Coping with the Climate Crisis:

Investigating the Mental Health Impacts of Climate Change on Youth and Exploring the Efficacy of a Photovoice Intervention

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Beth Grant

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Supervised by: Dr. Robert Case & Dr. James Nugent

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Abstract

The devastating impacts of climate change take a toll on the mental health and well-being of individuals around the world. Research suggests that young people experience compounding vulnerabilities to the mental health impacts of climate change (Clayton et al., 2017). Though severe cases can be detrimental, manageable levels of 'practical anxiety' are a natural reaction to climate change and promote sustainable behaviours (Marlon et al., 2019). Photovoice is a qualitative, participatory action research approach that is used to empower participants to "represent their community and narrate their everyday experiences using their own voices to become catalysts for social change" (Bulla & Steelman, 2016; Sutton-Brown, 2014, p. 170). This study examines the impacts of climate change on the mental health of young people and explores the efficacy of photovoice as an intervention for managing these impacts and empowering participants. Participants aged 16 to 23 were recruited from environmental programs and networks at the University of Waterloo. They were invited to capture and submit photographs and written descriptions reflecting on the mental health impacts of climate change they experience, as well as sources of courage. Participants then discussed their images and experiences in focus groups. Surveys were employed to capture levels of hope and climate anxiety pre- and post-intervention. Results indicate that climate anxiety and other mental health impacts are a reality for many students involved in environmental programs or networks. Although the objective impact of the photovoice intervention on participant well-being remains unclear, participants reported a subjective increase in mental health and well-being, as well as feelings of empowerment as a result of intervention participation. Additional research is required to better understand the mental health impacts of climate change on young people, to develop interventions and supports to help youth manage those impacts and to clarify the efficacy of photovoice methodology as a potential intervention.

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Introduction

The impact of climate change on mental health is an emerging field of study that has gained momentum over the past decade (Clayton et al., 2017). This paper focuses on the mental health impacts of climate change in youth and young adults, with specific interest in undergraduate student populations in environmentally related programs of study. Photovoice methodology is used as a data collection tool, and simultaneously is analyzed as a potential intervention to manage climate-related mental health impacts. In existing literature, photovoice methodology has been used to better understand the lived experiences of climate change, to gain insight into mental health issues including anxiety and to engage youth on a variety of topics (Bulla & Steelman, 2016; Han & Oliffe, 2015; Rose et al., 2017; Trott, 2019). MacFarlane et al. (2015) investigated the efficacy of photovoice as a tool to increase awareness of climate-related environmental changes, foster resilience to those changes and create positive mental health outcomes among women in rural Nepal. However, no available literature investigates photovoice as a tool to better understand the mental health impacts of climate change among youth and young adults.

For the purposes of this study, undergraduate Faculty of Environment students and members of local community-based climate action networks and environmentally related clubs and student associations in the University of Waterloo community were recruited for participation in a photovoice activity and focus group to address the following research questions:

- *How does climate change impact the mental health and well-being of youth and young adults in the Region of Waterloo and surrounding area?*
- *Can photovoice, as a research methodology, help to manage eco-anxiety and stimulate a sense of empowerment in youth and young adults?*

This thesis begins with a review of relevant literature on climate change and mental health, the increased vulnerabilities of young populations, the importance of, and strategies for managing adaptive anxiety and an introduction to photovoice methodology and its related applications. The methodology section then outlines the mixed-method data collection approach utilized for this study, including the pre- and post-intervention surveys as well as the photovoice activity and focus groups. The results of the initial survey, photovoice activity, focus groups and comparative post-intervention survey are presented. In the discussion section, the results are analyzed and recommendations for future action and future research are made. Finally, the conclusion section summarizes the key messages of this project.

Although youth and young adults are experiencing the mental health impacts of climate change, a variety of coping strategies can help to manage these impacts. There are many diverse strategies and points of action through which universities can support undergraduate students experiencing mental health impacts due to climate change. Photovoice methodology shows promise as a potential tool to aid in the management of the mental health impacts of climate change experienced by youth, particularly in post-secondary settings.

Literature Review

Climate Change and Mental Health

Climate change is happening at an accelerating rate and impacts are increasing in both frequency and severity around the world (Clayton et al., 2017). Canada is not immune to these impacts; in fact, it is currently warming at twice the global average (Hayes et al., 2019). Despite an expansive collection of research studies investigating the physical health impacts of climate change faced by people around the world, mental health impacts are only more recently being considered (Clayton et al., 2017). A variety of new terminology has been created to describe the alteration of mental states stemming from our changing relationship with the natural world, including "eco-anxiety," "climate grief" and "solastalgia" to name a few (Lewis, 2018; Panu, 2018). Eco-anxiety is a term that has been used to encompass a wide variety of feelings, but can be defined as a source of stress derived from "watching the slow and seemingly irrevocable impacts of climate change unfold, and worrying about the future for oneself, children, and later generations" (Clayton et al., 2017, p. 27).

Climate grief can be sub-divided into four categories: acute (stemming from direct experiences of ecological loss), cumulative (an experience built on compounding stress from landscape changes), vicarious (witnessing the suffering of others' ecological losses) and anticipatory (fear and grief over your own anticipated future losses) (Goldberg, 2020). Anticipatory grief has been identified as a form of 'ambiguous grief' which may be particularly difficult for individuals to articulate (Cunsolo & Ellis, 2018). Elizabeth Kübler-Ross's five stages of grief can help to explain the interplay of other emotions of individuals involved in environmental work as they shift between the stages of denial, anger, bargaining, depression and acceptance (Friedrich & Wüstenhagen, 2016, p. 193). The four stages of grief developed by counsellor William Worden which include "accepting the reality of loss, working through the pain and

grief, adjusting to the new environment and reinvesting emotional energy in a new life" have been adapted specifically to help climate activists cope with their work (Haseley, 2019, p. 113).

Solastalgia, rooted in the words solace and nostalgia, is the experience of loss or mourning that comes with the environmental destruction or alteration of a place of emotional and personal value (Panu, 2018). The overwhelming threat of climate change whether experienced directly or indirectly can result in "emotional distress and anxiety about the future, leaving many individuals feeling scared, sad, depressed, numb, helpless and hopeless, frustrated or angry" (Helm, 2018, p. 161). Cases of direct, severe impacts such as natural disasters can bring about severe psychological trauma; an increase in cases of depression, anxiety, post-traumatic stress disorder and suicide are common following disaster situations (Clayton et al., 2017). Similarly, climate scientists and naturalists often suffer from eco-anxiety as a result of the frequency of exposure and intimate knowledge of climate change and its devastating impacts (Panu, 2020). Indigenous communities are especially vulnerable to both physical and mental health impacts of climate change as they tend to be located in at risk geographies, and their cultural identity, traditions and ways of life are intimately connected to the land, local ecosystems and natural processes (Clayton, 2018).

Even in cases of indirect impacts, the general knowledge of climate change occurring and negatively impacting others can act as an additional, compounding source of stress and lead to increased instances of depression, general anxiety and maladaptive behaviours, including the use of addictive substances, workaholism or sexually risky behaviour (Panu, 2018). Eco-anxiety and depressive symptoms can also occur solely from learning about "the negative experiences of others and from fears – founded or unfounded – about their own potential vulnerability" (Clayton et al., 2017, p. 14). Feelings of helplessness and frustration can result from thinking about climate change and grappling with a perceived inability to make a difference in stopping it and its devastating impacts (Clayton et al., 2017). Considering one's personal contributions to climate change and the impact of one's choices on people in

more vulnerable positions, including future generations, can result in feelings of guilt (Clayton et al., 2017). This guilt can be carried around like a debt, which can bring an experience of depression or bitterness (Lewis, 2018).

Cunsolo et al. (2020) reported a sharp increase in both the chronic and acute mental health effects of climate change. A 2019 report found that 79% of Canadians expressed concern about the impacts of climate change and 78% believe that Canadians are at risk of experiencing these impacts (Field et al., 2019). It is of utmost importance to explore the mental health impacts of climate change not only for the sake of maintaining mental health and well-being, but also because psychological factors impact the ways in which information influences people's beliefs and actions around climate change (Clayton et al., 2017). The reality of climate change can be so overwhelming that a common human response is to remain within the first stage of grief, to deny its severity and existence entirely, greatly reducing concern and environmentally friendly actions and behaviours (Clayton et al., 2017; Friedrich & Wüstenhagen, 2016).

Increased Vulnerabilities of Youth and Young Adults

Despite common assumptions that youth are oblivious to issues beyond their day-to-day lives, climate change is affecting them both directly and indirectly through media exposure (Baker et al., 2020). Research shows that children, coping with less individual agency and a less advanced ability to express emotions about abstract concepts, are at a heightened risk of experiencing both physical and mental impacts of climate change (Clayton et al., 2017). Stress resulting from climate change impacts can lead to "changes in behaviour, development, memory, executive function, decision-making and scholastic achievement" in youth (Clayton et al., 2017, p. 6). As a result of a terrifying lack of control over a seemingly precarious future and a lack of perceived validation for their concern, children have developed depressive and obsessive-compulsive symptoms in a number of studies (Clayton et al., 2017). A 2020 survey of 2000 British youth found that "73% were worried about the state of the planet, 19%

have had a bad dream about climate change, and 41% do not trust adults to tackle the challenges presented by climate change" (Cunsolo et al., 2020, p. 261). Climate change has been personified as "the thief of childhood" (Grauer, 2020, p. 42).

Teens are old enough to have a strong comprehension of the science of climate change, as well as the failures of societal and political actors to adequately address the situation, breeding increasing frustration and hopelessness (Baker et al., 2020). A growing number of young adults have cited eco-anxiety and concerns around climate change as a reason for choosing not to have children of their own (Panu, 2020). Based on the findings of a 2020 YouGov poll commissioned by Friends of the Earth, 70% of people age 18-24 are more worried about climate change than they were a year ago (Hickman, 2020). Research has shown that climate scientists are especially prone to experiencing negative mental health impacts as a result of their intensive knowledge of, attentiveness to, concern for and evidence of climate change (Clayton, 2018).

Though literature has only begun to explore it, college and university students enrolled in environment or climate related programs and climate activists are at the same heightened risk for many of the same reasons (Kelly, 2017; Kluttz, 2020; Wallace et al., 2020). The intimate awareness of and engagement with research and educational materials about climate change and environmental degradation is "a prerequisite for an emotional response" (Clayton, 2018, p. 260). Undergraduate students in environmental programs reported higher rates of anxiety related to climate change than their non-environment counterparts and about half felt that their institutions and classes did not adequately address or prepare them to manage these mental health impacts (Kelly, 2017). In a review of 49 post-secondary institutions located in Canada, the U.S. and globally, Kluttz (2020) found that "action on mental health and the climate crisis is overall quite limited in the context of post-secondary institutions" (p. 17). In his writings in the Sand County Almanac in 1949, conservationist and ecologist Aldo Leopold described the emotional pain that accompanies environmental knowledge by noting that

“one of the penalties of an ecological education is that one lives alone in a world of wounds” (Humphrey, 2020).

Mental health impacts due to climate change are often compounded on academic and performance related stresses that are experienced by most undergraduate students (Wallace et al., 2020). Feeling overwhelmed, hopeless, anxious and depressed is a shared experience for the majority of college students (Ramasubramanian, 2016). Many post-secondary students perceive symptoms of anxiety and depression as “typical college stress” and thus believe their situation unworthy of treatment and normalize their suffering (Lattie et al., 2019, p. 2).

Many students who do desire or seek help are skeptical of care efficacy and perceive available options as being inconvenient (Lattie et al., 2019). The 2018-2019 wave of the COMPASS study which surveyed 47,290 Canadian high school students and 116 Canadian post-secondary schools found that 58% of students are reluctant to seek help at school for mental health concerns (Doan et al., 2020). The most common barriers to youth seeking help for mental health concerns include “stigma, embarrassment, poor mental health literacy, and a preference for self-reliance” (Doan et al., 2020, p. 2). The ambiguous, indirect nature of some forms of eco-grief or eco-anxiety can make expressing feelings difficult and make the problem feel abstract (Cunsolo & Ellis, 2018).

Many young people also face compounding vulnerabilities and barriers as a result of their socioeconomic status, race, culture, gender and physical health (Clayton et al., 2017). The mental health impacts of climate change are bound up in issues of environmental justice and both social and environmental determinants of health remind us that this issue does not affect everyone equally (Hayes et al., 2019). Research also shows that an individual’s ability to follow healthcare advice is always profoundly affected by “opportunity structures, social determinants and service access, all of which are most deficient among those in the greatest need” (Berry et al., 2018, p. 283).

Despite these extensive vulnerabilities, young people are today's change-makers and political actors with meaningful ideas and potential contributions to climate change action (Trott, 2019). The *Fridays for Future* movement inspired by Greta Thunberg, who has publicly discussed her own eco-anxiety, is an excellent example of the capacities of youth to take direct action on climate change and influence the political sphere (Panu, 2020). Unfortunately, it is not uncommon for youth to experience the "dismissing, criminalising, pathologizing and patronising [of] their feelings and voices" by adults in power failing to take sufficient action (Hickman, 2020, p. 411). For young people living in a time of climate change, "the moral failure of business-as-usual avoidance responses" from governments and other parties with power is the salt in the wound (Moser, 2019, p. 5). Growing up witness to great ecological destruction and peril, watching as those in positions of power sit idle and fail to correct course, while being told narratives of a 'bright future' and 'endless possibilities' is an impossible reconciliation. Today's young people are fed up with performative environmentalism: "the partially pretended or gesture politics of a context whose basic commitment is still to the intellectual and material comforts of the status quo, given the power and inertia of capitalism and consumer democracy" (Clark, 2020, p. 74).

The mental health impacts of climate change on youth and young adults being discovered and documented in recent literature are diverse and far-reaching. As the challenge of climate change related mental health impacts increases immensely, so too are efforts from the scientific community to better understand and manage them. At a conference in Lisbon in 2019 over 40 psychological associations of various countries signed a resolution "acknowledging that climate change poses a serious threat to mental health and signaling a desire to deal with the problem" (Craps, 2020, p. 3). Potential interventions to manage mental health impacts and empower young people are worth further exploration in a world where climate change and its tangible effects are an inescapable reality and burdensome responsibility for today's youth and future generations.

Managing Adaptive Anxiety

Though in severe cases eco-anxiety can be detrimental to an individual, it is critical to highlight the constructive role of anxiety in promoting information-seeking and problem-solving behaviours (Panu, 2020). As anxiety researcher David Barlow puts it, “without anxiety, little would be accomplished” (Panu, 2020, p. 12). Eco-anxiety is seen by many researchers as a rational and appropriate response to climate change, that most often is not maladaptive (Lewis, 2018; Panu, 2020). A healthy and manageable level of worry about climate change can help to foster environmentally friendly behaviours and build sustainable lifestyles and community resilience (Lewis, 2018; Panu, 2020). Eco-anxiety has also been identified as a “moral emotion,” as it exhibits concern and care for the planet and those suffering (Panu, 2020, p. 12). In a situation where the source of much anxiety and pain cannot be eliminated anytime soon, it seems that a delicate balance is required. Allowing time to grieve what has been lost and space to feel negative emotions is important, yet without any hope-focused or solution-oriented discussions “hopelessness emerges as a profound threat” (Baker, 2020, p. 12).

The type of hope and doubt are of great significance as “hope is not always good and doubt is not always bad,” (Marlon et al., 2019, p. 2). False hope and fatalistic doubt should be avoided as these extremes can lead to unproductive behaviours such as avoidance, distancing and inaction (Marlon et al., 2019). A manageable level of what researchers call “practical anxiety,” or constructive hope and doubt can have motivating effects (Panu, 2020, p. 1). Research shows that people are more likely to engage in climate solutions if “they can relate them to local experiences or if they see the relevance to their own health and well-being” (Clayton et al., 2017, p. 6). Individuals with high levels of perceived self-efficacy, or who are feeling capable to contribute positively to the issue, are more likely to act on climate solutions (Clayton et al., 2017).

