The Mount Polley Mine Spill: An Environmental Scan into Indigenous Holistic Approaches to Environmental Health and the Systems that Emerge in Canada and Australia

by

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Abstract

The tailings pond breach at the Mount Polley mine on August 4th 2014 is known as the worst disaster in Canadian mining history. The mine is operated by Imperial Metals and is located on the traditional territory of the Secwepemc te Qelmucw (NStQ) and the Xat'sull Soda Creek First Nations people. Despite coordinated protests and an ongoing investigation into the full magnitude of the effects of the spill, the B.C. Ministry of Energy, Mines and Natural Gas has accepted an application to reopen the Mount Polley mine. With reference to the ecohealth approach, this capstone aims to engage with Indigenous teachings about connection to land to promote new ecological ethics and holistic theoretical perspectives within environmentally oriented public health research and practice. This capstone is informed by an environmental scan of research, grey literature and web-based data, to explore how Indigenous communities in Canada and Australia are defining health and environmental health and what Indigenous systems are emerging that embody notions of holism and interconnectedness. The results of the scan show the need for Indigenous-led institutions to develop definitions of environmental health that are rooted in their knowledge base and encompass Indigenous notions of health and well-being. The findings also illuminate the silences in the literature and the powerful implications of silencing ecological losses. The literature search reveals that how we gather data with First Nations peoples in Canada nationally and historically is problematic. This study concludes with the assertion that building on the strengths of both Indigenous knowledge and ecohealth is fertile ground that has the potential to acknowledge the environment as a setting for health and a place for healing and reconciliation.

Keywords: Indigenous; Ecohealth; Solastalgia; Holism; Environment; First Nations Health Authority; Torres Strait Regional Authority

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CENPHER	Center for Public Health and Ecosystem Research
E.A.G.L.E.	Effects on Aboriginals from the Great Lakes Environment Project
ECP	Environmental Contaminants Program
EDS	Environmental Distress Scale
EHO	Environmental Health Officers
FNECP	First Nations Environmental Contaminants Program
FNHA	First Nations Health Authority
OCAP	Ownership, Control, Access, Possession
RHS	Regional Longitudinal Health Survey
SFU	Simon Fraser University
SEA	Southeast Asia
TFNHP	Tripartite First Nations Health Plan
TSRA	Torres Strait Regional Authority
WHO	World Health Organization

Introduction

It's difficult to express the depth of our connection to these lands, and the pain and sorrow that have resulted from this man-made disaster. We don't separate human health from our relatives, the water and the animals. We are connected as "One." Yesterday's ceremony marks our sacred duty to speak for those that cannot speak for themselves (FNHA, 2014).
-Kukpi7 Wayne Christian

The tailings pond breach at the Mount Polley mine on August 4th 2014 is known as the worst disaster in Canadian mining history (Hutchinson, 2014). The mine, operated by Imperial Metals and located on traditional territory of the Secwepemc te Qelmucw (NStQ) and the Xat'sull Soda Creek First Nations people, spilled approximately 25 million cubic meters of toxic mining waste into Hazeltine Creek and Quesnel Lake in the Cariboo region of British Columbia (B.C.), see Figure 1 (Hayward, 2015; Hutchinson, 2014; North, 2015). While a recent study has found that the massive tailings spill has created profound changes to the lakes ecosystems, the full magnitude of the effect of the spill on human health, economics and the environment is yet to be seen (Petticrew et al., 2015). Residents of the region have expressed fear and anger about the presence of waste materials in Quesnel Lake: "Quesnel Lake is everything to the folks in Likely. Many drink from it. They bathe in lake water, and use it for cooking, they pull fish from it, and have for decades" (Hutchinson, 2014).

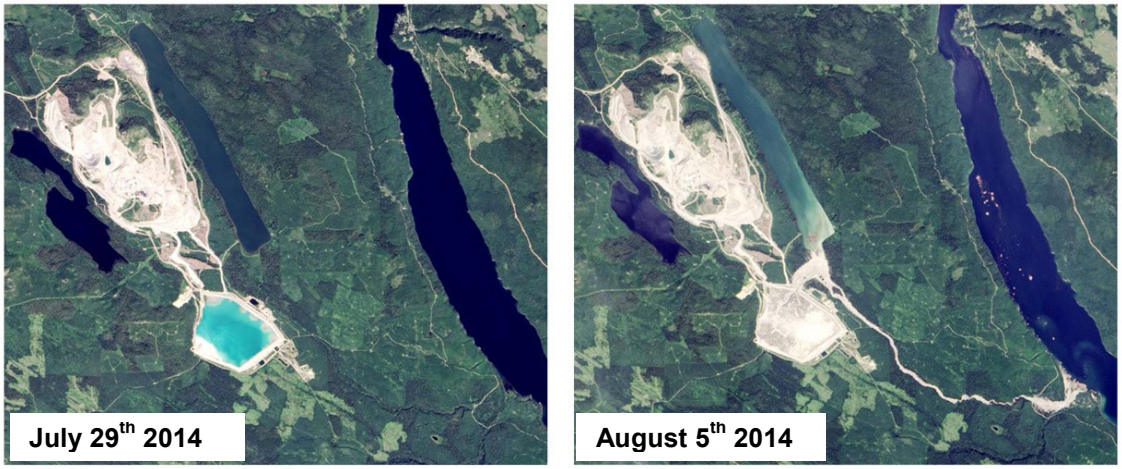


Figure 1: Mount Polley tailings dam before (left) and after the spill (right). These pictures show evidence of the massive influx of tailings into the pond and flowing into the nearby bodies of water (CBC News, 2014)

Environmental health is a dynamic and evolving field and its parameters are still being defined (Frumkin, 2010). This arena of research, policy formation and practice, is often underpinned by a dualistic Western view that separates humans from the natural environment.

The conception of a divide between social and environmental factors influencing health contrasts with Indigenous perspectives that see all life as interconnected. As a result, having to work and be treated within a perspective that does not appreciate the indivisibility of people and land can be detrimental to Indigenous people's health (Johnston, Jacups, Vickery, & Bowman, 2007; Kingsley, Townsend, Henderson-Wilson, & Gislason, 2013; Parkes, 2010; Pilgrim & Pretty, 2010). This capstone emerged from collaboration between the First Nations Health Authority (FNHA) and the Faculty of Health Sciences (FHS) at Simon Fraser University, to better understand how Indigenous knowledge and lived experiences of environmental disasters can be reflected in public health responses to issues such as the Mount Polley disaster. Embedded within this larger initiative, my capstone research project aims to contribute to a wider discussion about thinking ecologically about health and to do so in particular by considering efforts to 'boundary-cross,' in order to build bridges between theories, disciplines, methods, practices and mandates within the public health arena. In this report, boundary-crossing refers to overcoming intellectual obstacles that bifurcate environment, health and self, to develop more integrated theoretical approaches to health. A central theme running through my research is the notion that engaging with Indigenous teachings about connection to land has the potential to promote new ecological ethics and holistic theoretical perspectives within environmentally oriented public health research and practice. This idea is explored more in-depth using the ecohealth approach and the philosophical concept of solastalgia; a fairly new concept to address environmentally induced mental distress and physical illness. Utilizing Indigenous led research, through an environmental scan of scientific, grey literature and web-based data, this research will work towards learning how Indigenous communities in Canada and Australia are defining health and environmental health. Additionally, this research will explore some of the Indigenous led systems emerging in both Canada and Australia that embody notions of holism and interconnectedness. Two ground breaking institutions will be discussed: British Columbia's First Nations Health Authority's (FNHA) and Australia's Torres Strait Regional Authority (TSRA), as well as the Health*InfoNet,* an Australian Internet resource. Please see Appendix 1 for an informative description of the terminology used throughout this capstone. A secondary theme is to critically explore the power relations that control access to environmental resources through a feminist ecological and post-colonial studies lens. Thus, this paper will also question what are the implications of silencing or dismissing ecological losses for Aboriginal populations and how unfamiliar relationships of land and place to Western environmental researchers lead to further silences in scientific literature.

The analysis of this capstone is divided into four main parts. The first section introduces Ecosystem-based approaches to human health or ecohealth research as a theory that addresses health at the interface of complex and dynamic interactions between determinants, social and economic conditions, ecosystems and people. The second section aims to discuss the great potential for ecohealth as a space to identify how humans relate and connect to nature. Three complementary concepts are explored in this section: the Medicine Wheel, 'Caring for Country' and solastalgia. The third section puts these theories into practice by examining the emerging systems that have come out of Canada, particularly focusing in British Columbia and the FNHA, and Australia's TSRA. The final section provides a discussion of the results and findings of the environmental scan as well as speaks to the implications and recommendations for public health practice and policy.

Why Compare Canada and Australia?

Despite the great diversity of Indigenous peoples within and between Canada and Australia, some aspects of the contexts, strengths and challenges are shared (M. King, Smith, & Gracey, 2009; WHO et al., 2010). Thus, this research will use both Canada and Australia as sites for study. These countries were selected due to the similarities in their colonial history, laws, political structures and the socio-economic outcomes of their respective Indigenous peoples (Adelson, 2005; Coombes, 2006; Loppie & Wien, 2009). While the year 2008 witnessed apologies on the part of the federal governments in both Canada and Australia for their assimilationist policies, these steps towards reconciliation have not made significant progress in closing the gaps between Indigenous and non-Indigenous health inequities (Australian Government, 2008; Australian Human Rights Commission, 2015; CBC, 2008; Scoffield, 2012). Canada and Australia are consistently near the top of the United Nations Development Programme (UNDP's) human development index (HDI) rankings, ranked eight and second respectively (UNDP, 2014). Despite being considered as 'very high human development' countries, both have minority Indigenous populations with poor health and social conditions who are considered to have only medium levels of human development. The apparent health inequities and slow progress in improving the health and well-being of Indigenous populations, points to the underlying causes of the disparities and the need to navigate the social, economic, cultural and political inequities as they relate to health and the realities of contemporary Indigenous people. Furthermore, there are issues of environmental health and justice, as seen through the Mount Polley Mine spill, that are impacting Aboriginal health and efforts to redress

this as well as efforts coming from the Aboriginal community to rethink institutions and frameworks for improving aboriginal health.

Statement of the Problem

"Governments have completely sold out the environmental values of this province to industry"
The President of the Union of B.C. Indian Chiefs, Grand Chief Stewart Phillip
(Meiszner, 2014).

It has been approximately nine months since the Mount Polley disaster, yet according to First Nations residents of the area the clean up efforts have been inadequate (Young, 2015). The chaos of the Mount Polley mine spill is heightened by a history and lived reality of colonization, institutional racism and loss of lands and autonomy among First Nations populations; which will be discussed shortly (Camfield, 2013; Smith, 2012). Despite coordinated protests throughout Canada and the United States on April 29th 2015 and an ongoing investigation into the effects of the breach on the Lakes ecosystems, the B.C. Ministry of Energy, Mines and Natural Gas has accepted an application to reopen the Mount Polley mine (Kresnyak, 2015; Petticrew et al., 2015; Suzuki, 2014). While the B.C. Ministry of Energy, Mines and Natural Gas says that the spill is an "extremely rare" occurrence, the province of B.C. has reported 46 dangerous or unusual happenings at tailings pond between 2000 and 2012, as well as breaches at non-operating mine sites (Hoekstra & 2014, n.d.; Suzuki, 2014). This is significant given the plans of the government of B.C. to create 8 new mines in B.C. and expand 9 existing mines within a four-year period. Additionally, the government of B.C. is working to complete at least 10 non-treaty agreements with First Nations people (Bailey, 2011; RedWire Media, 2015). Out of these problems, a range of Indigenous-led responses is emerging. The establishment and strengthening of formal institutional structures will be discussed later in the paper.

