Utilizing Photovoice to Support Indigenous Accounts of Environmental Change and Injustice

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Abstract: Global environmental changes can happen quickly or over extended periods and have compounding effects. Indigenous communities experience environmental changes that can lead to a decline in quality of life, illness or disease, and unwelcome cultural adaptations that extend to future generations. Due to limited resources and political marginalization, members of these communities may not be able to respond to or prevent these conditions. Cultural connections to the land and community, along with limited resources, impact Indigenous peoples' willingness and ability to relocate to different geographic locations experiencing less damaging ecological changes or environmental risk. In this article, we respond to the Special Issue prompt probing "[m]ethods in which Indigenous communities engage within their environment and on the land to conduct research". We begin by describing environmental change, followed by a scoping review of Photovoice studies focused on environmental issues. Environmental changes affecting Indigenous groups are discussed, including a case study and a discussion of the ways that Photovoice can support and honor Indigenous peoples' connection to the natural environment. This article is not intended to be an exhaustive review, but rather seeks to understand how Photovoice is being used to respond to and document environmental change, and how such visual methodologies can be used in Indigenous communities.

Keywords: Indigenous people; environmental change; environmental justice; community-engaged research; community-based participatory research (CBPR); Photovoice; visual methodologies

1. Introduction

Global environmental changes can happen over extended periods and have compounding effects. Global environmental changes include acute weather events such as tornadoes or hurricanes, as well as chronic environmental changes such as technological events (oil spills) and climate change. The defining factor is that these changes to the environment are human-induced and occur differently around Earth. Marginalized communities can be exposed to environmental changes gradually that can lead to a deteriorating quality of life, long-term illness or disease, and unwelcome cultural adaptations that extend to future generations. Due to limited resources and political marginalization, members of these communities may not be able to respond to or prevent these conditions. Additionally, due to cultural connections to the land, community, and/or limited resources, they may not be willing or able to relocate to a different geographic location, experiencing less damaging ecological changes or environmental risk.

Given the effects of global environmental changes on marginalized populations, Indigenous peoples have compounding sensitivities given cultural, spiritual, and subsistence reciprocal relationships with all living forms and places (Billiot and Mitchell 2018). Indigenous peoples have long inhabited their lands, making their living from the natural resources of the area through fishing, hunting, and agricultural means (Colomeda 1999). However, the colonization of Indigenous peoples around the

world used social and political processes to disrupt and remove Indigenous peoples from their land and related resources. In many cases, this loss followed a similar pattern: First, Indigenous communities experienced armed encroachment from immigrant colonizers. Next, as colonial immigrants became the dominant political force, land was taken "legally" by the immigrants through self-benefitting land laws and subjugating Indigenous peoples as savages and living beings that can be owned (Whyte 2016; King et al. 2009). As the non-Indigenous population grew, the industrial-induced land loss was further escalated through anthropogenic environmental manipulation such as the installation of dams and levees, as well as mineral, oil, and gas exploitation, and now climate change (Billiot et al. 2019). This history of land loss and socio-political marginalization renders Indigenous peoples vulnerable to the effects of environmental change as it threatens their livelihoods and, therefore, their way of life. Global environmental change poses the latest threat for Indigenous peoples (Wildcat 2009).

Indigenous communities from around the world have been the first to notice these changes in their communities, often the only or loudest voices (Whyte 2016). In 2009, Indigenous peoples from every continent gathered at the Indigenous Peoples Global Summit on Climate Change in Anchorage, Alaska, following the 2007 release of the Intergovernmental Panel on Climate Change (IPCC) report. Many representatives felt their voices were not adequately represented during this multilateral report from the United Nations (UN). Therefore, the Anchorage gathering was to prepare a declaration of climate crisis and call to action for the UN and future IPCC reports (Martinez 2012). Much of the existing climate change literature reflects the approach of Western science, which uses a knowledge base built on assumptions of human ownership of the environment rather than a communing bond reflected in many Indigenous cultures (Armstrong 2012). Therefore, the Anchorage Declaration states that any future intergovernmental climate change agreements must reflect the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). The UNDRIP holds that the status of Indigenous peoples has fundamental and human rights that recognize the rights of political sovereignty and self-determination requiring that Indigenous peoples are included in all decision-making processes and activities that involve their landscapes and seascapes to include the right to asserting traditional ecological knowledge (Martinez 2012).