Eliminating the mental health impacts of climate change altogether is likely neither plausible nor in the best interest of individuals or society. Rather managing anxiety and other mental health impacts

in a way that acknowledges the experience, and allows it to foster moral and sustainable behaviours, while preventing debilitating and severe effects may be a more effective and attainable course of action. In more general terms, poor mental health is often related to the experience of feeling emotionally 'disconnected' from yourself, other people and the greater environment; therefore, interventions that foster intra and inter-personal connectivity and rejuvenate relationship to one's local environment can promote mental health (Nurse et al., 2010).

Social movements and community organizing can help foster interpersonal connectivity by creating "spaces where people can meet face-to-face, producing hope through joint action" (Kleres & Wettergren, 2017, p. 508). Engaging in social movements places the individual in solidarity with others which can create and rejuvenate emotional energy (Summers-Effler, 2002, p. 44). The collective identity found in group organizing can provide a new perspective, as "personal problems are revealed as social patterns, and the blame for energy loss is placed on the environment instead of the self" (Summers-Effler, 2002, p. 51). This is especially relevant in the case of mental health impacts of climate change which are rooted in social patterns and environmental conditions. Creating community and student organization around these experiences "can allow room for the legitimization of these emotions" (Summers-Effler, 2002, p. 50). This idea aligns with William Worden's four stages of grief which argue that we have to "accept the reality of loss," begin "working through the pain and grief" and make space for the process of "adjusting to the new environment" before we are able to begin "reinvesting emotional energy in a new life" (Haseley, 2019, p. 113). The negative mental health impacts of climate change experienced by youth can be turned into a point of connection and collective action: "In solidarity, deviant emotions come to represent less of a threat to one's social bonds because the deviant emotions themselves have come to be associated with new sources for solidarity and emotional energy formed in collective identity" (Summers-Effler, 2002, p. 50).

The *biophilia hypothesis* introduced in 1984 by American biologist, naturalist and writer Edward Osborne Wilson reasons that humans are innately connected to the natural world and receive psychological benefits from fulfilling and maintaining this connection (Usher et al., 2019). More recently, Richard Louv, author of *Last Child in the Woods*, coined the term 'nature-deficit disorder' (Louv, 2008). Louv theorizes that exposure to nature is necessary for both physical and emotional health of youth and adults (Warber et al., 2015). In keeping with these theorists' works, a large body of existing research has provided evidence that viewing and interacting with nature can have a "restorative function and rehabilitative benefits" including many controlled studies in which contact with the environment resulted in a reduction in several psychological stress indicators (Nurse et al., 2010, p. 28; Windhorst & Williams, 2016). This body of scientific research is only supporting evidence of a truth long known by Indigenous communities, including those in Canada (Mashford-Pringle & Stewart, 2019). Indigenous ways of knowing and being are embedded in the fact that "land is important to all aspects of physical, spiritual, emotional, and mental health and well-being" (Mashford-Pringle & Stewart, 2019, p. 65).

Mindfulness practices have also been shown to promote well-being, increase positive emotion and resiliency, and mitigate anxiety and depression (Ramasubramanian, 2016). Mindfulness activities often include aspects of "meditation, visualizing, focused thought, deep breathing, nature connectedness and artistic self-expression that are unified in their application of critical first-person attention, focus and intention to the present moment" (Ramasubramanian, 2016, p. 308). Photovoice methodology, as utilized in this study, brings together many of the aspects noted above, including: reconnection with yourself, others and your environment, spending time viewing and interacting with nature, visualizing, focused thought and artistic self-expression. Photovoice may be an effective tool to allow young people to embrace manageable levels of practical anxiety and foster constructive hope and doubt in relation to climate change.

Photovoice Methodology

Originally developed by Caroline Wang and Mary Ann Burris in the early 1990s, photovoice is a participatory action research (PAR) method frequently used to engage marginalized populations in research (Sutton-Brown, 2014). Photovoice methodology draws from feminist theory, documentary photography and empowerment education for critical consciousness (Sutton-Brown, 2014). Empowerment is a key pillar of photovoice research as participants are actively involved in the process of data collection and analysis (Bulla & Steelman, 2016). Photovoice research represents a platform for communities, often silenced and excluded from the political sphere, to capture and voice their experiences (Sutton-Brown, 2014). Though it can and has been altered and adapted for the purposes of individual studies, photovoice methodology as originally developed, is conducted through a multi-step process outlined below (Sutton-Brown, 2014, pp. 171-172):

1. Select and recruit a target audience of policy makers or community leaders.
2. Recruit a group of photovoice participants.
3. Introduce the photovoice methodology to participants and facilitate a group discussion.
4. Obtain informed consent.
5. Pose an initial theme for taking pictures.
6. Distribute cameras to participants and review how to use them.
7. Provide time for participants to take pictures.
8. Meet to discuss photographs.
9. Plan with participants a format to share photographs and stories with policy makers or community leaders.

While the process of capturing photographs creates a unique opportunity for participants to portray an experience or message in a creative way, this methodology prioritizes the interpretation of the photo over the image itself (Sutton-Brown, 2014). While the visual content of what is captured in

the image itself is valuable data, the personal meaning, value or experiences that the participant associates with the image is the focus. For this reason, and for the purpose of interpersonal connection, the sharing of photographs and initiation of critical dialogue among participants is a crucial step in photovoice research (Sutton-Brown, 2014). These discussions allow participants to engage in a process of meaning-making and analysis, determining for themselves the themes and issues of importance visible in the data (Sutton-Brown, 2014). While photovoice can be used to investigate a diverse range of topics, some traditional areas of application for this methodology includes public health, social justice and environmental justice (Bulla & Steelman, 2016).

Youth Empowerment Applications

Photovoice has been used to engage youth on a variety of research topics including violence, health promotion, social justice, empowerment, hope and spirituality (Rose et al., 2017). A limited number of studies have also used photovoice methodology to facilitate constructive engagement of youth on climate change issues (Trott, 2019). PAR methods such as photovoice pair well with youth research as they shift power and provide young people with more control and voice in matters that will have major impacts on their futures, such as climate change (Trott, 2019). Photovoice has been identified as "a positive way of engaging young people and entering their worlds" (Hatala, 2020, p. 4). A culture of respect and mutual learning fostered between participants and researchers in PAR settings creates conditions for youth to embrace a sense of personal agency and confidence in their abilities (Smith et al., 2012; Trott, 2019).

Mental Health Applications

Photovoice has been identified in the literature as "a robust method ideally suited to describing mental illness issues while affording some important therapeutic value" (Han & Oliffe, 2015, p. 122). Capturing photographs of aspects of daily life often help participants to acknowledge and reflect on events or moments that may otherwise go unnoticed (Han & Oliffe, 2015). This process of self-reflection

can lead to an enlightenment or realization of new perspectives for those who participate (Han & Oliffe, 2015). In relation to environmental research, photovoice is an opportunity for youth to interact with nature and consider how those interactions contribute to their sense of health, well-being and resiliency (Hatala, 2020). Photographs create a new means of communicating mental health experiences that may be hard to express verbally (Smith et al., 2012). Photovoice is a creative medium through which young people can grapple with ideas of place, identity and community and consider local sustainable solutions to the environmental problems they see (Trott, 2019). The participatory, action-based nature of photovoice research can help to combat the sense of paralysis experienced in relation to climate change (Trott, 2019). Photovoice represents a promising, potential tool to address the broad range of normal emotions elicited in youth as a result of climate change (Baker, 2020). This methodology may also help counselors to better learn from the wisdom and experiences of the youth they assist (Smith et al., 2012). Photovoice represents an opportunity for participants to spend time in nature, thus increasing biospheric concern which, in healthy doses, can be used to mobilize climate action and foster a moral response (Helm, 2018).

Methodology

This thesis research has two related aims. One aim is to investigate and document, on a broad scale the impacts of climate change on the mental health and well-being of youth and young adults in the Region of Waterloo and the surrounding area. The other is to explore the potential of using photovoice – an empowering and engaging method of data collection based in intentional self-expression and reflection – as a means of managing the mental health impacts of climate change and generating hope or courage for the future in participants. The mental health impacts of climate change and the impacts of participation in the photovoice study and related focus group were measured using pre- and post-surveys, which were intended to provide insight into the analysis of this type of methodology as a data collection tool, but also a potential intervention to manage eco-anxiety and stimulate a sense of empowerment in youth and young adults.

Research Questions and Objectives

The main questions being addressed in this thesis are:

- *How does climate change impact the mental health and well-being of youth and young adults in the Region of Waterloo and surrounding area?*
- *Can photovoice, as a research methodology, help to manage eco-anxiety and stimulate a sense of empowerment in youth and young adults?*

Participant Recruitment Methods

Participant inclusion criteria included the following: Participants should fall within 16-23 years of age and be members of or involved in a local community-based climate action group or an environmentally related club or student association on University of Waterloo campus or enrolled in an environment or sustainability related undergraduate program of study. This study recruited participants from local community-based climate action networks and environmentally related clubs and student

associations in the University of Waterloo community and undergraduate environment or sustainability related classes by contacting the appropriate directors, members and professors respectively. Gatekeepers, individuals responsible for social media and email communications, (on behalf of the research team) forwarded recruitment emails to their members or students and made postings on relevant social media and academic pages to inform potential participants of the study and where to complete the initial survey. Two rounds of recruitment occurred for this study, one in November 2020 and another in January 2021.

Data Collection Methods

The research questions were approached using mixed methods of data collection, including an independent photovoice activity and subsequent focus groups, as well as pre- and post-intervention surveys.

Pre-Intervention Survey

The purpose of the initial survey was to collect a baseline of mental health impacts of climate change that may be experienced by youth and young adults located in the Region of Waterloo and surrounding area and to recruit interested members for the photovoice and following focus group portions of the study. See Appendix C for details.

The first quantitative survey was advertised and administered electronically to members of local community-based climate action groups, clubs and student associations and/or students enrolled in environment or sustainability related undergraduate programs of study. At the beginning of the survey, participants were asked to input a unique code (month of their birthday, first three letters of their mother's first name, first letter of the street they currently live on) that was later used to link survey responses of those who participated in subsequent parts of the study. A section of the initial survey features eight questions from the well-established and utilized Adult Hope Scale (AHS), which defines hope as "a positive motivational state that is based on an interactively derived sense of successful (a)

agency (goal-directed energy), and (b) pathways (planning to meet goals)" (Snyder et al., 1991, p. 287). The four agency and four pathway questions from the AHS used in the initial survey provide a standardized measure of hope, which can be used to understand the general state of mental health and well-being of respondents as many correlational studies have shown that higher levels of hope are related to better overall adjustment (Snyder, 2002).

The subsequent section of the initial survey drew from a questionnaire specifically developed to measure climate change anxiety (Clayton & Karazsia, 2020). This recently developed scale is composed of questions that measure climate anxiety overall, cognitive-emotional impairment, functional impairment, experience of climate change, as well as behavioural engagement in climate action (Clayton & Karazsia, 2020). The initial survey then collected demographic data that helps identify experiences or patterns related to certain demographics.

At the end of the initial survey, participants were asked about their interest in the photovoice and focus group components of the study. If participants expressed interest, they were provided with an opportunity to provide an email address at which to contact them with information about the next steps. Identifying information was collected separately from participant survey responses to ensure confidentiality of the survey responses.

Photovoice Activity

Survey respondents who indicated an interest in the photovoice activity were then contacted and asked to provide their unique participant code for later linkage of data. Interested participants were randomly selected to participate in the photovoice study and were randomly divided evenly into two groups, the control and treatment groups. The control group was informed that their participation in the photovoice activity was not needed, but they were to be contacted at a later time to complete the final survey. The treatment group was provided with instructions for participation in the photovoice study to

ensure that photos were taken safely and ethically and that the content of the photos taken by participants was appropriate to be collected and shared during a focus group.

Two broad prompting questions were provided that give a creative basis for the participants to use to inspire their photo content. The first question was, “Does climate change impact your mental well-being or sense of happiness? If so, how?” The second question asked, “In spite of the climate crisis, what gives you courage for the future?”

Participants were encouraged to spend time thinking about the prompting questions and take a number of photographs to choose from, ultimately choosing one photo for each of the two prompts. Participants were also asked to write a short description or written piece to accompany each photo (150 words or less). This written description worked to explain the content of the photo and the feelings and thoughts of the participant that came with taking the photo or how the photo ties into the prompt; the written description could be literal and straightforward or creative and poetic. A time frame of two weeks was provided to participants to take photos and write prompts before submitting them and coming together for the focus group. This time frame was chosen as it fit reasonably well within the limited time allocation for this undergraduate thesis project. At the same time, the two weeks still provided participants with a sufficient amount of time to reflect on the prompting questions, capture and select the photographs and write the accompanying descriptions, keeping in mind that many undergraduate students also have a full course load, part time jobs and many other personal time commitments to attend to.

Focus Groups

After capturing and selecting their images, photovoice participants took part in qualitative, conversational focus groups. These focus groups provided an opportunity for participants to discuss the data collected by sharing photographs and written descriptions and partake in the analysis process by conversing about emerging themes (Sutton-Brown, 2014). A total of 3 focus groups were conducted

with 2, 3 and 2 participants respectively. During the focus groups, participants took turns sharing their photographs and written description with each other. Photos and descriptions to the first prompting question - “Does climate change impact your mental well-being or sense of happiness? If so, how?” - were shared among focus group members. To aid participants in elaborating on the context of their photographs, a series of questions was provided for them to respond to after reading their written response aloud to the group. The questions provided are outlined below:

- *What is happening in your picture?*
- *What has been captured in your picture?*
- *Why did you take a picture of this?*
- *What significance does it have to you?*
- *What does this photo mean to you?*
- *What does it tell us about your experience?*

These questions, though overlapping and arguably redundant, ensured that participants contextualized and made meaning and that the student researcher collected plentiful data for each photograph. In order to guide group conversations around shared themes after each participant shared their first photograph and written response, the following set of questions were posed to the group:

- *Does anyone have any additional thoughts they would like to share now that you have seen each other’s work?*
- *Did you notice any shared themes, ideas or experiences between your photographs and written descriptions?*
- *Are there any key takeaways of these photographs and descriptions that you think should be reflected in the research?*

- *Is there anything not captured in the photographs that you wanted to mention regarding your experience of mental well-being regarding climate change or others that of others in your community?*

These questions empowered participants to directly contribute to data analysis and shape the research by informally partaking in the identification of shared themes and experiences between their works and by explicitly asking them what they think is of importance for inclusion.

Participants then shared their photos and written responses to the courage-focused prompt, "In spite of the climate crisis, what gives you courage for the future?" The same process was followed using the above sets of questions to discuss themes and make meaning for the second round of photographs. See Appendix G for the detailed focus group guide.

The focus groups were conducted and recorded on Zoom in order to optimize participant accessibility. The recorded audio files were then run through Otter.ai, a transcription software for later analysis.

Post-Intervention Survey

The final quantitative survey was administered electronically to participants of both the control and treatment group upon completion of focus groups. Unique participant codes were asked for within the final survey to allow the linkage and comparison of individual responses between the initial and final survey. The final survey was circulated approximately two months after the initial survey was circulated. While this timeline was necessary in order to complete all of the intermediate steps of this research, the extended period between initial and final surveys may have led to some drop-off in final survey response in the control group. The purpose of the post-intervention survey was to take a second measure of mental health in relation to climate change. Surveying both control and treatment groups allowed for comparative analysis between groups. Having data from the initial survey separated into

control and treatment group responses allowed for comparison between both groups' initial and final survey responses (See Appendices D and E for details).

