancing knowledge through research that is more accessible to a wider non-academic audience (Lenette 2019). In both Indigenous and feminist thinking, the arts are widely conceived as a crucial practice of learning, meaning-making and challenging patriarchal norms (Carson and Pajaczkowska 2001; Butterwick 2002; Mullin 2003; Clover 2011; Todd 2015). Clover (2011) argues that 'women worldwide have always used the arts to uncover or create new knowledge, highlight experience, pose questions, or tackle problems' (p.13). Hence, arts-based methods can be utilised as an ethical, feminist, radical and even revolutionary approach to research (Finley 2008; Chilton 2013).

This study is guided by a feminist ethos of care, which can be defined as a resistance to the injustices inherent in the patriarchy that associates care (and caretaking) with *women* rather than with humans (Gilligan 1995, 2011). Although we practice care in our daily lives, care is often only limited to the private sphere, often taken for granted, devalued, and thus invisible (de La Bellacasa 2017). An intersectional perspective should also be taken when practicing an ethos of care by acknowledging that the lived realities of women of colour, and other marginalised groups of women, experience their gender struggle through additional lenses such as race, class and cultural contexts (Kalisch and Cole 2022). Feminist philosopher, María Puig de la Bellacasa dissects this further in her work on care ethics by calling for moving beyond dualisms and embracing the multiplicity of society-nature relations, promoting critical reflection on positionality and power-laden research contexts, and encouraging inclusion and diversification (de La Bellacasa 2017). Staffa et al. (2022) demonstrate how this can enrich knowledge co-production in sustainability science. Embracing relational ontologies, taking care of non-academic research partners, interrogating positionalities and power relations through reflexivity (Díaz-Reviriego et al. 2024), and building upon marginalised knowledges through feminist standpoints are some of the many ways that researchers can enact a feminist ethos of care within their methodologies (Staffa et al. 2022).

Drawing upon a case study with Chagga women in the Mount Kilimanjaro region, Tanzania, this paper aims to assess how relational approaches can inform research methodologies that reveal holistic understandings of how people value nature and its contributions. Here, we demonstrate the multiple layers in which relationality can manifest at different stages of the research process, from the conceptualisation of the research study to the dissemination of the findings. To this end, we address to the following research questions: (1) How can relational theories and concepts, such as feminist ethics of care, be used to inform research methods for nature valuation? And (2) How can arts-based methods provide insights into how people connect with, relate to, and value nature? Finally, we conclude with some recommendations based on our methodological reflections in hope to inspire other sustainability scientists and experts seeking to weave relational arts-based approaches into their own work.

Methods

Study site

Mount Kilimanjaro is a unique biodiversity hotspot that is home to 1.3 million people (United Republic of Tanzania 2013) of which the majority are from the

Chagga ethnic group and maintain home gardens as a principal source of sustenance (Fernandes et al. 1985). Located on the southern slopes of Mount Kilimanjaro, Tanzania, the two villages of Maharo and Nshara, where this study took place, are situated in two different districts. Maharo is located in Rombo District in the south-eastern zone of the mountain close to the border of the Kilimanjaro National Park. Nshara is located in Hai District, in the central region of the southern slopes of the mountain and further south of the National Park. Although both villages are located within Chagga home gardens (also known as the coffee-banana agroforestry belts), Maharo is closer to the forests within the National Park due to its high elevation (1653masl), while Nshara is lower in elevation (1125masl) and therefore closer to commercial agricultural land mainly for growing maize, beans, sunflower and wheat.

Chagga agroforestry home gardens are the main sources of food, income and wood energy for communities (Mbwiga 2016). However, modern challenges such as growing demand for wood, introduction of new coffee varieties and falling coffee prices around the world pose a threat to what has otherwise been described as an effective and sustainable agroforestry system (Hemp 2006). Chagga women are mostly responsible for maintaining agricultural practices, culinary traditions and taking care of the land (Knudsen 2002; Carr 2004; Minde 2015; Kimaro and Bogner 2019). They have a prominent role in selling crops such as banana, bean, coffee, maize and yams, dominating over 90% of activities related to street selling of banana (Minde 2015; de La Masselière et al. 2020). Chagga women traditionally brew and sell *mbege* (banana beer), take care of livestock, and sell animal products such as milk (Cook and Kerner 1989). In contrast, Chagga men often work as *bodaboda* (motorcycle) drivers, guards, shop sellers or in the local tourism industry either working as porters or tour guides leading hikes up Mount Kilimanjaro or other tourism activities within the region (Minde 2015; Prinster 2017; Hadfield 2020).

Chagga women generally do not have tenure over the land where they live and work (this tends to be their fathers', brothers' or husbands' land) and traditionally do not make decisions over land use (Minde 2015; Lyimo 2016; Kimaro and Bogner 2019). Although Chagga men are usually the heads of the households, there are some instances where women can become the heads of the households such as when they are widows, when their husbands work elsewhere, when they inherit land from their fathers, or when they own land through purchase (Carr 2004). Due to patriarchal norms and gender inequity, Chagga women often take on the additional work of household domestic duties such as cleaning, cooking, and paying school fees for their children (Raser 2010; Hadfield 2020). Carr (2004) suggests that Chagga women have a deep attachment to land, which has provided food and income for their families for generations. For these reasons, we selected Chagga women as the key informants in this study, not only for their critical role in taking care of the land and its resources, but also to centre the voices of women and understand how they relate with their environments.