In pursuing my Master's in Public Health my field of specialization has been global health; therefore I find it not only necessary, but also relevant to briefly situate the context of the Mount Polley mine spill and Canada's role in mining within the field of global health. A starting point for this discussion is the landmark Declaration of Alma-Ata and the slogan of "Health for All" by the year 2000 and "Health in All Policies." Alma Ata represents formal acknowledgment of the importance of intersectoral action for health, as it recognizes that health is determined by a multitude of factors outside of the control of the health care sector (Cueto, 2004). While member countries of the World Health Organization (WHO) have accepted the Declaration, the Mount Polley Mine spill provides an opportunity to reflect on the meaning and implementation of

'health in all policies' within the Canadian context and how Canadians implement this concept globally. Although there is a clear link between human and environmental health, it currently remains a neglected policy arena within Canada. How the government and industry respond to the disaster of Mount Polley, has the potential to set a precedent on how to handle future disasters and spills, whether from mining or pipelines (Kresnyak, 2015; Suzuki, 2014; Turner, 2015). Further, as a global leader in the mining industry, Canada is increasingly tying its foreign aid towards support for mining interests (Gordon & Webber, 2008; Marshall, 2014; Moore, 2014). Global mining production, including fossil fuels, has almost doubled since 1984, from just over nine billion tonnes to approximately 17 billion in 2012, with the greatest increases over the past ten years (Suzuki, 2014). While mining can impact local communities positively and negatively, the positive impacts such as employment do not counteract the negative aspects of mining, such as: forced migration, loss of biodiversity contamination of soil and waters, and increased marginalization of women (Friel, Marmot, McMichael, Kjellstrom, & Vågerö, 2008; Gordon & Webber, 2008; Marshall, 2014; Oxfam, 2014). Global health is frequently referenced as a priority subject and remains a highly diverse area of scholarship and practice (Janes & Corbett, 2009). For the purposes of this capstone, global health will refer to health issues that "undermine, or are oblivious to the territorial boundaries of states, and thus beyond the capacity of states to address effectively through state institutions alone (Janes & Corbett, 2009)." Within global health is the recognition of a degree of shared responsibility for the health outcomes in developing countries and the need to address the increasing technical and political complexities of health while reflecting the realities of globalization (De Cock, Simone, Davison, & Slutsker, 2013; Ooms, 2011). The idea of health being a globally shared responsibility is critical given that the environmental and health outcomes of climate change impinge unequally across regions and populations (Friel et al., 2008; Patz, Gibbs, Foley, Rogers, & Smith, 2007).

Critical Pre-reflection

Before I present my research, it is both appropriate and necessary that I declare who I am, who I claim to speak for, and why I am writing on this topic. I was born and raised in Southern Ontario to immigrant parents. My intention is to speak as a non-Indigenous female who grew up across the street from a nuclear power plant in Pickering, Ontario. I began each academic year, during elementary and high school by handing my teacher a permission slip that stated that they had permission to give me a Potassium Iodide (KI) pill in case of a radiation release from the plant. The first day continued with emergency preparedness training that consisted of informing students of their designated area in the gymnasium to receive their KI pill.

Summers were filled with trips to Pickering Beach, but also hesitations about swimming in the water. I have very vivid memories of the looks of panic and fear on my parents the few times the alarm on the power plant rang. In 2013, despite controversy, the Canadian Nuclear Safety Commission renewed the plant's licence, which was set to expire in September 2013 until the end of August 2018 (Globe and Mail, 2013). The extension of the license fuelled a series of questions for me surrounding the continuous divergence between environment and health, what propels the mentality of collective and individual profit over the environment and what other ways of being and knowing exist that see not only a responsibility but also a stewardship of the land, river and sea. These questions re-emerged during a 12-week practicum at the Center for Public Health and Ecosystem Research (CENPHER), where I was introduced to the ecohealth approach. While the practicum largely focused on conducting a scoping review of ecohealth practices in Southeast Asia (SEA), I had the opportunity to meet with some small-scale farmers in the Hanam Province to discuss how programs implementing the ecohealth approach are impacting their livelihood. While the farmers spoke to a method of small-scale farming wherein food gardening, fish rearing and animal husbandry are integrated, they also discussed the deep ties and dependency they have on their land. The ecohealth approach introduced me to a field of 'global environmental health' that spoke to the interconnection of human, animal and environment. As a non-Indigenous that is worried about the future of our environment, throughout this capstone I respectfully draw insights from Indigenous peoples connections to the land in the hope that this sense of intimate connection inspires a calling to hold everyone to the same standard in caring for the earth.

As a researcher I aim to be conscientious, to not romanticize Indigenous connections to land, nor to assume that they are the same as they were in the past or that all Indigenous people maintain or want to maintain this inherent relationship. Continuing to romanticize the notion of the 'Noble Savage' creates a stagnant view of Indigenous groups wherein they do not grow, revitalize and reinvent themselves to reflect their lived experiences and realities. This research is not presented without hesitation. Questions surrounding my place for participating in this research and imposing on this space are coupled with feelings of white guilt and fears of participating in colonial continuities through incorrect terminology. Despite these fears, I believe that white guilt should not result in a place of inactivity and fear of wording should not stifle the important dialogues and discussions that need to be had.

Theoretical Underpinnings

This research conceptualizes the environment and environmental health through an ecohealth lens, recognizing the complexity of the relationships between living and inert components of the ecosystems. Health in this context refers to human, animal and ecosystem health, suggesting that health is produced in the relationship between humans, animals, microbials and ecological activities. Health is seen as relational, interdependent and dynamic (Brown, 2007; Charron, 2011; Dakubo, 2011b; Gislason, 2013). My interpretive framework for this capstone extends beyond the ecohealth approach to include critical theoretical perspectives such as political ecology and feminist perspectives. The primary purpose for including other perspectives is to more fulsomely examine the complexities between people-environment interactions and the underlying forces that shape these interactions and the coping and resistance strategies people engage. The secondary purpose is to critically explore the power relations that control access to environmental resources through a feminist ecological and post-colonial studies lens. This is based in the recognition that by virtue of societal roles, local realities shape access to and use of environmental resources.

Effects of Colonization

Although an in-depth review of the determinants of Aboriginal health is outside the limits of this capstone, it is important to understand how colonization affects the lives and overall health of Indigenous peoples. This section will speak generally to the profound effects of colonization without extrapolating between different groups, as local circumstances differ greatly (Gracey & King, 2009). According to Kelm, colonization is a process that includes "geographic incursion, socio-cultural dislocation, the establishment of external political control and economic dispossession, the provision of low-level social services and ultimately, the creation of ideological formulations around race and skin colour that position the colonizer at a higher level of evolution than the colonized (Gracey & King, 2009; Kelm, 1998)." This section will also emphasize the harmful effects of colonization on Aboriginal peoples' relationship with the land and their ability to express and enact this connection. Colonialism in Canada, as well as in countries with similar colonization campaigns like Australia, took the form of settler colonialism, wherein settlers permanently settled on Indigenous lands, aggressively seized those lands and eventually greatly outnumbered Indigenous populations. The main purpose of settler colonialism was not to take advantage of the labour of Indigenous peoples; but rather to displace

Indigenous peoples from their lands, destroy the cultures that grew out of relationships with those lands, and eliminate Indigenous societies so that settlers could establish themselves (Bozorgmehr, 2010; Camfield, 2013; Kingsley et al., 2013; T. King, 2013; Loppie & Wien, 2009). Durie (2009) asserts that the devastating impacts that followed from the colonial experience resulted in the breaking of the key feature of 'indigeneity,' that is, the bond between peoples, their land and their natural environment (M. King et al., 2009; Kirmayer & Valaskakis, 2009). Contemporary Aboriginal peoples continue to face 'historic or cultural trauma,' that has negatively affected the physical, social, emotional and mental health and well-being of people in traditional societies (Gracey & King, 2009; Loppie & Wien, 2009). These traumas are tightly linked to issues relating to disrupted access to the environment as a place of healing and as a terrain over which Aboriginal agency and cosmologies are negotiated with settler populations. The powerful effects of colonization on Indigenous people and their lands are common to many Indigenous groups, yet few researchers have attempted to examine the complex dimensions that link Indigenous peoples to their physical land and the lived experiences of communities when these ties are severed (Adelson, 2005; Aquash, 2014; Chandler & Lalonde, 1998; Gracey & King, 2009; M. King et al., 2009; Kingsley et al., 2013; Loppie & Wien, 2009; Strang, 2005; Weir, 2012; Wilson & Rosenberg, 2002). However, recently questions have emerged surrounding the likelihood of people remaining healthy on a planet that is sick and getting sicker, both ecologically and socially.

Ecohealth Research

Ecosystem- based approaches to human health, or ecohealth research, is a comprehensive approach to understanding health at its human, animal and environmental interface. Ecohealth research evolved in the mid-1990s as action research that formally connects ideas of environmental and social determinants of health with those of ecology and systems thinking within a socio-ecological systems context (Charron, 2011; Forget & Lebel, 2001; Waltner-Toews, 2009). The approach acknowledges the inter-linkages between human health and ecosystem health, and seeks to understand the social, political and economic factors that influence their interaction and the implications on health for both humans and ecosystems. This research aims to go beyond the dominance of the biomedical and quantitative paradigm, to draw on both natural and social sciences (Brown, 2007; Charron, 2011, 2012; Forget & Lebel, 2001).

Ecohealth research relies on empirical evidence, flexibility and context-specific protocols (Charron, 2011; Waltner-Toews, 2009). Charron proposes that the application of the approach

should be conducted under the six pillars of systems thinking, transdisciplinary research, participation, sustainability, gender and social equity and knowledge to action. These principles are not meant to serve as a methodological checklist; rather they are elements of an effective process to generate knowledge (Charron, 2011; Forget & Lebel, 2001). While each principle aims to inform 'how' to conduct ecohealth research, the first three pillars focus on the process of ecohealth research, while the last three focus on the intrinsic goals of ecohealth research. The ultimate vision is that community and policymakers at local and wider scales use the knowledge generated by ecohealth research for productive action (Charron, 2011; Nguyen, Nguyen-Viet, Pham-Duc, Stephen, & McEwen, 2014; Parkes, 2010; Waltner-Toews, 2009). The development of the ecohealth approach creates a framework that addresses health more holistically, encourages the integration of multiple forms of knowledge and offers new space for conversations.

Methods of Data Collection

This capstone is informed by an environmental scan of research findings, grey literature and web-based data in order to understand how Indigenous communities in Canada and Australia are defining health and environmental health and what Indigenous systems are emerging that embody notions of holism and interconnectedness. For the purposes of the environmental scan a combination of sources emphasizing authors who identify as Indigenous were considered. The search was conducted from October 2014 - May 14th 2015, therefore all relevant news articles and academic scholarship that were published after this date were not considered. The search was focused in PubMed and ISI Web of Science, emphasizing particular results from the Journal of Aboriginal Health and Pimatisiwin, both of which are Indigenous-led journals. Keywords used included: "Indigenous," "Aboriginal," or "Aborigines," "First Nations," "Canada," "Australia," linked with "health," "environment," "land," "ecohealth," "ecosystem approach to health," "interconnectedness," "institutions," "holism," "culture," "tradition," "history," "colonialism," "country," "knowledge," "beliefs," "practice." Additionally, a targeted web based search was conducted to find Indigenous-led institutions that are discussing environmental health. The results of this search were scanned for relevancy and cultural appropriateness and the works referenced throughout this research are available in the public domain. This search was confined to the English language. Inclusion criteria for the papers used were: academic papers written by or with Indigenous peoples, written prior to May 14th 2015 and after the year 2000 to ensure relevancy. It is important to note that the literature reviewed for this paper focused on Indigenous-specific literature. Papers focused on solastalgia were

selected if they followed the Bradford Hill criteria, a group of minimal conditions necessary to provide adequate evidence of a causal relationship. In regards to the literature that spoke to First Nations led environmental health projects in B.C., due to the limited available public data, the search was expanded to include Canada-wide projects. All projects found in the search are discussed in this paper.