The final survey for treatment group members had additional questions regarding their perceived experience in the photovoice activity and focus group; otherwise, the content of the final survey remains similar to the initial one, using the AHS questions and climate change anxiety scale. Some of the additional questions included in the treatment group final survey include:

- A Likert scale asking participants to rate how much they agree or disagree with the following statements:
    - *"The photovoice activity and focus group was fun and enjoyable to complete."*
    - *"I believe participating in photovoice activities and focus groups like this one can create a positive change in attitudes and perspectives."*
    - *"Participating in the photovoice activity was a meaningful and empowering experience."*
    - *"The photovoice activity and focus group had a positive impact on my mental health and well-being in relation to my thoughts about climate change."*
- Open response questions asking participants:
    - *"What did you like about the photovoice activity and focus group?"*
    - *"What did you dislike about the photovoice activity and focus group?"*
    - *"What did you find meaningful or empowering about the photovoice activity and focus group?"*
    - *"If you could change anything about the photovoice activity or focus group, what would it be?"*

Sampling Method

This study used non-probability sampling techniques, including both purposive and convenience sampling. Purposive sampling, or more specifically homogeneous sampling, was used as participants

were required to be within 16 to 23 years of age and either a member of or involved in a local community-based climate action network, an environmentally related club or student association in the University of Waterloo community or a student enrolled in an undergraduate environment or sustainability related program (Etikan et al., 2016). This specific community was sampled from as they could be categorized as youth and young adults and were also hypothesized to have been exposed to increased mental health impacts of climate change as a result of their environment and climate related studies and/or extracurriculars. While the above eligibility criteria were used to select participants, convenience sampling was also used as those most easily accessible, available and willing to participate at the time of data collection were included as participants in the study (Etikan et al., 2016). As an undergraduate student in the Faculty of Environment at the University of Waterloo, I had direct and convenient access to the network of organizations, clubs and undergraduate classes utilized for recruitment.

Data Analysis

As a variety of data was collected using a mixed methods approach, a diverse variety of analysis methods were required. Photovoice and focus group data were qualitative in nature, while survey responses were mainly quantitative in nature, both requiring different analysis techniques outlined below.

Qualitative Data

Focus group transcriptions were coded using a process called initial coding, which consists of "breaking down qualitative data into discrete parts, closely examining them and comparing them for similarities and differences" (Saldana, 2013, p. 100). Once codes were created the process of thematic analysis took place which "allows categories to emerge from the data" (Saldana, 2013, p. 177). Themes were looked for not only in repeating ideas, but also shifts in focus group conversation, theoretical issues suggested by the data and gaps in discussion (Saldana, 2013). Because focus group conversations

were organized around the two prompting questions from the photovoice activity, many codes and resulting themes provided insights into the ways in which climate change impacts the lives of youth and young adults, as well as what gives them courage and hope for the future despite climate change.

Quantitative Data

The quantitative data were analyzed in excel using descriptive comparisons. Given the focus on qualitative methods and because probability sampling was beyond the scope of the survey elements of this project, inferential statistical analyses were not used to determine the statistical significance of the results.

Ethical Considerations

This research project received ethical clearance from a University of Waterloo Research Ethics Committee (ORE File #42164). Study details were provided to participants prior to all steps in the research, including at the beginning of both surveys and in the form of an Information for Participants Memo sent prior to participation in the photovoice activity and focus groups. These details ensured that all participants were fully informed of study purposes, data collection methods, and the use and storage of collected data. Informed and voluntary consent was obtained through the use of radio buttons at the beginning of both surveys, as well as through the completion of an additional consent survey prior to the photovoice activity and focus groups. Those who partook in the photovoice activity were provided with training and detailed instructions to ensure that any photographs captured were obtained ethically and safely, including consideration of the appropriate level of consent of any photography subjects. The use of unique participant codes and the separation of survey responses from the collection of identifying information maintained the anonymity of participants and privacy of personal information divulged through the surveys, including demographic information. After the completion of the photovoice activity and focus groups, the opportunity for attribution (inclusion of their name alongside their photographs, written descriptions and/or focus group contributions in any publications or presentations to come from

this research) was provided at the request of the participant. This option was completely voluntary and some participants chose to remain anonymous which is why some participant works are attributed while others remain coded.

Challenges and Limitations

Participant recruitment and data collection for this research project was carried out during the Covid-19 pandemic which created additional challenges. The entirety of this study was carried out online which made it difficult to encourage student participation and engagement. The influx of digital communications and online surveys for many undergraduate students (the majority of the participant pool for this study), may have contributed to difficulty recruiting participants for the photovoice and focus group aspects of the study. Due to the pandemic, all courses moved online along with professor communications that previously may have occurred at least partially in the classroom. Additionally, many other research studies that previously may have been conducted in person had to move into the digital environment. Additionally, Covid-19 related announcement and updates from the university contributed to an increase in emails received by students. An overload of incoming information may have made it difficult to recruit participants who were faced with a daily barrage of emails and therefore potentially more likely to overlook this research opportunity. Several sources of potential recruitment of high school aged students diminished as a result of pandemic related safety measures and a lack of funding for some climate action related organizations. Provincial safety restrictions and guidelines limited the scope of potential photography subjects as obtaining appropriate consent could have required participants to breach social distancing procedures. As a result, participants were provided the alternate option of looking back through their camera roll and using an existing photograph (that abides by ethical considerations and consent of photographed subjects as outlined in Appendix F) taken by them previously. The convenience and purposive based sampling methods used for this study present limitations in that data collected will not be an accurate representation of the general population (Etikan

et al., 2016). This limitation was to be expected as this exploratory study seeks specifically to investigate mental health impacts of climate change experienced by youth and young adults in the Region of Waterloo and surrounding area. However, the organizations and classes recruited from were primarily chosen based on convenience and access, many of which were affiliated or connected to the University of Waterloo community and created a sample likely not representative of the greater population of youth and young adults living within the Region of Waterloo and surrounding area. Nonetheless, the findings show interesting trends that could be valuable to confirm through further research and exploration.

Results

Initial Survey

Respondents

The initial survey was completed by a total of 66 individuals between the ages of 17 and 23. See Figure 1 for a detailed age breakdown. 73% of respondents were female identifying, 20% were male identifying and 7% did not disclose. Respondents were asked to disclose their ethnic identity. The results showed a diversity of ethnicities among respondents.

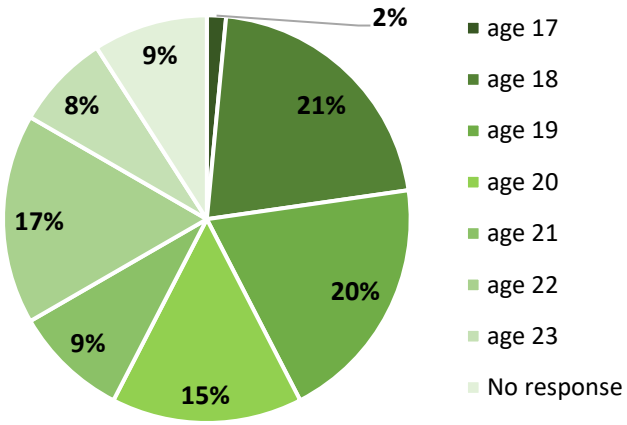

Figure 1. Age of initial survey respondents (n=66).

Adult Hope Scale

The AHS average was 46, with an average of 23 for both agency and pathway subscales, comparable to a study conducted by Lopez et al. (2000), which found an average AHS score of 48 in samples of students. Similar to broader research findings, there were no visible gender differences in AHS scores, although some variation was visible by age (Gallagher & Lopez, 2017).

Climate Anxiety Scale

The climate anxiety scale average was 31, the maximum possible score was 65 and the minimum possible score was 13. The male climate anxiety scale average was visibly lower at 18 compared to the female average of 34. Climate anxiety scores saw a general increase with age as seen in Figure 2. The authors who developed the climate anxiety scale suggest that “if 25% of a sample report that climate

change makes it difficult for them to function more often than 'sometimes,' this indicates that climate change is beginning to have a considerable effect on mental health" (Clayton & Karazsia, 2020, p. 6). In this sample, 26% of respondents reported difficulty functioning more often than "sometimes," exhibiting notable mental health effects due to climate change.

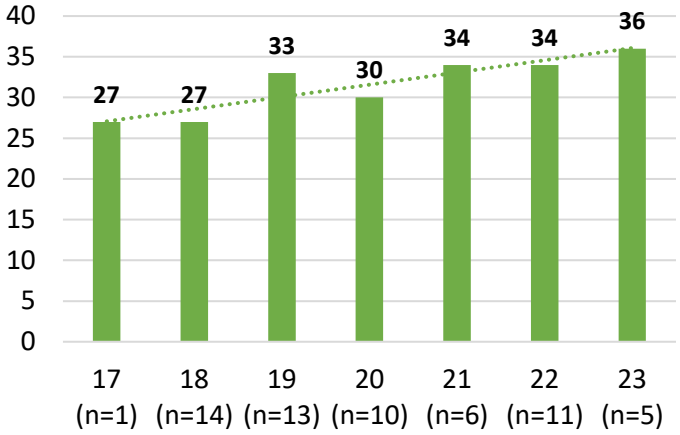

Figure 2. Average climate anxiety score by age (n=60).

Impacts of Anxiety

Eighty-eight percent of survey respondents have noticed a change in a place that is important to them due to climate change. Sixty-six percent have had a nightmare about climate change. As captured in Figure 3, over half of all respondents "never" or "rarely" feel hopeful for the future in relation to climate change. Respondents also report difficulty balancing sustainability concerns with the needs of their families.

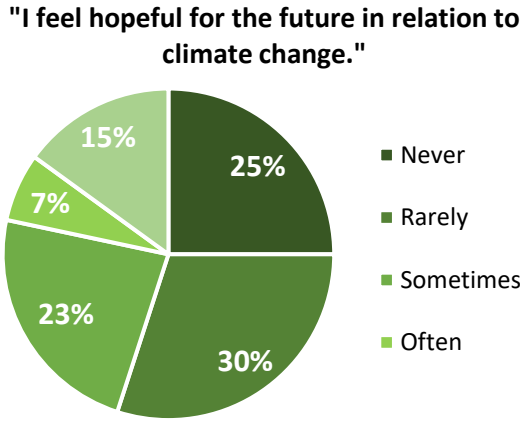

Figure 3. Frequency of hope in relation to climate change.

Final Survey

The final survey was completed by rather small samples of 10 individuals in the control group, and 5 in the treatment group. The AHS average in the treatment group post-intervention was somewhat higher than the control group; however, the AHS average for treatment group individuals in the initial survey was higher than post-intervention averages. While treatment group participants are slightly more hopeful on average than control group participants, treatment group participants appear slightly less hopeful after the intervention than they were at the time they completed the initial survey. See Table 1 for details.

Table 1. - *Comparative AHS average scores between respondent groups.*

Respondent Groups	AHS Overall	Pathway Subscale	Agency Subscale
Control Group	45	23	22
Treatment Group (Pre-Intervention)	52	26	26
Treatment Group (Post-Intervention)	48	24	25

The climate anxiety scale average on the final survey was 38 for the control group and 39 for the treatment group, of a possible maximum score of 65 and minimum score of 13. The climate anxiety scale average of the treatment group individuals from the initial survey was 38, showing no notable changes on average between either control and treatment groups or treatment group individuals before or after intervention. In the control group's final survey responses, 55% of respondents reported difficulty functioning more often than "sometimes," exhibiting considerable mental health effects due to climate change. In both the treatment group's initial and final survey responses, only 20% of respondents reported difficulty functioning more often than "sometimes."

Participant Experience in Photovoice Activity and Focus Groups

It is possible that the small sample size of the treatment and control groups may be impacting the quantitative data, as these findings appear to be contrary to the treatment group participants' perceived impact. When asked in the final survey if the photovoice activity and focus group had a positive impact on their mental health and well-being in relation to their thoughts about climate change,

two participants in the treatment group said they strongly agree, another two said they agree, and one participant said it had a neutral impact. One hundred percent of participants believe that participating in photovoice activities and focus groups like the one featured in this research can create a positive change in attitudes and perspectives. One hundred percent of respondents thought that participating in the photovoice activity and focus group was a meaningful and empowering experience. When asked what they found meaningful or empowering about the experience, participants said: *"connecting with other people who have similar experiences, as well as having a space to share creatively and capture my climate anxiety through art;" "I felt like my voice was valued and I had the space to share my thoughts without being interrupted or undermined"* and; *"It was very empowering to hear why other people had hope for the future and being able to relate that to my own situation."* All participants would recommend an activity like this to a friend. When asked what they liked about the photovoice activity and focus group, participants said, *"having a safe space to share deep emotions and be vulnerable with people who experience similar feelings"* and *"I loved hearing different perspectives and being able to share my thoughts in a safe space."* When asked what they disliked about the experience, one participant said *"that it only happened once! I wish this kind of peer-to-peer support on issues like this were more common."*

Photovoice Activity

Twelve of the fourteen photographs captured for the photovoice activity were images of natural landscapes, most of which were expressed by participants to be of personal importance or value. Many of the places captured were local to the participant's home, either in their own backyards or nearby places in the community that they visit often. Some images captured were related to school projects or research locations or places visited on vacation or an outing. Only two of the fourteen featured human subjects, three featured animal subjects and four featured bodies of water. As seen in Figure 4, one participant took a unique route, in which both of their photographs featured cards from the game *Cards*

Against Humanity that they felt connected to the prompting questions. See Appendix A for the full collection of participant photographs and written descriptions.

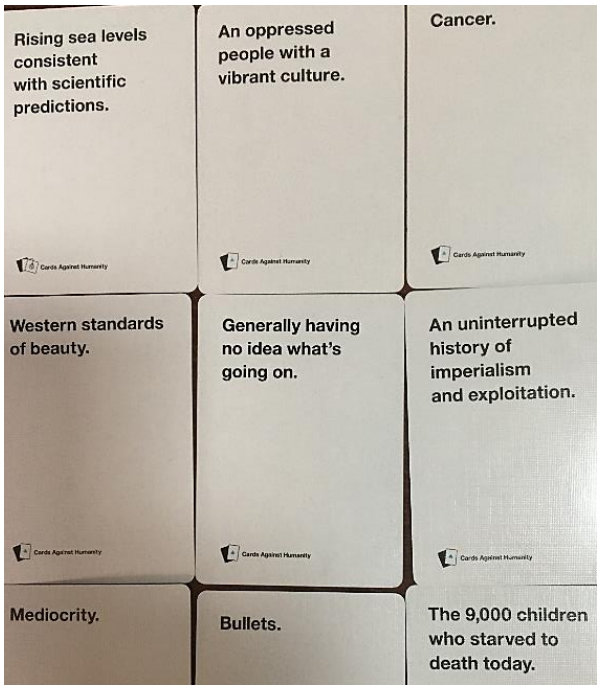

Figure 4. FG2, P3, prompt 1 [impacts] photovoice image, *Cards Against Humanity* selection.

Focus Group Analysis

The broad themes that emerged from focus group transcriptions include: 1.0 Encounters leading to mental health impacts of climate change, 2.0 Mental health impacts of climate change/Emotional states, and 3.0 Resilience (Participants' ongoing ability to live and function despite the mental health impacts of climate change). These themes were divided into subcategories of codes that represent topics discussed at the focus groups. See Appendix B for a breakdown of all the categories.

1.0 Encounters leading to mental health impacts of climate change

One of the most frequently cited encounters leading to mental health impacts of climate change was witnessing changes or deterioration to places of personal importance, including landscape changes, the loss or displacement of species and intense weather changes. Several participants noted landscape changes including development on natural land, illegal resource extraction, litter, melting glaciers and snow caps, sea and lake level rise and water pollution. Participants referenced the loss or displacement of many species, both flora and fauna, noting several endangered species. One participant reflected on these landscape changes as a unique, but common, experience in discussion with another participant by saying:

> *"I live inland, so I see a lot of change in local forests, whereas you live coastal, and you're seeing a totally different problem. It just shows how far-reaching climate change is and how it really impacts everything. It's not just going to be small pockets, it's happening everywhere, and it's impacting everyone differently."* (Jennifer Rhynas)

Intense weather changes were associated with the loss of recreation opportunities. The vulnerability of winter-weather based activities, such as skiing, snowshoeing, skating and playing in snow, was noted. Intense weather was associated with an increased sense of danger and volatility, including a fear of increased disease, violence and infrastructure damage. Both themes are visible in the following quote from a focus group participant:

"I've always lived a 10-minute walk to the river. It's role in my life has changed along with the climate. As a child, we'd swim there almost every day and we'd skate on the shallow parts in the winter frequently. But after two floods… and unstable ice from the rapid freeze thaw cycles, the river is also a frequent reminder that climate change is occurring. It's more of that reminder instead of what used to be a place of comfort and relaxation." (FG1, P1)

Figure 5. FG1, P1, prompt 1 [impacts] photovoice image, ice encased plant by the river.