Data collection

In September 2022, two focus group discussions (FGDs) were held in Nshara and Maharo villages with a total of 33 women. Focus group discussions can foster a space for storytelling, which encourages others within a group to remember and share their own stories (Krueger 2014). This sharing and ensuing conversations can provide a deeper understanding of community perspectives (Buggy and McNamara 2015). It is important to note that one group member's perspective can potentially influence how the others participate and what they contribute in a group. On the one hand, this can potentially bias the results to one person's perspective. On the other hand, this can positively influence the group dynamics by stimulating the memories, ideas and perspectives of other group members. When successful, FGDs blur the lines between researcher and participant, giving participants a sense of autonomy that can empower them to speak their minds freely (Bosco and Herman 2010). Due to the power dynamics between the researchers of this study and the participants, it was important to facilitate these FGDs in a way in which the women felt sufficiently comfortable to express their opinions in a relaxed setting with the support of one another and to enable a shared learning experience for everyone involved. In FGDs, a form of knowledge co-production always takes place since the final outcomes of the discussion could not have been achieved without the process of interaction and sharing of ideas, knowledge and perspectives (Morgan 2010, 2012; Nind et al. 2020). This can offer insights into the relational self, the processes by which meanings and knowledges are constructed through interaction with others (Morgan et al. 2012). Wilkinson (1998) states that focus groups can achieve this through enhancing disclosure, providing access to participants' own language and concepts, enabling participants to follow their own agenda, encouraging production of elaborated accounts and observing the co-construction of meaning in action.

To foster a trustful atmosphere in the FGDs, the fieldwork team consisted of five women, including two Chagga fieldwork assistants who co-facilitated and translated the FGDs, and one local Chagga artist who created two paintings (one per FGD) inspired by

the discussions that took place. The purpose of these paintings was to produce a graphical recording of each FGD using a culturally-appropriate artistic method that is commonly used amongst local artists. The painting method chosen by the artist was inspired by *Tingatinga*, a style of folk art named after Eduardo Saidi Tingatinga which first gained popularity in southern Tanzania in the late 1960s (Kilonzo 2016; Makukula 2019) and is still practiced throughout East Africa today. Tingatinga paintings often depict animated wildlife in savanna landscapes, influenced *by* 'wildlife emotions, ideas and stories' (Kilonzo 2016). Figure 1 shows the final paintings created by the artist after each FGD. By 'watching, sensing, feeling, and being present with people' (Aagaard and Matthiesen 2015, p. 41), participant observation was undertaken during the FGDs, and during the researchers' stay on the southern slopes of Mount Kilimanjaro to further understand participant behaviours (Dahlke et al. 2015).

Prior to undertaking fieldwork, human research ethical clearance was obtained from the Ethical Review Board at Leuphana University Lüneburg. The required Tanzania Commission for Science and Technology (COSTECH) and resident permits were also obtained before commencing fieldwork. At the beginning of each FGD, the purpose and nature of the research was explained verbally and in written form (both in Swahili), including participant confidentiality; research benefits and risks; and the research outcomes. Participants were informed that the research was conducted with an academic objective primarily and gave their full consent. The English version of the information and consent form is provided in Appendix 1. In addition, where consent was provided, parts of the FGD were audio-recorded and/or video-recorded so that they could be later transcribed into English and analysed. Photographs were also taken throughout with participant consent. All participants consented to the use of these photos and videos in scientific outputs, presentations and outreach material. An FGD guide was used by the fieldwork team to facilitate the activities (see Appendix 2).

During each FGD, a series of participatory arts-based activities were conducted to harness insights into how Chagga women relate to, connect with and value nature (see Figure 2). Each participatory activity was inspired by and developed based on relational concepts such as human-nature connectedness and relational values. The first FGD activity was an individual drawing exercise in which participants were asked to draw a picture which illustrates their relationship with or connection to nature. The intention behind this individual drawing exercise was to gain a deeper understanding of the participants' relationships with nature, inspired by concepts of human-nature connectedness and relational values. By starting with an individual activity, participants were

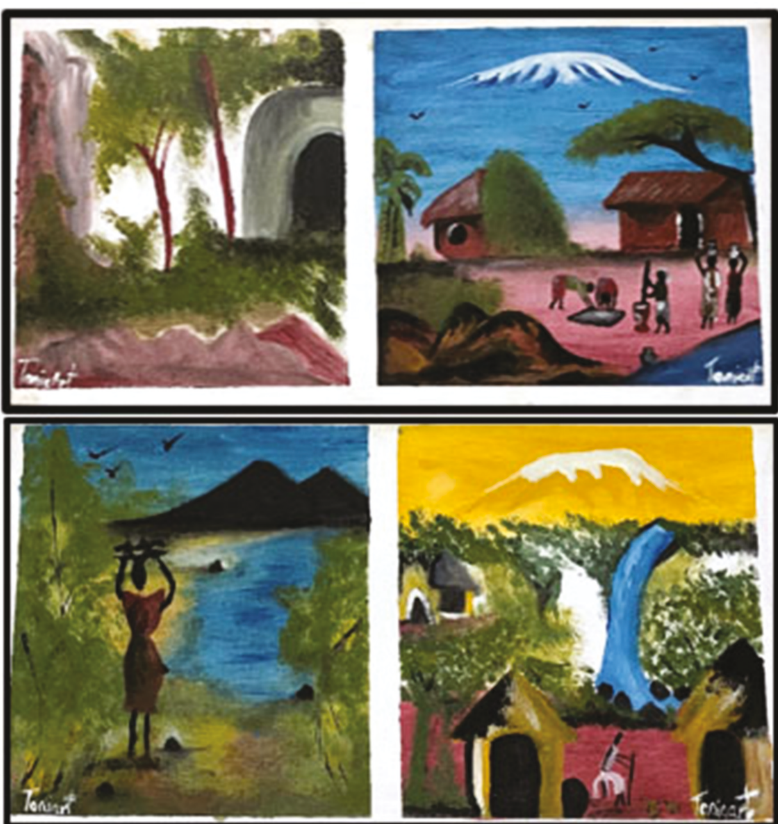


Figure 1. Paintings by Antonia Patrick Mbaruku, inspired by each FGD: the top painting is based on the nshara FGD and bottom painting is based on the maharo FGD.