Critical Review of Relevant Literature

Embedded within the ecohealth approach is the idea that humans are integral to ecosystems and that there is a link between human health and ecosystem health. However, this notion raises complex questions about people-environment relations and the underlying factors that shape these interactions (Albrecht et al., 2007; Dakubo, 2011a, 2011b; Gislason, 2013; Nguyen et al., 2014). Additionally, while there is a wealth of literature on the physical health impacts of environmental degradation, little attention is given to understanding the linkages between environmental dispossession and cultural identity, in addition to coping and resistance strategies. What is not evident in the ecohealth approach is discussions of political ecology and the power dynamics that influence human-environment relationships in shaping access, control, use and distribution of environmental resources (Albrecht et al., 2007; Dakubo, 2011b; Nguyen et al., 2014; Richmond & Ross, 2009). Therefore, this research aims to extend the ecohealth approach to engage with critical theoretical perspectives to allow for a more holistic and informed understanding of the people-environment relationship and the power structures that influence people's access to the environment.

Reviewing First Nations peoples connections to the land offers new ways of researching health, as it provides a deeper cultural exploration of the relationship between social and ecological systems (Johnston et al., 2007; Parkes, 2010). While this is not to suggest that non-Indigenous people cannot have spiritual connections to the land, such relationships are often outside of the Western philosophical position that segregates land and health (Johnston et al., 2007; Kingsley et al., 2013; Strang, 2005; Weir, 2012). Converging themes from the fields of environmental health promotion, environmental justice and Indigenous interconnectedness presents opportunities for innovation and inclusive advancement in environmental health theory and practice (Parkes, 2010). Parkes says that "ecohealth approaches that address health more holistically, and encourage integration and exchange among multiple forms of knowledge, suggest a new terrain of research and practice that can greatly benefit from, and potentially be highly complementary to, holistic approaches to Aboriginal health" (Parkes, 2010). While it is outside the scope of this capstone, a larger theme surrounding the notion of holism and

environmental health is how to appropriately engage diverse Aboriginal knowledge's, which are often located outside of the dominant scientific context, into the emerging Westernized theory of Ecohealth.

Rethinking Health through Aboriginal Frameworks of Health

Despite the great diversity of Indigenous peoples, many similarities in their health, illnesses and determinants exist. Often research into Indigenous health has largely viewed health through non-Indigenous notions of health, disease and treatment (Gracey & King, 2009; M. King et al., 2009, p. 2). This is problematic because general Indigenous peoples define health and well-being far more broadly than physical health or the absence of disease. Indigenous health articulates themes of holism and balance, where interactions between the physical, emotional, mental and spiritual support a strong and healthy person. Thus, Indigenous ideas of ill-health refer to an absence of well-being or an imbalance. Ideas of balance extend beyond the realm of individual health, but also require that a person live harmoniously with others, their community, and the spirit worlds. Many Indigenous peoples believe that identity is to a large extent a collective experience and characterized as community-centered, since people belonging to one's own community, the land, and its animals are viewed as a part of the self. Contrary to dominant discourses, Indigenous identities and cultures are not stagnant in time or location, but are rather co-created and renegotiated within the context of society (Boffa, King, McMullin, & Long, 2011; First Nations Health Society, 2010; Gracey & King, 2009; M. King et al., 2009). According to King (2009), cultural identity is about access to culture and heritage, but also refers to opportunities for cultural expression and endorsement within society's institutions. Isolation from aspects of this identity is understood to have a negative effect on Indigenous health, as well as a range of Indigenous specific factors such as, loss of language and connection to the land, environmental deprivation, and spiritual, emotional, and mental disconnectedness.

Conversations about Indigenous notions of interconnectedness to land can provide deeper insights into the dependence of the physical, emotional and spiritual health on ecosystems. For example, some North American First Nations groups have referred to the Medicine Wheel to teach alignment and the continuous interaction of the physical, emotional, mental and spiritual realities, see Figure 2. While there are many ways to utilize, design and interpret the Medicine Wheel, each distinct group's shares fundamental similarities; the importance of appreciating and respecting the ongoing interconnectedness and interrelatedness of all things is constant. The Medicine Wheel depicts the four elements of nature and life: the

physical, emotional, mental, and spiritual. These four elements are intricately woven together and interact to support a healthy and well-balanced person (Bell, 2015; Joseph, 2013; M. King et al., 2009). Equal emphasis needs to be given to each of the directions of the Wheel to be considered walking in balance. The perspective of the Medicine Wheel can be viewed as an expression of wholeness, interconnectedness, balance and respect. In this sense, conceptions of health and well-being are moving from a linear model to the interconnectedness of a circle, wherein, reflecting on experiences of outer and inner wholeness create an awareness of relationships between spiritual, physical, mental, and emotional aspects of health (Aboriginal Healing Foundation, 2008; Bell, 2015; Joseph, 2013).

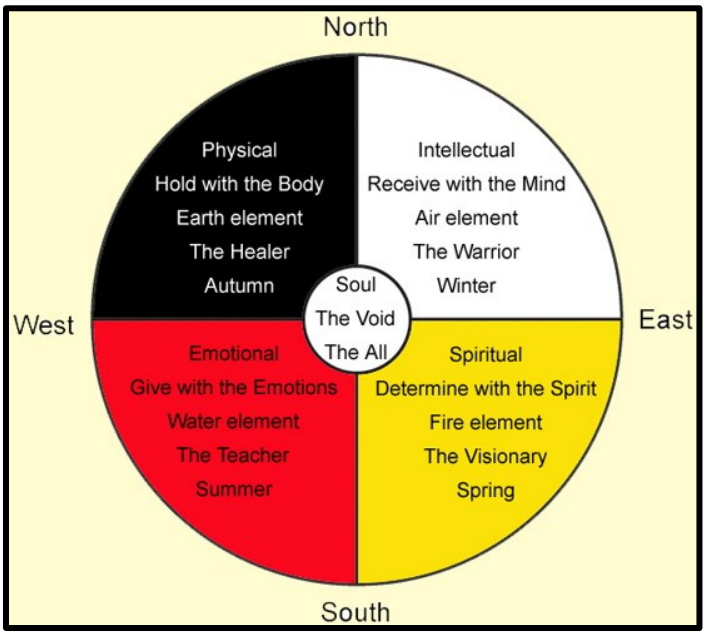


Figure 2: First Nations Medicine Wheel (Bell, 2015)

As in Canada, Australian Aboriginal peoples have a deep spiritual connection to their land known as Country. While the meaning of Country is dynamic and has multiple significances for Aboriginal individuals and communities, it is a philosophy of existence that guides and governs social economic and cultural structures (Albrecht et al., 2007; Australian Government, 2015; Kingsley et al., 2013; Weir, 2012). The knowledge and interaction with Country involves every living and non-living entity, ranging from land, fire, water, minerals or animals (Kingsley et al., 2013). In essence, “knowledge, country, species and people are co-created. Country is the locus of this knowledge and ecological life” (Weir, 2012). Caring for country represents an essential element of health and well-being and the cultural obligation to manage this relationship is often referred to as ‘caring for Country.’ In this instance caring for Country is

defined as having 'knowledge, sense of responsibility and inherent right to be involved in the management of traditional lands" (Kingsley, Townsend, Phillips, & Aldous, 2009). It represents a place to escape that creates connections to ancestral roots in a stress-free environment. This spiritual and cultural connection to land is shown to increase identity, pride and self-esteem, integral elements to health in wellbeing, for Aboriginal and Torres Straight Islanders (Albrecht et al., 2007; Kingsley et al., 2013; Weir, 2012; Kingsley et al., 2009).

Data Results: Ground breaking Indigenous-led Institutions

This section of the paper will present two Indigenous-led health authorities. Both British Columbia's First Nations Health Authority (FNHA) and Australia's Torres Strait Regional Authority (TSRA) represent innovations in health and show how Indigenous and non-Indigenous peoples and services can work together to close the gap in health disparities. Reviewing the work of these two institutions, in addition to Australia's Health*InfoNet,* provides Indigenous-led examples of holistic frameworks for thinking and addressing the links between environment and health.

The First Nations Health Authority

The First Nations Health Authority (FNHA) is the first province-wide health authority of its kind in Canada. The establishment of the FNHA is a key component of the Tripartite First Nations Health Plan (TFNHP), which identified two strategic priority areas to improve the health and well-being of First Nations peoples: health governance and health actions. The FNHA aims to reform the way health care is delivered to BC First Nations to close the significant gap in health disparities that exists among BC First Nations peoples by advocating for traditional wellness in First Nations communities, including providing technical coordination support to the fulfillment of the traditional wellness health action (FNHA, 2015). The mandate of the FNHA is to plan, design, manage, deliver and fund the delivery of First Nations Health Programs in BC, incorporate and promote First Nations knowledge, beliefs, values, practices, medicines and models of health and healing into the First Nations Health Programs and carry out research and policy development in the area of First Nations health and wellness. The FNHA works with a variety of partners and collaborators, each of who has a critical role in supporting traditional wellness. Some traditional partners include: elders, First Nation Communities and Members, Health and Medical Centres and health associations. In recognition of the importance of traditional wellness in improving First Nations peoples health, the FNHA, through community engagement, key informant interviews and document and file reviews, created a First Nations

Perspective on Wellness, see Figure 3. This Wellness Model is a tool for both internal and external stakeholders to use to create a shared understanding of the holistic vision of wellness shared by BC First Nations (FNHA, 2015). Embedded within the First Nations Perspective of Wellness is the notion of the environment as a nurturer of the soul and a part of identity. In this sense we each have a responsibility to care for the land due to its closeness to physical, spiritual, emotional and mental health.

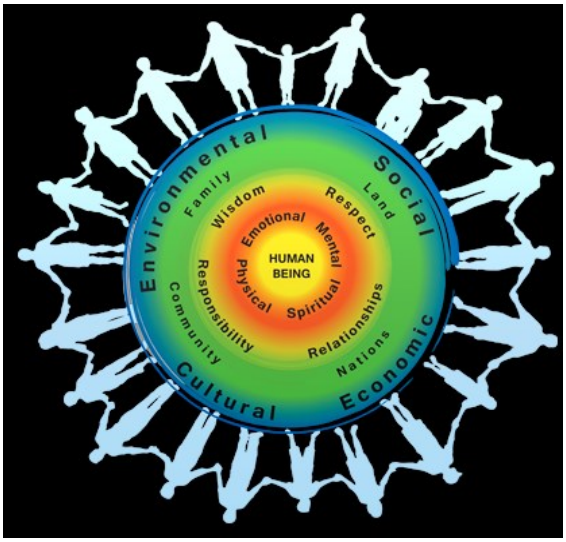


Figure 3: First Nations Perspective of Wellness. Centre circle: Represents individual human beings; second circle: shows the importance facets of a healthy, well, and balanced life; third circle: overarching values that support and uphold wellness; fourth circle: the people that surround us and the places from which we come; fifth circle: determinants of our health and well-being (FNHA, 2015).