See Figure 5 for the photovoice image of the river this participant is referring to. The other most frequently cited encounter leading to mental health impacts of climate change was education exposure, in this case through environmentally related post-secondary programs of study. Participants explained that studying and researching changes and loss due to climate change makes it an inescapable reality; *"I've been trained now to see signs of lack of health on the landscape everywhere I go, so it's impossible to ignore it"* (Emily Swerdfager). Participants expressed that their post-secondary class content frequently featured the devastating impacts of climate change, on both ecosystems and human populations. Regarding their education, one participant explained that

"all it does is really talk about the negatives, and never the positive. So you just become trapped in the cycle of learning about negativity and not learning what to do about it." (Mackenzie Cosman)

Another participant puts this experience into words by saying, *"our education can kind of be a process of accumulating worry"* (FG2, P3). Within environmentally focused post-secondary educations, participants spoke of the impact that learning about the history and lived reality of the colonization and violence towards Indigenous communities has had on mental health. One participant depicted their ancestor's colonial history as

"this dirty secret that I don't want to talk about, what my ancestors have done and this blood on my hands. The feelings I feel are so deep, but then I know that this is probably only one small dip in the pool of generational trauma that my ancestors have brought to other people." (Emily Swerdfager)

Consideration of future generations was another encounter leading to mental health impacts of climate change. Participants expressed concern for younger generations and whether they might have the same environmental opportunities or bear witness to the same landscapes one day:

"A lot of my formative experiences have happened in outdoor places. And it worries me that future generations may have diminishing opportunities to do the same," said one participant. (FG2, P3)

While this concern can entirely blanket future generations, it also has a more personal manifestation;

"My brother just had a baby in November, which was really exciting, so I have a niece and that has been a huge joy in my life. But it also, at the same time was so heartbreaking, because I think about how when she gets to be my age, she might actually not ever get to see the snow-capped mountains. These places that I really want to bring her to, might not be there." (Emily Swerdfager; see "snow-capped mountains" in Figure 6)

Figure 6. Emily Swerdfager, prompt 1 [impacts] photovoice image, melting glacier and snow-capped mountains.

Participants reported a concern for an increasing disconnect between youth and their natural environments:

"Just because of how they've grown up they don't see being in nature as a thing to do. They see the attractions of convenience and that kind of thing." (Isabel Curtis)

Lastly, media exposure as a potential pathway for the mental health impacts of climate change was discussed. Participants mentioned avoiding the coverage of violent and devastating impacts of climate change frequently featured on television news programming and expressed interest in increased coverage of positive news stories: *"If there was a CP24 for good news, I would watch that"* (FG2, P3).

2.0 Mental health impacts of climate change/Emotional states

Eco-grief was a frequently cited experience that was described as a sense of loss, a heavy feeling, feeling bogged down, deep sadness, the loss of something you love deeply, trauma, and the tangible grief of inheriting a dying world. One participant relayed both existing and anticipatory grief by saying, *"There's definitely a sense of eco-grief that I have towards all living beings and landscapes that we're going to lose and have lost"* (FG2, P3). Another participant explains the way in which eco-grief complicates relationships with places of personal importance by saying,

"It's really hard when your happy place and the place that gives you peace of mind is also the place that kind of is the source of a lot of your deepest anxiety and grief." (Emily Swerdfager)

Eco-anxiety and worry were commonly referenced emotional states that stemmed from threatening landscape changes, uncertainty for one's future or the future of places of importance and concern about the intensification of potentially catastrophic climate change impacts. In one focus group, a participant announced that *"it's these uncertainties that impact my mental health when unpredictable consequences affect places I love most"* (Mackenzie Cosman). One participant stated that they will not have children of their own because of their experience with climate anxiety, and another said, *"It makes me very upset to think about my future and my potential children's future"* (Jennifer Rhynas).

Though no one mentioned it by name, solastalgia (the experience of loss or mourning that comes with the environmental destruction or alteration of a place of emotional and personal value),

appeared to be a widely shared experience that manifested as the loss of childhood experiences with places of importance as a result of climate change, witnessing change in a place you've become deeply connected to and the sense of loss that now invades existing memories of those personally valued places. One participant described this solastalgic experience:

"Looking at the snow melting away made me think of when I was younger and how much I love the snow. There was always snow this time of year when I was a kid and its unsettling to think that so much has changed in just the last 10-15 years. It's definitely upsetting to think that this will probably continue to change in the next 10-15 years." (FG1, P2)

Guilt is an emotional state experienced by several focus group participants. They described feeling as though their actions on climate change were mediocre and a sense of pressure to do more to fight it. Guilt was experienced when making unsustainable choices and when avoiding thinking about climate change out of self-preservation. One participant observed that *"having an added sense of responsibility opens up a door for guilt when you're not doing enough and it can be paralyzing"* (FG2, P3).

Feelings of hopelessness, powerlessness and a sense of overwhelm were also identified in the focus groups. One participant described a sense of *"powerlessness that my friends and I feel about what we're supposed to be doing and what actual steps we're supposed to be taking."* They also expressed that their individual actions feel so small that they question whether those actions even matter (FG1, P1).

Many participants felt anger at the lack of governmental action and environmental protection, and frustration with a general disregard and lack of care for resources, species and ecosystems. Often these emotional states and feelings mingle together as the following participant noted:

"As an environment student, and young adult, there is a serious level of frustration, pressure and sadness that comes with dealing with these topics, especially when I often think about where we went wrong and how we became so disconnected from our planet. And I think it's only going to get worse before it gets better." (FG2, P3)

Focus groups conducted for this study revealed several ways in which the climate crisis can invoke a sense of identity loss. In one focus group, the loss of snow and traditional winter conditions was seen as a threat to the Canadian identity attached to outdoor winter recreation. In a different focus group, the sense of identity that comes from place attachment in coastal environments was highlighted. One participant said that both environmental degradation and some exclusive environmental protections of their local oceanic ecosystem threatened not only the livelihood, but the identity of local fishermen.

One participant even cited functional impairments resulting from the mental health impacts of climate change they were experiencing, including difficulty focusing on and completing schoolwork and trouble chatting and making upbeat small talk.

3.0 Resilience

When asked what gives them courage for the future despite the climate crisis, participants offered a diverse array of coping strategies including spending time in nature, community, political and environmental action, avoidance and humour. The most frequently cited coping strategy was to spend time in nature, which was associated with captivation, peace, harmony, hope, sense of calm, grounding, recharging, ease of worries and strengthened emotional connection. One participant referenced the established connection between spending time in nature and mental health benefits.

Not only did spending time in nature give them courage for the future, but seeing other people connecting with nature did as well:

> *"Watching people interact with nature so close to their homes made me hopeful that stronger connections to nature will make people more likely to take steps to protect it and to reduce their impact."* (FG1, P1)

Another participant described access to natural spaces as not only valuable, but life changing. Outdoor recreation and education were mentioned as active ways to spend time outdoors that aided in coping.

Encounters with other species were mentioned by several participants to have an important emotional and profound impact. These encounters were recounted as magical, motivational, joyful and an opportunity for relationship making and trust building. One participant experienced feelings of hope and gratitude:

"Seeing the Great Blue Heron reminds me that not all is lost and that I should enjoy my time in nature, rather than worrying whether it will last, focusing on just observing the things around while they're here." (FG1, P1; see "Great Blue Heron" in Figure 7)

Another participant found motivation:

"The truth I found in the caribou's eyes will never let me deny the urgency of our environmental crisis or my responsibility to take action." (Emily Swerdfager; see "caribou" in Figure 8)

Figure 7. FG1, P1, prompt 2 [courage] photovoice image, Great Blue Heron flying overhead.

Figure 8. Emily Swerdfager, prompt 2 [courage] photovoice image, endangered caribou sighting.

Participants found that acknowledging the beauty and resilience of natural systems brought feelings of hope and courage. They commented on the ability of forests to absorb carbon, the interconnection of trees and mycorrhizae in underground networks and the resiliency and adaptability of species and ecosystems to bring hope despite the changing climate: *"This is why forests give me courage for the future, because it's a constant reminder of ecological processes still working in our favour"* (Mackenzie Cosman). These examples are just a few of the ways in which *"nature can be beautiful in essence of its functioning"* (Isabel Curtis). See the forests captured in Mackenzie and Isabel's photovoice images in Figures 9 and 10.

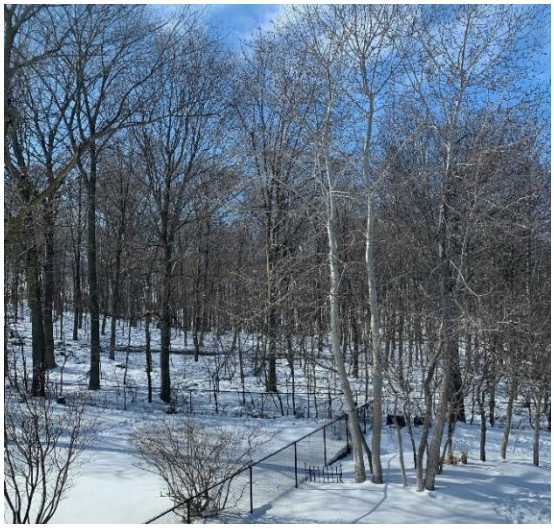

Figure 9. Mackenzie Cosman, prompt 2 [courage] photovoice image, deciduous forest.

Figure 10. Isabel Curtis, prompt 2 [courage] photovoice image, mangrove forest.

Gratitude was used as a tool to help frame experiences in nature despite climate change. Participants reported being grateful for the experiences they have had outdoors, interactions with species, the beautiful places they have visited and having had access to green space:

> *"It's motivating to keep doing this work of fighting the biodiversity crisis, because I know that there are still more beautiful landscapes and species that I'll get to see along the way. Even if they aren't here for that long, to get to see them is a privilege, and I hope to try and tell their stories as much as I can through those experiences."* (Emily Swerdfager)

Community was the second most highly discussed topic in terms of coping. Participants spoke of the resiliency that comes from a sense of community, the power in putting aside difference and coming together and the importance of empowering communities to sustainably manage resources themselves when possible. Two subtopics emerged from conversations around community: future generations and Indigenous communities. Several participants noted the importance of kids spending time connecting with nature as those experiences allow them to create a love and responsibility for the Earth:

"Kids being outside at a young age is really important so that they can see all these things and grow up asking questions. I think that's really important for the future because we are going to need a lot more questions being answered." (FG1, P2)

A childlike sense of wonder and curiosity towards the natural world was valued by participants: *"Kids are so full of wonder and curiosity, they're so excited to learn and discover new things. I truly think that they can help battle climate change"* (Jennifer Rhynas). Indigenous communities and Indigenous knowledge was highlighted as something that brings feelings of hope and courage for the future. Participants declared a desire to strengthen and empower Indigenous communities and respectfully learn from their cultures.

Political and environmental action brought feelings of hope and courage for the future to participants. Small scale individual actions were mentioned, such as gardening, growing your own food, eating less meat/vegetarian, creating less carbon emissions, energy and water conservation. Larger scale community and systemic actions were also discussed, including conservation initiatives, urban biodiversity initiatives, creation of accessible green spaces, increased opportunities for outdoor recreation and design of multi-purpose environmental interventions that serve both human and non-human populations. A need for systemic changes was cited. An intersection between education and environmental action is visible in the following quote –

"I think there are a lot of opportunities to make more eco-friendly suburbs and that gives me a lot of hope because I am in Planning. There are ways we can make those spaces conducive to fostering habitat or localize green infrastructure solutions." (FG1, P1)

A few participants spoke about avoidance as a coping strategy to manage the mental health impacts of climate change. Participants said that they sometimes avoid watching the news or reading articles about climate change. They compartmentalize their thoughts and avoid thinking too much about it in order to protect themselves from the hefty emotional toll. One participant explained the function of compartmentalization in completing their thesis work by explaining that

"there were a lot of times at the beginning of my research that I would not really think about what I was doing, which I think was kind of necessary to get through some of it." (Emily Swerdfager)

But an avoidance strategy can generate new problems. Another participant described how guilt was the fallout of using avoidance as a coping strategy:

"While climate change is scary to think about, I tend to not think about it and I don't invest a lot of time or emotional bandwidth to that. And a lot of the time that can make me feel really guilty." (Jennifer Rhynas)

The final coping strategy used by participants to manage the mental health impacts of climate change was humour. One participant tagged using humour to cope with the emotionality of dark truths or large issues. Another addressed the importance of seeking a balance between the seriousness of important issues and enjoyment of life:

"Humour plays an interesting role when we express some of the darker things in life and the climate crisis is definitely one of them." (FG2, P3)

A few resources and activities that participants use to maintain resilience were shared during the focus groups. These include writing and mindfulness exercises and reading books about sustainability solutions. PASS (Panic, Anxiety and Stress Support) Eco-Grief Cards, as seen in Figure 11, were also cited by a participant. PASS is a company local to the Region of Waterloo who have developed mental health first aid kits, which function to provide credible science-based information, strategies and tools for managing overwhelming feelings of panic, anxiety and stress in the moment (PASS cards for eco-grief, n.d.). The Eco-Grief Cards feature snippets of advice backed by scientific research on methods to help manage eco-grief and were made available to customers in June 2020 (PASS cards for eco-grief, n.d.).

Figure 11. PASS Eco-Grief Cards.

Participants acknowledged both facilitators and barriers to resilience in relation to the mental health impacts of climate change. Privilege was stated by several participants as a facilitator of resilience. Various types of privilege were named, including the opportunity to travel and work in beautiful, natural environments, physical proximity to natural spaces like forests, physical health, encounters with species and privileges based on intersectional identity (race, gender, socio-economic status, education, etc.). Participants expressed the privilege of not having to face the more extreme, direct impacts of climate change, both mental and physical.

A lack of discussion and support within post-secondary institutions was the most frequently noted barrier to resilience. Participants voiced their desire to have more support within their education to help process these emotions, more conversations about these experiences with peers and professors and more resources tailored to these experiences:

"That's something that frustrates me, especially with working on my thesis. It takes me a long time to get something done because not only am I processing through the data, I'm also processing through these devastating feelings of grief and loss. I wish there was way more support for that in my academic experience." (Emily Swerdfager)

"I don't see why these kinds of conversations couldn't be happening more often within the faculty or within our education because I think they're important and it gives people a chance to know that other people are feeling the same way." (FG2, P3)

One participant declared that an entire course on this subject should be designed and made available to students:

"This would make for such a useful and interesting course. A lot of people, especially in our faculty, deal with so much anxiety. I feel like this would be helpful for so many people, including myself." (Mackenzie Cosman)

Another recommended that all environment students should be automatically enrolled into a LEARN course full of content relating to the mental health impacts of climate change and the potential strategies and activities for coping with and managing those impacts.

Another barrier the participants talked about is the persistent mental health stigma and absence of emotion from academic work.

"I feel like in an academic setting, there isn't a place for emotion. Even though it's such an emotional learning experience to do this type of work." (Emily Swerdfager)

Several other compounding mental health issues that combine with climate change impacts were addressed, including pandemic related stress, seasonal affective disorder and other pre-existing mental health concerns. Participants remarked that a lack of access, either geographically or monetarily, to outdoor spaces and sustainable choices can act as a troublesome barrier to many of the coping mechanisms they deem important for maintaining resiliency in the face of climate change.

Discussion

So how does climate change impact the mental health and well-being of youth and young adults in the Region of Waterloo and surrounding area? The answer is: in diverse, numerous and compounding ways.

AHS scores within this sample appear to be average (Lopez et al., 2000); however, when asked about their feelings of hope for the future in relation to climate change, over half of all respondents said they never or rarely feel hopeful. The climate anxiety scale measured interesting mental health effects due to climate change in this sample. Sixty-six percent of respondents for this study have had a nightmare about climate change, compared to 19% of British youth (Cunsolo et al., 2020).