Climate change along with the threat of oil drilling has been a serious concern of the Iñupiat people who rely on hunting activities in the Arctic Wildlife Refuge and Arctic Ocean (Thompson et al. 2012). Climate change has also affected the Northern Hemisphere high latitudes, as 57 Indigenous narratives described climate change and its impacts, including the following: (1) the melting of snow and ice influencing the migration patterns of several polar animals, (2) unsuccessful hunts for Indigenous hunters because of changing animal behavior due to stress, (3) modes of transportation are being compromised because of thinning ice and melting permafrost, destabilizing community infrastructure, (4) exotic species are appearing, such as willow trees (*Salix* spp.) and beavers (*Castor canadensis*), and (5) forest fires are increasing, adversely affecting land mammals, such as caribou (*Rangifer tarandus groenlandicus*), who are modifying their migratory patterns and causing geographic and temporal changes in Indigenous livelihood practices (Mustonen 2005; Sakakibara 2008, 2009, 2010 as cited in Alexander et al. 2011). Moreover, some of the Indigenous narratives from Oceania, Latin America, and Africa state that climate changes are affecting health, coastal livelihoods, water resources, and food production, as well as adaptation to changes in climate regimes (Alexander et al. 2011).

Objectives

In this article, we draw from published studies that make use of Photovoice methodology concerning environmental change and injustice. First, we broadly introduce visual research methods and then direct our attention to the use of photography, narrowing further as we focus on Photovoice, a community-based participatory research method. Next, we searched the literature for contemporary examples of how scholars use Photovoice to document and examine issues of environmental change and injustice across the globe. Though not an exhaustive review, we aim to provide insights into how Photovoice is being used to address environmental issues in general and then specifically within

Indigenous community contexts. As an exemplar, we provide a case study from the first author to illustrate how the method can be used to support Indigenous priorities related to environmental change. We further examine the benefits and limitations of the method. As scholars of Indigenous and Latina heritage, we believe it important to examine the cultural and ethical considerations of this method specifically employed with Indigenous communities. The article concludes with a discussion of future research considerations for engaging in visual methodologies with Indigenous communities.

2. Visual Methods

Visual methods are generally comprised of qualitative research modalities that use a variety of creative means to produce and represent knowledge. Such artistic mediums may include, but are not limited to, digital media, drawings, film, paintings, photographs, and sculptures. For this article, we are primarily interested in the potential of photography as a visual method for supporting Indigenous peoples in documenting and addressing environmental change and injustice in their communities. In recent years, visual research methodologies have gained recognition as a powerful tool for participatory research approaches. In the social sciences, visual research methods use a variety of images to answer research questions, not only by examining images, as do visual culture studies, but also by creating images (Rose 2012). Participatory visual research methods utilize participant-generated artistic mediums, such as photographs that represent data that are analyzed within the community research context. For the researcher, the participatory approach to photography is key to understanding the participants' views, insights, and perceptions of the issue being studied.

2.1. Visual Research Methods—Photography

With the rise of digital photography, the ability to collect participant-generated photographs in qualitative research has "become accessible and commonplace" (Sanon et al. 2014). Common participant-generated visual methodologies that use photographs include Photo-elicitation, PhotoStory, and Photovoice. Photo-elicitation has been used in multiple studies and is based on the simple idea of "inserting a photograph into a research interview" (Harper 2002, p. 13). Photo-elicitation can include researcher- or participant-generated photographs. The photographs are used alongside interviews, not only to elicit information about a particular phenomenon but also to evoke different types of information (Harper 2002). For instance, Rosenthal et al. (2014), used photo-elicitation to understand perceptions of violence from a youth perspective through case studies of collaborations among health services research trainees and community organization leaders. In their study, youth participants took photographs to document their experiences with violence in their community; they then discussed common themes in focus groups with community health providers. Murray and Nash (2017) used photo-elicitation to understand how Vietnamese mothers understand and react to infant crying. They intended to learn the cultural elements and context women in Central Vietnam used to calm their babies and help them fall back to sleep. While many elicitation studies use photographs, other studies have used paintings, cartoons, and public displays including graffiti, billboards, or essentially any type of visual image (Harper 2002).

