

INDIGENIZING WATER SECURITY

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By

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ABSTRACT

The term ‘water security’ continues to gain traction in the water resources literature with broad application to human health and longevity of water supply. In this body of literature, water security holds a strong anthropogenic focus, particularly on utilitarian needs and water resource demands of society. There is presently little reference in the literature to ‘water security’ from an Indigenous perspective in Canada. Water has many symbolic meanings to Indigenous people including but not limited to a sacred gift, a life form, and a medicine. These Indigenous ways of knowing are not captured in the current definitions of water security. The purpose of this research is to explore opportunities for an ‘Indigenous’ water security and in so doing make a contribution to the water security discourse.

Data for this research emerged from semi-structured interviews with Indigenous participants each representing varied backgrounds and communities from across Saskatchewan. Using an approved interview guide, this qualitative research approach identified themes from the participant interviews specific to an Indigenous perspective on water security. The results clearly indicate that water security from an Indigenous perspective embraces much more than water quality and water availability. At least six themes emerged from this research that speaks to a more holistic framing of water security than that found in the current western science literature. It is shown that an Indigenous water security includes water as a life form, water as connected to the spirit world, women as water-keepers, water as relational to human ethics, water as foundational to Indigenous culture, and the linkage between water and landscape. This broader, Indigenous understanding of the term provides a transformative understanding of water security that not only enriches the narrative but contributes positively to reconciliation between settler state and Indigenous peoples through social learning. While an Indigenous understanding of water security includes a much broader, holistic framing of the term this research also reveals that Indigenous people feel they have little water security. This divergent perspective illustrates the tension between traditional values and belief systems and the current condition of water in many Indigenous communities. The lack of water protection, upstream contamination, challenges facing water treatment, and the inability to govern water are just some of the factors contributing to low water security as reported in this research. An Indigenous understanding of water security encapsulates ‘two-eyed seeing’ by including the strengths of Indigenous knowledge and ways of knowing and the strengths of western knowledge.

Keywords: Water security, Saskatchewan, Indigenous people

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LIST OF ABBREVIATIONS

DWAs	-	Drinking water advisories
INAC	-	Indigenous and Northern Affairs Canada
BSF	-	Band Support Funding
IWRM	-	Integrated Water Resource Management
FSIN	-	Federation of Sovereign Indigenous Nations

1 INTRODUCTION

1.1 Water Security and Indigenous communities

The concept of water security emerged in the 1990s and was used in relation to military security, food security, and environmental security (Norman & Bakker, 2010; Norman et al., 2012). After 2001, the number of publication containing the term ‘water security’ increased across a wide range of disciplines from engineering and agriculture to public health and water resources (Bakker & Cook, 2011). The focus on water security has shifted to include water quality, human health, water-related hazards, sustainable development, water supply, and ecological concerns. Water security, as presented in the literature, involves a balance between the protection of resources and the enhancement of livelihoods (Global Water Partnership, 2000b; De Fraiture et al., 2010). Determinants of water security include water availability for ecosystem services as well as acceptable quality and quantity for human uses (Grey & Sadoff, 2007). Water security is presented in the literature as meeting short and long-term needs to enable access to sufficient water quality, at a fair price, for human health, safety, welfare, and productive capacity (Witter & Whiteford, 1999). In addition, water security has been linked to the political, social, and economic power of people in society (Kaplowitz & Witter, 2002; Gerlak & Mukhtarov, 2015). Despite this broad scope, the literature is largely silent on any Indigenous perspective on the meaning of water security, a condition that has motivated this thesis.

The inability to access affordable water quality and quantity safe drinking water for many Indigenous communities especially First Nations in Canada is a persistent problem (Hanrahan & Hudson, 2016). More so, adequate sanitation in Canada depends on where you live and who you are (Hanrahan & Hudson, 2014b; Hanrahan & Hudson, 2016). Provision of safe drinking water for Indigenous communities is critical to Indigenous health, safety, and economic viability (Simeone, 2010). There is an on-going challenge in providing safe drinking water to most Indigenous communities, resulting in one in five of these communities being under a drinking water advisory at any one time (Bakker & Cook, 2011; Norman et al., 2012). Indigenous people experience double the number of water contamination incidences as compared to non-Indigenous communities in Canada (Patrick, 2011). The reason for the high number of contamination events is beyond the scope of this thesis but includes the lack of community water distribution systems, inadequate technology, lack of federal funding, and land use activities that affect source water quality (Plummer et al., 2011; Patrick et al., 2017).

As at March 2017, Health Canada reported approximately 100 long-term drinking water advisories (DWAs) in 89 First Nations communities south of 60° north latitude (excluding British Columbia) due to confirmed or suspected microbiological or chemical contamination in the drinking water supply. DWAs vary in cause, duration and frequency, with some lasting a few days and others persisting for months or years as long-term advisories (Health Canada, 2009a). A Health Canada (2009b) review of DWAs in First Nation communities from 1995 to 2007 revealed that the median duration for a DWA was 39 days. Furthermore, approximately 25% of all DWAs were persistent, yielding a mean average duration of 343 days. Clearly, there is a problem when many communities cannot access safe drinking water for nearly a year at a time, and some for even longer.

Despite the challenges, Indigenous communities show great ability to adapt to many of the current drinking water challenges in their communities (Patrick et al., 2017). Factors contributing to this resilience include adaptive capacity, human and technological innovation and a deep respect for water. This respect for water is described in the literature as a spiritual connection to water, an understanding of water as a life form, and the belief that water has many healing powers. This research asks how Indigenous values of water may enhance and broaden the definition of water security. An Indigenous perspective on water security provides a more nuanced and de-colonized understanding of the term while contributing to traditional ecological knowledge to enrich western science. This research is also intended to facilitate and inform reconciliation through education and the dissemination of knowledge. In this thesis, the term Indigenous is used to include First Nations and Metis people.¹

1.2 Water governance and accountability

Water governance in Canada is highly decentralized and this has created many challenges that hinder effective water management (Bakker & Cook, 2011). The responsibility for water management is shared by the federal, provincial and municipal governments, and, in some instances, by the Territories and Indigenous governments under self-government agreements (Bakker & Cook, 2011; Norman et al., 2012). The nature of Indigenous and treaty rights and their constitutional relationship to federal and provincial jurisdiction is complicated. With respect to water law in Canada, First Nations fall within federal government law irrespective of their location in a province (Lebel & Reed, 2010). As a result, a province may have a

¹ Although the Inuit are included with First Nations and Métis in the term "Indigenous", no one was found to represent this people group in this research.

particular law protecting its watersheds but if a First Nation community is located in the watershed, that community and its water bodies fall under federal law rather than provincial law. These conditions, therefore, have led to a string of governance gaps that include a lack of coordination among the various levels of government, poor data sharing across watershed groups, lack of coordination among institutions, inadequate monitoring and enforcement of water laws, and a general loss of accountability to water-related issues (Bakker & Cook, 2011; Patrick, 2013).

At the level of federal jurisdiction, the government oversees water, fisheries, transboundary waters and First Nations, including their drinking water. Three separate departments at this level also handle First Nations drinking water management: Health Canada, Indigenous and Northern Affairs Canada (INAC), and Environment Canada (Norman et al., 2012). Health Canada helps to prevent pollution of Canada's water resources and sets guidelines for water quality and monitoring (Health Canada, 2017). INAC is responsible for providing funding to support safe drinking water in First Nations communities while Environment and Climate Change Canada is responsible for environmental issues to preserve and enhance the general quality of Canada's environment. The federal government does not have a direct regulatory role or responsibility to provide safe drinking water to non-First Nations communities. The provincial governments in Canada have authority over water resources and this is further delegated to municipal governments (Norman et al., 2012). The constitutional division of authority over water between all three branches of government, coupled with the freedom to create guidelines that are not legally enforced at the federal level, has created a lack of accountability and inconsistent standards.

1.3 Water governance and Indigenous communities

First Nations, through their individual Band Administration, send proposed initiatives to INAC at the federal government level where funds are allocated for infrastructure based on availability and priorities. Both Health Canada and Environment and Climate Change Canada are mandated to allocate financial resources, if available, to First Nations communities. Walters (2012) indicates that annual federal funding provided to First Nations for the delivery of general band-led initiatives – referred to as Band Support Funding (BSF) – which includes the provision of safe drinking water, is often inadequate. INAC has a responsibility to support Indigenous peoples (First Nations, Inuit, and Metis) in their wellbeing and economic prosperity. As well, INAC is responsible for ensuring that healthier and more sustainable communities are developed. It is difficult for Indigenous communities to fully concentrate on

the issue of drinking water because of the broad range of responsibilities placed upon them including solid waste management, roads, housing, and other services.