Figure 2. Chagga women in the process of group-based activities in Maharo (left) and Nshara (right). Photos taken by Berta Martín-López with previous and informed consent of participants.

provided with impetus to begin expressing their unique sense of individual identity through art as it enabled the freedom to choose their own design, colours and content. Once the drawings were complete, participants were then asked to individually explain what they drew and why. This process allowed for important contextual information behind the illustrations, providing a more in-depth understanding of Chagga women's relations with and connections to nature. The second activity was a group-based photo exercise in which participants were asked to write down any benefits of nature associated with photographs of the different ecosystems and land uses of the mountain, along with the emotions they felt when looking at the photographs. The third and final activity was another group-based exercise which allowed participants to come up with a creative way to express their shared values of nature. By working together in a collaborative and relational manner, the intention behind this activity was to allow the women to express their collective identity through art.

In terms of the overall FGD structure and design, the sequence of activities was intentional. We started with a basic individual exercise to first break the ice and stimulate initial thinking on how the women conceive their own relationship to nature without any external input. The purpose was not only to reveal individual perceptions of nature but also to provide a basis for discussion in the following group-based activities. Moreover, the next exercise was intended to dig deeper into benefits of nature and associated emotions to encourage participants to engage in a more in-depth discussion with one another. And finally, the third activity was reserved for last since it was the most abstract and open-ended exercise, and thus, required the most creativity. The idea was that the human-nature connectedness, benefits and emotions expressed in the previous two activities would provide inspiration for the creative expression of values of nature in the last activity. Here, the participants had the power to choose any potential art form they felt the most comfortable expressing themselves through. Table 1 provides an overview of the three activities and example outputs from each one.

Data analysis

Once the FGD recordings were transcribed into English, they were coded using MAXQDA software, an effective and appropriate software for organising and analysing qualitative data (Kuckartz and Rädiker 2019). Content analysis was used to categorise and code the data into key themes, along with the identification of trends and patterns of words used, their frequencies, and relationships (Vaismoradi et al. 2013). In line with IPBES framework, a context-specific perspective was used to guide the coding process (Hill et al. 2021). This approach was used to identify contextual benefits and values of nature instead of organising the data into predetermined categories of the generalising perspective. During our analysis, we paid careful attention to the terminology being used by participants. For example, when participants use terms like 'benefits' we coded them as such. When participants use terms like 'important' or 'value' when talking about nature, we coded them as values. Photographs taken of the individual drawings created in the first activity were also coded to identify the natural and human-made entities present across the illustrations (see Figure 3). Once coding was completed, several analysis tools were applied to the dataset. 'Code frequencies' were used to identify the total number of mentions across themes. 'Code explorer' was also used to explore patterns and relationships between different codes.

Limitations and critical reflexivity

A critically reflexive approach was applied to this study which is vital to practicing a feminist ethos of care. Critical reflexivity refers to recognising one's potential biases and interpretations of the research based on their positionality (Cohen et al. 2011). 'Researcher positionality entails delineating one's

Table 1. Overview of arts-based activities.

Title	Activity I: Relationship with nature	Activity II: Emotions and beneficial contributions of nature	Activity III: Values of nature
Type of exercise	Individual	Group-based	Group-based
Facilitator instruction	Draw or paint something that represents your relationship with nature.	What emotions do you feel when you look at the ecosystems/land-uses/natural elements in these photos? What benefits do you see?	In your groups, come up with a creative way to express how you value nature.
Example artworks	Nshara village	Maharo village	Nshara village (Photo taken by Berta Martín-López with previous and informed consent of participants.
Example verbatims tied to art	*I also drew trees which is very important to us as they give shades which help to keep/retain water in the soil of which our crops grows well.* (Maharo village)	*We have many fruits plants that we are proud of.* *Together let's conserve and protect our environment.* (Nshara village)	*Bees attracts and give us honey* *Birds attracts and fly in the trees* *Wild animals also attract* *Let's conserve the environment to maintain its origin.* (Maharo village)

Figure 3. Coding of illustration from activity I using MAXQDA software.

position in relation to a study and understanding that one implication of this position is that it will influence various aspects of a research study, including the questions asked and the conclusions drawn' (Foote and Gau Bartell 2011, p. 47). The position of the first author as a young, Māori-Australian woman with a Western educational background from an outside country has an influence on this study in several ways. For instance, there is a certain degree of privilege that comes with travelling from a wealthy country in the Global North to undertake research in low-income communities in the Global South. This power imbalance can lead to a number of challenges including social desirability bias (the tendency of research participants to respond in ways they perceive to be more socially acceptable as opposed to sharing their honest perspectives (Bergen and Labonté 2020)), as well as a lack of trust or skepticism amongst participants about the researcher and their intentions. Cultural and language barriers were also present. Although the positionality of the researcher cannot be removed, it is important to address the associated limitations that come with this position – not only for transparency purposes – but also to actively manage the effect of one's positionality on the entire research process.

To account for social desirability bias and potential mistrust, participatory FGDs and arts-based methods were selected. Our attempt here was to minimise the effects of the power imbalance between the researchers and research participants. Through arts-based methods, we addressed this by facilitating a process of creative expression in which the women had power over how they chose to represent their stories and their relationship to nature. They also kept the artworks they created, ensuring that the artistic research outputs are owned, shared, and valued by the women and their communities. Likewise, the paintings inspired by each FGD (Figure 1) were donated to the two communities. To address cultural and language barriers, Chagga women were hired as part of the FGD facilitation team not only for translation purposes but also because of their local knowledge and lived experiences in the study region. They were consulted about the methodology and provided advice on how to make the process more culturally appropriate. This was essential for creating a respectful and culturally sensitive space where local traditions, protocols and norms were adhered to during the fieldwork process. For example, the Chagga facilitators advised on appropriate forms of participant compensation, cultural processes for gaining permission from village leaders to conduct research and sharing traditional meals together. Moreover, the Chagga artist summarised the outcomes of the FGDs using a local style of artwork (Figure 1). In turn, this may have enabled participants to feel more open to sharing their stories and insights from a Chagga perspective. Although the FGD recordings were transcribed and translated from Swahili to English by research participants fluent in both languages, it is likely that the meaning and nuances behind some text excerpts may have been unavoidably lost in translation.