The FNHA delivers Environmental Health Services in First Nations communities throughout BC by Environmental Health Officers (EHOs) employed by the First Nations Health Authority. Key programming areas include: environmental public health assessment, training, and public education and awareness. Activities are delivered in core areas such as: Drinking Water; Food Safety; Health and Housing; Wastewater; Solid Waste Disposal; Facilities Inspections; Environmental Communicable Disease Control; and Emergency Preparedness and Response (FNHA, 2015). The First Nations Health Authority also supports the Environmental Contaminants Program (ECP), which provides funding to help First Nations' of Canada assess the extent of their exposure to environmental contaminants and the potential for associated risk to their health and well-being. The Program encourages community-based studies of environmental health issues through the integration of Indigenous ways of knowing, traditional

knowledge, and empirical science. It recognizes that wellness is influenced by the environmental, social, cultural, and economic determinants of health, and that Nations, Family, Community and Land are all critical components of our health experience as human beings (FNHA, 2015). The results of the ECP research proposals and outcomes are sent to FNHA as part of reporting requirements for funding; however, the information within them belong to the communities and thus FNHA cannot make the reports public.

In the aftermath of the Mount Polley mine spill, the FNHA has taken numerous steps to address the health and wellness of those affected by the spill. These include: supporting independent water testing program for affected First Nations peoples, providing mental health and spiritual wellness supports and coordinating the First Nations public health response with the broader health system. Additionally, the FNHA participates in communication updates to relay concerns and address public health considerations. Throughout the ordeal the FNHA is liaising with the First Nations Health Council (FNHC), Department of Fisheries and Oceans (DFO) and BC Ministry of Environment to understand both the short and long term potential effects on fish stocks. The FNHA has been credited with acting promptly and working with the community to carry out independent testing to address fears around water quality and food safety (FNHA, 2014).

Status of First Nations Environmental Health Research

There are many organizations that are currently engaged in conducting research on Indigenous health. An example of these initiatives includes the First Nations Regional Longitudinal Health Survey (RHS), which is the "only First Nations -governed, national health survey in Canada" (FNIGC, 2013b). The survey collects information about on reserve and northern First Nations communities based on both Western and traditional understandings of health and well-being to provide scientifically and culturally validated information, while enhancing First Nations capacity and control over research (FNIGC, 2013b). Another successful example of community-based research is the Effects on Aboriginals from the Great Lakes Environment Project (The Eagle Project). The Eagle Project was a 10-year study that identified how environmental contaminants affect the health and well-being of First Nations people who live in the Great Lakes basin. This project was based on the assumption that Aboriginal people consume, on average, a greater amount of fish and wild meat than non-indigenous people. The program undertook a three-pronged approach from three different perspectives: eating patterns, human tissues program, wild meat sampling. Although the socio-cultural component of the Eagle Project was terminated before the end of the project, preliminary results from all three

approaches do suggest that there are significant impacts of contamination and environmental destruction on First Nations communities in the Great Lakes Basin (Cultural Survival, 2010; McGregor, 2001). While the Eagle Project adopted the World Health Organizations' definition of health,[1] the Eagle Project made several attempts to study the mental, social and spiritual impacts of environmental contaminants on the health and well-being of First nations people living in the Great Lakes Basin (McGregor, 2001). For a detailed list of First Nations led environmental health projects in Canada please see Appendix 2.

Torres Strait Regional Authority

The Torres Strait Regional Authority (TSRA) is an Australian Commonwealth Authority established on July 1st 1994 under the Aboriginal and Torres Strait Islander Commission Act 1989. It is the leading Commonwealth representative body for Torres Strait Islander and Aboriginal people living in the Torres Strait and aims to strengthen the economic, social and cultural development of the Torres Strait to improve the lifestyle and wellbeing of Torres Strait Islanders and Aboriginal people living in the region. The TSRA's functions include administering programs to support individuals, councils and community organisations within the Torres Strait region in eight key development areas. They are: economic development, fisheries, culture art and heritage, native title, environmental management, governance and leadership, healthy communities and safe communities. The TSRA has recently created its fifth development plan, the Torres Strait Development Plan 2014-2018, to outline how the TSRA will contribute to the Australian Governments Indigenous Advancement Strategy (HealthInfoNet, 2015; TSRA, 2014).[2] The programs outlined in the TSRA Development Plan are aligned with the Council of Australian Governments (COAG) Building Blocks for overcoming Indigenous disadvantage; see Figure 4.

Although the environment is not one of the building blocks in addressing Indigenous disadvantage, the Australian Government and State governments recognize the crucial role of

[1] Health is a state of complete physical, mental and social well-being, not merely the absence of disease or infirmity (WHO, 2015).

[2] The Australian Government is committed to achieving better results for Aboriginal and Torres Strait Islander Australians in three priority areas: getting children to school, adults into work and building safe communities. The Indigenous Advancement Strategy consolidates the many different Indigenous policies and programs that were delivered by Government into five overarching programs, making it easier for organizations delivering local services. The new program streams are: Jobs, Land and Economy, Children and Schooling, Safety and Wellbeing, Culture and Capability and Remote Australia Strategies. The Indigenous Advancement Strategy is changing the way Australian Government funding is delivered to ensure it is more flexible and better designed to meet the aspirations and priorities of individual communities (HealthInfoNet, 2015).

the environment in maintaining health. The Torres Strait communities have a high reliance on and connection with the marine environment and resources, however they are increasingly vulnerable to rising sea levels. Therefore, the TSRA has developed a regional environmental goal, stating that, “our natural and cultural environment is an asset that is protected, preserved and enjoyed through sustainable management (TSRA, 2014).” The Environmental Program has a mandate from the TSRA Board to undertake projects and initiatives that focus on land, sea, people, coasts and climate.

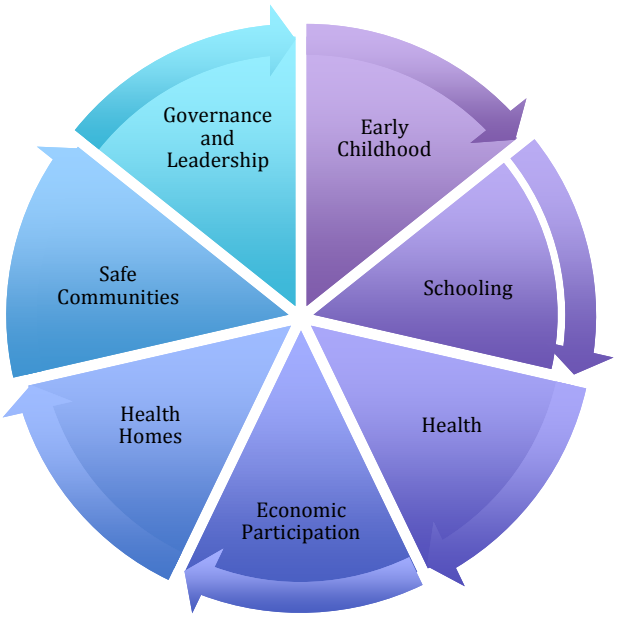


Figure 4: Council of Australian Governments (COAG) seven strategic platforms or Building Blocks. These strategies support the reforms aimed at closing the gap in Indigenous disadvantage (TSRA, 2014).

Australian Indigenous HealthInfoNet

The Australian Indigenous Health*InfoNet* is an internet resource that collects, collates and interprets evidence-derived knowledge on Australian Indigenous health. The site is a national research project that contributes to closing the gap in health disparities by facilitating the sharing and exchange of knowledge. The core functions of Health*InfoNet* are supported by a grant from the Australian Department of Health and Ageing’s Office for Aboriginal and Torres Strait Islander Health (HealthInfoNet, 2015). It is currently the most comprehensive source of up-to-date authoritative information on Indigenous health and provides practitioners and policy-makers the information needed to make informed decisions in their work. In addressing the

needs of people working, studying or interested in Indigenous health, the site provides information about: more than 50 health and health-related topics of relevance to Indigenous health, eight population groups, such as women, infants and children, and offenders and Indigenous health by states and territories. Important outcomes of Health*InfoNet* are narrative reviews and analyses of health topics such as, social and emotional wellbeing for Aboriginal and Torres Strait Islander health workers (HealthInfoNet, 2015).

Findings

Solastalgia

As mentioned in the introduction, one of the main themes of this research is the idea that engaging with Indigenous teachings about connection to land has the potential to promote new ecological ethics within environmentally oriented public health research and practice. The philosophical approach of solastalgia emerged out of Australia with the aim of giving greater meaning and clarity to environmentally induced distress. Albrecht (2005) uses the term to refer to the pain, sickness, distress, suffering and psychological consequences experienced by the Australian Aboriginal peoples and also residents of Australia's Hunter Valley. It is an approach that links notions of traditional health and healing into environmental health research to begin to analyze how a sustained loss of land over time impacts health. The concept is relevant wherever there is a negative transformation of the physical environment that undermines a personal and community wide sense of identity, belonging and control. According to Albrecht, the factors that cause solastalgia can be both natural and artificial and can be experienced by both Indigenous and non-Indigenous persons. Historically, Indigenous people are likely to have experienced solastalgia as they lived through the colonization and devastation of their cultural traditions and lands. Where a collective memory of traditional cultural identity and beliefs exist, profound grief for the loss of 'country' and all that entails is experienced (Albrecht et al., 2007; Kingsley et al., 2013; McNamara & Westoby, 2011). The communication of solastalgia provides a space to create a deeper understanding of the emotional connection between self and country, and the sadness, fear and distress that can emerge amidst this loss.

Solastalgia in the literature

Despite literature that acknowledges the impact of the destruction of Country on health, wellbeing and identity, few studies have focused on solastalgia in reference to the lived experiences of Aboriginal peoples. In this section I discuss the few articles that have engaged

the concept. McNamara and Westboy (2011) explore the gendered nature of climate change to provide a deeper insight into how environmental impacts are experienced. The study interviewed 13 Torres Strait Islander women, focusing on respected elder women (Aunties'), to understand the biophysical, potential emotion, cultural and psychosocial impacts of climate change. The in-depth semi-structured interviews revealed that the health of Islanders' land and sea country is directly related to mental and physical well-being of the community and their cultural heritage and practices (McNamara & Westoby, 2011). In a second study, Kirker (2012) focuses on Aboriginal and non-Indigenous artists collaborating to display concepts of sadness due to local environmental changes and solastalgia. In an art exhibition entitled, "Life in Your Hands: Art from Solastalgia (LIYH)," nine case studies are displayed that emphasize empowerment and circumstances where interventions may in fact assist in reversing or easing the effects of solastalgia. The most salient outcome of the exhibit displayed a need to recognise Indigenous peoples and learn from them (Kirker, 2012). Detailed studies were also conducted among non-Indigenous populations to draw connections between the distresses experienced by those without deep traditional ties to the land. For example, Albrecht (2007) applied theories of solastalgia to the Upper Hunter region of New South Wales, a region that has been the subject of rapidly expanding open-cut coal mining and power industries. Key informant interviews with over 60 people, showed that the community members were experiencing direct solastalgia as their sense of place, their identity, physical and mental health and general wellbeing were all challenged by unwelcome change. Moreover, they felt powerless to influence the outcome of the change process (Albrecht et al., 2007). Further empirical work followed in the form of an 81-point Environmental Distress Scale (EDS). This scale aims to provide an index of the bio–psycho–social cost of development activities. The study randomly mailed a survey questionnaire to Upper Hunter residents living in a high disturbance open-cut mining area and to a comparable sample in a nearby farming area. With 203 responses, the results showed significantly higher environmental distress scores across all EDS subscales, including solastalgia for the high disturbance group. Using the EDS scale for the communities living around the two mines, Higginbotham et al., concluded that those living around the mines felt distraught about the destruction of their land by outside forces, but felt powerless to advocate against it (Higginbotham, Connor, Albrecht, Freeman, & Agho, 2006). As well as shared common ground, the projects in Table 1 demonstrate significantly higher human distress syndromes that correspond to ecosystem distress.