In Canada, the federal government has authority over First Nations; therefore, the provincial government is not responsible for providing First Nations with safe drinking water and provincial water regulations do not apply to First Nations communities. This, together with the lack of a federal standard for drinking water quality, has created a gap in legislation and regulation applicable to on-reserve water management (Bakker & Cook, 2011; Norman et al., 2012). First Nations water plans differ from most water plans developed in the rest of the country with regard to scale. Rather than using entire watershed regions, which is a common scale used in formulating land and water plans, First Nations drinking water plans use “reserve” boundaries as their scale of assessment (Boyd, 2011; Walters, 2012; Patrick, 2013). First Nation water plans often do not identify land uses and potential risks to their sources of water, and, even if identified, mitigation is complicated by jurisdictional issues (Patrick, 2013). Among Indigenous communities, especially First Nations, there is no authority to control neighbouring land uses that might be potential sources of water contamination. It is this kind of problem that has led to the persistent boil water advisories that sometimes last for decades (Eggertson, 2008; Kot et al., 2011; Patrick 2011). Recent plans developed by First Nation communities in Saskatchewan identified the following threats to their source water (Patrick, 2017):

- Leaching from wastewater including sewage lagoons and household sewage outflows;
- Abandoned wells;
- Waste disposal, including landfills;
- Damaged household cisterns;
- Water truck contamination; and
- Agricultural runoff.

These findings show that there are many similarities in water quality concerns in First Nation communities. The Canadian system of water governance is complex and broad. The responsibilities interwoven between numerous departments make it difficult to address all issues concerning drinking water, especially in Indigenous communities. Although there are departments responsible for water management at the federal and provincial government level, they do not share a unified perspective because their roles differ. This has led to accountability issues and is a factor contributing to the duration of some boil water advisories.

The federal government has made recommendations and committed funds to remediate the water and wastewater situation in First Nations communities for many years, yet the problem remains acute. On World Water Day 2016 (22nd March), Prime Minister Justin Trudeau announced his government's budget with nearly \$4.6 billion to be invested in Indigenous infrastructure including water and wastewater systems (Make it Safe, 2016). This shows a willingness by the government to resolve this ongoing issue, but it is evident that financial commitment alone will not achieve government's goal. Aside from investments in infrastructure, the government needs to address the following issues (Source Protection Media Releases, 2014):

- the lack of binding regulations regarding water quality in Indigenous communities;
- the persistent underfunding of water system expenses (including capital, operation and maintenance costs) due to the number of departments handling water issues;
- the worsening source water conditions;
- the lack of capacity and support for water operators and institutions in Indigenous communities; and
- the lack of accountability at the federal level in First Nations water management.

The federal government audits its water management system to see whether money that is invested results in positive outcomes and their findings show a pattern of overpromising and underperforming, as well as insufficient monitoring. Simply put, investments of billions of dollars over decades have not translated into safe drinking water for thousands of people living on reserves (Boyd, 2011; Make it safe, 2016).

The legal discrimination that exists in relation to the regulation and protection of Indigenous communities is a primary contributor to the persistence of boil water advisories. Provincial and territorial regulations governing safe drinking water and sanitation, which operate to protect the health of most Canadian residents, do not extend to many First Nations' reserves. Water systems have been designed, constructed, and operated on reserves without the kind of legal standard and protection that the government has adopted for all other Canadians – a failure to ensure that residents of reserves benefit from equal protection before the law (Health Canada, 2017; Make it safe, 2016). The literature has repeatedly shown that the government's water systems on First Nation reserves in Ontario would not be acceptable off reserve, but the practice continued, and, to date, many water systems fall below provincial standards (Boyd, 2011; Basdeo & Bharadwaj, 2013; Health Canada, 2017).

1.4 Water insecurity

There is a growing literature on the subject of water ‘insecurity’ in Indigenous communities in Canada. Water insecurity has been linked to water scarcity and insufficient water supply, as well as universally ‘poor conditions’ of drinking water in First Nation communities (Wutich, & Ragsdale, 2008; Hanrahan & Hudson, 2014b; Hanrahan & Hudson, 2015). After carrying out research on water quality and cultural interpretation of water insecurity at the southern Inuit community of Black Tickle-Domino (Labrador) in Nunavut Territory, Hanrahan & Hudson (2014a) concluded that water insecurity has a direct link to poverty, food insecurity, men’s health, and mental health. This means that there is usually a direct link to major health risks to the residents of a community when its water is “insecure”.

Wutich & Ragsdale (2008) also carried out research to examine intra-community patterns of water insecurity in an urban setting. They drew upon the theoretical and methodological development of the “food security” concept to group the problems of water insecurity under the category of water availability, access, and usage. They saw food security as a complementary perspective to their understanding of water as a natural resource, as a commodity, and an entitlement. They concluded with an agenda focused on improving policy designs, as well as actions that curb water insecurity. Studies on water insecurity have been limited to the far north and the east coast of Canada. Researchers have yet to explore this topic in relation to other Indigenous communities in other parts of the country. Through a critical lens, the water security discourse has largely served the colonial nation-state interest at the expense of Indigenous peoples and their communities. To date, water security as a form of water governance excludes Indigenous people.

The motivation for this research is to explore the narrative of water security in the context of Indigenous people in the prairie region of Canada. In the face of persistent and expanding hydro-electric projects, agricultural development, climate change, urban expansion and resource extractive industries – all dependent on water availability, it is prudent to assess ‘water security’ from the perspective of Indigenous people.

1.5 Research goal and objectives

The purpose of this research is to interrogate the concept of ‘water security’ from an Indigenous perspective based on participant interviews.

The specific objectives are:

1. To identify an Indigenous conceptualization of water security based on participant interviews and from the academic literature.
2. To explore how an Indigenous perspective may enhance a more inclusive definition of water security.
3. To expand the utility of the water security narrative to include Indigenous values and perspectives.

1.6 Positionality

I started my master's program with a thesis-based research topic on governance to support source water protection in Canada. In the process of selecting my courses, my supervisor advised that I take a graduate course in the school of public policy on governance and administration. My background prior to this program was in human settlement planning and, as an immigrant, I knew very little about Canadian water policies and governance. However, in the classes the topic of Indigenous rights and institutions led to an in-depth discussion on the legal rights and institutions that have developed for and been developed by First Nations, Inuit and Métis. This topic explored the differing views, held by Indigenous peoples and the states in which they reside, on the types of rights held and how they play out in specific scenarios. It also examined legal decisions made by courts that have shaped the nature and power of Indigenous rights and institutions. This made me realise that many of the issues that were raised about the Indigenous communities in Canada were quite similar to what my home country Ghana had experienced years back when colonized by the British in the 1860's. This piqued my interest to learn more about Indigenous groups in Canada and I even ended up with many as my friends. With my supervisor's agreement, I changed my research topic.

Through my study, I have come to realise how close some of their traditional values and beliefs are to some of my Asante tribal beliefs from the Ashanti Region of Ghana, such as the respect for water and the belief that water has a feminine spirit. I understand that this might influence the tone of my work; however, this is what drew my interest towards this research.

2 LITERATURE REVIEW

This section examines existing literature that pertains to water security and insecurity, Indigenous water rights and understanding of water, colonialism, and Indigenous water governance in Canada.

2.1 Water security

Water security is commonly defined as “the availability of an acceptable quality and quantity of water for health, livelihood, ecosystems, and production coupled with an acceptable level of water-related risks to people, environments, and economies” (Grey & Sadoff, 2007).

According to Horwitz & Finlayson (2011) and Zeitoun et al. (2011), water security exists when humans and ecosystems are free from water-related harms. Conversely, de Loë et al. (2007) and Grey & Sadoff (2007) argue that there is no one universally-accepted definition of water security due to the varied context of disciplines within which it is used. These disciplines include agriculture, environmental science, social sciences, and water resources. Bakker & Cook (2011) also noted that water security is examined through the use of various approaches that are usually based on the scale at which it is viewed and the discipline under which it is assessed.

Common approaches to water security usually emphasize access to water to meet human needs but fail to recognize the importance of links to aquatic ecosystems (Longboat, 2015). Water security is a broader concept of Integrated Water Resource Management (IWRM) that seeks to balance resource protection and resource use. IWRM promotes coordinated development and management of water, land, and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (UN-World, 2012). This indicates that all the different uses of water resources are considered together. However, the rates of implementing IWRM plans remain unsatisfactory and well behind targets (UN-World, 2012). IWRM is narrowly characterized as a perspective-way of knowing water, based on technical-scientific knowledge, while water security represents a more inclusive and diverse way of understanding water, with a greater consideration for human values, ethics, and power (Gerlak & Mukhtarov, 2015). An ecosystem-based approach to examining water security aligns closely with the traditional Indigenous perspective on water (Longboat, 2015). De Loë et al. (2007) identified seven interconnected water security concerns that relate to water allocation. The concerns include

ecosystem protection, economic production, equity and participation, integration, water conservation, climate vulnerability, and transboundary sensitivity. From the perspective of an ecosystem-based approach, community participation and principles of good governance are essential to achieving water security (de Loë et al., 2007).