During the data analysis and interpretation stage, the first author discussed the preliminary results and associated reflections with both Chagga and Tanzanian colleagues (listed as co-authors of this paper) to minimise potential biases associated with interpreting the results from a Western perspective. Critical reflexivity not only entails addressing the researcher's positionality, but also taking a broader approach to interrogate existing power relations in a given research context. Since the Chagga societies of

Mount Kilimanjaro are patriarchal, women were purposely chosen as the key informants of this study to amplify the voices of those who are often left out of land and resource management decision-making processes at a family and village level. The FGD facilitation team was purposely limited only to women so that the participants could feel comfortable enough to share their perspectives in a safe space without any men present. One aspect of the research that could have been improved was the design of the FGD guide and participatory activities which were developed only by the first and last author of this study, without any input from Chagga women.

Finally, the results of this study were returned to research participants in the form of poster presentations (Meyer et al. 2023). The posters were also designed using an arts-based approach, including the creation of multiple graphic illustrations depicting the research findings. It is worth noting here that the content was based not only on findings from the FGDs but also other forms of data collected by the research team in the wider Kilimanjaro region (including interviews, surveys and photo-voice and photo-elicitation). Because the presentation of the posters comprises data and information that is not presented in this paper, we intentionally do not provide them here. The overall purpose of these poster presentations was to be transparent about how the participants' data was being utilised and interpreted, as well as potentially inspiring discussion around transformative change for local actors. In this way, the research allowed for a reciprocal learning journey for both the researchers and research participants. Although it is not always implemented, returning research findings to participants is now widely accepted as a standard ethical obligation for researchers as a way to demonstrate respect for participant autonomy and their right to access results (Hintz and Dean 2020). In this study, Chagga women provided positive feedback on these poster outputs, validating that their values and perspectives have been well-represented (see Figure 4). They also provided verbal consent to have their photographs taken and used in publications.

Results

The results from the FGDs revealed rich information on Chagga women's relationship with nature at Mount Kilimanjaro. The following sections will describe the artworks created by the women and how this builds a more comprehensive picture of their connections with nature.

Connecting to nature through more-than-human relations

Chagga women depicted a web of relations between humans, nonhumans and human-made entities through their artworks. For example, Figure 5 shows an illustration created in response to the prompt: 'Draw something that represents your relationship to nature'. The most noticeable and prominent feature of the illustration is the *ndege* (bird) which is the largest entity within the illustration. The narrative to accompany this is '*Birds are always in our daily environment, flying over the trees*'. Two smaller birds feature in this illustration, showing how they are always present and watching over the land. One interpretation here is that the illustration has been drawn from a birds' eye view, meaning that we are closer to the bird, hence why it appears larger, while

Figure 4. Chagga women reading the poster outputs during the outreach tour, Nshara village. Photo taken by Berta Martín-López with previous and informed consent of participants.

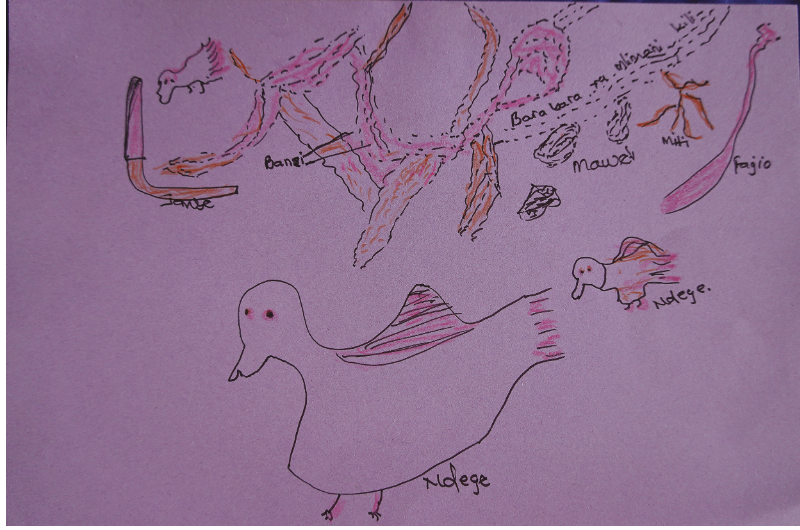


Figure 5. Individual drawing of relations between ndege (bird), ufagio (broom), jembe (hoe), bara bara (road), mawe (stones) and miti (trees), created by participant during activity I in Nshara village.

the rest of the natural entities on land are below, and therefore further away. The remaining features of the illustration consist of a *ufagio* (broom), *jembe* (hoe), *bara bara* (road), *mawe* (stones) and *miti* (trees). The inclusion of both human-made entities like the broom, hoe, and road, with both biotic and abiotic natural entities, demonstrates a holistic interpretation of what nature means and how Chagga women connect with nature as part of their daily lives.