Table 1: Solastalgia Related Projects in Australia

Research	Location	Methods	Findings
Glenn Albrecht initial study with large-scale open-cut coal mining on individuals in the Upper Hunter Valley of New South Whales (Albrecht et al., 2007)	Upper Hunter Valley of New South Whales, Australia	Qualitative (interviews and focus groups) and quantitative (community-based surveys) research were conducted on the lived experience of mining (over 60 people)	There is an increase in ecosystem distress syndromes matched by a corresponding increase in human distress syndromes. The specific role played by global-scale environmental challenges to 'sense of place' and identity will be explored in the future development of the concept of solastalgia
Environmental Distress Scale (EDS) (Higginbotham et al., 2006)	Australia: Upper Hunter residents living in a high disturbance open-cut mining area and to a comparable sample in a nearby farming area	Validity was tested by randomly mailing the instrument to Upper Hunter residents living in a high disturbance open-cut mining area and to a comparable sample in a nearby farming area. 203 respondents returned the survey (41% response rate)	The high disturbance group had significantly higher environmental distress scores across all six EDS subscales, including solastalgia. Psychometric analyses found the EDS subscales were highly intercorrelated (r = 0.36–0.83), and they demonstrated both strong internal consistency reliability (Cronbach_s alpha = 0.79– 0.96) and test–retest reliability (ICC = 0.67–0.73)
Glenn Albrecht initial study with Eastern Australia and droughts (Albrecht et al., 2007)	Eastern Australia	Qualitative (interviews and focus groups) and quantitative (community-based surveys) research was conducted on the lived experience of drought and mining	There is an increase in ecosystem distress syndromes matched by a corresponding increase in human distress syndromes. The specific role played by global-scale environmental challenges to 'sense of place' and identity will be explored in the future development of the concept of solastalgia
Gendered nature of climate change: Australia's Erub Island in the Torres Strait (McNamara & Westoby, 2011)	Erub Island, Torres Strait, Australia	In-depth, semi-structured interviews: 5 were conducted with Aunties and 8 with Elders	The responses of the Aunties revealed Solastalgia; feelings of sadness, worry, fear and distress, along with a declining sense of self, belonging and familiarity. This feeling was distinct from the Elders who did not express these emotions

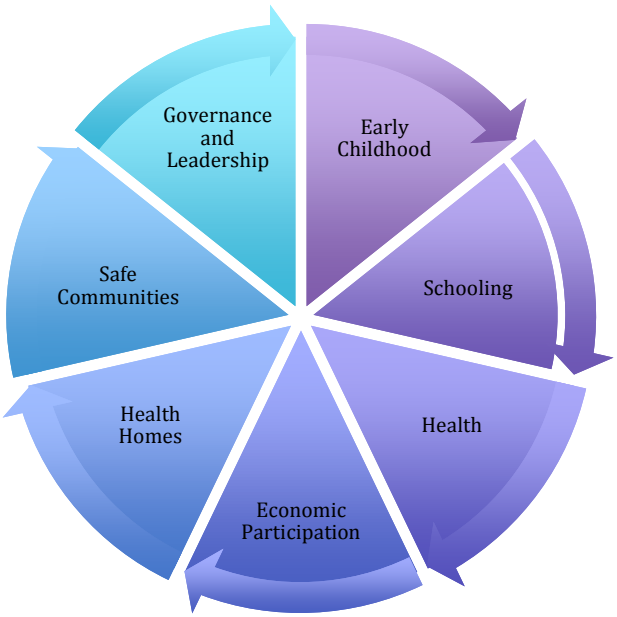
Research into solastalgia has also been conducted with First Nations groups in Canada; however it is limited. Willox et al., (2011) explored the impacts of climate change on the health and well-being of an Inuit group in Rigolet, Nunatsiavut, Labrador, Canada. In this community the land is considered to be the heart of culture and community life, as well as a source of health and wellness. Through 70 in-depth interviews following a conversational structure, the

study found that participants associated the changes in land, snow, ice and weather, with feelings of anxiety, sadness, depression, fear and a loss of self-worth (Willox et al., 2013). Additional studies with Indigenous people living in the Circumpolar North show that the rapid changes in air temperature, snowfall ice dynamics and rising sea levels coincide with emerging mental health illness (Willox et al., 2014). Despite limited studies that highlight solastalgia, inferences can be made. Richmond et al., (2005) examines the 'Namgis First Nations' perceptions on the links between environment, economy, health and well-being, in association with salmon aquaculture. The study found that aquaculture development has decreased the 'Namgis First Nations access and control over environmental resources, thereby limiting economic, social and cultural activities that determine good health and well-being for the community. Key findings of the research indicate that there are strong links between reduced access to environmental resources, marginal participation in the economy, and declining community health and well-being (Richmond, Elliott, Matthews, & Elliott, 2005). Furthermore, Aboriginal communities living in towns near the Alberta Tar Sands have cautioned that the rapid development of the oil sands has come at too high a cost to the environment. Feelings of distress have surfaced as research has found that wild-caught foods in northern Alberta have higher-than-normal levels of pollutants. As a result, First Nations are already shifting away from their traditional diets out of fear of contamination (Bartlett, 2003). The projects in Table 2 show solastalgia in a Canadian research context.

Table 2: Solastalgia Related Projects in Canada

Research	Where	Methods	Findings
'The land enriches the soul': Climatic and Environmental change and the Rigolet, Nunatsiavut, Labrador, Canada (Cunsolo Willox et al., 2013)	Rigolet, Nunatsiavut, Labrador, Canada	70 in-depth interviews following a conversational structure, approx. 45 minutes in length (57 people – 33 females and 24 males). All questions were pre-tested with 12 community members, 4 academics and health specialists for content and context	Changes in land and climate directly impact emotional health and well-being. Focus on individuals' emotional health will improve resilience to potential emotion-psychological trauma from climate change. Affect and emotion of populations can be a strong measure of the severity of climatic and environmental changes
Examining the relationship between climate change and mental health: Indigenous people living in the	Indigenous people living in the Circumpolar North	Literature and research examination	Mental health may be affected by climate change due to changes to land, ice, snow, weather, and sense of place; impacts to physical health; damage to infrastructure;

Circumpolar North (Willox et al., 2014)			indirect impacts via media, research, and policy; and through the compounding of existing stress and distress
Perceptions of environment, economy, health and well-being among 'Namgis First Nation (Richmond et al., 2005)	'Namgis First Nation (Alert Bay, British Columbia, Canada)	19 in-depth interviews (11 women, 8 men) were conducted in the summer of 2002. Interviewees varied in age: 24-72, n=15 were employed, n=4 were unemployed, n=4 key informant interviews were conducted	Aquaculture development has further decreased the community's access to environmental resources, thereby restricting those economic, social, and cultural activities that determine good health and well-being for this community



Discussion

What is Environmental Health?

As previously mentioned, environmental health is an evolving field whose boundaries are still being defined. The FNHAs definition of environmental health is aligned with the World Health Organization (WHO), stating that, "it *is the promotion and protection of public health by preventing disease and creating health-supportive environments (FNHA, 2015)*." In this definition, environmental health is the practice of ensuring that public health is protected from 'environmental problems.' The TSRA definition of environmental health focuses on the physical, chemical, biological and social factors that affect people within their surroundings. This involves the provision of adequate infrastructure including housing, water supply and sewage systems to minimize environmental health risk factors. The TSRA says that "environmental health should

also be viewed within a social and cultural context (TSRA, 2014);" however it does not go into detail on what this means. Analyzing the way each health authority defines environmental health shows a critical disconnect between Indigenous notions of health and well-being and how these beliefs are implemented at the institution level. A major challenge for each health authority is to develop a definition of environmental health that encompasses traditional ecological knowledge, holistic mentalities and spirituality.

Silences in the Literature

The literature reviewed in this paper shows the gaps in knowledge on environmental health for First Nations communities in Canada. However, it also demonstrates the limited information base in the environmental health field Canada-wide. Additionally, the search revealed the difficulties in data collection, specifically as a non-Indigenous person researching Indigenous-led environmental health projects. While the initial goal of this capstone was to discuss First Nations led environmental health projects in B.C., the research encountered numerous hurdles that proved to be insurmountable. The limitations of data collection were twofold. Firstly, in researching this topic I faced both political and legal impediments with reference to collecting data on First Nations led research projects. The First Nations Principles of OCAP (Ownership, Control, Access, and Possession) means that First Nations control the data collection processes in their communities and that First Nations own, protect, and control how their information is used and shared. These rights are fundamentally tied to self-determination and to the preservation and development of their culture. Access to First Nations data is important; thus, First Nations peoples determine how access to external researches is facilitated and respected (FNIGC, 2013a; Schnarch, 2004). Recognizing OCAP™ as a political response to colonial approaches to research and information management, gathering and disseminating the initial goals of this capstone became both culturally inappropriate and insensitive due to time and financial restrictions. Therefore, exploring Indigenous-led institutions created a space for learning and facilitating research in an ethical setting. With respect to access to information, Australia's Health*InfoNet* provides a wealth of knowledge to those interested in Indigenous health, practitioners and policy-makers to make informed decisions. The website categorizes environmental health programs and projects by three categories: Indigenous, mainstream with Indigenous content and mainstream. Each program or project provides a status report, an overview, any relevant publications and links and contact information for the research team. While the website does not disclose the necessary cultural steps taken to respectfully publish the data, the wealth of public information provides opportunity

and ideas for cross-pollination between the Health*InfoNet* and the FNHA. The fundamental goal is to provide an ethical space to facilitate the conversation on research and to ensure that information is collected and presented in a culturally-sensitive and contextual manner that is appropriate and meaningful to the communities who the research is intended to serve (Assembly of First Nations Environmental Stewardship Unit, 2008).

Secondly, the results of the environmental scan show that how we as Canadians collect data with First Nations peoples nationally and historically is problematic. The aftermath of the tailings dam at the Mount Polley mine witnessed the suppression of information and heightened mistrust among First Nations groups and the government. The refusal of the province to provide recent inspection reports, as well as the need for the President of the Union of B.C. Indian Chiefs to file a class action lawsuit to force the government and Imperial Metals to perform more comprehensive water, soil, and fish testing shows the frustration felt by First Nations communities towards the governments response to the spill. As a further response, residents of Likely, B.C. and First Nations leaders have hired their own experts, including doctors who have worked on issues of mercury pollution in other places (Hunter, 2014a, 2014b; Meiszner, 2014). The silences in the data about the causes of the Mount Polley Mine spill and the aftermath of the disaster are troubling.