In a review of academic literature, Bakker & Cook (2011) identified 400 references to water security that could be framed around four main themes: water availability, human vulnerability to hazards, human needs, and sustainability. These authors explain that water security has been promoted by international organizations that share in the growing recognition of how critical it is to address threats from pollution and to improve on human well-being. However, the study failed to present a water security framework and the methods used by the authors focused on literature reviews intended to stimulate dialogue about the need for convergence on framing the concept of water security. There is limited literature covering water security from an Indigenous perspective, even though Indigenous customs usually promote both human connection with nature and water. Phare (2009b) reported that most research on Indigenous communities and water tends to concentrate more on spiritual aspects, Indigenous rights, and water-related rights than on human values, ethics, and power. Lebel & Reed (2010) also noted that most Indigenous communities' water research is focused on safe drinking water. There have been a few studies conducted involving water policies and governance groups to identify challenges and solutions relating to the governance of water and its security among Indigenous communities across Canada (von der Porten & de Loë, 2010). The works of Hanrahan & Hudson, (2014a; 2015) are notable exceptions since their focus was on multiple dimensions, health risks, and coping strategies of long-term water insecurity among Indigenous communities.

Bakker & Cook (2011) explained that research on water security that relates to water availability usually focuses on water quantity and quality, and places emphasis on assessment tools used to measure water stress or general water shortages. Studies done by Vörösmarty et al., (2010) investigated the perspectives of humans and biodiversity on water security, using a spatial framework that quantified a variety of stressors. The method used was based solely on spatially-explicit data depicting 23 stressors that represented the various environmental impacts. This was done globally and the findings revealed that areas with high technological investments have limited exposure to water security threats, as compared to areas with little

or no technological investments; this approach was limited by its failure to recognize human perspectives on water security.

Water security is critical to the economic growth of all societies (Grey & Sadoff, 2007); likewise, water insecurity or lack of water security is reported to be a result of unreliable access to potable water, pollution or health concerns that may hinder the growth of economies (Grey & Sadoff, 2007). Witter & Whiteford (1999) link the lack of water security to inequality issues between those who have access to clean drinking water and those who do not, usually the wealthy and the poor, respectively. Grey & Sadoff (2007) explained that a thorough investigation of physical, cultural, political, and economic aspects of water is required to fully understand the challenges to achieving water security. The study reported that it will take both the narrow and broad approach to water security to capture the full range of potential perspectives of Indigenous communities regarding water security. A broad approach includes a range of perspectives on water from Indigenous communities, while, according to Bakker & Cook (2011), a narrower framing will address specific concerns pertinent to community drinking water. Therefore, this research will utilize both approaches. Wutich et al (2017) make explicit calls for a water security that extends beyond water quality and quantity to include cultural and spiritual components. Similarly, Jepson et al (2017) introduce a relational approach to water security that calls for consideration into human-societal considerations to explore human capability as a means of performing water security. In this context, achieving water security will vary between communities as there is no single measure of water security.

2.2 Indigenous water rights

Access to safe water is an essential right of Indigenous people (Phare, 2009b; United Nations Association in Canada, 2007). Water also serves as a means to preserve tradition, contemporary needs, and economic development (Nowlan, 2004). Indigenous communities have rights to water from a variety of sources (Longboat, 2015). For instance, Canadian courts recognize Indigenous water rights, riparian rights, and other rights that are derived from a number of Indigenous and treaty rights (Nowlan, 2004; Walkem, 2007; Phare, 2009a). As riparian rights holders, Indigenous communities hold rights to the use, access, drainage, flow, and quality of their water and rights of accretion to waters adjacent to their reserved lands (Lysyk, 2005; Walkem, 2007; Phare, 2009b). Indigenous community water rights are

also derived from Indigenous and treaty rights that recognize their relationship with their traditional homelands (Walkem, 2007), but this is subject to judicial interpretation (Lysyk, 2005). Indigenous water rights and claims are primary drivers for change and they provide an opportunity to enhance their water security since water security is focused on human values, ethics, and power.

2.3 Indigenous communities' understanding of water

Water means everything to Indigenous communities (Swain, 1997; Jackson & Altman, 2009). Indigenous people view water as a blessed trust and usually locate their buildings around water bodies because they feel that water is their source of life (Swain, 1997). Studies done by Longboat (2015) revealed that Indigenous peoples' concern for water goes beyond drinking water and they view water as a "sacred gift and a life blood of Mother Earth" which helps Indigenous people to maintain their traditional way of life. From the Walkerton Inquiry report in 2001, ten Elders shared their perspectives on water, explaining that they have a profound respect for water because of its importance in physical, emotional, cultural, and spiritual life. These Elders view water as both a life form and as a link between the past and present (Kamanga et al., 2001).

2.4 Colonialism

Colonialism is a form of invasion, dispossession, and subjugation of a group of people (Curthoys & Moore, 1995; Buzo, 2016). This invasion can begin with agricultural, urban or industrial encroachments and is not necessarily military in nature. This can result in the dispossession of vast amounts of lands from the original occupants (Crais, 1992; Curthoys & Moore, 1995; Buzo, 2016). Due to the colonial structure of the Indian Act of 1876, Indigenous perspectives in Canada often are not considered in deliberations about the environmental impacts of development activity regarding land use and this results in low participation rates of Indigenous communities in watershed developmental issues (Walters, 2012).

2.4.1 Indigenous vs Western planning practice

Indigenous settlements, both past and present, were often located adjacent to water because they felt that water was their source of life (Swain, 1997). This made Indigenous people feel

the need to be custodians of water bodies. Colonial planning practices failed to take into account the connection of Indigenous people to their environment and thus goals were set with little or no consideration given to the very people who would be directly affected (Lane, 1997). Colonial planning in earlier years ignored the input of people living on the land, instead focusing on authoritative controls. Alternatively, Indigenous planning incorporates traditional knowledge, cultural identity, and stewardship of land and resources in the planning process (Matunga, 2013). Jojola (2008) explains that reformulating the planning approach in a manner that incorporates traditional knowledge and cultural identity is the distinguishing factor between Indigenous and mainstream planning. The mainstream approach is more a reactive form of management, as compared to the proactive nature of Indigenous planning (Brunckhorst, 2013). A good example of this is the water crisis faced by Ontario's (Canada) community Shoal Lake No. 40 First Nation (16x9onglobal, 2015), wherein the community experienced scarcity of drinking water due to a man-made dike built in 1914 to help supply water to the growing city of Winnipeg. This dike was built to solve an immediate problem, with no future consideration given to its impact on the people. The dike created an artificial island between Shoal Lake No. 40 and Winnipeg, permanently cutting off the Shoal Lake No. 40 community from their drinking water, forcing them into isolation, and restricting economic opportunities. It was noted that all stakeholders were involved in the planning process except the rights-holders who were the owners and occupants of the land. The situation faced by Shoal Lake No. 40 could have been prevented if the rights-holders had been involved in the planning process. The responsibility of monitoring the water could have been handed down from generation to generation, instead of turning the area into an artificial island (16x9onglobal, 2015).

Western planning involves scientists, government managers, and other 'expert elites' developing plans often without involving the Indigenous people in the area, while Indigenous planning involves local elders, women, and children, as well as experts in the field. Lavalley (2006) stated that "elders of the land have a role to play in water and therefore should be consulted for their views on how to protect water." In Western planning, water is known as a global resource where all issues concerning water are compared globally and decisions are made with no direct reference to the specific area, while Indigenous planning allows for local-scale collaboration whereby specific goals are set based on specific features of the land. Also, water is seen as a lifeless resource in Western planning, while Indigenous planning views water as a living, medicinal, and even spiritual entity (McGregor & Whitaker, 2001).

Indigenous planning aim to include everyone's input in decision-making before an agreement is made. This builds trust amongst the community throughout the process and clears the path for success. Traditional values guide the decision-making process and succeed in protecting environmental resources, the land, and future generations, providing them with the opportunity for a better life and reducing environmental contamination issues (Bartlett et al., 2012; Patrick, 2013). Structuring the decision-making process and conducting meetings according to accepted cultural protocols is essential to the formulation of high-quality and sustainable decisions. Indigenous planning involves honouring all protocols and inculcating beliefs and practices of the people, which helps in sustaining the life of the planning project.

2.5 Indigenous water governance

“Governance” is the establishment of policies, rules, or practices, with continuous monitoring of their proper implementation, by which leaders ensure accountability, fairness, and transparency in their decision-making (Umbdenstock et al., 1990; Nanda, 2006; Institute of Governance, 2014). However, water governance refers to policies or ideas formulated to meet development goals for water through interventions that promote good governance (Franks, 2007; Nowlan & Bakker, 2010). Water governance is the process of developing policies or ideas that seek to meet water development goals through interventions that promote good governance, while water management is the decision-making process by which policy makers are held accountable for the development and delivery of water resources (Norman et al., 2012). These processes should be continuously monitored if there is to be any hope of ensuring proper implementation of policies to help achieve effective accountability, fairness, and transparency.