Other visual methods include PhotoStory, a method of "collecting information and expressing issues and emotions through photos and associated diary entries" (Keremane and McKay 2011, p. 408). Guided by Wang's Photovoice method, Keremane and McKay (2011) believed participants did more than take photographs but provided a "deeper and wider" account of their stories. While such methods have become commonplace in the literature, Photovoice has gained a more extensive application across disciplines for its participatory characteristics and adaptability, particularly when considering Indigenous communities; therefore, we direct our attention to Photovoice for the remainder of this article.

2.2. Photovoice—A Community-Based Participatory Research (CBPR) Method

Photovoice is a qualitative community-based participatory research (CBPR) method. Therefore, in discussing Photovoice, it is necessary first to describe CBPR and its particular importance to historically marginalized communities, which are inclusive of Indigenous peoples. Community-based participatory research is an approach that seeks meaningful partnerships with communities and community members involved in the research endeavor. It strives to begin with a research topic of importance to the community, generally seeking to combine knowledge with social action. Key principles of CBPR include acknowledging the community as a unit of identity and focusing on the facilitation of collaborative, equitable partnerships between research partners, including community members, stakeholder organizations, and investigators during all aspects of the research process. Community-based participatory research is grounded in the notion that all partners participate in shared decision-making and control of the research process, including describing the problem, gathering and interpreting data, disseminating findings, and using results to address community concerns. Community-based participatory research principles assume that the community and researchers are united in a shared vision of research priorities, co-development, and co-production. Additionally, researchers maintain a local health board, community organization, and—within Indigenous communities—tribal council or Native corporation. Ensuring representation and community voice throughout the research process poses unique challenges for all partners and may include navigating local politics and power dynamics within communities and research relationships.

Photovoice

Photovoice (previously *photo novella*), a qualitative CBPR method, originated with Wang and colleagues as a methodology to support rural Chinese women in documenting their daily health and work conditions (Wang et al. 1996). In general, the method uses participant-generated photographs and storytelling to convey perspectives on important community issues to others outside the community. Photovoice has three primary goals: (1) engage the community in active dialogue, (2) establish a safe space for critical reflection, and (3) inform the larger, more dominant society to support community change (Wang and Redwood-Jones 2001).

Photovoice is informed by Freire's theory of education for critical consciousness, feminist theory, and a community-based approach to documentary photography (Wang and Pies 2004). Upholding what Freire called "education for critical consciousness", Photovoice supports community members (i.e., participants) in documenting and sharing their lived experiences as they see them (Wang et al. 1996). The practice of detailing one's own life experience and sharing them empowers community members with limited resources (i.e., money, power, or status) to voice what changes are necessary to improve health and well-being in their community Freire (2013, 2017). In feminist theory, power is conferred to those who have a voice, decide language, influence history, and partake in decision-making (Smith 1989). Photovoice seeks to explore feminist theoretical perspectives "in practice and to bring new or seldom-heard ideas, images, conversations, and voices into the public forum" (Wang and Redwood-Jones 2001, p. 561). Feminist theory informs Photovoice through the taking of photographs, and connected narratives that participants use to elevate their voice and decide the language to use that best reflects their experiences and can influence decisions and generate change and awareness in their community (Wang and Pies 2004). Photovoice has become a powerful photographic technique that enables historically marginalized peoples to consider the strengths and challenges of their community and communicate their experiences to policymakers and other prominent stakeholders (Wang and Redwood-Jones 2001).