The Ways Forward

Building on the strengths of both Indigenous knowledge and ecohealth is a rich field of study that has the potential to acknowledge the environment as a setting for health and a place for healing and reconciliation (Parkes, 2010). This requires recognition and appreciation of Indigenous traditions that connect health, land and culture and an acknowledgment of the environment as a setting for health (Parkes, 2010). Understanding and extending the concepts of Indigenous people's connection to the land has the potential to promote new ecological ethics and holistic theoretical perspectives within environmentally oriented public health research and practice. Relying on Western philosophical approaches towards environment, wherein land is segregated from health, creates a mindset where people do not value protecting the planet and in turn the health of the human species as whole (Kingsley et al., 2013; Strang, 2005; Kingsley et al., 2009). While the ecohealth approach is an innovative way of analyzing the inter-linkages between human health and ecosystem health, promoting the ecohealth approach needs to be strategic so that it is compelling enough for populations, Indigenous and non-Indigenous, to protect all forms of the environment and to engage in land management (Charron, 2011;

Kingsley et al., 2013). A strategy that is presented throughout this capstone is the integration of Indigenous knowledge into contemporary definitions of environmental health to promote new ecological ethics and holistic theoretical perspectives within environmentally oriented public health research and practice. However, a challenge within this research is how to appropriately incorporate diverse Aboriginal knowledge and to not take Indigenous worldviews as just a tool or something to be absorbed within a Western approach; but rather is to be engaged with on an equal footing. Along these lines, a general consideration is to not de-radicalize concepts such as decolonization. Approaching health in an integrated way and reviewing Indigenous connections to the land offers new ways of researching ecohealth, as it provides a deeper cultural exploration of the relationship between social and ecological systems (Johnston et al., 2007; Parkes, 2010). The inclusion of Aboriginal perspectives of connection to nature can contribute to decolonizing the research process, extend the purview of who holders of medical knowledge are and enhance non-Indigenous understandings of Indigenous health and potentially work towards reconciliation (Gislason, 2013; Kingsley et al., 2013; Smith, 2012). The revitalization of concepts of integration and interdependence can enable radical changes within health research and practice. But, this requires risky conversations between courageous researchers, practitioners and people, to develop good collaborate work. Addressing questions like how do Indigenous and non-Indigenous people begin to talk to each other, what are the forms of knowledge that we are using to define what we see and experience, and how can we work collaboratively and respectfully towards healing and reconciliation?

Implications and Limitations

In addition to engaging Indigenous worldviews and Western approaches of ecohealth theory, an important theme throughout this capstone is to critically examine the power relations that control access to environmental resources. Considerations of power are essential in a settler colonial context, as it is central to the many complexities of discussions surrounding resource development related to land, self-determination and sovereignty. Furthermore, questions regarding the implications of silencing ecological losses are vital in thinking about policy and program implications, as well as recommendations for health entities such as the First Nations Health Authority. In analyzing solastalgia and the lived experiences of negative environmental changes as an attack on one's sense of place, it is imperative to ask how health authorities can change their existing programs and services in response to new and emerging ideas of environmental distress and mental and community health and wellbeing. Furthermore,

this theoretical context and related research foster critical reflection on the ways in which some mandates of health authorities can limit more holistic and place based public health responses. Acknowledging the links between environmental degradation and biopsychosocial distress also has implications for public health practice and should generate a new set of integrated health recommendations for government and industry. A limitation of this study is that it poses questions to which the answers remain unclear. The findings of this capstone show, however, that people in a variety of contexts and settings are aware of the issues affecting the environment and future of this planet, and according to Albrecht, what is needed now is "ethical commitment and inspired leadership to usher in a sustainable future that we cannot yet fully see" (Pilgrim & Pretty, 2010) – a tall task for public health.

Post-Reflection

> *Education either functions as an instrument which is used to facilitate integration of the younger generation into the logic of the present system and bring about conformity or it becomes the practice of freedom, the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world (Freire, 2000).*

Paulo Freire in, *Pedagogy of the Oppressed*, develops the idea that education can be an act of liberation and freedom or an act of domination and repression. Freire believes that the present education system is one that represses, oppresses and dominates so that there is no hope for the oppressed to get liberated and to be free. The only method for achieving liberation is awakening a critical conscious that involves not only reading the word, but also reading the world. The development of a critical consciousness allows people to question the nature of their historical and social situation and to read their world with the goal of taking action against the oppressive elements of society (Freire, 2000). Writing this capstone signifies an awakening and development of my critical conscious. Through weekly meetings with my supervisor, Dr. Maya Gislason, I was able to have open discussions about some of the challenges of being a non-Indigenous researcher studying First Nations environmental health. These meetings and the research required to execute this capstone signified a process of unlearning and relearning in order to take charge of my learning journey (Cochran-Smith, 2003; Lee, 2003). In elementary school I was taught stereotypes about First Nations groups and presented with cultural misconceptions, such as the ability to speak of First Nations groups as homogenous. I was taught about physical characteristics, historical errors and notions of the "Drunk Indian." This is

in stark contrast to my education in both high school and my undergraduate studies, wherein Indigenous peoples were left out of the conversation.

My time at Simon Fraser University has proved to be an enlightening experience. It has instilled the idea of two-eyed seeing and the importance of giving equal consideration to diverse Indigenous and non-Indigenous worldviews (Connors, 2015; Martin, 2012). I see my capstone as a culmination of my lived experiences as a graduate student. My field of specialization is global health, which often is considered to be a stream that trains students to work in a resource-challenged context, usually in a developing country. However, this training has neglected to speak to the marginalization of communities within Canada and globally to the challenges of communities dependent on the land for survival. Within the Faculty of Health Sciences, themes of environmental health are often intertwined with occupation health, which speaks to the significant gaps in research. During my practicum at CENPHER in Vietnam I was exposed to the ecohealth approach and the innovative strides that it is making in addressing health at the interface of social and economic conditions, ecosystems and people. The ecohealth approach has created a field of possibilities for me, not only to explore what it means to become an advocate for health, but also about what it means to care for the earth.

References

AANDC, & Government of Canada. (2012). Terminology [fact sheet; terminology]. Retrieved April 24, 2015, from http://www.aadnc-aandc.gc.ca/eng/1100100014642/1100100014643

Aboriginal Healing Foundation. (2008). *Aboriginal Healing in Canada: Studies in Therapeutic Meaning and Practice* (pp. 1–279). Ottawa: The Aboriginal Healing Foundation Research Series. Retrieved from http://www.ahf.ca/downloads/aboriginal-healing-in-canada.pdf

Adelson, N. (2005). The embodiment of inequity: health disparities in aboriginal Canada. *Canadian Journal of Public Health = Revue Canadienne De Santé Publique*, *96 Suppl 2*, S45–61.

Albrecht, G., Sartore, G.-M., Connor, L., Higginbotham, N., Freeman, S., Kelly, B., … Pollard, G. (2007). Solastalgia: the distress caused by environmental change. *Australasian Psychiatry: Bulletin of Royal Australian and New Zealand College of Psychiatrists*, *15 Suppl 1*, S95–98. http://doi.org/10.1080/10398560701701288

Aquash, M. (2014). First Nations in Canada: Decolonization and Self-Determination. *In Education*, *19*(2). Retrieved from http://ineducation.ca/ineducation/article/view/142

Assembly of First Nations Environmental Stewardship Unit. (2008). *Current Status of First Nations Environmental Health Research* (pp. 2–28). Retrieved from http://www.afn.ca/uploads/files/rp-final_environmental_health_scoping_paper.pdf

Australian Government. (2008). Apology to Australia's Indigenous peoples. Retrieved April 24, 2015, from http://www.australia.gov.au/about-australia/our-country/our-people/apology-to-australias-indigenous-peoples

Australian Government. (2014). Indigenous Australians Caring for Country. Retrieved April 17, 2015, from http://www.environment.gov.au/indigenous/index.html

Australian Government. (2015). Australian Indigenous cultural heritage. Retrieved April 25, 2015, from http://www.australia.gov.au/about-australia/australian-story/austn-indigenous-cultural-heritage

Australian Human Rights Commission. (2015). Close the Gap: Indigenous Health Campaign. Retrieved April 24, 2015, from https://www.humanrights.gov.au/our-work/aboriginal-and-torres-strait-islander-social-justice/projects/close-gap-indigenous-health

Bailey, I. (2011). New mines, first nations deals key pillars in B.C. Premier's job plan. Retrieved May 14, 2015, from http://www.theglobeandmail.com/news/british-columbia/new-mines-first-nations-deals-key-pillars-in-bc-premiers-job-plan/article595946/

Bartlett, J. G. (2003). Involuntary cultural change, stress phenomenon and aboriginal health status. *Canadian Journal of Public Health. Revue Canadienne de Santé Publique*, *94*(3), 165–7, 232.

Bell, N. (2015). *Teaching by the Medicine Wheel: An Anishinaabe framework for Indigenous education*. Retrieved from http://www.cea-ace.ca/education-canada/article/teaching-medicine-wheel

Boffa, J., King, M., McMullin, K., & Long, R. (2011). A process for the inclusion of Aboriginal People in health research: Lessons from the Determinants of TB Transmission project. *Social Science & Medicine*, *72*(5), 733–738. http://doi.org/10.1016/j.socscimed.2010.10.033

Bozorgmehr, K. (2010). Rethinking the “global” in global health: a dialectic approach. *Globalization and Health*, *6*(1), 19. http://doi.org/10.1186/1744-8603-6-19

Brown, V. A. (2007). Principles for EcoHealth Action: Implications of the Health Synthesis Paper, the Millennium Ecosystem Assessment, and the Millennium Development Goals. Workshop Group, EcoHealth ONE, Madison, Wisconsin, October 2006. *EcoHealth*, *4*(1), 95–98. http://doi.org/10.1007/s10393-007-0082-8

Camfield, D. (2013). First Nations Rights: Confronting Colonialism in Canada. Retrieved April 24, 2015, from http://www.globalresearch.ca/first-nations-rights-confronting-colonialism-in-canada/5321197

CBC. (2008). Prime Minister Stephen Harper’s statement of apology. Retrieved April 24, 2015, from http://www.cbc.ca/1.734250

CBC News. (2014). Mount Polley mine spill, an aerial view. Retrieved May 14, 2015, from http://www.cbc.ca/1.2730436

Chandler, M. J., & Lalonde, C. (1998). Cultural Continuity as a Hedge against Suicide in Canada’s First Nations. *Transcultural Psychiatry*, *35*(2), 191–219. http://doi.org/10.1177/136346159803500202

Charron, D. (Ed.). (2011). *Ecohealth Research in Practice: Innovative Applications of an Ecosystem Approach to Health* (2012 edition). Ottawa : New York: Springer.

Charron, D. (2012). Ecosystem Approaches to Health for a Global Sustainability Agenda. *EcoHealth*, *9*(3), 256–266. http://doi.org/10.1007/s10393-012-0791-5

Cochran-Smith, M. (2003). Learning and unlearning: the education of teacher educators. *Teaching and Teacher Education*, *19*(1), 5–28. http://doi.org/10.1016/S0742-051X(02)00091-4

Connors, E. (2015). Two Eyed Seeing | Manitoba Trauma Information and Education Centre. Retrieved from http://trauma-informed.ca/trauma-and-first-nations-people/two-eyed-seeing/

Coombes, A. E. (2006). *Rethinking Settler Colonialism: History and Memory in Australia, Canada, New Zealand and South Africa*. Manchester University Press.

Cueto, M. (2004). The ORIGINS of Primary Health Care and SELECTIVE Primary Health Care. *American Journal of Public Health*, *94*(11), 1864–1874.