Focus group participants identified almost as wide a range of mental health impacts of climate change as are present in the literature. They are experiencing eco-grief, eco-anxiety, solastalgia, guilt, hopelessness and powerlessness, anger and frustration, identity loss and functional impairment. The frequency of experiences with direct impacts of climate change within this sample were startling, with 88% of survey respondents having noticed a change in a place that is important to them due to climate change. This finding is in line with a 2019 report which found that 78% of Canadians believe they are at risk of experiencing impacts of climate change (Field et al., 2019).

In the focus groups, witnessing changes in places of personal importance (including landscape changes, loss or displacement of species and intense weather changes) was the most frequently cited encounter leading to mental health impacts of climate change. Although several participants noted the personal privilege of not having to experience the most direct and severe effects of climate change as a facilitator of resilience, it appears that they are being exposed to direct impacts nonetheless. Some of the direct impacts participants spoke about include flooding, increasingly intense storms and tornados,

rising water levels, snow and glacier melt, habitat degradation and species loss (in places local to their homes or of personal importance).

It is important to explain the unique geographic experience of the University of Waterloo student. Throughout the course of their degree, any given student may live and experience direct impacts of climate change in their home communities (which are sometimes international or interprovincial), towns or cities they have worked in for co-op placements, completed research in or studied abroad in, in addition to their campus city of Waterloo. Despite the Region of Waterloo's relative protection from the most direct, severe impacts of climate change, students may be experiencing these impacts elsewhere during their time studying at university.

Unsurprisingly, educational exposure was the next most frequently cited encounter leading to mental health impacts of climate change in this sample of mostly university students, primarily enrolled in environment or sustainability related programs of study. Educational exposure may help to explain the general increase in levels of eco-anxiety with age between the ages of 16-23, measured in the initial survey. As secondary and post-secondary students age, they progress further in their environmental education. Like literature on the subject, participants discussed how the awareness of and constant engagement with research on the topic of climate change through classes and projects is an emotional burden of knowledge that contributes to feelings of eco-anxiety and eco-grief (Kelly, 2017; Kluttz, 2020; Ramasubramanian, 2016; Wallace et al., 2020). Learning about the 'doom and gloom' impacts of climate change without also gaining adequate knowledge on existing solutions and routes of change is an experience shared by participants in this study and that conducted by Kelly (2017).

Both direct and indirect mental health impacts of climate change can come from educational exposure. One participant explained the impact that collecting data for their thesis project was having on their mental health:

"The more that I was learning about that landscape, the more heartbreaking and devastating it was. As I was falling more in love with it, it was also breaking my heart. I was coming to see all the signs of deterioration." (Emily Swerdfager)

Participants were also exposed to vicarious and anticipatory grief and other indirect mental health impacts by learning about the suffering of other communities and species occurring as a result of climate change, and the projected losses and changes yet to come (Goldberg, 2020; Kluttz, 2020).

Similar to the findings of Kelly (2017) and Kluttz (2020), several focus group participants felt as though their university education has not adequately addressed the mental health impacts associated with the content of their programs of study or prepared them to manage those impacts. This represents a huge opportunity for the University of Waterloo and other local universities to foster discussions and improve supports for students and staff dealing with the mental health impacts of climate change. Potential routes of action are discussed further in the recommendations section.

Compounding this educational experience is the participants' perception of media coverage as primarily negative, believing news sources and other media outlets to lack in dissemination of solutions or breakthroughs on climate change action.

Several coping strategies were mentioned by participants to help increase resilience in the face of climate change. Spending time outdoors engaging with nature was the most frequently cited coping strategy used to manage mental health impacts. The mental health benefits of time spent in nature are well documented in the literature (Mashford-Pringle & Stewart, 2019; Nurse et al., 2010; Warber et al., 2015; Windhorst & Williams, 2016). Species interactions were highlighted by participants as impactful and meaningful experiences. Literature shows that direct physical interaction with other species can bring about mental and physical health benefits as can visual and auditory exposure (the sights and sounds of nature) (Franco et al., 2017).

The second most frequently mentioned source of resilience was community, also cited by Panu (2020) as an important promoter of resilience in cases of eco-anxiety and similar experiences. Seeing the resilience of community and interconnection within nature was an important reminder for participants to find interconnection within their own communities. The Covid-19 pandemic likely complicated the ability of young people to tap into the resilience benefits of community organizing. While the shift to digital communications and connection may have increased accessibility to some organizing efforts and communities, the lack of in-person programming, discussions and camaraderie may have hindered the development of collective identity and related feelings of resilience. Within the mention of community were two sub-themes, future generations and Indigenous communities. Interestingly, both of these populations who have historically been excluded and undervalued in climate change discourse, were highlighted by focus group participants to be sources of hope and courage for the future (Graham & Bell, 2020).

Another source of resilience mentioned by participants, taking political or environmental action, is cited in the literature as a useful antidote to the mental health impacts of climate change (Clayton, 2018; Panu, 2020). Resilience can be optimized, tapping into the benefits of community and political and environmental action simultaneously through involvement in organizations and student groups. Experts do not advise prescribing political and environmental action as the sole coping strategy to any individual as it is likely to lead to burnout if not accompanied by other strategies (Panu, 2020). However, taking action is not always draining as engaging in social movements places the individual in solidarity with others which can create and rejuvenate emotional energy (Summers-Effler, 2002, p. 44).

Avoidance was also cited by students as a coping mechanism they would sometimes use. This strategy would manifest in participants avoiding and distancing themselves from climate-related media and even educational research when feeling emotionally drained. Avoidance and the denial stage of grief look quite similar as “one is unwilling to admit the change and its effect on one’s life” (Friedrich &

Wüstenhagen, 2016, p. 198). Responses in this stage tend to be passive and make it impossible to consider and imagine new strategies and futures, which ultimately makes it maladaptive in the long run (Friedrich & Wüstenhagen, 2016).

A couple of resources mentioned by participants included writing and mindfulness exercises, which Ramasubramanian (2016) notes can encourage resilience and mitigate anxiety and depression. Photovoice methodology represents an opportunity to harness the resilience boosting power of all of these strategies, folding them into one experience that could be utilized in a number of contexts, including eco-therapy or as a university course assignment.

Limitations of this study meant that not all of the above facets of photovoice were used to their full potential. For example, participants were provided with an alternate option of using an existing photograph taken by them previously, instead of going out and taking new photographs which would have encouraged time spent in nature. Additionally, the limited scope and capacity of this project meant that the first and last steps of traditional photovoice methodology (Step 1: Select and recruit a target audience of policy makers or community leaders, and Step 9: Plan with participants a format to share photographs and stories with policy makers or community leaders) were not included (Sutton-Brown, 2014, pp. 171-172). These aspects of the methodology might have embodied a political action which likely would have further increased participant feelings of empowerment and resilience. Had focus groups occurred in person as opposed to virtually, a stronger sense of community and relationship may have been forged between participants.

In summary, diverse and numerous mental health impacts of climate change are being experienced by youth and young adults in the Region of Waterloo and surrounding area. Students lack hope for the future in relation to climate change and are experiencing eco-anxiety and eco-grief among other emotional states. They are bearing witness to landscape deterioration first-hand and unique

compounding exposure through their environmental education. A variety of coping strategies and sources of resilience can help students to manage these challenging realities including spending time in nature, connecting with community and taking action. Despite the limitations of this study, photovoice methodology represents a unique opportunity to manage these impacts by tapping into all of the sources of resilience mentioned by participants.

The second research question this study sought to answer was, “Can photovoice, as a research methodology, help to manage eco-anxiety and stimulate a sense of empowerment in youth and young adults?” The quantitative, comparative data from the final survey was unclear as to whether the photovoice activity had any visible impact on feelings of hope and climate anxiety. The climate anxiety scale average scores were not drastically varied either between control and treatment groups or between treatment group individuals before and after intervention. There was a noticeable difference in the percent of control and treatment group respondents who reported difficulty functioning more often than “sometimes,” with 55% and 20% respectively. However, 20% of the treatment group pre-intervention also reported difficulty functioning more often than “sometimes,” showing no change within the treatment group as a result of intervention. While treatment group participants are slightly more hopeful on average than control group participants, treatment group participants appear slightly less hopeful after the intervention than they were at the time they completed the initial survey. Both control and treatment group participants, however, had notably higher scores on the hope scale than other survey respondents. Both control and treatment groups were very small samples too, which further contextualizes the limits of the comparative findings on the AHS and climate anxiety scale.

The qualitative data showed much clearer impacts of the intervention. When asked in the final survey if the photovoice activity and focus group had a “positive impact on their mental health and well-being in relation to their thoughts about climate change,” two of the five respondents from the treatment group said they “strongly agree,” another two said they “agree” and one participant said it

had a “neutral” impact. This shows that despite the unclear data from the AHS and climate anxiety scale, participants experienced a positive impact to their subjective mental health and well-being. Despite the limitations of the photovoice activity in the context of this study, 100% of respondents thought that participating in the photovoice activity and focus group was “a meaningful and empowering experience,” exhibiting the success of photovoice as a tool for the empowerment of youth and young adults.

Recommendations

Future Action

Action on the mental health impacts of climate change is just beginning to occur on post-secondary campuses, and primarily in the form of student run groups and initiatives. On February 18, 2020, the student-led group Climate Students hosted a virtual event for University of Waterloo students called *“Envisioning Our Future: Facilitated Discussions on Eco-Grief/Anxiety,”* which provided a space for students struggling with the mental health impacts of climate change to voice their experiences and connect and support others with similar struggles. In 2015, University of Waterloo student Tina Chan developed PASS mental health first aid kits (cited by a participant in a focus group as a coping resource), which functioned to provide credible science-based information, strategies and tools for managing overwhelming feelings of panic, anxiety and stress in the moment (CBC News, 2018). In June 2020, PASS Cards for Eco-Grief were made available to customers (PASS cards for eco-grief, n.d.). The Eco-Grief cards feature snippets of advice backed by scientific research on methods to help manage eco-grief and retail for $5.00 a pack (PASS cards for eco-grief, n.d.). In November 2020, the Environment Student Society at University of Waterloo gave away free sets of PASS Cards for Eco-Grief to interested University of Waterloo students.

These initiatives grew out of student efforts to acknowledge the problem and create much needed supports. Gaps in student supports and education on this topic were identified by several focus

group participants who voiced a desire to have more discussions and supports within their post-secondary education to manage these emotions and experiences. If a relationship is present between increases in environmental education and the mental health impacts experienced (as is suggested in the literature and by participants in this study), do universities not then have an obligation to provide adequate supports for students experiencing those impacts (Clayton, 2018; Kluttz, 2020)?

Kluttz (2020) recommends post-secondary institutions take action on the mental health impacts of climate change in the following five areas: research and planning, awareness and advocacy, teaching and learning, coping and self-management strategies and mental health services. Further research and planning is a necessary step to better understand the mental health impacts of climate change on diverse populations within the campus community, including undergraduate students, graduate students, faculty, staff and marginalized groups (Kluttz, 2020). Kluttz (2020) recommends the development of a taskforce composed of researchers, students, staff and faculty to drive action on this issue, as well as a student forum to discuss the student experience and communicate needs and desired change.

To boost awareness and advocacy, the climate crisis must be included in existing dialogue on mental health (Kluttz, 2020). This can be achieved by featuring information on climate change and mental health on existing counselling services and sustainability webpages and incorporating this topic into mental health and well-being campaigns like Thrive Week and Bell Let's Talk (Kluttz, 2020). It may also be beneficial to create an online platform for students and faculty to share their stories about mental health and the climate crisis, coping strategies or things that give them courage for the future (Kluttz, 2020).

A desire for improvements to teaching and learning on this subject were mentioned by several participants in this study. Participants expressed interest in an entire course being made available on the

subject of mental health and climate change, as well as increased acknowledgement and discussion of the mental health impacts of course content in existing course offerings. One participant recommended a non-credit, asynchronous online course that environment students could be automatically enrolled in that would provide education and resources on the subject of managing mental health impacts of climate change. In addition to the recommendations listed by participants, Kluttz (2020) suggests the development of a workshop for all faculty and teaching staff covering climate change and environmental courses which would "create an opportunity for instructors to share their knowledge and experience with one another, including the ways they currently address the affective nature of the climate crisis in the classroom" (p. 27).

In order to foster coping and self-management strategies, training, resources and workshops should be provided to students researching, learning about or doing advocacy work on the topic of climate change or environmental degradation (Kluttz, 2020). Participants in this study expressed a demand for increased peer-to-peer opportunities for discussion and support, similar to the focus groups conducted in this study. Creating regularly offered open-grief forums and peer support groups may be a step towards making these discussions and support networks more frequent and accessible (Kluttz, 2020). Lastly, Kluttz (2020) recommends providing counsellors and healthcare professionals on campuses with specific training on climate change and mental health; as well she suggested and creating closer connections and lines of communication between counselling services and student groups and communities likely to experience the mental health impacts of climate change. The student demand for increased acknowledgement of and support for the mental health impacts of the climate crisis is visible, both in this research and in the broader literature. The range of opportunities for intervention in the post-secondary context are numerous and diverse and should be further considered for immediate action.

Within all five areas of action recommended by Kluttz (2020) (research and planning, awareness and advocacy, teaching and learning, coping and self-management strategies and mental health services) are opportunities for post-secondary institutions to build community between environment students, breed hope despite climate change and allow a collective identity to form (Kleres & Wettergren, 2017; Summers-Effler, 2002). A desire for these connections was expressed by focus group participants and identified as an important source of resilience. Community can also encourage other sources of resilience such as environmental and political action.

Participant encounters leading to the experience of mental health impacts of climate change as well as sources of resilience can be used as jumping off points for action within post-secondary institutions. Universities should take full advantage of their campus grounds as spaces to engage in the mitigation of climate change itself, and the mental health impacts that stem from it. Just as focus group participants noted, smart urban planning that serves both human and non-human populations can contribute to the resilience of the greater ecosystem and the individuals who frequent it. Campuses should be filled with accessible, naturalized spaces that provide students with opportunities to get to know the local species around them and appreciate their simultaneous beauty and function. More classes, field courses and extracurricular workshops, should be instructed outdoors when possible, to provide students with the mental health benefits of time spent in nature and offer experiential learning opportunities. Universities and municipalities alike should see conservation and restoration of local greenspace and habitat as investments in the mental and physical health of their communities. We must work to decolonize the urban greenspaces we create, to ensure equal access to and safety of all individuals in these spaces, fostering experiences from discrimination, racism, and harassment (Hatala et al., 2020).

Environment and climate related courses should ensure a balanced approach to their curricula, thoroughly explaining the issues, but also the existing landscape of solutions and future pathways for

transformation to manage feelings of despair and paralysis. Course projects should strive to collaborate with environmental clubs, associations and not-for-profits within the university and surrounding community. Not only would this offer benefits to local organizations with limited budgets and resources, but provide students with opportunities to forge new connections, build community and engage in the meaningful political and environmental action that breeds resilience. Now that the PASS Eco-Grief cards are available to the public, the University of Waterloo should include these cards in first year Faculty of Environment welcome packages and/or make them available to students conducting upper-year research projects and graduate studies. PASS Eco-Grief cards could be distributed by counselling services and healthcare professionals on campus as a supplementary source of support for distressed students between appointments.

Media created and shared by university platforms should consider the framing and content of their environmental messaging. Does it aim for a practical anxiety, avoiding the extremes of false hope and fatalistic doubt (Marlon et al., 2019)? That messaging should also consider who it frames as the intended audience, who's experience it voices and who's it excludes. It is of utmost importance that universities take meaningful action (as defined by involved communities) on the social inequalities and injustices embedded within their histories and continued practices. As focus group participants acknowledged, social issues and inequalities are inextricably bound with environmental issues and inequalities, as are the solutions.

Future Research

Although the mental health impacts of climate change are recently being explored in more detail, further research is necessary. In the context of post-secondary institutions, "limited research has been done to understand the impacts of the climate crisis on mental health… and even less has been done to understand how we might begin to address the issue in practice" (Kluttz, 2020, p. 14). The results of this study suggest that photovoice may be a promising intervention to manage the mental

health impacts of climate change experienced by youth and young adults; however, further research on the efficacy of photovoice methodology for this purpose, using larger sample sizes to strengthen validity, is required. Additional studies should explore the occurrence within this project of a possible reverse impact on high-hope participants to determine if it was an anomaly or if that pattern might exist.