In their original study, Wang and Burris state that Photovoice can be "creatively and flexibly adapted to the needs of its users" (Wang and Burris 1997, p. 383). Said differently, Photovoice is an adaptable method that is modifiable to fit a particular community's needs and preferences. Modified versions of Photovoice have become commonplace in the literature, as researchers strive to meet the needs and realities of communities (Mitchell 2018; Castleden et al. 2008; Badowski et al. 2011;

Bennett and Dearden 2013; Cunningham et al. 2009). The flexibility of Photovoice is a particularly important aspect of CBPR in an Indigenous context where cultural considerations such as tribal diversity and sovereignty, extended timelines, and Indigenous ways of knowing are essential to the research process (LaVeaux and Christopher 2009).

3. Method

This article is not intended to be an exhaustive review of visual methods but, rather, a scoping review that highlights innovative approaches to using visual methodologies with global and Indigenous communities to respond to environmental change. Scoping reviews seek to identify and summarize the main concepts in specific research areas. For our scoping review, we were primarily interested in Photovoice and its usefulness in supporting Indigenous peoples in documenting and addressing environmental change and injustice in their communities. In contrast with systematic reviews, which focus on the appraisal of the quality of research, scoping reviews chart and analyze the extent, range, and type of the literature and examine wide topics and research questions with the intention of identifying gaps in the existing literature and offering recommendations for future research (Arksey and O'Malley 2005; Pham et al. 2014). Our scoping review aimed to address the following questions: (1) How is Photovoice being used to address issues of environmental change globally? (2) How is Photovoice being used to address issues of environmental change in Indigenous specific contexts? We conducted a scoping review of journal articles that used Photovoice to document and address issues in the physical environment; this included searching for Indigenous- and non-Indigenous-focused Photovoice studies to see how the method has been used to document environmental change in communities across the globe. One Search and Google Scholar were primarily used for this review, and keywords used in our searches included "Indigenous", "Aboriginal", "First Nations", "American Indian", "Inuit", and "Alaska Native", coupled with other identifiers such as "environment", "water", "climate change", and "Photovoice". Once articles were deemed acceptable for inclusion based on topical areas, we examined their respective reference lists for additional articles to include in the review.

We identified 18 articles from the global Photovoice literature that illustrate the diverse and innovative ways Photovoice is being used to document environmental change, including a variety of approaches used for data collection, analysis, and dissemination. All identified articles were published between 2009 and 2017 and used Photovoice to study environmental change or human–environment interactions, including climate change in non-Indigenous settings. The global Photovoice literature includes studies in Australia, Africa, Thailand, Tanzania, Nepal, Canada, Costa Rica, and the United States.

We identified seven articles from the Indigenous Photovoice literature that illustrate the ways the method is being used to document environmental change in Indigenous communities. All identified articles were published between 2008 and 2018 and used Photovoice to study environmental change or human–environment interactions in Indigenous settings. The Indigenous Photovoice literature includes studies in Australia, Canada, and the United States.

4. Photovoice and Environmental Change

Photovoice is often used in the social sciences and health-related research. However, Photovoice has recently gained popularity among researchers who focus on environmental change or human–environment interactions (Bennett and Dearden 2013). In the global Photovoice literature, issues such as climate change, water and sanitation issues, natural disasters, and other pertinent environmental areas have been the focus of much of this research. We intentionally focus on Photovoice's application to community concerns and priorities structured around the physical environment. We broadly review exemplar studies to illustrate the diversity in Photovoice's application to issues of environmental change and injustice outside of Indigenous contexts, as a means to explore potential uses of the method within Indigenous communities.

Global Photovoice Literature

　　Climate change has been the focus of several Photovoice studies, whereas the method has been used to record and document participants' experiences of climate change in their communities. These studies span the globe and offer innovative examples of how Photovoice can be used to chronicle climate change events from community members' perspectives. Such studies highlight the diversity of community adaptation and resilience strategies used by communities to respond to and understand community perspectives of climate change and its associated threats (Hissa 2016; Bulla and Steelman 2016). For instance, Photovoice has been used to examine marine conservation and climate change in coastal communities on the Coast of Thailand and with women in rural Nepal to record experiences of climate change and mental health needs (Bennett and Dearden 2013; MacFarlane et al. 2015). The Photovoice method assisted women in the Nepal study to identify local and existing resources, develop adaptive strategies, and promote mental health in relation to climate change (MacFarlane et al. 2015).