Bakker & Cook (2011) show that Canada's water governance is highly fragmented, creating challenges to water management goals. Irvine (2002) explains that the Canadian constitution has two entrenched orders of government: the federal government and the ten provincial governments. Each government is autonomous in its water management, having complete authority over it (Bakker & Cook, 2011) and thus water is managed by different administrative boundaries (Hill et al., 2006; Kot et al., 2011). Section 91(24) of the Constitution Act, 1867, grants the federal government jurisdiction over “Indians and reserves” (Simeone, 2010; Plummer et al., 2011; Bakker & Cook, 2011). As a result, the legislative authority over the provision of water for First Nations communities rests within

the federal government laws, irrespective of the First Nation's location in a province (Irvine 2002; Nowlan & Bakker, 2010; Lebel & Reed, 2010; Kot et al., 2011).

It is the sole responsibility of the federal government to manage and provide safe drinking water, overall safety, and good health to all First Nations, as guaranteed by Indigenous and treaty rights (Harden & Levalliant, 2008). It was noted by Harden & Levalliant (2008) and Bakker & Cook (2011) that Indigenous and Northern Affairs Canada (INAC) is the primary body through which the federal government fulfills its constitutional and legal responsibilities to First Nations. INAC works with Health Canada and Environment Canada to provide funding and support to help First Nations make safe drinking water available (Harden & Levalliant, 2008). These departments look at water differently depending on their roles. This has led to accountability issues and is likely a contributing factor for boil water advisories lasting decades in many First Nation communities (Patrick, 2011).

Water and wastewater operations and systems are the responsibility of the provincial and territorial governments (Simeone, 2010; Plummer et al., 2011). However, provincial regulatory standards do not apply to on-reserve First Nations communities (Simeone, 2010). First Nations' leadership are responsible for the design, construction, operation, and maintenance of their water systems, for which they assume 20 percent cost (Simeone, 2010; Mendelson, 2014). Frideres (1998) and Hogg (2007) explain that the federal government has entrusted many social services to First Nations to administer on-reserve, but these social services remain the primary source of revenue for the communities. Therefore, First Nations' power to govern is significantly limited, and, with the exception of rare cases, all costs of operation and maintenance of water systems come from the federal government (Hogg, 2007; Aubry et al., 2013; Gaetz et al., 2014). The federal government fails in many cases to evaluate the communities' financial ability to contribute 20 percent of the total costs (Aubry et al., 2013; Gaetz et al., 2014).

According to Swain (1997), the role of the federal government is broad and their responsibility for First Nations does not allow room to handle the specific needs of these communities. Studies done by Lebel & Reed (2010) and Örmeci (2015) revealed that little attention is given to Indigenous communities' water problems, as compared to those in the big cities in Canada. Their findings revealed that Indigenous community residents are at risk from a low standard of drinking water safety. The Expert Panel on Ground Water (2009) warns that Canada's governance framework on water is not strong enough to manage both

domestic and international water issues effectively, yet water governance is an essential component of water security in Indigenous communities (Norman et al., 2012). Norman & Bakker (2010) explain that in order to achieve water security, it will require a full commitment to good governance from all levels of government.

There are challenges to achieving water security in Indigenous communities associated with Aboriginal and riparian rights that relate to the multi-jurisdictional nature of water governance in Canada (Harden & Levalliant, 2008; Longboat, 2015). Walkem (2007) explains that Indigenous communities – especially First Nations ‘reserves’ – are federal allocations, yet the provinces maintain responsibility for water allocation. In some cases, provinces have refused to honour reserve water allocations or have issued licenses to reduce the water available to these lands, and it is therefore important to note that federal and provincial relations play a significant role in Indigenous water security (Longboat, 2015). This research will focus on the relationship that Indigenous communities have with water and how that relationship informs an ‘Indigenous water security’.

2.6 Research gap

Literature on Indigenous water issues in recent years has been related to water policies, Integrated Water Resource Management (IWRM), and water governance challenges and solutions (von der Porten & de Loë, 2010). Gerlak & Mukhtarov (2015) argue that IWRM and water security are complementary to each other, rather than conflicting. However, the IWRM approach is based on a technical-scientific understanding of water research. It is important to look at water security from an Indigenous perspective because Indigenous customs promote human connection with nature, especially water. This gap opens opportunities to expand the water security discourse and contribute to a more critical definition of water security that includes customs, traditions, spirituality and community.

3 RESEARCH METHODS

3.1 Overview

The methods used to investigate Indigenous perspectives on water security are presented in this chapter. The chapter contains details of the research approach, data collection process and analytical process. The details presented include an explanation of the qualitative research approach used in this study, as well as details of the semi-structured interview and document review methods that were employed.

3.2 Research approach

A qualitative research approach using a semi-structured interview method was used for this study. The strength of this method is that it allows participants the flexibility to ask additional follow-up questions or to ask for clarification (Baxter & Jack, 2008; Aberdeen, 2013, Brinkmann, 2014). It also enables information to be obtained about the ‘human side’ of the research questions being asked. Collecting detailed information about personal feelings, perceptions, and opinions allows for a more interactive process of gathering data (Creswell, 2013). In order to achieve the goal of this research, a constructive approach was taken into account for the differences in participant perception and experience through the application of social constructivism (Creswell, 2013). This approach allowed for a focus on the way individuals understand, perceive and interpret the facts surrounding water security.

Interviews were conducted to record direct quotations about people’s personal perspectives on, and experiences with, water security. The interviews focused on what water security means to the participants, how water is managed in their community, the condition of their community’s drinking water, and coping strategies to address water concerns. Adopting this method allowed participant expression on multiple meanings and interpretations of problems, rather than imposing one interpretation on everyone (Winchester & Rofe, 2010).

A review of existing academic and grey literature was undertaken to investigate existing research on this topic. An inductive approach was used to analyse the data. As explained by Caelli et al., 2003 and Kahlke, 2014, an inductive approach is a qualitative analysis method that provides flexibility in its use. This allowed room for discussions on new topics raised by participants during the interviews. The data analysis included content analysis, word association, and inclusivity of language in order to respect Indigenous culture. Specific details of the data analysis are presented in Section 3.6.

This research approach was chosen because it has been successfully applied by other research work in related communities, such as Montreal Lake First Nation (Lebel & Reed, 2010), South Saskatchewan River Basin (Rawlyk & Patrick, 2013), and Muskowekwan First Nation in Saskatchewan (Grant, 2016). Also, Winchester & Rofe (2010) noted that a qualitative research method using the semi-structured interview method is effective at collecting information that might otherwise be difficult to uncover. This type of information is often held by groups of people, or individuals, whose voices are silenced or ignored because of colonial structures that are in place or other such factors such as uneven access to research participants, interviewer bias, or social stigma. Due to the nature of the Indian Act (1876), Indigenous people are not often considered when decisions are made on the use of lands (Walters, 2012). Adopting a qualitative research approach using the interview method was therefore identified as an effective research methodology for the purpose of gaining the perspective of Indigenous people with regards to the term ‘water security’.

3.3 Study area

For the purpose of this study, twenty-one (21) people from Indigenous communities in Saskatchewan were interviewed. The region that is now the province of Saskatchewan has been populated by various Indigenous peoples of North America. The province is home to 103,205 First Nations, 52,450 Metis, and 290 Inuit (Statistics Canada, 2016). Participants in this study were mostly Cree and some Métis were also interviewed. Individuals that were interviewed represent Treaty areas, 4, 5 and 6 in Saskatchewan (as shown in Figure 3.1).