Additional research should also be conducted to better understand the experiences of specific populations, including environment undergraduate and graduate students, professors in this area of teaching and research, marginalized communities and climate activists within the University of Waterloo community. A comparative study on the experience of climate anxiety between undergraduate students in various faculties at the University of Waterloo may help to better understand the degree to which an environmentally specific education may enhance or increase exposure to mental health impacts of climate change. Further research on the relationship between climate anxiety and grief and other academic and personal stressors may provide insight into the compounding relationship of stress and mental health impacts, particularly within the post-secondary setting. The student population should be included in discussions around what types of supports and interventions on this issue would be most useful, which constitutes another emerging area of needed study.

Conclusion

The purpose of this study was to explore the mental health impacts of climate change on youth and young adults in the Region of Waterloo and surrounding area and to gauge the efficacy of photovoice methodology as a means of managing these impacts, generating courage for the future and empowering youth. The research questions that guided this study were:

- *How does climate change impact the mental health and well-being of youth and young adults in the Region of Waterloo and surrounding area?*
- *Can photovoice, as a research methodology, help to manage eco-anxiety and stimulate a sense of empowerment in youth and young adults?*

Based on the survey responses, photovoice images, written descriptions and focus group content, students in the University of Waterloo community are experiencing a variety of mental health impacts of climate change including eco-grief, eco-anxiety, solastalgia, guilt, hopelessness and powerlessness, anger and frustration, identity loss and functional impairment. These impacts are experienced through several pathways, including changes and deterioration to places of personal importance, their educational experience as undergraduate students in primarily environmental programs of study, their concern for future generations and media exposure. Students made use of a number of coping strategies and resources to foster resilience in the face of these challenging experiences including spending time in nature, community, political and environmental action, avoidance and humour. Based on the coping strategies valued by participants, photovoice methodology represents a tool to harness the benefits of those strategies within one experience. As an intervention to manage the mental health impacts of climate change, photovoice looks promising as participants experienced notable subjective improvements in mental health and well-being and feelings of empowerment. Participants made several suggestions on changes they would like to see made within

the University of Waterloo and their programs to better acknowledge these experiences, create accessible supports and foster resilient communities of students within their programs and the Faculty of Environment. These findings can help to inform actions, both on the part of individuals and post-secondary institutions, and within other organizations engaged in environmental work to foster resilience and manage practical levels of anxiety in relation to climate change. Photovoice may be a useful pedagogical tool for organizations and post-secondary institutions to employ as they work towards this goal.

Though compelling qualitative and preliminary quantitative findings emerged, the parameters of this study did pose some limitations. The ongoing Covid-19 pandemic limited recruitment and the participant experience of photovoice methodology. Safety policies and restrictions meant that this experience was entirely virtual, void of in-person communications and experiences. While in some ways this may have made it easier to coordinate participant schedules and to attend the focus group, it also likely did not foster the same sense of community that an in-person focus group may have. The sampling methods utilized mean that the results are not representative of the general population. Statistical significance tests were not performed for quantitative measures which should be taken into account when interpreting the results of this study. Additional research in this topic area would be beneficial to better understanding the diverse experiences of the mental health impacts of climate change within various segments of the University of Waterloo population. Understanding what mental health impacts young adults face at the University of Waterloo and within the Region of Waterloo more broadly, will aid in the development and implementation of appropriate strategies and supports to be implemented in the future. Further research on the efficacy and feasibility of a variety of potential supports and interventions, including photovoice methodology, is necessary. More rigorous quantitative studies should be conducted to gain insight into the objective impacts of photovoice interventions on student mental health and well-being in relation to climate change.

In the meantime, findings of this study suggest that universities (and community groups) can take action now by protecting and increasing student access to natural spaces, creating tailored educational experiences and mental health supports, connecting students to positive and effective opportunities for action and fostering a sense of community and collective identity in this struggle.

Even in the case of successful progress on mitigation and adaptation, the effects of climate change will be felt worldwide for decades. As a society, we will be actively coping with the mental health impacts of the climate crisis for some time. Given these circumstances, it is of utmost importance that we come to understand and acknowledge the unique experiences of these impacts, and offer accessible and effective supports and interventions for today's youth battling climate change and for those yet to come.

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Appendices

Appendix A: Participant Photovoice Works

FG1, P1, Prompt 1 [impacts]

“Pictured here is a plant encased with ice beside the unfrozen Ottawa River. I have always lived a 10-minute walk to the River, but it’s role in my life has changed. As a child, we would swim there almost every day and we skated on the shallow parts in the winter. After two floods in 2017 and 2019 and unstable ice from rapid freeze thaw cycles, the river serves as frequent reminder of climate change rather than a place of comfort and relaxation. While I cherish the memories I have, I wonder if future generations will have similar positive experiences with the river or winter in general. It’s the little things that make me most upset about climate change. Observing the small shifts around me. Less snow, hotter days, more tornadoes. That I’m not doing enough to fight it. That the things I notice are too small to matter.”

FG1, P1, Prompt 2 [courage]

“A Great Blue Heron flew overhead when I was visiting a stormwater management pond in a suburb of Ottawa. There were quite a variety of birds present in the stormwater management ponds, which to me demonstrates that environmental interventions can serve a variety of purposes. Watching people react and interact with nature so close to their home made me hopeful that stronger connections to nature will make people more likely to take steps to protect it and reduce their impact. Seeing the great blue heron reminds me that not all is lost. It's a reminder that I should enjoy my time in nature rather than worrying whether it will last.”

FG1, P2, Prompt 1 [impacts]

"This is a picture I took of the back of our house while I was taking out the garbage. At first glance, there does not seem to be anything wrong. However, looking at the snow melting away made me think of when I was younger, and how much I loved the snow. There was always snow this time of year when I was a kid, and it is unsettling to think so much has changed in the last 10-15 years. It makes me upset to think in another 10-15 years, December might not see any snow. I was glad that there was no garbage strewn across the yard. It also made me quite hopeful seeing people park their cars and walk around (public parking in background). I also know that this time last year, there was no snow, so I am grateful it snowed (despite the roads!)."

FG1, P2, Prompt 2 [courage]

"This is not the greatest picture, but it was taken at Waterloo Park, and it shows the light displays they currently have up. All the displays were cool, and it was a great activity to encourage people to get outside (especially during the pandemic). It was awesome seeing that people had been riding their bikes, and pushing strollers around and overall, just enjoying the park. However, seeing the light displays and all the other facilities at the park reminded me that a lot of development was needed for the park to look the way it does. I will never know what the park looked like before, but I hope that it was designed in a way that would try to sustain as much of the biodiversity in the area as possible. That being said, it was nice having a moment to enjoy being outside."

Emily Swerdfager, Prompt 1 [impacts]

“These glaciers are melting, faster than I can cry. I spend so much time looking at the data sometimes I start to forget these are real places I have loved and breathed in deeply. The idea of mountains without their snow-capped peaks breaks my heart. Beautifully, plants take light, intangible brilliance, and turn it into air and water, and then they give it all away. Gulp, gulp, gulp, thank you to the plants for their gift with every breath I take. Are you listening? Deeply listening? To a forest of birds and insects. I want to be an ecologist because I am in love with the natural world. The plants, the insects, dirt, and wind, life so wild. I need to know, why is it all so beautiful?

Emily Swerdfager, Prompt 2 [courage]

“I once met a caribou, rare and endangered, with thick eyelashes and slipper feet, looking up at me in a sub-alpine meadow dotted with winter flowers. I studied caribou before and with the understanding I had, I came to believe there was a greater chance I would never get to see one in real life. Another caribou, a magical reindeer, appeared and I thought I was dreaming. This was the moment where everything collided; I felt the heaviest guilt sink into my stomach as my heart soared with passion. I carry this experience with me every day because I know I am one of the privileged few people who have met one of the forty-five remaining Southern Mountain woodland caribou left on this little planet, and there are many more species with similar stories. The truth I found in the caribou’s eyes will never let me deny the urgency of our environmental crisis, or my responsibility to take action.“

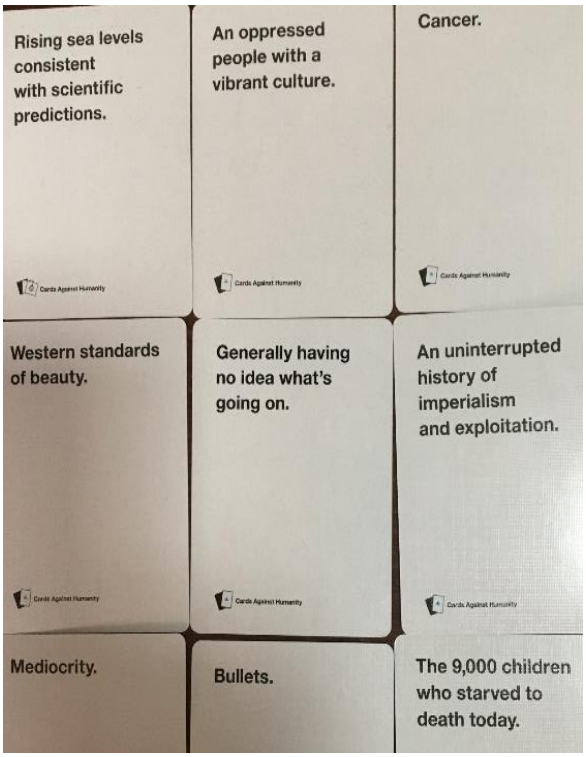
Mackenzie Cosman, Prompt 1 [impacts]

"This photo was taken this past summer in Tobermory, Ontario at my friend's cottage. I decided to use this photo because I spent most of my childhood on the east coast and being around large bodies of water brings me joy. This photo represents how the issue of climate change impacts my mental-health and sense of happiness because implications of climate change are causing issues such as rising water levels in lakes. Lake levels have increased greatly in the past years, so much so that the removal of the doc that previously took you into open water from the shoreline. When I think about what other problems rising lake levels could implicate, I can't help but be anxious of what this means for properties and cottages. Will shoreline cottages be underwater in a few years' time? It's these such uncertainties that impact my mental health when unpredictable consequences effect places I love most.

Mackenzie Cosman, Prompt 2 [courage]

"In spite of the climate crisis, forests give me courage for the future. Although that may seem insignificant, what gives me courage is the fact that trees absorb excess carbon from the atmosphere. Since media all too often focuses on negative environmental news, I think that sometimes we need to look around at what we still have of our natural environment. This is why forests give me courage for the future, because it is a constant reminder of the ecological processes still working in our favour."

FG2, P3, Prompt 1 [impacts]



"Climate change has a negative effect on my mental well-being and happiness for a few reasons. First, there is the sense of eco-grief I have towards all of the living beings and landscapes that we are going to lose. A lot of my formative experiences have happened in outdoor places, and it worries me that future generations may have diminishing opportunities to do the same. The cards I chose from the deck are things that can be attributed to climate change, including conflict, not doing enough, and our exploitation of the environment. As an environment student and young person, there is a serious level of frustration, pressure, and sadness that comes with dealing with these topics, especially when you know that so much of it could be avoided. I often think about where we went wrong and how we became so disconnected from our planet. I think things will only get worse before they get better because of our so called 'human nature,' with greed and inequity digging a deeper hole for us to try and climb out of."

FG2, P3, Prompt 2 [courage]

"I also found cards in the deck that gave me courage for the future. I tried to approach these with a serious tone, but also made sure to include some of the humorous cards because I believe humour makes a big difference when dealing with large issues. This past year has exposed a lot of societal issues, and also witnessed a great deal of social progress. I have read books that showed me that sustainability is possible. The real issue is that at the core of this problem, it is a people crisis that has deepened the climate crisis. I am reminded of the following quote, 'Humans change by either disaster or design.' Right now, both are happening, but I hope it gets us all to the same place. Strong leaders, a base level of love for humanity, and groups coming together despite polarized pasts on either side of history coming together gives me courage."

Jennifer Rhynas, Prompt 1 [impacts]

"This photo represents my emotional and mental state towards climate change. The frozen icicles on the right of the photo represent how I try my best to live in the moment and appreciate all the beautiful and wonderful things happening around me. I love being in nature, and it gives me a sense of peace observing how everything is connected and lives in harmony. The fast-moving water on the left represents my mind when I think about climate change, how quickly the earth is changing and how nature is reacting to these changes. My mind becomes a swirling, rushing mess of scary thoughts. It makes me upset to think about my future, and my children's future. Just as the moving water and the frozen water are side by side in the photo, these contrasting thoughts and feelings are compartmentalized in my own mind."

Jennifer Rhynas, Prompt 2 [courage]

"This is a photo of myself feeding chickadees. This moment reminds me of when I worked at an outdoor education school. One of our programs was leading the children on a hike, where we would always take a moment to feed the chickadees. The children loved this part of the program the most. They would all become very still and quiet, hoping for the chance a bird would choose to land on them. Youth experiencing and learning about nature gives me hope for the future of our climate crisis. I believe that by helping the younger generation learn about their planet and grow to love the land they walk on will inspire them to be better to the earth and make lasting positive impacts. Youth are full of wonder and curiosity, leading them to discover new technologies and ways of life that will help the world battle climate change."

Isabel Curtis, Prompt 1 [impacts]

"Pictured is a small beach within walking distance of my house. Like many people, I enjoy time at the beach whether swimming or walking. Climate change can seem like such a far away concept; something that affects other people in other parts of the world. When I consider the impacts that just a one-foot rise in sea level can have there is a certain level of anxiety. An anxiety that is intensified when I consider the lack of action or protection that these resources are afforded locally. The reef which protects this beach and the small bay nearby is not a marine protected area. The mangrove and pond within the bay have not been afforded any legislative protection. In the face of such inaction, it can be hard to enjoy the resources which may be damaged beyond repair in my lifetime."

Isabel Curtis, Prompt 2 [courage]

"This is a mangrove forest that surrounds a brackish pond, where saltwater and freshwater mix in Anguilla. The adaptive abilities of the mangrove are impressive and different species thrive in varying conditions. Mangroves provide a large number of services, closely tied to other major ecosystems like coral reefs they are essential for maintaining coastal resiliency. Their ability to adapt and thrive is very encouraging for the future changes that climate change entails."

Appendix B: Focus Group Coding Scheme

- **1.0 Encounters leading to mental health impacts of climate change**
  - **1.1** Changes/deterioration to places of personal importance
    - **1.1.1** Landscape changes
    - **1.1.2** Loss/Displacement of species
    - **1.1.3** Intense weather changes
      - **1.1.3.1** Loss of recreation opportunities
      - **1.1.3.2** Increased danger and volatility
  - **1.2** Concern for future generation
  - **1.3** Educational exposure
    - **1.3.1** Learning about Indigenous communities
  - **1.4** Media exposure
- **2.0 Mental health impacts of climate change/Emotional states**
  - **2.1** Eco-Grief
  - **2.2** Eco-Anxiety/Worry
  - **2.3** Solastalgia
  - **2.4** Guilt
  - **2.5** Hopelessness/Powerlessness/Overwhelm
  - **2.6** Anger/Frustration
  - **2.7** Identity Loss/Threat
  - **2.8** Functional Impairment
- **3.0 Resilience** (Participants' ongoing ability to live and function despite the mental health impacts of climate change)
  - **3.1** Coping (Strategies/experiences that aid coping with the mental health impacts of climate change)
    - **3.1.1** Spending time in nature
      - **3.1.1.1** Outdoor recreation/Outdoor education
      - **3.1.1.2** Encounters with other species
      - **3.1.1.3** Acknowledging the beauty/resilience of nature
      - **3.1.1.4** Gratitude
    - **3.1.2** Community
      - **3.1.2.1** Future Generations
      - **3.1.2.2** Indigenous Communities
    - **3.1.3** Political/Environmental action
    - **3.1.4** Avoidance
    - **3.1.5** Humour
  - **3.2** Resources
    - **3.2.1** PASS Eco-Grief Cards
    - **3.2.2** Writing exercises
    - **3.2.3** Reading
    - **3.2.4** Mindfulness exercises
  - **3.3** Facilitators of resilience
    - **3.3.1** Privilege
  - **3.4** Barriers to resilience
    - **3.4.1** Compounding mental health issues
    - **3.4.2** Mental health stigma
    - **3.4.3** Lack of educational supports
    - **3.4.4** Lack of access

Appendix C: Mental Health, Climate Change and Youth Initial Survey

SECTION 1:

Exploring Photovoice as a Tool to Empower and Mitigate Mental Health Impacts of Climate Change on Local Youth

EXTERNAL CONTACT: This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. If you have questions or concerns please contact the Office of Research Ethics (ORE File #42164), at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

CONTACT: If you have questions about the study or the procedures, please contact Robert Case (Principal Investigator) at (519-884-4404 ext. 28683 or rob.case@uwaterloo.ca) or Beth Grant (Student Investigator) at (wegrant@uwaterloo.ca).