　　Photovoice was also used with three different groups in Noosa, Australia, to capture their views about living on the water's edge and the impacts of climate change (Baldwin and Chandler 2010). In the study, participants reflected upon their personal beliefs about climate change, which prompted them to take action on climate change. The research's broader implications advance our understanding of community views of climate change that Baldwin and Chandler (2010) state is "an emerging and critical area of international [climate change] research" (Baldwin and Chandler 2010). The Photovoice method was also utilized within an Ontario community to understand their perceptions on disaster recovery and climate-related threats related to a recent F3 tornado and with farmers in North Carolina concerning vulnerability to climate change (Bennett and Dearden 2013; MacFarlane et al. 2015; Baldwin and Chandler 2010; Hissa 2016; Bulla and Steelman 2016). Findings from farmers in North Carolina suggest that developing active social networks and employing new adaptive behaviors may increase small farm resilience to climate change threats (Bulla and Steelman 2016).

　　Water is a finite resource, and water insecurity is expected to increase as water supplies become scarcer globally (Mitchell 2016, 2019; Pawar 2013). Accordingly, water and sanitation issues were a common focus of Photovoice studies. In a village in Limpopo Province, South Africa Photovoice was used to understand the community's water needs (Cunningham et al. 2009), and the method was used with urban American youth to explore local watershed issues and concerns (Chanse et al. 2017). Among women, Photovoice has been used in Usoma, a lakeshore community in Western Kenya (Bisung et al. 2015a; Bisung et al. 2015b) and with Dar es Salaam mothers in Tanzania (Badowski et al. 2011) to explore the nexus of water and health in relation to unsafe water and inadequate sanitation. Issues of water governance have been assessed through Photovoice (Fantini 2017), as well as the gendered nature of water in Sierra Leone concerning the use of water and water infrastructure (Thompson 2011). These studies illustrate that Photovoice is a viable method to research water and sanitation issues in water insecure communities. Results from these studies provide indicators such as the community's perceptions about water, including issues around water infrastructure and access, the relationship between water and health and hygiene, and gender roles and cultural aspects of water and sanitation (Cunningham et al. 2009; Bisung et al. 2015a, 2015b; Badowski et al. 2011).

　　Beh (2011) used Photovoice as a tool for developing conservation education in Kenya, while (Bosak 2008) used Photovoice to survey competing conceptions of nature in India. In Costa Rica, (Cook et al. 2016) used Photovoice to connect students and community members to local sustainability issues. Further illustrations of Photovoice's utility to environmental issues include Crabtree and Braun (2015) work with a rural Hawaiian community to develop a tsunami preparedness plan for natural environmental disasters. Similarly, Berbés-Blázquez (2012) used Photovoice to measure the relationship between ecosystem services and human well-being, while residents of Buzzard Point, Washington, D.C., used Photovoice to identify environmental pollution and health hazards in their community (Aber et al. 2017).

5. Case Study

The following case study serves as an example of a Photovoice collaboration between an American Indian tribe and an academic-based researcher. The researcher, who identifies as an Indigenous woman, is also the first author of this article but is not a member of the tribal community represented in the case study.