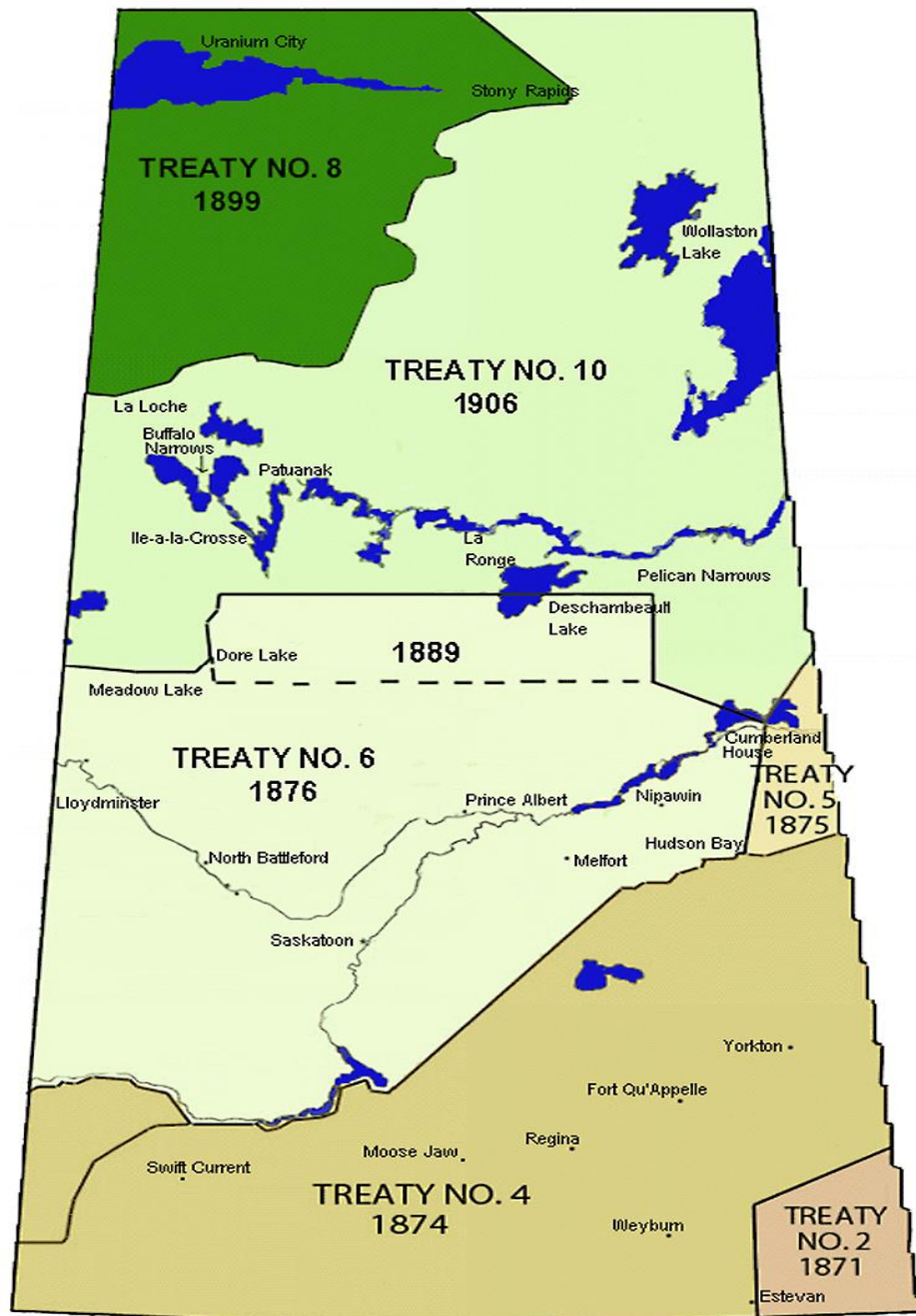


Figure 3.1: Treaty areas in Saskatchewan

3.4 Semi-structured interview process

The data collection method included interviews with selected participants. The participants were interviewed over a six month period, from April 5th, 2017 to November 7th, 2017, to gain their insights into the subject of water security. The interviews were conducted with the aid of an interview guide. The interview guide (presented in Table 3.1 below) was used to identify the challenges, barriers and knowledge about water security from an Indigenous perspective.

Table 3.1: Interview guide

Guide	Indicator Questions
Problems	<ol style="list-style-type: none"> 1. How would you describe the condition, or situation, of water in your community? 2. In your opinion, has the condition of water in your community changed over your life time? In what way(s) has it changed? 3. What do you feel has caused changes to your water?
Challenges	<ol style="list-style-type: none"> 4. Are these changes something you or your community can control? Why? Why not?
Knowledge	<ol style="list-style-type: none"> 5. What does water mean to you? 6. What is your relationship or connection to water? 7. Have you heard of the term ‘water security’? 8. If yes, where did you first hear this term? From whom? 9. What do you think the term ‘water security’ means? 10. What do you think the term ‘water security’ should mean? 11. Do you feel you have water security? 12. Do you feel your community has ‘water security’? 13. Who do you feel has the most water security in Canada? Industry? Cities? First Nations? Agriculture? The environment? 14. Who has the least water security in Canada? Industry? Cities? First Nations? Agriculture? The environment? 15. Is there anything from Indigenous traditional knowledge that you feel might add to the definition of ‘water security’? What needs to be considered?

3.4.1 Preparation for interviews

This research involved interviews with key participants from Indigenous communities in Saskatchewan. As a result, an Ethics Approval application was required by the University of Saskatchewan. An application was submitted to the University of Saskatchewan Behavioural Research Ethics Board in February 2017. A Certificate of Approval (BEH#17-58) was issued by the University of Saskatchewan Behavioural Research Ethics Board dated March 23, 2017. Renewal of the Certificate of Approval was issued March 2018.

3.4.2 Selection of participants

As the research work is focused on Indigenous water security, a purposive sample was used to select initial participants. The criteria for selection was based on the following: interest in the research study, the participant is an Indigenous adult (as self-declared), a resident of Saskatchewan, a person who has spent not less than fifteen (15) years in their community, and familiarity with water security and management issues. The sampling was restricted to only Indigenous people. These criteria were used to ensure that the selected participants had adequate knowledge of water, and community water issues, from an Indigenous perspective. Community websites were used to obtain contact information for other potential participants. Additional participants were later identified using the ‘snowball’ technique through referrals from initial participants in order to expand the list of potential informants (Sadler et al., 2010). The initial participants served as ‘seeds’ through which other participants were recruited; the first subject recruited the second subject and so on until the sample reached the required number (Handcock & Gile, 2011). Although the snowball technique has the potential to lead to the selection of the same type of participants due to its nature, it is important to note that there were participants in this research who were without expertise on water but were knowledgeable about the water issues in their community. They were included in this research for this reason. A total of twenty-one Indigenous people were interviewed. The required number of participants was determined by the content of the interview responses. Once these responses began to repeat it was determined that the appropriate number of responses had been achieved.

Initially, the participants were to be selected from one Indigenous community in Saskatchewan. However, due to limited numbers of potential participants, the pool of potential interviewees was subsequently opened to Indigenous people from different communities in Saskatchewan who were willing and available for the interview. Some potential participants showed no interest in this research. These potential participants reported that they felt used by past students who interviewed them for research work because they never received a copy of the completed work or saw any improvement in their situation. Interviewing participants from multiple communities allowed for a broader sample and a more representative sample from multiple Treaty areas and the region in general.

3.4.3 Conducting interviews

The participants who were interviewed included community Elders, women, band office employees, students, and water treatment plant operators. The participant's role in the community and their field of work had the potential to influence their perspective on the subject, so it was more appropriate to select participants with diverse backgrounds. During the semi-structured interviews, topics that the participants were less familiar with were given less time and attention, while more familiar topics were focused on. This format allowed for more freedom to fully explore each participant's own experiences (Horton et al., 2004).

The participants were initially contacted directly by telephone and asked if they would agree to be interviewed as part of the research study. My initial goal was to conduct the interview with each participant in person; however, only two participants agreed to meet with me in person for the interview, while the other nineteen opted to be interviewed over the phone because of the following reasons: busy work schedule, proximity to meeting place, convenience, and personal preference. A convenient time that suited each participant's schedule was chosen for the interview and a brief outline of the project, the interview questions and a research consent form (Appendix 1) was sent to them via email for review and was to be signed not less than 48 hours before the interview. This was to allow ample time for participants to review the documents and sign the research consent form. The research consent form included a confidentiality statement outlining the purpose of the study, the projected benefits, the protection of the participant's anonymity, and their right to withdraw. All potential participants agreed with the content after reading the research consent form; however, approximately 85% of the participants agreed to verbal consent and 15% signed and dated the form. Each interview participant was also notified about the recording instrument either via email or in person before the interview.

On the interview day, I met with or phoned the participants at the scheduled time to conduct the interview. All interviews were conducted one-on-one to reduce the possibility of external influence and to keep the interviews focused. I asked the participants the interview questions and they provided their answers. Closed questions were used to gather background information from participants (Glesne, 2010) and open-ended questions were used to discover what was relevant to the participant (Dunn, 2010). The interviews were conducted in a relaxed and semi-formal manner, so the participants were very comfortable to express

themselves. The interview questions are provided in Table 3.1. The interviews lasted between 20 and 40 minutes, with an average of 25 minutes (See Figure 3.2 below).

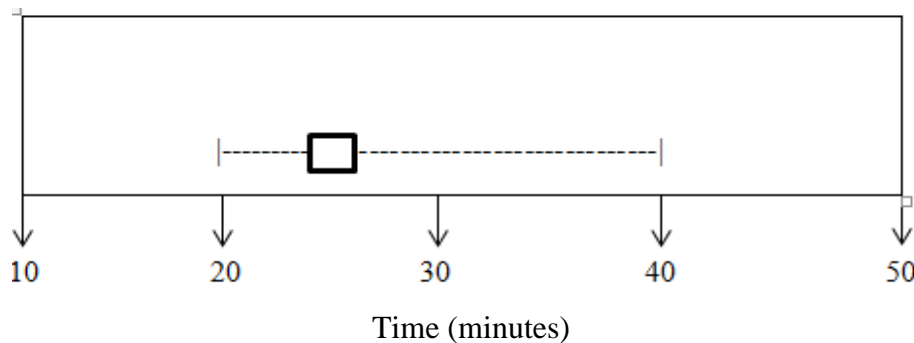


Figure 3.2: Interview length

All the interviews were voice recorded using a digital voice recorder. Transcriptions were made of each interview. Handwritten notes were also taken to help guide the data analysis.