WHAT IS THE STUDY ABOUT?

The purpose of this research study is to investigate on a broad scale, the impacts of climate change on the mental health and well-being of youth and young adults in Region of Waterloo and the surrounding area. This study seeks to engage and empower participants to illustrate the mental health impacts and implications of climate change present in their own lives using an on-line survey and (in future steps of this research), a method knows as photovoice and focus-group discussions as the methods of data collection. In addition to survey responses and focus group discussion, photographs and written descriptions collected by participants will also be collected as data and analyzed. Participation in this study will not provide any personal benefit to you, however, the goal of the study is to generate insight into the degree to which mental health impacts as a result of climate change are experienced by youth and young adults locally as well as the impact of participating in a photovoice study on participant mental health and feelings of empowerment.

METHODS AND PROCEDURES: This research project will draw participants from local community-based climate action organizations, environmentally related student clubs and student associations between the ages of 16-23 years of age.

Participation in this study will involve between two to four components. First, you will be invited to participate in a 10-minute online survey where you will be asked for some demographic information (e.g. age, gender, ethnicity etc.) as well as questions about climate change and mental health. Upon completion of this survey you will be asked about your interest in participating in the next phases of the study. If you agree, you will be randomly assigned to one of two groups.

The first group will be asked to complete the same online survey again approximately 2 months after the first survey was submitted. The second group will be asked to take part in a 2-hour photovoice activity, a 1-1.5 hour online focus group session and a final 10-minute survey. Assigning participants to the different groups will help the researcher to determine the possible impact that participation in the photovoice activity and focus groups may have on participant mental health and wellbeing.

Photovoice methodology requires participants to take creative photographs and write short descriptions for their images based on given prompting questions. If you are assigned to the second group, you will be given a period of 2 weeks during which to capture two photographs and write short descriptions around the topic of climate change, your mental health and feelings of courage for the future.

Next, you will be asked to participate in an online focus group and invited to share your photographs and written works with a small group of other participants. Focus groups will be conducted between October – February 2020 on Zoom or a similar online meeting software. Video and audio from the focus groups will be recorded with your permission to help facilitate the collection of information and later transcription for analysis.

Afterwards, the final online survey will be circulated which will ask the same questions as before, in addition to questions about your experience of photovoice and participating in the focus group.

Not everyone who indicates interest in participating in the photovoice activity and focus group portion of the study will be selected to participate as participants will be randomly assigned to two different groups, one of which will complete these additional activities while the other will complete only the initial and final survey.

The findings from these study methods will be used for academic publication in an undergraduate thesis and for a community-oriented summary report. With your permission, anonymous quotations from your open-ended survey responses, written photo descriptions and/or focus group contributions may be used in study results to demonstrate research findings. Findings from the study will be made available to research participants and other interested parties through a summary report that will be disseminated upon completion of the study. Research findings may also be submitted for publication in academic journals and for presentation at academic conferences.

SECTION 2:

Ethical Considerations

CONFIDENTIALITY: Identifying information will be removed and stored separately from collected data and your name will not appear in any paper or publication resulting from this study. Photovoice participants may choose to allow their photographs to be used in study results to help illustrate findings. In these, your name will not be used, however your face may be seen (if you were the subject) which means that your participation in the study will not be confidential. In addition, all focus group participants will be asked to keep in confidence information that identifies or could potentially identify another participant and/or their comments; however, we cannot guarantee that everyone will honour this request.

Collected data will be securely stored on a password protected computer for a minimum of one year. You may withdraw your consent and request that your data be removed from the study by contacting the researchers within this time period. Please note that due to the format of focus groups, it may not be possible to remove all data associated with you. Additionally, it will not be possible to withdraw your data once results have been submitted for publication.

RISKS: Participants will be asked to provide information on their experiences and reflect on their mental well-being, either individually and/or with the researcher and other participants. Given the focus of the study, it is possible that you may find some of the questions upsetting. In addition, please note that whenever information is collected online, privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party (e.g., government agencies, hackers). University of Waterloo researchers will not collect or use internet protocol (IP) addresses or other information which could link your participation to your computer or electronic device without first informing you.

VOLUNTARY PARTICIPATION: Participation in this study is voluntary. You may decline to answer any question(s) you prefer not to answer by leaving your response blank or by requesting to skip the question. Further, you may decide to end/leave the study sessions at any time by simply closing the survey or by advising the researcher of this decision. The commitment of the researchers is to inform all participants of their right to decline to participate without penalty and to withdraw from the study at any time before results are published without penalty or consequence.

SECTION 3:

Unique Participant Code Creation

Please input a unique code based on the below questions. This code will allow linkage of your responses with other data, should you participate in subsequent portions of the study.

- What day of the month is your birthday? Ex. 07
- What are the first three letters of your mother's first name? Ex. Car
- What is the first letter of the street you currently live on? Ex. M
    - For this example the unique code would be: 07CarM

Enter Code Here: _____

Eligibility to Participate

Please check all boxes below to confirm your eligibility to participate in this study.

If you do not meet the below eligibility requirements, please close your browser now.

- I am between the ages of 16-23 years of age.
- I am currently involved with/a member of a community-based climate action organization, environmentally related student club or student association within the Region of Waterloo or the surrounding area OR enrolled in an environment or sustainability related undergraduate program of study.

What is the name of the community-based climate action organization, environmentally related student club, student association or program of study that you are involved in?

_____

Informed Consent

Please confirm that you have been fully informed about the study and wish to provide your consent to participate in this survey of your own free will by checking the box below. Please not that by continuing on with the survey you are providing implied consent.

(If you are interested in participating in additional components of this study you will be provided with an additional consent form at a later date).

- I have read the prior information about the survey and about voluntary participation, and I consent to participating in the survey component of this study.

SECTION 4: In this section, I will be asking you some questions about your general outlook on life.

Read each item carefully. Using the scale shown below, please select the number that best describes YOU.

1 = Definitely False
2 = Mostly False
3 = Somewhat False
4 = Slightly False
5 = Slightly True
6 = Somewhat True
7 = Mostly True
8 = Definitely True

1. I can think of many ways to get out of a jam.
2. I energetically pursue my goals.
3. There are lots of ways around any problem.
4. My past experiences have prepared me well for my future.
5. I can think of many ways to get the things in life that are important to me.
6. I've been pretty successful in life.
7. Even when others get discouraged, I know I can find a way to solve the problem.
8. I meet the goals that I set for myself.

SECTION 5: In this section, I will be asking you some questions about some of your thoughts and actions related to climate change.

Read each item carefully. Using the scale shown below, please rate how often the following statements are true of YOU.

1 = Never
2 = Rarely
3 = Sometimes
4 = Often
5 = Almost Always

1. Thinking about climate change makes it difficult for me to concentrate.
2. Thinking about climate change makes it difficult for me to sleep.
3. I have nightmares about climate change.
4. I find myself crying because of climate change.
5. I think, "why can't I handle climate change better?"
6. I go away by myself and think about why I feel this way about climate change.
7. I write down my thoughts about climate change and analyze them.
8. I think, "why do I react to climate change this way?"
9. My concerns about climate change make it hard for me to have fun with my family or friends.
10. I have problems balancing my concerns about sustainability with the needs of my family.
11. My concerns about climate change interfere with my ability to get work or school assignments done.

12. My concerns about climate change undermine my ability to work to my potential.
13. My friends say I think about climate change too much.
14. I have been directly affected by climate change.
15. I know someone who has been directly affected by climate change.
16. I have noticed a change in a place that is important to me due to climate change.
17. I wish I behaved more sustainably.
18. I recycle.
19. I turn off lights.
20. I try to reduce my behaviors that contribute to climate change.
21. I feel guilty if I waste energy.
22. I believe I can do something to help address the problem of climate change.
23. I feel that I have courage and motivation to act on the issue of climate change.
24. I feel hopeful for the future in relation to climate change.

SECTION 6:

In this final section, I will be asking you some demographic questions, so we can see if there are any differences in survey responses across different groups of people.

What is your age? _____

What is your gender?

- Woman / Transwoman
- Man / Transman
- Gender queer / Gender non-conforming / Gender non-binary
- Two-Spirited
- I prefer not to answer

In regards to gender I prefer to self identify: _____

What is your ethnicity? _____

What is the highest level of education you have completed so far?

- Grade 9
- Grade 10
- Grade 11
- Grade 12
- 1st year of college / university
- 2nd year of college / university
- 3rd year of college / university
- 4th year of college / university
- More than undergraduate college or university

SECTION 7: Would you like to know more?

The next phase of the study involves a creative, independent photography activity in which participants capture photographs that illustrate their sense of anxiety or hope regarding climate change and their future.

Using these captured images, participants will then come together in small focus groups to discuss their works and shared themes.

Are you interested in finding out more and potentially participating in the next steps of the study including the photography activity and focus group?

- Yes
- No

(If participants answer yes to the below question, a new, separate survey will open for them which will ask for an email address that researchers can use to get in contact with them.)

SECTION 8:

Thank you for your time and participation!

I would like to thank you for your participation in this study entitled "Exploring Photovoice as a Tool to Empower and Mitigate Mental Health Impacts of Climate Change on Local Youth." As a reminder, the purpose of this study is to investigate on a broad scale, the impacts of climate change on the mental health and well-being of youth and young adults in Region of Waterloo and surrounding area and to analyze photovoice methodology as not only a data collection tool, but a means of managing eco-anxiety and stimulating of a sense of empowerment in youth and young adults.

The data collected through the surveys, photovoice study and focus groups will contribute to a better understanding of the appropriate direction of future research in the area of mental health and climate change and to consider potential strategies to manage eco-anxiety and empower youth and young adults.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#42164). If you have questions for the Committee contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

We remind you of your continued right to withdraw from the study any time prior to publication. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. The completion of the study is anticipated by early May 2021.

For all other questions or if you are interested in receiving more information regarding the results of this study, or would like a summary of the results, feel free to reach out to me at the contact information indicated below.

Sincerely,

Beth Grant, Student Investigator
University of Waterloo (Renison University College)
Environment, Resources & Sustainability
wegrant@uwaterloo.ca

Appendix D: Mental Health, Climate Change and Youth Final Survey – Control Group

SECTION 1:

Exploring Photovoice as a Tool to Empower and Mitigate Mental Health Impacts of Climate Change on Local Youth

EXTERNAL CONTACT: This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. If you have questions or concerns please contact the Office of Research Ethics (ORE File #42164), at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

CONTACT: If you have questions about the study or the procedures, please contact Robert Case (Principal Investigator) at (519-884-4404 ext. 28683 or rob.case@uwaterloo.ca) or Beth Grant (Student Investigator) at (wegrant@uwaterloo.ca).

WHAT IS THE STUDY ABOUT?

The purpose of this research study is to investigate on a broad scale, the impacts of climate change on the mental health and well-being of youth and young adults in Region of Waterloo and the surrounding area. This study seeks to engage and empower participants to illustrate the mental health impacts and implications of climate change present in their own lives using an on-line survey and (in future steps of this research), a method knows as photovoice and focus-group discussions as the methods of data collection. In addition to survey responses and focus group discussion, photographs and written descriptions collected by participants will also be collected as data and analyzed. Participation in this study will not provide any personal benefit to you, however, the goal of the study is to generate insight into the degree to which mental health impacts as a result of climate change are experienced by youth and young adults locally as well as the impact of participating in a photovoice study on participant mental health and feelings of empowerment.

METHODS AND PROCEDURES: This research project will draw participants from local community-based climate action organizations, environmentally related student clubs and student associations between the ages of 16-23 years of age.

Participation in this study will involve between two to four components. First, you will be invited to participate in a 10-minute online survey where you will be asked for some demographic information (e.g. age, gender, ethnicity etc.) as well as questions about climate change and mental health. Upon completion of this survey you will be asked about your interest in participating in the next phases of the study. If you agree, you will be randomly assigned to one of two groups.

The first group will be asked to complete the same online survey again approximately 2 months after the first survey was submitted. The second group will be asked to take part in a 2-hour photovoice activity, a 1-1.5 hour online focus group session and a final 10-minute survey. Assigning participants to the different groups will help the researcher to determine the possible impact that participation in the photovoice activity and focus groups may have on participant mental health and wellbeing.

Photovoice methodology requires participants to take creative photographs and write short descriptions for their images based on given prompting questions. If you are assigned to the second group, you will be given a period of 2 weeks during which to capture two photographs and write short descriptions around the topic of climate change, your mental health and feelings of courage for the future.

Next, you will be asked to participate in an online focus group and invited to share your photographs and written works with a small group of other participants. Focus groups will be conducted between October – February 2020 on Zoom or a similar online meeting software. Video and audio from the focus groups will be recorded with your permission to help facilitate the collection of information and later transcription for analysis.

Afterwards, the final online survey will be circulated which will ask the same questions as before, in addition to questions about your experience of photovoice and participating in the focus group.

Not everyone who indicates interest in participating in the photovoice activity and focus group portion of the study will be selected to participate as participants will be randomly assigned to two different groups, one of which will complete these additional activities while the other will complete only the initial and final survey.

The findings from these study methods will be used for academic publication in an undergraduate thesis and for a community-oriented summary report. With your permission, anonymous quotations from your open-ended survey responses, written photo descriptions and/or focus group contributions may be used in study results to demonstrate research findings. Findings from the study will be made available to research participants and other interested parties through a summary report that will be disseminated upon completion of the study. Research findings may also be submitted for publication in academic journals and for presentation at academic conferences.

SECTION 2:

Ethical Considerations

CONFIDENTIALITY: Identifying information will be removed and stored separately from collected data and your name will not appear in any paper or publication resulting from this study. Photovoice participants may choose to allow their photographs to be used in study results to help illustrate findings. In these, your name will not be used, however your face may be seen (if you were the subject) which means that your participation in the study will not be confidential. In addition, all focus group participants will be asked to keep in confidence information that identifies or could potentially identify another participant and/or their comments; however, we cannot guarantee that everyone will honour this request.

Collected data will be securely stored on a password protected computer for a minimum of one year. You may withdraw your consent and request that your data be removed from the study by contacting the researchers within this time period. Please note that due to the format of focus groups, it may not be possible to remove all data associated with you. Additionally, it will not be possible to withdraw your data once results have been submitted for publication.

RISKS: Participants will be asked to provide information on their experiences and reflect on their mental well-being, either individually and/or with the researcher and other participants. Given the focus of the study, it is possible that you may find some of the questions upsetting. In addition, please note that whenever information is collected online, privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party (e.g., government agencies, hackers). University of Waterloo researchers will not collect or use internet protocol (IP) addresses or other information which could link your participation to your computer or electronic device without first informing you.

VOLUNTARY PARTICIPATION: Participation in this study is voluntary. You may decline to answer any question(s) you prefer not to answer by leaving your response blank or by requesting to skip the question. Further, you may decide to end/leave the study sessions at any time by simply closing the survey or by advising the researcher of this decision. The commitment of the researchers is to inform all participants of their right to decline to participate without penalty and to withdraw from the study at any time before results are published without penalty or consequence.

SECTION 3:

Unique Participant Code Creation

Please input a unique code based on the below questions. This code will allow linkage of your responses from your initial survey.