Tribal members from an American Indian reservation in the Midwestern United States used Photovoice to detail their observations and experiences with water insecurity in their community. Climate change combined with water quality concerns and recent droughts in the region has continued to expose the tribe's susceptibilities to environmental change. Similar to other Indigenous groups, the tribe has generally had limited resources, experienced political marginalization, and has had limited resources and power to make substantial changes concerning their environmental circumstances. The study used a modified version of Photovoice in combination with an environmental justice framework that fits the needs and realities of the tribal community. Study participants included 11 self-identified tribal members who either worked and/or lived on the reservation Mitchell (2016, 2018). During the Photovoice study, participants photographed images that reflected their perspectives on the relationship between water and health in their community. Next, participants partook in face-to-face interviews using the SHOWeD technique. During the interviews, participants selected and shared the images they had taken based on the research prompt. Figure 1 provides an example of a participant-generated photograph and accompanying narrative collected during the project. In vivo coding was used to analyze the qualitative data using participants' own words; this was followed by thematic analysis to contextualize the codes within the cultural context of the tribe. Study findings describe how water is central to the lives of tribal members and exposes the extent of health concerns tribal members attribute to water circumstances on their reservation. Tribal members shared concerns about whether the water that has sustained their people for generations is safe for use and questioned if there will be sufficient water supply for future generations of tribal members. These sentiments mirror many tribal members' viewpoints that those who use hazardous fertilizers on crops along the Delaware River and those who waste and contaminate water resources and do not practice sustainable agricultural activities around waterways and their connected tributaries lack respect for the water, the river, and the people who rely on it. Many tribal members believe that upstream activity along the river has possibly contaminated the river, fish, and the people who rely on it Mitchell (2016, 2018, 2019).

Figure 1. Participant K focused much of their interview on the lack of regard for the environment by surrounding agricultural operations; while holding a photo they took of a drainage tube that feeds into the River, they stated, "So all their chemicals they put on their plants drains right into our water system. I wish they could have did that better. Otherwise, all the chemicals we're taking in".

As Photovoice is an action-oriented method, the study concluded with a community photo exhibit on the reservation. The exhibition provided tribal members who did not participate in the study a chance to view and comment on the Photovoice project before it was shared with the public or published. Photographs in the exhibit were chosen by the participants and exhibited in their original

form to uphold the integrity and meaning of tribal members' perspectives. The community's response to the display was exceedingly positive, with numerous tribal members affirming that the Photovoice project should be shared with the broader public outside of the reservation. Based on this feedback, and with Tribal Council's endorsement, a public Photovoice exhibit was displayed at the state capital and endorsed by the state's only American Indian representative at the time. A member of Tribal Council gave an opening welcome to the exhibit, and the event was well attended by tribal members and key local and state-level stakeholders who were intentionally invited based on Tribal Council's recommendations Mitchell (2016, 2018, 2019).

6. Photovoice, Environmental Change, and Indigenous Peoples

With Indigenous groups, Photovoice has been used to document a wide range of issues including healthy eating among Aboriginal youth (Adams et al. 2012); HIV prevention among rural American Indians (Markus 2012); breast cancer experiences of Aboriginal women (Poudrier and Mac-Lean 2009); and substance abuse among American Indian youth (Gonzalez 2017), among others. However, in this section, we are primarily interested in ways that Photovoice has been used to support and honor Indigenous peoples' connection to the natural environment and document their experiences of environmental change and injustice. Similar to the global literature on ecological change and Photovoice, Indigenous Photovoice projects tackled many of the same issues and environmental challenges reflected in the mainstream literature. However, within an Indigenous context, one cannot discuss the physical environment without also considering Indigenous identity, culture, which is reflected in the literature.

Expanding on Photovoice projects with two different Aboriginal groups in northern Australia (Maclean and Woodward 2013) used the method to facilitate research between Aboriginal Australians and non-Aboriginal researchers involved in water resource management. The method was a powerful tool that informed researchers about Aboriginal values, knowledge, concerns, and aspirations for water resource management, which may not have been captured through other research methods (Maclean and Woodward 2013). Bradford et al. (2017) used Photovoice/Postervoice to better understand on-reserve First Nations youth's view of water and health, with emerging themes related to aesthetics, pollution, technological treatment, and the universal need for water. Photovoice, in conjunction with qualitative data analysis, was used to pinpoint important climate-sensitive, community-identified health outcomes, define determinants of sensitivity at multiple scales, and describe the adaptive capacity of Batwa health systems (Berrang-Ford et al. 2012). In a study conducted with an American Indian community in the Midwestern United States, Photovoice was used to document tribal members' perceptions and beliefs about water and health on their reservation (Mitchell 2018; also see case study). Three First Nations, located in Northern Ontario, Canada, documented social and ecological changes occurring in these communities through the use of Photovoice (Lemelin et al. 2015). First Nations leaders in Canada developed a Photovoice research partnership to understand environmental and health risk perspectives in the Huu-ay-aht territory. The Photovoice project proved to effectively balance power and create a sense of research ownership, trust, capacity building, and response to cultural preferences in the community (Castleden et al. 2008). Collectively, these studies have confirmed that Photovoice can be a useful tool in supporting Indigenous peoples' ecological concerns from a participant-centered, community-based perspective where issues and their potential solutions are defined by and for community members.