The road was an unexpectedly common feature in multiple artworks across the FGDs (see Figure 6 (c)). One woman from Nshara expands on this: '*I drew the road which heading to Mount Kilimanjaro I put bumps on it and stones besides and birds which are always in our daily environment. For me this is what connects me with nature because stone is nature from mountain*'. (Participant 1, Nshara village). Another participant explained

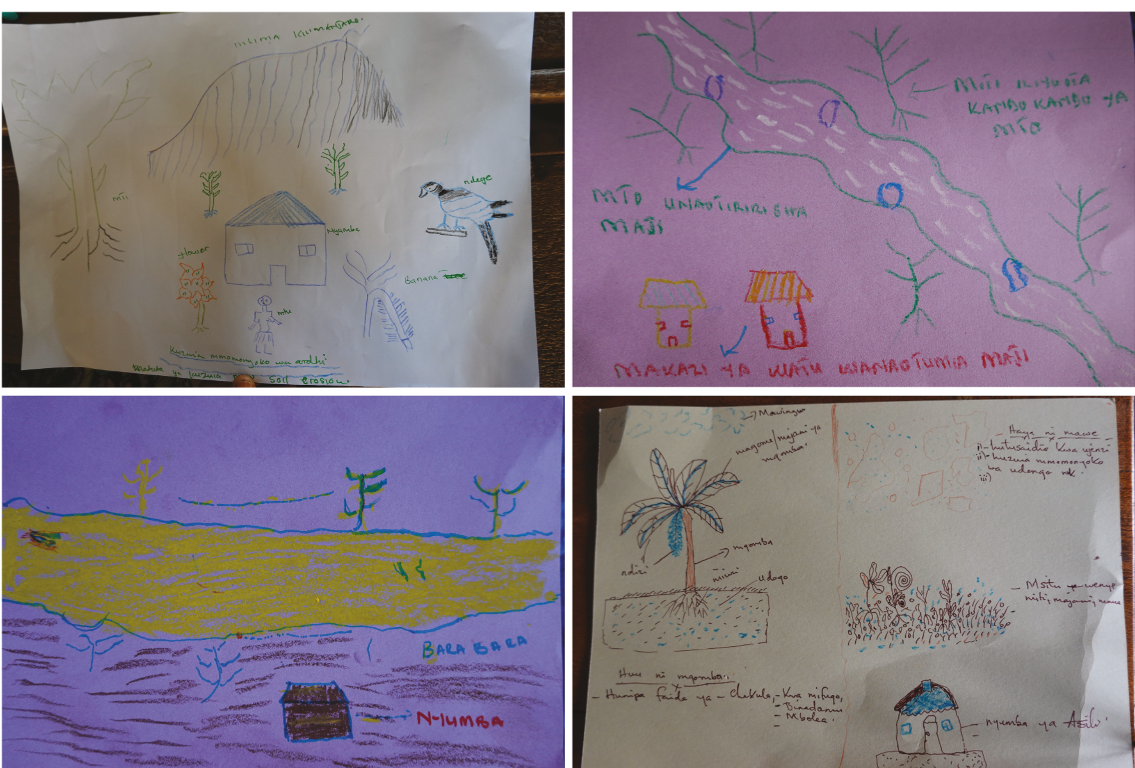


Figure 6. Examples of individual and group drawings that featured nyumba (house) and bara bara (road), created during activity I and III in both maharo and Nshara villages.

the inclusion of the road as something that connects them to nature, not only because it is made from stone, but also because it quite literally connects them to other parts of the mountain, including to other natural entities. The illustration below is one example of the road as a main feature of their illustration, which also includes trees and a *nyumba* (house). As shown in Figure 6(a-d), houses were also featured in multiple artworks, indicating that Chagga women consider their homes as an integral part of nature.

There were some notable differences in the illustrations between the two villages. As shown in Figure 7, *ndizi* (banana) was more prevalent in Maharo village whereas *kahawa* (coffee) was only noted in Nshara village. *Parachichi* (avocados) were only present in the drawings by women in Maharo village, whereas none were drawn by women in Nshara village. This demonstrates the variation in perceived entities of nature across the southern slopes of Mount Kilimanjaro, likely due to the differences in elevation and thus, vegetation of the two villages. One woman from Maharo village elaborated on this when explaining her drawing: *'I have just drawn an avocado tree in which we eat avocado. We also use avocado as raw materials to make oil which is used in applying on our skin. We get timber from trees to build our houses. I also drew banana trees which we get food from'* (Participant 14, Maharo village). A myriad of benefits from nature such as these were revealed during the arts-based activities, further underpinning Chagga women's relationship to nature. Food, building materials and water supply were some of the most common benefits of nature expressed by the women.

Another key theme that arose from the artworks was the role of Chagga cultural heritage, identity and traditions in Chagga women's connections to nature. For example, when asked to draw something that illustrates their relationship with nature, some women drew a *chungu* which is a traditional cooking pot used by Chagga communities, accompanied by traditional utensils used for cooking (seeFigure 8(a)). The woman explains that this pot is important for cooking traditional '*natural Chagga food like Makurukuru and Mtori*'. This symbolises the important role of culinary traditions in Chagga society, and how this relates to maintaining their relationship with nature through food. Figure 8(b) shows another illustration whereby Chagga culinary traditions are the main feature. This features not only the *chungu* but also the *jiko la maviga asili* (natural wood stove) and *panga* (machete), more human-made entities which are essential for Chagga cooking practices. *Mboga tembere* (vegetables), *mto* (river), *kahawa* (coffee), and *kuku* (chicken) are the natural entities depicted within this drawing. As described in the narrative behind the drawing, the relations that exist are between the chicken and vegetables used in local cuisine, while the cooking utensils and natural stove are used for preparation of this. The words written in the river are '*mto makoa kueleke mjoni*' which roughly translates to '*the river flows towards the forest*' in English. This aligns with a more relational ontology since the focus is on the relations between entities rather than perceiving nature solely as individual entities.

Connecting to nature through emotions and affective experiences

Chagga women expressed their underlying emotions tied to values of and connections with nature (see Figure 9). When looking at photos of different landscapes across Mt Kilimanjaro, most ecosystems brought up positive emotions, while others revealed

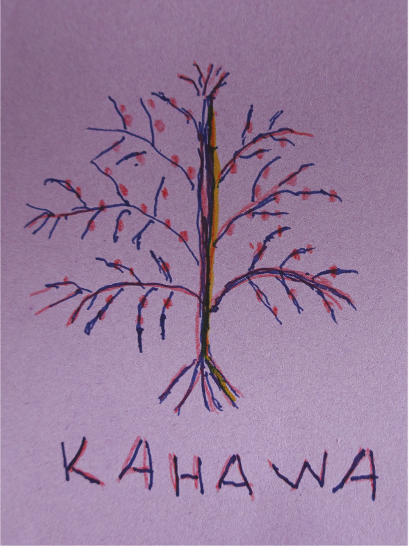


Figure 7. Examples of individual drawings created during activity I. (a) Ndizi (banana), Maharo village (b) Kahawa (coffee), Nshara village (c) parachichi (avocado), Maharo village.