3.5 Document review

The document review was done between July and November, 2017. The purpose of the document review was to investigate and establish what has already been researched on this topic and to identify any gaps worth pursuing in future research (Bernard, 2012). Academic articles retrieved through online databases such as Web of Science© and SCOPUS© were reviewed for content. Video documentaries from government, Indigenous community websites and various grey literature were accessed as available. The reviewed articles provided a framework for the identification and discussion of the various identified themes. They also provided a conceptual basis for how Indigenous perception of water security differs from scientific knowledge and how to incorporate Indigenous knowledge in water-related planning processes.

3.6 Data analysis

Content analysis was adopted to analyse the documents and the interview transcripts because it removes much of the subjectivity and simplifies the detection of trends (Duong et al., 2017). This approach helped to reduce the bulk of interview data into more manageable sections of information and it provided a systematic technique for arranging and categorizing data to determine common themes (Weber, 1990). Content analysis is a research method used to make inferences about the content of recorded text by objectively and systematically

identifying specific characteristics of messages (Stemler, 2001; Neuendorf, 2016). Weber (1990) explains that these inferences may address the message itself, the sender(s), or the impact of the message. Content analysis also can be described as a systematic, replicable technique for compressing many words of text into a few content categories based on explicit rules of coding. Content analysis can also be used for studying documents that systematically describe written, spoken or visual communication (Zawahreh, 2012; Bell et al., 2016). This technique was adopted for data analysis because it draws on narrative methods, describing the meaning of communications within specific contexts rather than statistical analysis (Drisko & Maschi, 2015). Also, according to Drisko & Maschi (2015) content analysis involves “some judgements by the researcher in understating, interpreting and coding complex data”. This allowed for the attitudes, views, and interests of the participants to be identified and documented.

After each interview was completed the taped interview recordings were transcribed verbatim into a word document using a naturalized transcription practice. The naturalized transcription process involves transcribing participant information provided during interviews in as much detail as possible (Roulston, 2014). This method was chosen because the more natural the conversation in the transcription, the more it preserves the participant’s personal expression in the end (Oliver et al., 2005; Roulston, 2014). The transcripts of the interviews were sent back to participants between November 27th and December 6th, 2017 and given a minimum of two (2) weeks for confirmation and any amendments. The necessary corrections were made prior to continuation with the analysis of this research. It also allowed the participants to reflect on the answers they provided and to make alterations if desired (George & Stratford, 2010). It is important to allow the participants to review transcripts because it can lead to significant changes in the results. Tracy (2010) noted that participant reflections can “enhance qualitative credibility.”

Charmaz (2003) noted a significant concern about “disciplinary assumptions and theoretical perspectives” in qualitative research analysis. Consequently, this influences the results and analysis of the research work and creates a biased perception of the participants. In an attempt to address these concerns a technique called thick descriptions and reflexivity was used. Thick descriptions are illustrations that “capture and record the voices of lived experiences” (Denzin, 2001). These have been added to the discussion and research results so as to truthfully represent participant perspectives of water security. Reflexivity can be described as

a way of subduing one's perception of a subject and viewing the issue from the participant's perspective (Glass, 2014). This was used in this research work to reduce the influence of assumptions and personal perceptions (Charmaz, 2003).

Coding was applied to the transcripts to draw out themes, patterns, and trends that were present in the results to support findings in the analysis. This was done in two stages: thematic analysis and coding.

3.6.1 Thematic analysis

The initial coding involved searching through the transcripts for themes and patterns (Bowen, 2008), with additional coding used to refine the work (Glesne, 2010). This helped to refine the analytical framework in order to achieve broader pattern recognition (Thorne et al., 2004; Bowen, 2008). Where applicable, participants were asked to expand on some topics they brought up during their interview. A thematic analysis of data was undertaken for this research because of its flexibility (Thorne et al., 2004; Tuckett, 2005; Braun & Clarke, 2006). A theme identifies the patterns found in the information gathered from the research data and describes or interprets the various aspects of the situation into a simple and meaningful form (Braun & Clarke, 2006). Furthermore, it allows for a translation of observations and applies statistical analysis to determine the validity of the codes (Tuckett, 2005; Braun & Clarke, 2006). This method helped to achieve greater clarity in the results, findings and the ease of communication (Braun & Clarke, 2006).

3.6.2 Coding

Coding involves structuring the qualitative data for further analysis and discussion (Padgett, 2011; Waitt, 2010). A manual coding method was adopted for this research. The different themes identified during the initial coding were identified in light of the information gathered during the document review process. A discussion of the thematic examination of how Indigenous people's perceptions affect their understanding of water security is presented in the results section. Furthermore, a discussion is presented on how Indigenous knowledge differs from scientific knowledge and how Indigenous knowledge can be incorporated into scientific knowledge.

4 RESULTS

4.1 Overview

The results obtained from the research study, the details of the interviews held with participants, and their perceptions of the term ‘water security’ are presented in this chapter. The chapter also includes a discussion of some themes and trends that were observed during the interviews. The chapter reports on participant knowledge of the term ‘water security’ as well as Indigenous perspectives on water security.

All the participants are from Indigenous communities and have a good understanding of the water issues and concerns within their respective communities. Some participants have multiple working relationships and knowledge with both water and the community through various activities and employment that pertains to their work field (See Table 4.1 below). This is very helpful to this research because of the diversity it brings. There is potential for an overlap in the types of knowledge and relationships, such as scientific knowledge attributed to water security since some participants have had diverse experiences with water and the term ‘water security’ through their field of work. Perspectives on the nature of scientific knowledge can be influenced by both personal and social constructivism (Driver et al., 1994; Popper, 2014). This is likely to influence participant point of view of the term ‘water security.’

Table 4.1: A brief profile of selected participants

No.	Participant Occupation	Gender	Experience	No. of years in position	No. of years in community	Other relationships with water & community	No. of years
1	Student	M	Lives in the community	n/a	< 20 but currently schools outside the community	Research work relates to water	n/a
2	Water Treatment Plant Operator #1	M	Day-to-day managing and operation of treatment plant	< 10	Since birth	Community Leader (Helped develop a Source Water Protection Plan)	4
3	Water Treatment Plant Operator #2	M	Day-to-day managing and operation of treatment plant	Over 20	≤ 40	n/a	n/a
4	Water treatment Plant Operator #3	M	Oversees treatment, healthy conditions and distribution of drinking water	Almost 30	Since birth	n/a	n/a
5	Band Officer #1	M	GIS Expert/ Watershed Engineer	≤13	Since birth	Land Manager & Indigenous Mentor	1
6	Band Officer #2	M	Oversees treatment, healthy conditions and distribution of drinking water	5	Since birth	Public Works & Housing Officer	5
7	Band Office #3	M	Special Project Officer	8	< 20	n/a	n/a
8	Band Officer #4	M	Manages the financial transactions of the band office & a community member	15	n/a	Financial Consultant & Band manager expert resource advisor	2
9	Band officer # 5	M	Acting General Manager	10	< 35	Financial Coordinator	5

Table 4.1 continued

No.	Participant Occupation	Gender	Experience	No. of years in position	No. of years in community	Other relationships with water & community	No. of years
10	Professor	F	Teaches students about Indigenous land management	<3	17	Assistant Professor, supervises undergrad projects on First Nations	2
11	Ex- INAC coordinator	F	Works on Aboriginal programs and outreach Coordination	8	16	Working on First Nations land managers for communities across Canada	n/a
12	Mother/ Student	F	n/a	n/a	≤ 35 but schools outside the community	Research work on Indigenous water management	n/a
13	Community Leader/Treatment plant operator	F	Usually involved in meetings concerning water and the general well-being of the community	n/a	≤ 20	n/a	n/a
14	School Principal	F	Responsible for the school's administrative work	8 as a Principal & 16 as a teacher	Since birth	Coordinate's with U of S students for an 8 th grade student's water training program	n/a
15	Elder #1	M	Has an interest in water issues	n/a	< 75	n/a	n/a
16	Elder #2	M	Community Leader	< 20	<50	Swampy Cree River Delta Advocate & Counselor	n/a

Table 4.1 continued

No.	Participant Occupation	Gender	Experience	No. of years in position	No. of years in community	Other relationships with water & community	No. of years
17	Elder/Community Leader #3	M	Special Projects worker at the Iron Buffalo Centre	< 10	Since birth	Indigenous Mentor	1
18	Director of Environmental Health (FSIN)	M	Oversees special projects, partnerships, health and human Resources	20	n/a	Researcher & Analyst	9
19	Certified water operator	M	Manager of Public Works	20	Since birth	Sees to water management issues in his community	n/a
20	Health officer #1	M	Directs and controls health-risk prevention programs.	7	n/a	n/a	n/a
21	Health Officer #2	M	Monitors and tests drinking water to prevent contaminations	20	< 40	n/a	n/a

Note: n/a indicates that the information was not in the transcripts

As indicated in Table 4.1 above, one student, three treatment plant operators, five band officers, one university professor, one Ex-INAC coordinator, one student who is also a full-time mother, one community leader who is also a water treatment plant operator, one school principal, three Elders, one Director of Environmental Health official (FSIN), one certified water operator, and two health officers were interviewed. In total, five females and sixteen males were interviewed for this research work. These participants have diverse backgrounds and experiences as Indigenous people, which informed my work. In instances where female participants were interviewed, for example, I allowed them to answer the interview questions from two perspectives, from that of an Indigenous woman and also from their experience in their field of work.