Cultural Survival. (2010, March 19). The EAGLE Project: Re-mapping Canada from an Indigenous Perspective [Text]. Retrieved May 16, 2015, from http://www.culturalsurvival.org/ourpublications/csq/article/the-eagle-project-re-mapping-canada-indigenous-perspective

Cunsolo Willox, A., Harper, S. L., Edge, V. L., Landman, K., Houle, K., & Ford, J. D. (2013). The land enriches the soul: On climatic and environmental change, affect, and emotional

health and well-being in Rigolet, Nunatsiavut, Canada. *Emotion, Space and Society*, *6*, 14–24. http://doi.org/10.1016/j.emospa.2011.08.005

Dakubo, C. Y. (2011a). Ecosystem Approaches to Human Health: Key Concepts and Principles. In *Ecosystems and Human Health* (pp. 37–53). Springer New York. Retrieved from http://link.springer.com/chapter/10.1007/978-1-4419-0206-1_3

Dakubo, C. Y. (2011b). Towards a Critical Approach to Ecohealth Research and Practice. In *Ecosystems and Human Health* (pp. 207–221). Springer New York. Retrieved from http://link.springer.com/chapter/10.1007/978-1-4419-0206-1_14

De Cock, K. M., Simone, P. M., Davison, V., & Slutsker, L. (2013). The new global health. *Emerging Infectious Diseases*, *19*(8), 1192–1197. http://doi.org/10.3201/eid1908.130121

First Nations Health Society. (2010). *First Nations Traditional Models of Wellness (Traditional Medicines and Practices) Environmental Scan in British Columbia*. West Vancouver, BC, CAN: First Nations Health Council. Retrieved from http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10586065

FNHA. (2014). *Ceremony Marks Beginning of Healing Journey at Mount Polley Site*. First Nations Health Authority. Retrieved from http://www.fnha.ca/about/news-and-events/news/ceremony-marks-beginning-of-healing-journey-at-mount-polley-site

FNHA. (2015). *Traditional Healing*. First Nations Health Authority. Retrieved from http://www.fnha.ca/what-we-do/traditional-healing

FNIGC. (2013a). OCAP. Retrieved July 4, 2015, from http://fnigc.ca/ocap.html

FNIGC. (2013b). The Regional Health Survey. First Nations Information Governance Centre. Retrieved from http://fnigc.ca/our-work/regional-health-survey/about-rhs.html

Forget, G., & Lebel, J. (2001). An ecosystem approach to human health. *International Journal of Occupational and Environmental Health*, *7*(2 Suppl), S3–38.

Freire, P. (2000). *Pedagogy of the Oppressed: 30th Anniversary Edition*. Bloomsbury Publishing USA.

Friel, S., Marmot, M., McMichael, A. J., Kjellstrom, T., & Vågerö, D. (2008). Global health equity and climate stabilisation: a common agenda. *The Lancet*, *372*(9650), 1677–1683. http://doi.org/10.1016/S0140-6736(08)61692-X

Frumkin, H. (Ed.). (2010). *Environmental Health: From Global to Local* (2 edition). San Francisco, CA: Jossey-Bass.

Gislason, M. K. (Ed.). (2013). *Ecological Health: Society, Ecology and Health* (Vol. 15). Emerald Group Publishing Limited. Retrieved from http://www.emeraldinsight.com/doi/book/10.1108/S1057-6290%282013%2915

Globe and Mail. (2013). Pickering, Ont. nuclear power plant gets five-year licence extension. Retrieved May 11, 2015, from http://www.theglobeandmail.com/news/toronto/nuclear-power-plant-in-pickering-ont-gets-five-year-licence-extension/article13700774/

Gordon, T., & Webber, J. R. (2008). Imperialism and Resistance: Canadian mining companies in Latin America. *Third World Quarterly*, *29*(1), 63–87. http://doi.org/10.1080/01436590701726509

Gracey, M., & King, M. (2009). Indigenous health part 1: determinants and disease patterns. *Lancet*, *374*(9683), 65–75. http://doi.org/10.1016/S0140-6736(09)60914-4

Hayward, J. (2015). Quesnel Lake future still cloudy after Mount Polley mine disaster: report. Retrieved May 10, 2015, from http://www.vancouversun.com/news/metro/Quesnel+Lake+future+still+cloudy+after+Mount+Polley+mine/11030814/story.html

HealthInfoNet. (2015). *Australian Indigenous HealthInfoNet*. Australian Indigenous HealthInfoNet. Retrieved from http://www.healthinfonet.ecu.edu.au/

Higginbotham, N., Connor, L., Albrecht, G., Freeman, S., & Agho, K. (2006). Validation of an Environmental Distress Scale. *EcoHealth*, *3*(4), 245–254. http://doi.org/10.1007/s10393-006-0069-x

Hoekstra, G., & 2014. (n.d.). Liberals keeping “dangerous occurrences” at B.C. tailings ponds a secret. Retrieved May 14, 2015, from http://www.vancouversun.com/news/Liberals+keeping+dangerous+occurrences+tailings+ponds+secret/10131898/story.html

Hunter, J. (2014a). Government’s suppression of Mount Polley report “verges on the absurd”: lawyer. Retrieved May 16, 2015, from http://www.theglobeandmail.com/news/british-columbia/governments-suppression-of-mount-polley-report-verges-on-the-absurd-lawyer/article20975496/

Hunter, J. (2014b). Mount Polley disaster undermines public trust. Retrieved May 16, 2015, from http://www.theglobeandmail.com/news/british-columbia/mount-polley-disaster-undermines-public-trust/article20714915/

Hutchinson, B. (2014). Anger and confusion after worst disaster in Canadian mining history darkens B.C. town. Retrieved from http://news.nationalpost.com/news/canada/anger-and-confusion-after-worst-disaster-in-canadian-mining-history-darkens-prosperous-b-c-town

Janes, C. R., & Corbett, K. K. (2009). Anthropology and Global Health. *Annual Review of Anthropology*, *38*(1), 167–183. http://doi.org/10.1146/annurev-anthro-091908-164314

Johnston, F. H., Jacups, S. P., Vickery, A. J., & Bowman, D. M. J. S. (2007). Ecohealth and Aboriginal Testimony of the Nexus Between Human Health and Place. *EcoHealth*, *4*(4), 489–499. http://doi.org/10.1007/s10393-007-0142-0

Joseph, B. (2013). What is an Aboriginal medicine wheel? Retrieved April 25, 2015, from http://www.ictinc.ca/blog/what-is-an-aboriginal-medicine-wheel

Kelm, M.-E. (1998). *Colonizing Bodies: Aboriginal Health and Healing in British Columbia 1900-1950*. Vancouver, BC, CAN: UBC Press. Retrieved from http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10145695

King, M., Smith, A., & Gracey, M. (2009). Indigenous health part 2: the underlying causes of the health gap. *Lancet*, *374*(9683), 76–85. http://doi.org/10.1016/S0140-6736(09)60827-8

Kingsley, J., Townsend, M., Henderson-Wilson, C., & Gislason. (2013). Exploring Aboriginal People's Connection to Country to Strenghthen Human-Nautre Theoretical Perspectives. In *Ecological Health : Society, Ecology and Health* (Vol. 15, p. 357). Emerald Insight. Retrieved from http://site.ebrary.com.proxy.lib.sfu.ca/lib/sfu/detail.action?docID=10778309

King, T. (2013). *The Inconvenient Indian: A Curious Account of Native People in North America* (First American Edition edition). Minneapolis: Univ Of Minnesota Press.

Kirker, A. (2012). Perilous Paths. *Art Monthly Australia*, (254), 41–43.

Kirmayer, L. J., & Valaskakis, G. G. (2009). *Healing Traditions: The Mental Health of Aboriginal Peoples in Canada*. UBC Press.

Kresnyak, D. (2015). First Nation group launches protest to halt re-opening of Mount Polley mine. Retrieved May 10, 2015, from http://www.vancouverobserver.com/news/first-nation-group-launches-protest-halt-re-opening-mount-polley-mine

Lee, V. (2003). *Unlearning: A Critical Element in the Learning Process*. North Carolina State University. Retrieved from http://cft.vanderbilt.edu/files/vol14no2_unlearning.htm

Loppie, C., & Wien, F. (2009). *Health Inequalities and Social Determinants of Aboriginal Peoples' Health* (pp. 1–47). National Collaborating Centre for Aboriginal Healt. Retrieved from http://www.nccah-ccnsa.ca/docs/social%20determinates/NCCAH-Loppie-Wien_Report.pdf

Marshall, B. (2014). *Facts and Figures of the Canadian Mining Industry*. The Mining Association of Canada. Retrieved from http://mining.ca/sites/default/files/documents/Facts_and_Figures_2014.pdf

Martin, D. H. (2012). Two-eyed seeing: a framework for understanding indigenous and non-indigenous approaches to indigenous health research. *The Canadian Journal of Nursing Research = Revue Canadienne De Recherche En Sciences Infirmières*, *44*(2), 20–42.

McGregor, L. (2001). *E.A.G.L.E Project: Socio-Cultural Pilot Project Technical Report*. Assembly of First Nations. Retrieved from http://www.chiefs-of-ontario.org/sites/default/files/files/socio-c.pdf

McNamara, K. E., & Westoby, R. (2011). Solastalgia and the gendered nature of climate change: an example from Erub Island, Torres Strait. *EcoHealth*, *8*(2), 233–236. http://doi.org/10.1007/s10393-011-0698-6

Meiszner, P. (2014). First Nations, residents call for more testing after Mount Polley mine disaster. Retrieved from http://globalnews.ca/news/1550912/first-nations-residents-call-for-more-testing-after-mount-polley-mine-disaster/

Moore, J. (2014). Canadian Development Aid No Longer Tied – Just Shackled to Corporate Mining Interests. Mining Watch Canada. Retrieved from http://www.miningwatch.ca/article/canadian-development-aid-no-longer-tied-just-shackled-corporate-mining-interests

Nguyen, V., Nguyen-Viet, H., Pham-Duc, P., Stephen, C., & McEwen, S. A. (2014). Identifying the impediments and enablers of ecohealth for a case study on health and environmental sanitation in Hà Nam, Vietnam. *Infectious Diseases of Poverty*, *3*(1), 36. http://doi.org/10.1186/2049-9957-3-36

North, D. (2015). Mount Polley spill shows increase in temperature, sediment levels: UNBC report. Retrieved May 10, 2015, from http://www.cbc.ca/1.3061779

Ooms, G. (2011). *Global health: What is has been so far, what it should be, and what it could become* (No. 2). Retrieved from

http://www.itg.be/itg/Uploads/Volksgezondheid/wpshsop/SHSOP%20WP%202%20Oms%20Global%20Health.pdf

Oxfam. (2014). Impacts of Mining. Retrieved May 14, 2015, from https://www.oxfam.org.au/explore/mining/impacts-of-mining/

Parkes, M. W. (2010). *Ecohealth and Aboriginal Health: A Review of Common Ground*. Prince George, BC, CAN: National Collaborating Centre for Aboriginal Health. Retrieved from http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10516218

Patz, J. A., Gibbs, H. K., Foley, J. A., Rogers, J. V., & Smith, K. R. (2007). Climate Change and Global Health: Quantifying a Growing Ethical Crisis. *EcoHealth*, *4*(4), 397–405. http://doi.org/10.1007/s10393-007-0141-1

Petticrew, E., Albers, S., Baldwin, S., Carmack, E., Dery, S., Gantner, N., … Vagle, S. (2015). *The impact of a catastrophic mine tailings impoundment spill into one of North America's largest fjord lakes: Quesnel Lake, British Columbia, Canada* (pp. 1–9). Retrieved from http://www.unbc.ca/sites/default/files/sections/quesnel-river-research-centre/petticrew2015.pdf

Pilgrim, S., & Pretty, J. N. (2010). *Nature and Culture: Rebuilding Lost Connections*. Routledge.