6.1. Benefits and Limitations of Photovoice with Indigenous Communities (Photovoice Evaluated)

In general, scholars have affirmed that Photovoice is an effective method for engaging with Indigenous groups (Carroll et al. 2018; Maclean and Woodward 2013; Castleden et al. 2008; Roy 2010). In this section, we further examine the literature to evaluate the usefulness of Photovoice in addressing Indigenous community's strengths and challenges, promoting critical dialogue and collective knowledge development, and informing policy and practice concerning issues of environmental

change and injustice. Our discussion includes both the benefits and limitations of the method concerning environmental issues faced by Indigenous communities.

6.1.1. Benefits

One of the main benefits of Photovoice is its ability to be modified to fit the needs of its users (Wang et al. 1996). For Indigenous groups, this has allowed for cultural adaptions of Photovoice, including the integration of cultural values and protocols (Bennett et al. 2019), while other scholars have "Indigenized" the Photovoice process (Thompson et al. 2016; Mark and Boulton 2017). For example, (Mark and Boulton 2017) adapted Photovoice in their investigation of *Māori* patient's views on *rongoā* (traditional Māori healing) and primary health care. In their study, the Photovoice method and theoretical frameworks were adapted to let Māori participants document and share their worldviews on health and their experiences with health services (Mark and Boulton 2017). Similarly, Photovoice was found to support Aboriginal oral and visual cultural practices during the research process (Wilkin and Liamputtong 2010). Likewise, (Higgins 2014) bridges Photovoice, which is shaped by Western theology, with Indigenous analogs and Indigenous standpoint theory to "rebraid" Photovoice with a cultural interface. Within an Indigenous context, the adaption of Photovoice is common and strengthens the method as a culturally appropriate and engaging research method for Indigenous groups (Maclean and Woodward 2013; Castleden et al. 2008; Mark and Boulton 2017; Lemelin et al. 2015).

Successful Photovoice projects typically choose dissemination strategies based on participant and community preferences. Honoring community preferences supports the community and participants in deciding and directing how photographs that were taken in their community will be shared internally and externally. Community ownership of the dissemination process is a primary benefit of the Photovoice method and has allowed for innovative dissemination strategies that expand beyond the traditional photo exhibitions used by many scholars (including Mitchell 2018; Roy 2010; Castleden et al. 2008; MacFarlane et al. 2015, among others). Similarly, hiring community members as researchers can assist in developing community capacity in the research process and leads to the co-production of information (Lemelin et al. 2015)

Indigenous environmental Photovoice projects have used images from their projects in many ways, including in publication for researchers and policymakers (Harper et al. 2015); still-image documentary (Carroll et al. 2018); printing Photo(voice) books (Harper et al. 2015); creating photo-banks on community websites (Harper et al. 2015), and developing "postervoice" (Bradford et al. 2017). Photovoice studies have found that the public display of photographs was an incentive for young people to participate in research (Larson et al. 2001). Additionally, Photovoice projects create a collection of community-driven photographs and captions that can stay with the community as an archive of the community's history, knowledge, and experience that can be studied and built upon in the future (Roy 2010; Mitchell 2016).