4.2 Indigenous water security

All participants were asked what the term “water security” means to them. Participants responded by noting that water security means having a reliable source of safe, reliable, and abundant water with an emphasis on drinking water quality, land stewardship, water monitoring to prevent contamination and cultural identity. One participant said that water security means “essentially having a reliable source water, water management, processes and principles or infrastructural capacity services [human, social and physical] to provide safe reliable drinking water.” The predominant explanation of water security, as understood by the participants, was the securing of water from external contaminants to preserve a healthy flora and fauna. As one participant noted: “Water security means ... protecting the water at all cost from pollution, farmers, chemicals around any sort of watershed that has the potential to contaminate and lead into the streams, riverbeds and lake beds [thus] protecting water quality for everyone. It is not just humans alone but animals are also protected.” Another participant also said that: “Water security means if your water provides for the flora and fauna and it is not impacted by any unnatural type source and if it is, it is mitigated accordingly.” Some of the participants understood water security in relation to the quality of water, while others who explained their understanding of water security in terms of reliability and abundance, or quantity of water, focused on having enough water such that there would not be shortages at any point in the future. One participant noted that the term referred to both water quality and quantity by stating that water security means “being able to have adequate access to a good supply of water and also a

good quality with no barriers to access to it.” Another participant also noted that; “it means having an acceptable water quality and quantity.” Seven out of the twenty-one participants specifically understood water security in terms of safety.

The other participants explained their understanding of water security in the terms of healthy sanitation. One participant said: water security means “to provide safe reliable drinking water and waste management to the residents of the community.” Another participant said that; it means “protecting our water supply at all means and also ensuring that in the event [that] we have a complete water breakdown on our First Nation that we are able to still provide water to our people so that they can still provide food, sanitation and healthcare to their families.”

Monitoring of water quality was another interpretation of the meaning of water quality. As noted, one participant said that: “Water security is monitoring the quality of water. Water managers should make us aware of what chemicals are coming into the river system.” This participant explained further that water managers should monitor the river system to keep track of contaminants and get it treated immediately in order to provide water security as well as water quality to the community. Several participants noted that protecting water from contaminants leads to high water security. One participant stated, there is high water security when there is “access to water without too much chemicals to it [or] no contaminations.” Another participant in agreement explained that when water is protected and safe to drink as well as healthy enough for plants, crops, rivers, and lakes then there is high water security. These interpretations align closely to that of most western science definitions of ‘water security’.

Interestingly, other participants linked water security to cultural identity. These respondents explained their understanding of the term ‘water security’ as preserving their cultural identities since preserving water for their future generations means preserving cultural ceremonies that surround water. As stated by one participant: “water security means understanding the entire water cycle and the relationships with human beings and all species. I think it’s also understanding those interactions even though it may not be visible to our eye [and] in a sense is our ability to protect our cultural identity using source water protection.” Another participant said; “I think it means that the water we have today will be secure for the generations to come and use in the future.” One respondent had no opinion of the meaning of water security.

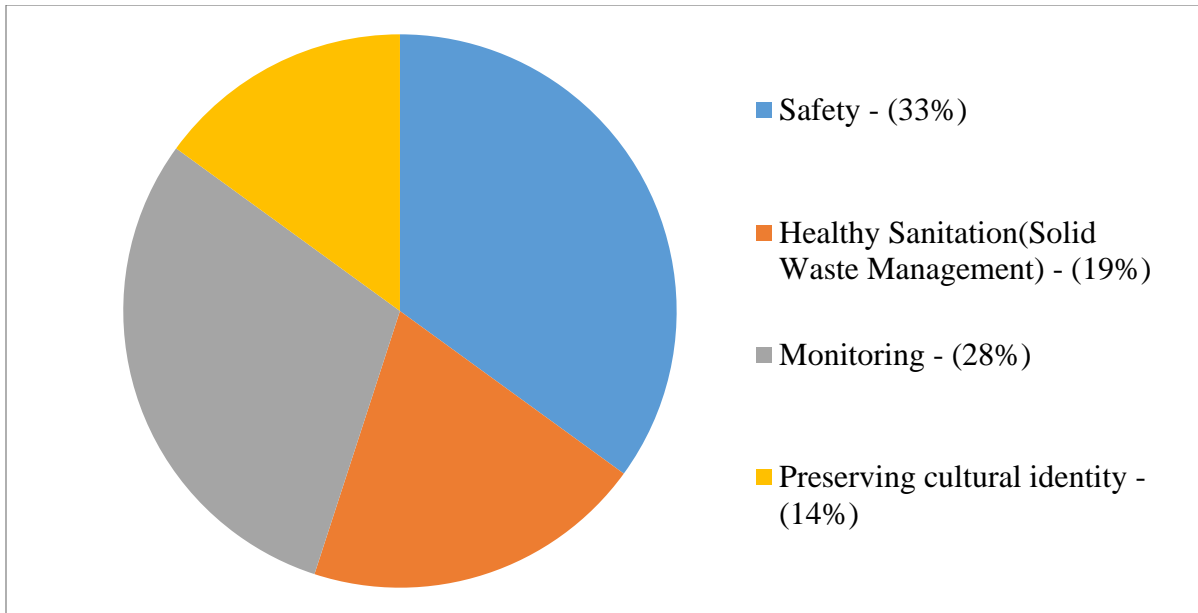


Figure 4.1: Interpretation of water security

The initial questions of the participants sought to gain some understanding of the relationship of Indigenous people to water. The responses revealed a relationship to water beyond the utilitarian needs of humans. While several participants referenced the utilitarian benefits of water, the majority of participants spoke of a spiritual connection to water and the medicinal or healing properties of water. Others mentioned that water was a “source of strength” and a “universal foundation for all life”. Still others expressed that “water is a spirit, a sacred form”. Following this question, participants were asked to describe the condition of their water. The responses were somewhat surprising, and disturbing since the condition of the local water was reported to be very poor. The responses did not align well with the strong relationship that the same individuals had with water. For example, almost all participants noted the condition of local water in a negative context. Several respondents noted the existing boil water advisories from Health Canada restricting the use of tap water. Others expressed concern over poor maintenance of the water treatment plant. Water shortages were noted, a condition pointing to either drought or poor water delivery service. Contamination of local water from external and internal sources was viewed as a serious problem, inadequate government regulations were also viewed as a factor contributing to poor drinking water quality. Changes to the condition of the community water were also noted in a negative context. Respondents noted quality deterioration, increasing water shortages, excessive chemical treatment (chlorination) and extended boil water advisories.

The cause of these changes over time to the water condition was reported to be lack of water testing and treatment and poor water distribution methods. Others expressed concern over the excessive chemical treatment of the water as well as uncontrolled, over-use of the water. Other contributing factors included farming and use of pesticides and herbicides, flooding and climate change.

One participant noted that water needed protection. As stated by one participant, “water provides for us and there is a need to protect it to ensure its continuity”. Another participant said; “I get my strength from water and I am a water protector.” Most of the participants noted that water has a significant role in Indigenous spirituality. These participants spoke of a spiritual connection to water, such as: “water has a spirit and it connects the living to our ancestors”, “water has a memory, it has a thought and it has a voice”, “water is a senior spirit and we are humble in its presence”. Still others reflected on the empowerment of water by stating, “water gives me strength, water gives me peace, so I respect it”. Some gave expression to the utilitarian aspect of water, “I use water for daily domestic purposes, I relate to water through my field of work, water is my lifeline and a basic necessity”. The majority of the participants indicated that there is a strong relationship between water and life. In the words of one participant, “water means life. Water is the fundamental resource in providing myself, my people, my community with the life-giving resources that ensure our way of life.” Another participant stated, “water means life, it cleanses our hearts, bodies, mind, spirit, and soul. Water is the most important thing next to air, there is no life without water, it keeps me alive.”

Several participants mentioned that there is a strong relationship between water and women, hence women should be involved in making decisions concerning water. In the words of one participant; “the water spirit is a woman and without women, no man or child will be alive. So women have to play a big role in it [water security]. Women are warriors and [they] stand up for what is right. Without women, no one will exist.”