Figure 8. Individual drawings that feature that feature nonhuman and human made entities essential in Chagga cooking practices including the chungu (traditional Chagga cooking pot), both drawn by participants in Nshara village.

Figure 9. Photographs taken during activity ii, Maharo village. Photos taken by Berta Martín-López with previous and informed consent of participants.

negative emotions for the women. The emotions that participants associated with these landscapes were mostly positive, with only two groups expressing negative emotions engendered by two landscapes. Positive emotions expressed by the women were happiness, gratitude, and pride across most of the landscapes presented. In contrast, sadness and anger were expressed by some when looking at photographs of maize and savanna, as these landscapes were associated with drought and land clearing.

Multiple groups provided a brief explanation behind why certain landscapes evoked their emotional response. For example, one group from Maharo village said: '*The feeling we get is happiness because the landscape is beautiful*' in response to photographs of the *Erica* habitat. Aesthetic experiences, regulation of climatic conditions, and provision of firewood were frequently mentioned as benefits of nature at Mt Kilimanjaro. Ecosystems in higher altitudes (i.e. *Erica*, Lower Montane, *Ocotea* and *Podocarpus)* were perceived to have a key role in climate, water quantity and air quality regulation of the mountain. *Podocarpus, Ocotea* and *Erica* habitats were linked to honey, beekeeping, and firewood since Chagga women have traditionally collected materials from these forests to be used for firewood for cooking. Aesthetic experience was mostly expressed by participants who described the forest and shrubland habitats as 'beautiful' and 'attractive'. In contrast to these positive emotions and benefits, the photograph of commercial agriculture (maize) elicited the following response: '*we get angry because they harvested crops and [did] not leave some grasses on land to maintain soil fertility*' (Nshara village). This suggests that Chagga women feel a sense of responsibility for nature and stewardship in their opposition to the detrimental consequences of monoculture farming.

Connecting to nature through shared values

Chagga women expressed an intertwining mix of intrinsic, instrumental and relational values of nature at Mt Kilimanjaro. The women conveyed how they value nature through an eclectic variety of art forms including dance, poetry, song, storytelling, and painting.

The main types of relational values that prevailed were aesthetics, culture, stewardship and reciprocity.

Aesthetics as a relational value refers to the non-substitutable value of beauty in nature. Our definition here aligns well with that of Arias-Arévalo et al. (2017), who argue that aesthetic values of nature are inherently relational because aesthetic appreciation cannot be substituted by a painting of nature. In Maharo village, one group of women expressed aesthetic values and intrinsic values through storytelling: *'From nature we also have beautiful environment for wild animals to live'*. (Group 1, Maharo village). The relational value of stewardship, defined as the inherent responsibility to conserve, protect and care for nature (Chan et al. 2018), was expressed through lines of poetry such as:

> Everyone should stop cutting trees and prevent drought
>
> We should take care of agricultural land and prevent it from harm
>
> When we harvest crops we need to leave some rejects on the land to maintain
>
> Its fertility and let the insects live.
>
> (Group 2, Nshara Village).

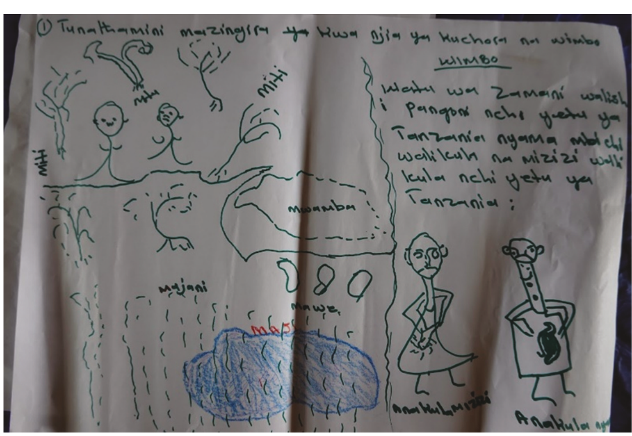
The groups of women often expressed their reciprocal relationship with nature during this activity, which was highly linked to stewardship values. By drawing upon the benefits that come with conserving nature, the following poem excerpt demonstrates the value of reciprocity when taking care of nature:

> Hello, hello, our greetings to you.
>
> We have something to share with you which is the natural environment.
>
> We should take care of the nature for our benefits.
>
> Mountain and trees attracts, we get fresh air and shades.
>
> Mountain attracts and enhances tourism.
>
> Let's conserve the environment to maintain its origin.
>
> (Group 3, Maharo Village).

This poem sends the message that if you take care of nature then nature will take care of you by providing manifold benefits (i.e. fresh air, shade, tourism), representing the reciprocity expressed by Chagga women. Cultural values were expressed by women in both villages. This refers to relational values associated with tangible objects in nature and intangible aspects, stemming from traditional beliefs, customs or ways of doing interlinked with nature. In Nshara village, one group presented both a drawing and a song to describe why nature is important to them, revealing deep connection to their ancestral and cultural heritage (Figure 10).

In Maharo village, one group presented an adapted version of an existing traditional Chagga song and dance (Figure 11). The traditional song and dance was said to be performed by Chagga women after harvesting certain crops. This performance further revealed the inherent link between Chagga culture and nature through the importance of their agricultural traditions.