- What day of the month is your birthday? Ex. 07
- What are the first three letters of your mother's first name? Ex. Car
- What is the first letter of the street you currently live on? Ex. M
    - For this example, the unique code would be: 07CarM

Enter Code Here: _____

Informed Consent

Please confirm that you have been fully informed about the study and wish to provide your consent to participate in this survey of your own free will by checking the box below. Please not that by continuing on with the survey you are providing implied consent.

- I have read the prior information about the survey and about voluntary participation, and I consent to participating in the survey component of this study.

SECTION 4: In this section, I will be asking you some questions about your general outlook on life.

Read each item carefully. Using the scale shown below, please select the number that best describes YOU.

1 = Definitely False
2 = Mostly False
3 = Somewhat False
4 = Slightly False
5 = Slightly True
6 = Somewhat True
7 = Mostly True
8 = Definitely True

1. I can think of many ways to get out of a jam.
2. I energetically pursue my goals.
3. There are lots of ways around any problem.
4. My past experiences have prepared me well for my future.
5. I can think of many ways to get the things in life that are important to me.

6. I've been pretty successful in life.
7. Even when others get discouraged, I know I can find a way to solve the problem.
8. I meet the goals that I set for myself.

SECTION 5: In this section, I will be asking you some questions about some of your thoughts and actions related to climate change.

Read each item carefully. Using the scale shown below, please rate how often the following statements are true of YOU.

1 = Never
2 = Rarely
3 = Sometimes
4 = Often
5 = Almost Always

1. Thinking about climate change makes it difficult for me to concentrate.
2. Thinking about climate change makes it difficult for me to sleep.
3. I have nightmares about climate change.
4. I find myself crying because of climate change.
5. I think, "why can't I handle climate change better?"
6. I go away by myself and think about why I feel this way about climate change.
7. I write down my thoughts about climate change and analyze them.
8. I think, "why do I react to climate change this way?"
9. My concerns about climate change make it hard for me to have fun with my family or friends.
10. I have problems balancing my concerns about sustainability with the needs of my family.
11. My concerns about climate change interfere with my ability to get work or school assignments done.
12. My concerns about climate change undermine my ability to work to my potential.
13. My friends say I think about climate change too much.
14. I have been directly affected by climate change.
15. I know someone who has been directly affected by climate change.
16. I have noticed a change in a place that is important to me due to climate change.
17. I wish I behaved more sustainably.
18. I recycle.
19. I turn off lights.
20. I try to reduce my behaviors that contribute to climate change.
21. I feel guilty if I waste energy.
22. I believe I can do something to help address the problem of climate change.
23. I feel that I have courage and motivation to act on the issue of climate change.
24. I feel hopeful for the future in relation to climate change.

SECTION 6: Thank you for your time and participation!

I would like to thank you for your participation in this study entitled "Exploring Photovoice as a Tool to Empower and Mitigate Mental Health Impacts of Climate Change on Local Youth." As a reminder, the

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University of Waterloo (Renison University College)
Environment, Resources & Sustainability
wegrant@uwaterloo.ca

Appendix E: Mental Health, Climate Change and Youth Final Survey – Treatment Group

SECTION 1:

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The first group will be asked to complete the same online survey again approximately 2 months after the first survey was submitted. The second group will be asked to take part in a 2-hour photovoice activity, a 1-1.5 hour online focus group session and a final 10-minute survey. Assigning participants to the different groups will help the researcher to determine the possible impact that participation in the photovoice activity and focus groups may have on participant mental health and wellbeing.

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8. I meet the goals that I set for myself.

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5 = Almost Always

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17. I wish I behaved more sustainably.
18. I recycle.
19. I turn off lights.
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21. I feel guilty if I waste energy.
22. I believe I can do something to help address the problem of climate change.
23. I feel that I have courage and motivation to act on the issue of climate change.
24. I feel hopeful for the future in relation to climate change.

SECTION 6: In this section, I will be asking you some questions about your experience participating in the photovoice activity and focus group portions of this study.

Read each item carefully. Using the scale shown below, please rate how much YOU agree or disagree with the following statements.

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

1. To confirm, did you complete the photovoice activity portion of this study?
    - Yes, both
    - No, neither
    - Only the photovoice activity but not the focus group
- The photovoice activity and focus group was fun and enjoyable to complete.
- I believe participating in photovoice activities and focus groups like this one can create a positive change in attitudes and perspectives.
- Participating in the photovoice activity was a meaningful and empowering experience.
- The photovoice activity and focus group had a positive impact on my mental health and wellbeing in relation to my thoughts about climate change.
- How would you rate your overall experience in participating in the photovoice activity and focus group?
    - Poor
    - Okay
    - Good
    - Very Good
    - Excellent
- I would recommend participating in a photovoice activity and focus group like this one to a friend.
    - Yes
    - No
    - Maybe
- What did you like about the photovoice activity and focus group? _____
- What did you dislike about the photovoice activity and focus group? _____
- What did you find meaningful or empowering about the photovoice activity and focus group? _____
- If you could change anything about the photovoice activity or focus group, what would it be? _____
- If you have any other feedback or thoughts you'd like to share regarding your experience with the photovoice activity and focus group please share those below. _____

SECTION 7: Thank you for your time and participation!

I would like to thank you for your participation in this study entitled "Exploring Photovoice as a Tool to Empower and Mitigate Mental Health Impacts of Climate Change on Local Youth." As a reminder, the purpose of this study is to investigate on a broad scale, the impacts of climate change on the mental health and well-being of youth and young adults in Region of Waterloo and surrounding area and to analyze photovoice methodology as not only a data collection tool, but a means of managing eco-anxiety and stimulating of a sense of empowerment in youth and young adults.

The data collected through the surveys, photovoice study and focus groups will contribute to a better understanding of the appropriate direction of future research in the area of mental health and climate change and to consider potential strategies to manage eco-anxiety and empower youth and young adults.

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We remind you of your continued right to withdraw from the study any time prior to publication. Once all the data are collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. The completion of the study is anticipated by early May 2021.

For all other questions feel free to reach out to me at the contact information indicated below. A copy of the study results will be circulated through your organization as well as emailed to participants once it becomes available.

Sincerely,

Beth Grant, Student Investigator
University of Waterloo (Renison University College)
Environment, Resources & Sustainability
wegrant@uwaterloo.ca

Appendix F: Photovoice Activity Detailed Instructions

What is Photovoice?

Photovoice is a community-based participatory research method in which the study participants are actively involved in data collection through photography. Empowerment is a central focus of photovoice research as participants are given voice to share their experiences directly. In this study, we want to empower you as local youth to share your experiences of how living with climate change impacts your mental health and wellbeing.

What Does This Photovoice Activity Involve?

Your participation in this photovoice portion of the study will involve capturing two photographs inspired by our two prompting questions below and writing a short description of 150 words or less to accompany each photograph.

The two prompting questions which can provide creative inspiration for the content of your photograph are as follows:

1. Does climate change impact your mental well-being or sense of happiness? If so, how?
2. In spite of the climate crisis, what gives you courage for the future?

Use these prompts to guide your photography, but keep in mind that there is no right or wrong way to interpret these prompting questions and this is a creative process so everyone will have unique responses. There are no requirements regarding the content of your photographs, though due to the current ongoing situation with Covid-19 we do have some rules that we ask you follow during the photovoice portion of this study. In order to ensure safety of participants and agreeance with government social distancing recommendations and other Covid-19 safety protocol, **please do not capture images of human subjects who do not belong to your household.** Feel free to take photographs of yourself or of people from within your shared household from whom you can safely obtain the appropriate level of consent (E.g. A roommate). **You can capture photos that feature other human subjects so long as they do not require consent** (See ethical considerations below for further clarification). Photos should depict your experience and thoughts regarding the prompting questions. Feel free to take a number of creative photos for each prompt but know that you will need to eventually choose just one photo for each prompt for a total of two photographs.

Written descriptions that accompany each photo can take whatever form you would like, whether a simple paragraph or a more poetic piece. The purpose of the description is to help others to understand the content of the photograph and the thought and experience behind it. You might consider looking at the prompting questions and explaining how your photograph ties into that question when writing your description. Please remember to keep these descriptions under the 150-word maximum.

Ethical Considerations

This study allows you to be part of the data collection process. By taking the photograph and writing about it you have the power to frame the issue; with this opportunity comes responsibility as well. It is of utmost importance to ensure that the safety and consent of all involved is always maintained. This not only includes you, but any people who you may want to photograph. Photographs can be powerful

and may be intrusive of someone's private space or experience, be embarrassing or portray someone falsely, and if taken without permission, can make someone feel unsafe. For these reasons it is very important that you follow the ethical guidelines listed below:

1. You as photographer are responsible to obtain the appropriate level of consent when capturing photographs containing other people or personal information. The breakdown of appropriate consent based on the content of the photograph is listed below:
    a. Consent Not Need When:
        i. Large public area with people you can not make out in the photo (Ex. a large crowd)
        ii. Public figures in public (Ex. politician on a podium)
        iii. Photos taken of public places, objects, or environments without people in them
    b. Obtain VERBAL Consent When:
        i. Non-recognizable individuals -- from all individuals in all settings when possible (Ex. ask a group of people standing in front of a bus stop if it's ok you take their picture even though you won't be able to see their face)
            - Non-recognizable individuals included in photos **MUST be members of your household** to ensure safety when obtaining their consent, otherwise please do not photograph at risk of breaking social distancing recommendations and other Covid-19 safety protocol.
    c. Obtain WRITTEN Consent When:
        i. Individuals whose faces (or other recognizable markings such as tattoos) are photographed in public or private setting
        ii. If an individual photographed is under the age of 18, the individual AND their parent or guardian must sign the consent form in order to have the child/youth in the photo
        iii. Individuals in any setting where personal, private information is exposed in the photo or documented in the caption (Ex. someone's house, that shows their address and the street sign)
            - Recognizable individual/child/private information **MUST be members of your household** to ensure safety when obtaining their consent, otherwise please do not photograph at risk of breaking social distancing recommendations and other Covid-19 safety protocol.
2. Always keep safety in mind! Do not put yourself or others in any danger and abide by all laws and government recommendations while capturing photographs for this study. For example, do not trespass on private property in order to capture a photograph. Do not do anything that risks your health and safety or the health and safety of a subject in order to capture a photo, including breaking encouraged social distancing protocols. Also consider protecting yourself and subjects from emotional harm, harm to reputation and financial harm in addition to physical wellbeing. Please use common sense to ensure safety is always maintained.
3. Always consider the wellbeing of any human subjects you photograph. Think about the impact of the photo being published and viewed by the public. Even if consent has been obtained, think about how you would feel if a similar photo of you was published. If there is any chance you might feel embarrassed or regret it later, consider a different approach to ensure the wellbeing of the subject.

How to Approach Potential Photography Subjects

1. Assess: Be sure to assess the situation before you enter into it. Can you approach the person safely? Do they appear to be in a stable and approachable state of mind?
2. Explain: Explain a little bit about the study.
3. Ask for Consent: Ask for their consent before taking the photo when possible. If they are identifiable in the photograph you have taken or intend to take, be sure to gain their written consent.
    - In order to abide by Covid-19 safety protocols, **please do not approach persons or photograph in a way that would require consent anyone outside of your household.**

Photography Tips

- Be aware of what you are capturing in your photo. What do you want to be the focus? Does that focus point stand out? What message are you trying to get across? Is the photograph you have captured telling the same narrative you see?
- Consider colour. Would your photograph be more powerful in full colour? Black and white? Some combination? Do you want certain colours to be featured in order to express your message?
- Consider the perspective. Would your photograph be more powerful or interesting from a different angle?

Appendix G: Focus Group Discussion Guide

Welcome and Introduction

- Welcome to the focus group section of this research study! Thank you all for being here today. My name is Beth and I am the Student Researcher for this study. I will be facilitating the focus group today.
- The purpose of the focus group is to discuss your experience with the photography activity, share your photographs and written works with the one another and potentially identify some shared themes between your experiences.
- I think it might be a good idea to start off with a quick roundtable introduction! Please introduce yourself with your name, pronouns, program/year of study and one interesting fact about you so we're just a little more familiar with one another.

Laying Some Ground Rules

- I want to remind you all that like every part of this study, this focus group is entirely voluntary and if at any time you feel uncomfortable or no longer wish to participate you have every right to cease participation.
- I would like to encourage confidentiality amongst the participants here that upon completion of this focus group, any ideas, thoughts, comments or experiences shared by participants of this study are not disclosed or discussed publicly.
- I would also like to encourage respectful listening, consideration for one another and attention to each speaker while they are sharing their photos and thoughts. I want this to be a safe space where you can all share your experiences freely and comfortably.
- I would like to remind you that I intend to audio record this session for transcription purposes. The audio recording of this focus group will only be heard by myself and fellow researchers and will be deleted upon completion of the analysis.
- If at any point you have any questions or concerns please feel free to direct those towards me so I can clarify or provide more information.
- I would also like to remind you of the mental health and well-being resources I sent yesterday over email for you to access should you feel any distress at any point in the focus group while discussing your experiences, thoughts or feelings.

First Round of Photo Sharing

- We will start with our first prompting question: Does climate change impact your mental well-being or sense of happiness? If so, how?
- We will take turns to go around and share with each other the photograph you captured based on this prompt and the written description that you created!
- We can share the photo with everyone to admire and you can feel free to read out the written description that accompanies your photograph. You can also use the below questions to provide some extra context for your photograph if you wish. Feel free to share as much or as little about the photo as you wish.
    - What is happening in your picture?

    - What has been captured in your picture?
    - Why did you take a picture of this?
    - What significance does it have to you?
    - What does this photo mean to you?
    - What does it tell us about your experience?
- Thank you everyone for sharing your creative work and experiences and to everyone for listening intently. We will now discuss the first round of photos and open the floor for questions comments and observations about underlying themes.
    - To guide these conversations the following prompting questions can be used:
        - Does anyone have any additional thoughts they would like to share now that you have seen each other's work?
        - Did you notice any shared themes, ideas or experiences between your photographs and written descriptions?
        - Are there any key takeaways of these photographs and descriptions that you think should be reflected in the research?
        - Is there anything not captured in the photographs that you wanted to mention regarding your experience of mental well-being regarding climate change or others in this community?

QUICK BREAK DEPENDING ON THE SPEED AND PROGRESSION OF THE FOCUS GROUP.

Second Round of Photo Sharing

- Now we will move on to our second prompting question: In spite of the climate crisis, what gives you courage for the future?
- We will take turns to go around and share with each other the photograph you captured based on this prompt and the written description that you created!
- We can share the photo with everyone to admire and you can feel free to read out the written description that accompanies your photograph. You can also use the below questions to provide some extra context for your photograph if you wish. Feel free to share as much or as little about the photo as you wish.
    - What is happening in your picture?
    - What has been captured in your picture?
    - Why did you take a picture of this?
    - What significance does it have to you?
    - What does this photo mean to you?
    - What does it tell us about your experience?
- Thank you everyone for sharing your creative work and experiences and to everyone for listening intently. We will now discuss the second round of photos and open the floor for questions comments and observations about underlying themes from these photographs.
    - To guide these conversations the following prompting questions can be used:
        - Does anyone have any additional thoughts they would like to share now that you have seen each other's work?
        - Did you notice any shared themes, ideas or experiences between your photographs and written descriptions?

- Are there any key takeaways of these photographs and descriptions that you think should be reflected in the research?
- Is there anything not captured in the photographs that you wanted to mention regarding your experience of hope and courage for the future despite the climate crisis or others in this community?
- How did you find the process of taking photographs and putting your thoughts into words?

Conclusion

- Thanks everyone! Before we start to conclude today's focus group does anyone have any remaining thoughts that they'd like to share? Or any outstanding questions or concerns about the study in general?
- The next step of our meeting today is for you to complete our final survey which will conclude your participation in this research study. The link to the final survey has just been shared to the email address you provided us with. It should not take you more than 10 minutes to complete.
- I would just like to thank you again for your participation and remind you that if you have any follow up questions about the study that you can reach me at the contact information provided at the end of the final survey. If you are interested in receiving more information on the findings of this research study there is an option in the final survey to receive a copy of the study upon completion.
- Just a reminder of the mental health and well-being resources available for you to access should you feel any distress moving forward or reflecting on any of your experiences participating in the study or otherwise.