RedWire Media. (2015). Indigenous People United! Stop Christy Clark's mining and pipelines. Retrieved from http://redwiremagazine.com/site/redwire/archives/indigenous-people-united-stop-christy-clarks-mining-and-pipelines/

Richmond, C. A. M., & Ross, N. A. (2009). The determinants of First Nation and Inuit health: A critical population health approach. *Health & Place*, *15*(2), 403–411. http://doi.org/10.1016/j.healthplace.2008.07.004

Richmond, Elliott, Matthews, & Elliott. (2005). The political ecology of health: perceptions of environment, economy, health and well-being among 'Namgis First Nation. *Health & Place*, *11*(4), 349–365. http://doi.org/10.1016/j.healthplace.2004.04.003

Schnarch, B. (2004). Ownership, Control, Access, and Possession (OCAP) or Self-Determination Applied to Research: A Critical Analysis of Contemporary First Nations Research and Some Options for First Nations Communities. *Journal of Aboriginal Health*, *1*(1), 80–95.

Scoffield, H. (2012). Four years after Stephen Harper offered an unfettered apology to aboriginal peoples for residential schools, the prime minister is at a turning point in his relationship with First Nations, says National Chief Shawn Atleo. *The Toronto Star*. Retrieved from http://www.thestar.com/news/canada/2012/06/11/four_years_later_harpers_apology_for_residential_schools_rings_hollow_for_many.html

Smith, L. T. (2012). *Decolonizing Methodologies: Research and Indigenous Peoples* (2 edition). London: Zed Books.

Statistics Canada. (2010). *Aboriginal Statistics at a Glance*. Statistics Canada. Retrieved from http://www.statcan.gc.ca/pub/89-645-x/89-645-x2010001-eng.htm

Strang, V. (2005). Knowing Me, Knowing You: Aboriginal and European Concepts of Nature as Self and Other. *Worldviews: Global Religions, Culture & Ecology*, *9*(1), 25–56.

Suzuki, D. (2014). Mount Polley: A wake-up call for Canada's mining industry. Retrieved May 14, 2015, from http://www.davidsuzuki.org/blogs/science-matters/2014/08/mount-polley-a-wake-up-call-for-canadas-mining-industry/

TSRA. (2014). The TSRA [Text]. Retrieved April 28, 2015, from http://www.tsra.gov.au/the-tsra

Turner, J. (2015, February 7). After Mount Polley: "This is Indigenous Law." Retrieved May 10, 2015, from http://thetyee.ca/News/2015/02/07/After_Mount_Polley_Indigenous_Law/

UBC. (2009). *Aboriginal Identity & Terminology*. University of British Columbia: First Nations Studies Program. Retrieved from http://indigenousfoundations.arts.ubc.ca/home/identity/aboriginal-identity-terminology.html

UNDP. (2014). *Human Development Index (HDI)*. United Nations Human Development Reports. Retrieved from http://hdr.undp.org/en/data

Waltner-Toews, D. (2009). Food, Global Environmental Change and Health: EcoHealth to the Rescue? *McGill Journal of Medicine : MJM*, *12*(1), 85–89.

Weir, J. K. (2012). *Country, Native Title and Ecology*. ANU E Press.

WHO. (2015). WHO | World Health Organization. Retrieved May 16, 2015, from http://www.who.int/about/en/

WHO, Pulver, L. J., Haswell, M., R., Ring, I., Waldon, J., Clark, W., & Whetung, V. (2010). *Indigenous Health – Australia, Canada, Aotearoa New Zealand and the United States - Laying claim to a future that embraces health for us all* (pp. 1–80). World Health Report,

Background Paper 33. Retrieved from http://www.who.int/healthsystems/topics/financing/healthreport/33IH.pdf

Willox, A. C., Stephenson, E., Allen, J., Bourque, F., Drossos, A., Elgarøy, S., … Wexler, L. (2014). Examining relationships between climate change and mental health in the Circumpolar North. *Regional Environmental Change*, *15*(1), 169–182. http://doi.org/10.1007/s10113-014-0630-z

Wilson, K., & Rosenberg, M. W. (2002). Exploring the determinants of health for First Nations peoples in Canada: can existing frameworks accommodate traditional activities? *Social Science & Medicine (1982)*, *55*(11), 2017–2031.

Kingsley, J., Townsend, M., Phillips, R., & Aldous, D. (2009). “If the land is healthy … it makes the people healthy”: The relationship between caring for Country and health for the Yorta Yorta Nation, Boonwurrung and Bangerang Tribes. *Health & Place*, *15*(1), 291–299. http://doi.org/10.1016/j.healthplace.2008.05.009

Young, N. (2015). VIDEO: Protesters fight reopening of Mount Polley mine in B.C. | Ricochet. Retrieved May 11, 2015, from https://ricochet.media/en/426

Appendix A.

Terminology used throughout the paper

Cognizant of colonial histories and the deeply embedded power relations and weight that terminology carries, this research will aim to use safe and inclusive terminology that is representative of the preferred choices of the peoples being discussed. Throughout this capstone the term Indigenous is used to describe Aboriginal peoples in an international context. The aim of using this word is to be as inclusive as possible, since it identifies peoples in similar circumstances without respect to national boundaries or local conventions. However, it is necessary to acknowledge that this term is considered contentious for some, as it defines groups primarily in relation to their colonizers (AANDC & Government of Canada, 2012; Statistics Canada, 2010; UBC, 2009). Canadian Aboriginal refers to individuals who identify with at least one Aboriginal group. For example, First Nations (North American Indian), Métis or Inuit (Eskimo), and those who report being a Treaty Indian or a Registered Indian as defined by the Indian Act of Canada and/or who are members of an Indian Band or First Nation (Loppie & Wien, 2009; Statistics Canada, 2010). It is important to note that First Nations, Métis and Inuit are three separate peoples with unique heritages, languages, cultural practices and spiritual beliefs (AANDC & Government of Canada, 2012). The term First Nations, while initially had a broad usage, has undergone a shift towards a more restrictive meaning based upon identification with legally recognized reserve communities and people who are recognized members of them. In this sense, First Nations refers to status Indians who are members of a First Nation. This term excludes non-status Indians, Metis, Inuit and those who have Aboriginal ancestry but less clear identification with a particular community (AANDC & Government of Canada, 2012; Statistics Canada, 2010; UBC, 2009). Australian Aboriginal refers to Aboriginal and Torres Strait Islander people, who are members and descendants of Aboriginal cultures of Australia or the Torres Strait Islands, as this is the preferred terminology of the peak body of Aboriginal community health (Australian Government, 2014).

Appendix B.

First Nations led Environmental Health Projects in Canada

Project Name	Objective(s)	Where	Methods	Findings	Partners
The Effects on Aboriginals from the Great Lakes Environment Project (The Eagle Project) (AFN, 2001a, 2001b, 2001c, 2001d; Eagle, 2001)	Use western scientific information, under the guidance of Aboriginal people to assess the socio-cultural effects of environmental contamination on some of the aspects of the health and well being of Aboriginal Peoples Great Lakes Basin.	Lake Huron/Georgian Bay Region, Lake Superior Region, Lake Ontario/ Southeastern Region and the Lake Erie/Southwestern Region.	Program undertook a three-pronged approach from three different perspectives: eating patterns, human tissues program, wild meat sampling	The socio-cultural component of the Eagle Project was terminated before the end of the project. Preliminary results from all three approaches do suggest that there are significant impacts of contamination and environmental destruction on First Nations communities in the Great Lakes Basin.	Assembly of First Nations, Health Canada and First Nations in the Great Lakes basin. The final stage of the Project was administered by the Chiefs of Ontario
First Nations Regional Longitudinal Health Survey (RHS) (ESA, 2009; FNC, 2004; FNCHC, 2007; FNHC, 2014)	To provide scientifically and culturally validated information, while enhancing First Nations capacity and control over research. Support decision-making, planning, programming and advocacy with the ultimate goal of improving First Nations health	It is conducted across ten regions in Canada, surveying participants in over two hundred First Nation communities. It includes First Nations Peoples living on-reserve across all of southern. All provinces participated except Prince Edward Island and Newfoundland	Face-to-face interviews were used in all regions with the interviewers being trained Aboriginal Peoples, usually from the community itself. With the exception of Alberta, each regional survey covered both adults and children, although the age ranges varied slightly from region to region. Interviews with children were done by proxy	There is a link between exposure to environmental contaminants and potential health risks The RHS provides a statistical overview of First Nations seniors living on reserve. The most prevalent medical conditions are: arthritis, high blood pressure, diabetes, hearing impairment, chronic back pain, kidney function	First Nations Information Governance Committee Supported by Regional Health Survey Steering Committee and the Assembly of First Nations

National First Nations Environmental Contaminants Program (FNECP)	Provides funding to help First Nations' of Canada assess the extent of their exposure to environmental contaminants and the potential for associated risk to their health and well-being	Canadian First Nations communities (particularly First Nations (FN) communities (on-reserve) south of 60°	The program provides funding support directly to First Nation communities/ organizations, who partner with public health and/or environmental scientists	A list of projects is not made publicly available	Collaborative research program between the Assembly of First Nations (AFN) and the Medical Services Branch, now known as the First Nations and Inuit Health Branch (FNIHB), Health Canada.
The Advanced Aboriginal Water Treatment Team (AAWTT)	Educate on safe drinking water quality and focus on developing partnerships with rural communities throughout Canada	Volunteer participants throughout Saskatoon	Education program, teaching schools about: Operation Water Drop (OWD), Operation Water Pollution (OWP) and Operation Water Biology		Relies on donations
Lesser Slave Lake Health Study	Find out: how the community dealt with the fire, the ways in which families and children dealt with the fire, and how the local and regional services assisted families, children and communities to recover from the wildfire	Rural community located in Northern Albert	Conducted interviews with stakeholders (n=20), interviews with families (n=19) and children (ages 9-12; n=17), extensive fieldwork, a school-based survey with children (ages 8-18; n=160), and a household survey (n=550)	Most residents were not prepared for the disaster and felt overwhelmed by the suddenness and severity of the fires. Many families underwent six main changes after experiencing the wildfires: Re-evaluation of life goals and priorities, changes in interactions within family units community, and attitudes.	Project was funded by the Alberta Centre for Child, Family and Community Research (ACCFCR), the Government of Alberta, and the Institute of Catastrophic Loss Reduction
Northern River Basins Study	Examined the relationships between industrial, agricultural,	Alberta and Northwest Territories portions of the Peace,	Divided its research into eight component areas. Research	Produced over 150 technical reports and 12 synthesis reports	The study was co-funded by the governments of

	municipal and other development, and the Peace, Athabasca and Slave River basins (ecological concerns of the pulp mill expansion)	Athabasca and Slave River basins	groups included: contaminants, drinking water, food chain, hydrology/ hydraulics, nutrients, other river uses, synthesis and modeling, and traditional knowledge. In total, 150 projects or "mini studies" were initiated.		Canada and Alberta. The government of the Northwest Territories also participated in the Study
Health Study in Fort Chipewyan 2014	To characterize the impacts of upstream industrial activity associated with the Athabasca Oil Sands for wildlife, environmental and especially human health as it affects the MCFN and ACFN.	Athabasca Oil Sands (Northern Alberta)	To evaluate contaminants levels by testing the environment and culturally important wildlife and promote capacity in community-based monitoring to address any environmental concerns	Cancer occurrence is positively associated with employment in the Oil Sands Communities are already playing an effective role in mitigating some of these declines in health and wellbeing, most notably the community based monitoring program, responses	National First Nations Environmental Contaminants Program, Health Canada, SSHRC, Mikisew Cree First Nation, and Athabasca Chipewyan First Nation