The instrumental values expressed by participants were mostly linked to the monetary value assigned to nature in the form of 'cash crops' sold at markets and revenue from tourism. Non-monetary values linked to regulating and material benefits of nature for human well-being were also mentioned as highly important. One participant expressed in the narrative behind an illustration: *'Also through this mountain we get foreign currency to our nation. I also drew trees which are very important to us as they give shades which help to keep/retain water in the soil of which our crops grow well'* (Participant 1, Maharo village). One group from Nshara exemplifies this through story and song: *'We benefit timber from trees like Mruka, Msesewe, Gravelia which is used to make different furniture like desks, tables, doors, beds, chairs and so on. From environment we also get good weather condition, frequently rainfalls ... We get pastures for our domestic animals like cows and goats'* (Group 1, Nshara village).



"We drew the picture [of] our elders the way they lived in a difficult environment. We drew people, grasses and plants, water, stones, rocks, rainfall and trees. We drew two pictures of people one is eating meat and another roots.

And our song says this,
Ancient people used to live in caves here in Tanzania
They ate uncooked meat and roots here in Tanzania."

Figure 10. Illustration and song representing the connection of Chagga women to their cultural and ancestral heritage (group 4, Maharo village). Note: for the original version in Swahili, see the text in the drawing.

Figure 11. Chagga women performing a traditional song and dance (group 4, Maharo village). Photos taken by Berta Martín-López with previous and informed consent of participants.

Instrumental and relational values were often interconnected throughout this activity. For example, one group in Nshara village wrote a poem which included the lines:

> Mount Kilimanjaro is beautiful with its snow and ice which attract tourists
>
> The government get income through it and the youth get employment.(Group 2, Nshara village)

This demonstrates the *aesthetic* value of nature, and its subsequent contribution to *monetary* value through tourism. Intrinsic values were also mentioned briefly by women, who suggested that conserving nature is important also for insects and other living organisms to survive. Another example of this was expressed through storytelling: '*We also get fresh air from nature which helps living organisms to live better. Therefore we need to take care of our natural environment*' (Group 1, Maharo village).

Discussion

Stronger human-nature connections are needed for sustainability transformations. Scholars have called for more research into the manifestations of connections between people and nature, and how this influences our values (Ives et al. 2017; Petersen et al. 2019). Our study addresses this by providing in-depth, contextual and embodied insights into how Chagga women relate to and connect with nature in multiple ways. Drawing on the framework of Ives et al. (2018), we summarise how Chagga women's connections to nature unfolded through material, experiential, cognitive, emotional, and philosophical dimensions. Material connections to nature are maintained through the collection of firewood and food which are vital for Chagga culinary traditions. Chagga women's experiential connections are made through daily interactions with natural environments during agricultural activities, while their cognitive connections involved the intertwining instrumental and relational values of aesthetics, culture, stewardship and reciprocity. These interplays between instrumental and relational values were highly attached to livelihood practices, aligning with the work of Riechers et al. (2024). Emotional connections were expressed through the positive and negative emotions evoked across different landscapes. And finally, philosophical connections to nature manifested through drawings by the women which showed their perception of nature consisted of interrelations between human, non-human and human-made entities, aligning with a relational '*more-than-human*' ontology. According to Ives et al. (2018), addressing 'inner' connections such as philosophical and cognitive are necessary for sustainability transformation.

Arts-based methods can support sustainability transformations in multiple ways. Scholars argue that arts-based methods can enhance human-nature connectedness (Arbuthnott and Sutter 2019; Muhr 2020); and feelings of empathy and stewardship towards nature (Thomsen 2015; Raatikainen et al. 2020), and therefore, inspiring conservation action and caretaking practices for nature. While we did not assess whether participation in this study influenced Chagga women's connections to nature, we found art to be an engaging, interactive and effective approach for unravelling the layers behind existing connections. The eclectic artworks and accompanied narratives presented in-depth, contextual, and embodied accounts of nature connectedness. Moreover, Muhr (2020) suggests that arts-based methods can

support transformation in sustainability science by sparking discussions about perceived 'reliability' and 'validity' in research (Leavy 2020), challenging the prevailing positivist mindset in Western sciences. We therefore encourage sustainability scientists to apply creative and innovative arts-based methods that foster relationality and interrogate dominant Western scientific approaches. The latter is imperative for ethical, respectful and reciprocal engagements with Indigenous and non-Western sciences (Stein et al. 2024). Creativity-inducing exercises such as 'constraint-based brainstorming' could help sustainability scientists think outside of the box when it comes to developing innovative research methods that support pluralistic and transdisciplinary approaches toward sustainability transformations (Gould et al. 2023).

Methodological reflections and ways forward for future research

Since arts-based methods are an emerging research approach in the field of sustainability science, we would like to share our methodological reflections with hope to inspire other creative and innovative methods. Due to the nature of arts-based methods, we cannot provide objective and quantitative evidence to support our claims, as is usually expected in the Western sciences. However, moving towards more relational approaches in sustainability science requires a shift from the constant need to 'measure' everything in science towards alternative modes of enquiry that are subjective, qualitative, and descriptive (Leavy 2020; Stein et al. 2024). We share these descriptive reflections based on our participant observations during the FGDs, the nuanced results of each arts-based activity and our lived experiences at Mt Kilimanjaro. Our experience at Mt Kilimanjaro involved observing and contributing to other research methods to understand nature's values including interviews, photovoice, survey questionnaires and many informal conversations with local Chagga people. The results associated with these methods remain unpublished and are therefore not referred to in this paper.