6.1.2. Limitations

As a visual method, it can be challenging to detail intangibles, such as feelings, attitudes, and opinions with Photovoice, as not everything is visually discernable or can be photographed. In response to this limitation, Photovoice scholars commonly ask participants, "Is there anything you did not photograph, but wanted to?" By asking participants to elaborate on topics that they were unable to convey through photographs, researchers can account for the intangible subjects that participants may have wanted to include but were unable to capture (Castleden et al. 2008; Mitchell 2016, 2018).

Photovoice requires regular communication and access to the community by the research team. (Lemelin et al. 2015). Travel to remote communities can be costly and time-intensive and not always feasible (Lemelin et al. 2015). Therefore, other modalities of communication, such as conference calls and email, maybe necessary (Lemelin et al. 2015). Additionally, using photography as a medium can be challenging, as a number of items need to be considered during data collection. Digital cameras or smartphone cameras can mean that an infinite number of photos can be taken to fill memory space, whereas use of disposable cameras can confine participants to a particular number (commonly

around 27 exposures). Additionally, digital photographs may give participants the opportunity to delete or alter their original photos or produce an image that is not possible with film cameras (Murray and Nash 2017). In choosing a camera type, researchers must also consider cost, ease of use, and any additional photography training needed. Other considerations include how a large volume of participant-generated photos will be organized and printed for community exhibitions, reports, or other publications.

6.2. Cultural and Ethical Issues

Photovoice can pose a number of cultural and ethical challenges because it involves distinct relationships between the community, participants, and researchers (Bisung et al. 2015b). Several studies have offered guidelines and examples of ethical guidelines and considerations (Wang and Redwood-Jones 2001; Castleden et al. 2008; Bisung et al. 2015b); however, each Photovoice project presents unique ethical challenges because of cultural and contextual variances (Bisung et al. 2015b). Here, we focus on cultural and ethical issues that are particular to Indigenous communities.

In Indigenous contexts, cultural considerations are central to establishing a safe and ethical Photovoice project. For instance, when informing participants that they should avoid photographing people, places, or things of a personal or private nature, researchers should also encourage participants to reflect on "things that are sacred to their tribe and should not be photographed or shared outside their tribal community" (Mitchell 2018). Additionally, research agreements with tribal communities should outline how the data will be shared between the respective partners (i.e., academic, tribal, community) and be indicative of a reliable communication system, a comprehensive research agreement, and commitment to collaborative research approaches.

7. Future Research Considerations

Although Photovoice has been praised as a powerful method to support marginalized communities in elevating their voices and creating community change, the method is still founded in qualitative methods that do not always garner the same respect as quantitative research in certain groups. Contemporary challenges require forward-looking methodological approaches to make a substantial impact; therefore, we believe that utilizing Photovoice within a mixed-methods approach is not only popular, but also communities a greater possibility of establishing the support and resources they need to tackle the most pressing environmental issues in their community. For instance, using Photovoice alongside a traditional community needs assessment creates an opportunity for communities to collect not only the story of their community but also allows them to attach numbers of people impacted by the environmental circumstances being studied. As more Indigenous scholars and communities undertake Photovoice projects, we must critically reflect on the research processes through an Indigenous lens that includes thought-provoking questions that initiate conversations about methodological and ethical issues pertinent to Indigenous peoples and environmental change and injustice. Reflecting on the literature, other areas where Photovoice could be useful for Indigenous communities include in land-use studies to map and document activities on traditional territories (Lemelin et al. 2015).

8. Conclusions

We assert that Photovoice has great potential as a methodological tool in environmental change research with Indigenous communities. Although not an exhaustive review, this article highlights the innovative ways in which Photovoice has been used to document and address environmental change and injustice across the globe. As illustrated by the literature and case study exemplar, environmental change can be complex and produce ongoing challenges that affect quality of life and cause unwanted cultural adaptations. Due to limited resources and marginalization, many Indigenous communities may be limited in their response to prevent or address environmental change. However, Photovoice may give Indigenous groups a strategic tool to document and voice their concerns, which can be shared

with the broader, more powerful public to stimulate action on the impacts of environmental change and injustice in their communities.

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