Arts-based methods enabled a sense of playfulness during the FGDs which allowed us as the research team and research participants to connect with one another through laughter, discussions, and the co-creation of meaningful artworks. Although the sentiments behind their nature connections permeated throughout the FGDs, we identified nuanced results between each activity. The first activity entailed an individual drawing exercise which revealed Chagga women's philosophical connections to nature through visual artworks of how they perceive and relate to nature. Using photo-elicitation, the second activity uncovered the positive (e.g. happiness and gratitude) and negative (e.g. anger and sadness) emotional connections felt by Chagga women across different landscapes. The third and final activity unraveled cognitive connections through shared values of nature expressed in diverse artforms. These findings demonstrate how different prompts and types of arts-based activities can reveal different yet complementary insights. The artworks created throughout all three activities and the vibrant discussions that unfolded were all conducive to building a comprehensive understanding of Chagga women's connections to nature. Based on our empirical findings and methodological reflections, we outline three key recommendations for designing arts-based methods that foster relational caring practices and transformative change in sustainability science.

First, we advocate for reflexive and embodied research practices with a strong ethical foundation. Critical reflexivity should be practiced throughout the entire research process and explicitly document this for both transparency purposes and to normalise the approach within sustainability science. Embodied research practices involve being grounded in a place of research by forming personal connections with communities, committing to ethical responsibilities towards people and engaging with a care-centred approach (Horlings et al. 2020; Giambartolomei et al. 2021). Policymakers, practitioners and decision-makers alike could also benefit from this process by addressing how their positionality affects the way in which they work and the decisions they make. Transformative change can be advanced through ethically informed practices and a broader culture of care in sustainability science (Moriggi et al. 2020; Giambartolomei et al. 2021). Through a reflexive approach, we intentionally only selected Chagga women as key informants due to their marginalisation in a patriarchal society and the global underrepresentation of Indigenous women's values of nature (Hartmann and Pearson 2024). We hired and worked *with* Chagga women during data collection, transcription and interpretation of the results as well as formally recognising their role by including them as co-authors of this paper. We made this decision to ensure that their perspectives were accurately represented, minimising potential biases and risks that come with interpreting the results from a Westernised perspective. However, this process could be further improved through a co-design approach whereby researchers collaborate with local actors from the beginning of the research process to embed a localised perspective into the research purpose and design. We communicated the findings to Chagga women through an outreach tour to give them insight into how their data is being used and whether it has been interpreted accurately (Taylor 2019; Hintz and Dean 2020).

Second, we recommend creative freedom, openness and flexibility to capture important contextual understandings behind human and non-human relations. Providing space for participants to express themselves on their own terms can foster autonomy by giving research participants control over how they wish to represent their values and perspectives. When participants are not restricted to a single artform, they also have more freedom to create art that aligns with their culture. In our study, the third activity inspired an eclectic variation of artforms co-created across the FGDs, enabling the opportunity for Chagga women to express their shared values in a way that best reflected their cultural identity. This revealed some values that may have otherwise been missed if it was restricted to only one type of artform (Bridges et al. 2023). For instance, if the women were asked to describe their values through poetry, then one group from Maharo village would not have been able to perform their traditional Chagga song and dance. The cultural value identified here *was* the embodied practice of song and dance itself, not the lyrics. Therefore, we would not have understood the cultural traditions embedded into Chagga women's connections to nature to the same extent without witnessing the performance itself. Cultural values are relationally constituted through *experience* and dialogue, rather than expressed through inherent preferences (Stålhammar and Pedersen 2017). For many Indigenous societies, certain concepts such as 'values' are sometimes impossible to describe in line with Western understandings. In traditional Hawaiian worldviews, for example, values are demonstrated and embodied in *practices*, rather than discussed (Chun 2011). In Fiji, the use of natural materials such as 'mangrove dye' in traditional artworks demonstrates how cultural values of nature are displayed through the practice of painting (Pearson et al. 2019). Creative freedom through artistic expression can therefore be a powerful tool for building a contextual and embodied understanding of nature connectedness and values, particularly in Indigenous and other non-Western contexts.

Third, we encourage sustainability scientists to elicit the emotions and affective experiences underpinning human and non-human relations. Emerging research has started to integrate emotions to understand the processes by which people connect with and care about nature (Pramova et al. 2022; Castro et al. 2023). Emotions play a vital role in how we connect with others, and connectedness with nature is no different (Petersen et al. 2019; Muhr 2020). Emotions are deeply embedded in our values (Moriggi et al. 2020) and thus, incorporating methods that elicit such emotions can unpack diverse and potentially hidden values of nature. This was demonstrated during the second activity of this study in which participants were asked to express their emotions in response to various photographs of different landscapes at Mt Kilimanjaro. These nuanced emotions were then linked to relational values of care and reciprocity because they highlighted feelings of concern for nature's well-being. For instance, the positive emotion of 'pride' was linked to conservation motivations through poetry in Nshara village, while unsustainable monoculture farming ignited feelings of anger. In the field of sustainability science, there are often strong feelings of anger, hopelessness, despair, grief or frustration when investigating sustainable development issues where inequity and injustice are prevalent (Fischer and Riechers 2021; Staffa et al. 2022). Some scholars even argue that emotions and affective resources can be potential motivators for social-ecological transformation (Moriggi et al. 2020; Muhr 2020; Martin et al. 2022) because they can enable cognitive shifts in the way people understand certain issues, triggering motivation for action in both the short and long-term (Lakoff and Johnson 2003; Barnes 2008) and inspiring transformative change (Held 2006).

Concluding remarks

Creative and innovative strategies are urgently needed to address modern sustainability challenges and strengthen connections between human and nonhuman entities of nature. Our study demonstrates how relational methodologies can inform research methods that unravel how people connect with, relate to and value nature. Chagga women co-created artworks to express their connections to nature through culinary traditions (material), agricultural activities (experiential), shared values (cognitive), affective responses to nature (emotional), and a more-than-human relational perception of nature (philosophical). Arts-based methods can paint a holistic and dynamic picture of nature connectedness, especially in contexts where this is often expressed through creative and embodied practices. To foster relationality and transformative change in sustainability science, we encourage arts-based approaches based on feminist caring practices that encourage creative freedom and unravel human emotions. Such approaches can further our understanding of the diverse and unique ways that people connect with, relate to and value nature in pursuit of sustainability transformations.

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