All the participants affirmed that there is a strong relationship between water and Indigenous culture, hence, it is important to incorporate Indigenous values when making decisions about water. Doing so will ensure that Indigenous culture is respected. As stated by one participant: “There are ceremonies that do happen for certain family groups [in our community on water]. It

is not public but more traditional [and] it is not something that is done by the entire community. I would like it to be a community thing.” Another participant noted, “I know that First Nations peoples have a lot of their ceremonies based around water so when the water that they know is contaminated it doesn’t make the ceremonies as effective if the water is contaminated because water is revered by First Nations”. These two participants further explained that some First Nations will put some celebrations on hold if they have any water contaminations reported and the celebration only goes ahead after the contamination problem is resolved. Furthermore, another participant stated that “we as First Nations people are the keepers of the land and keepers of the water and it’s our duty to ensure that these things are not being abused but sometimes too we fail but thus because we are left out of the process. Nobody really actually cares to ask what First Nations people think, want or need in terms of water security for example.” The participant further explained that: “Unfortunately, First Nations are never involved nor consulted in decision-making processes in water management though they have a stronger connection to water. They are only slightly involved when the situation is out of control.

Several participants indicated the importance of preserving natural water systems as a means toward water security. In the words of one participant: “Indigenous knowledge has been here for thousands of years and this knowledge is based on the belief that we were put here to protect the land. [This] has been replaced by this new common knowledge to take the land and resources to generate wealth and this is [due] to greed and corruption.” This participant, when asked, further stated that we should go back to our basics where humans are supposed to protect the environment. Another participant noted; “water security means protecting mother earth, protecting who we are, and protecting what we need to live.” These two participants further explained that if we fail to protect the environment then we are no better than those who pollute it. In a similar thought pattern, one participant states, “we need to protect our life through the water and if we fail to do that then we are no better than the people who are polluting it.” Furthermore, another explained that “we used to have the trappers and the fishers and they had commercial fishing where they used to get lots of fish to sell but we do not have them anymore. Our waters are so low and we are losing our fish and beavers. We have one of the biggest deltas but the animals are moving [away] because the delta is getting too shallow and we are losing our way of life.” This participant further explained that human activities are destroying the natural

environment, and therefore we should reconsider the best ways to preserve it to bring back its natural state.

Several other participants mentioned ethical concerns related to water that they believe have effects on water security. In the words of one participant; “I think we need to consider the ethics of water. I think we don’t make ethical decisions [about water]. SaskPower is negotiating the relicensing of the biggest hydroelectric dam (EB Campbell Dam) and the Village of Cumberland House is not being consulted.” The participant explained that SaskPower has left the First Nation community out of this negotiation because “they do not have a voice”. The participant further noted that we should strive to make ethical decisions during negotiations that will affect water directly or indirectly in our communities. Perhaps most profound was the statement, “If you have water security, then it means you care and respect water.”



Figure 4.2: Indigenous water security

4.3 Indigenous perspectives on the term water security

Participants were given the opportunity to give voice to what the term water security should mean. This provided an opportunity for the participant to talk about anything from Indigenous traditional knowledge that they feel might add to the definition of ‘water security’. It is important to note that the participants were not given any western scientific definition of the term water

security or any established definition from the existing literature. A theme that emerged was that, water has a personality of a woman. Some participants related to water as a life form by explaining that the way we relate to water, for example, by not polluting it and protecting it from various contaminants will either greatly help or hinder our preservation of life. Participants explained that water has a female spirit and therefore women have a stronger connection to water. For this reason, it was expressed that women should be allowed to get involved in making decisions concerning water, in order to preserve its sacredness. Participants also explained that women are better at being stewards of water.

Another theme that emerged was that water can be secured if humans protect it. When asked what Indigenous knowledge and values can be added to the term ‘water security,’ a participant explained that it is important for us humans to go back to protecting the environment from pollution. This participant explained that: “Indigenous beliefs order humans to be custodians and protectors of the land from pollution and if humans fail to do so, then we will lose the purity of the land. Thus, our crops will not grow well, our rivers will lose the fish and our general environment will be lost”. He explained further that: “We will eventually reap whatever we sow in the land, so we will eventually lose everything that the land provides if we continue to pollute it”. In that person’s perspective, water security means learning from our ancestors by looking for alternative ways to reduce the amount of pollution we create through our human activities.

Another participant stated, “Let us learn from our ancestors and look for alternatives to reduce pollution”. Another participant made a link between people’s individual behaviour and the definition of water security by stating: “Those who pollute water are those who are least water secure”. These responses introduce a non-Western perspective on water security that stresses, when done right, water security will eventually preserve the purity of the land.

Other participants stressed the ethics of maintaining respect for water. They explained that when we show respect for water, we will then be able to make ethical decisions in favour of water. One participant stated that having water security means, “you care and respect water”. For this reason, another theme materialized stating that ethical decisions are important in water security.

When asked what the term “water security” ought to mean it was possible to gain an Indigenous perspective into the definition. From the responses, it became clear that from an Indigenous perspective the term had a meaning that went beyond water quality and quantity or the safe

treatment or monitoring of water for human health and sanitation. These additional ‘Indigenous perspectives’ regarding the meaning of water security introduce human values and relationships to water that include respect for water and ethical decisions about water. The responses also identified those who feel that they have water security as well as those who feel they lack water security. It became clear from the participants that those who protect water have the greatest water security. Participants noted that the more a community protects its water the greater will be its water security.

4.4 Participant perception of areas with least and most water security in Canada

Participants were asked if their community had water security. Eight out of the twenty-one stated they have water security. However, the majority stated that they do not have water security, and only one participant was not sure of how secure the community’s drinking water was, due to the continuously changing condition of their water over time. When asked to explain why they felt their community may have little water security, the explanations given were more related to what they feared might happen in the future than to what was currently happening in their community. Some were concerned about future mining operations while others reported that sharing with their neighbours would cause future shortages. Others explained that community members were not using their water sparingly and that this might affect future water availability. Figure 4.3 below shows a graphical summary of whether the participants feel they have water security.

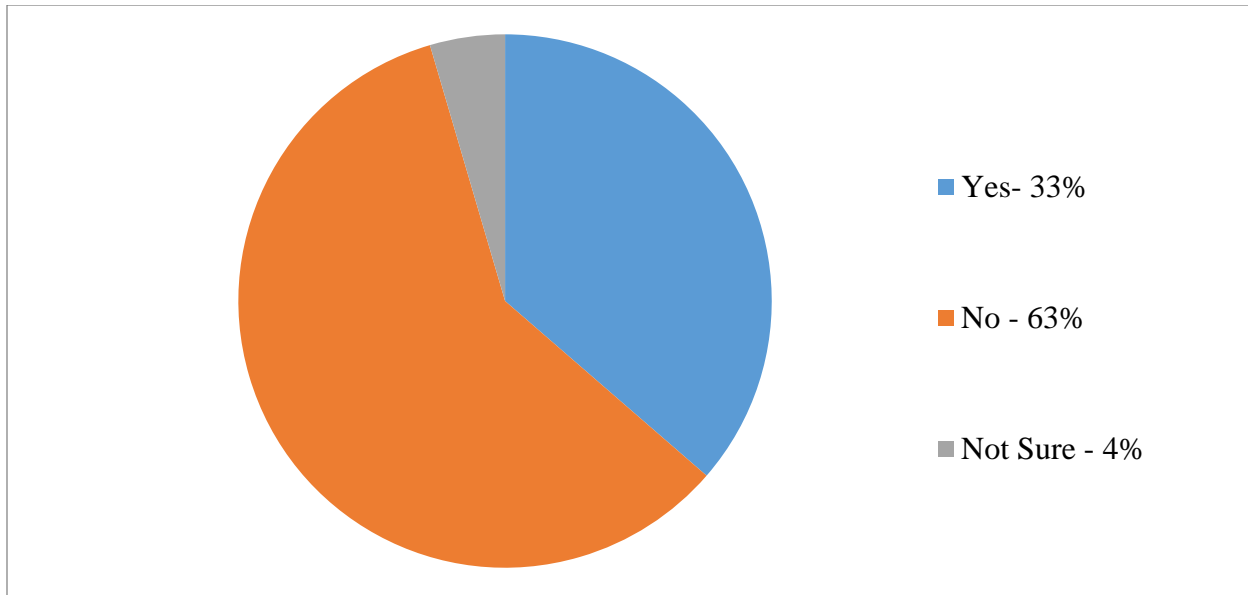


Figure 4.3 Participants reporting they have water security

4.4.1 Areas with least water security in Canada

The majority of participants (17 of 21) stated that Indigenous communities have the least water security. Only one participant mentioned cities, and another participant said towns and villages. Two participants were not sure and none chose agriculture or industries (see Figure 4.4). When asked who has the least water security in Canada, a participant answered, “First Nations, because we are always the last people. They [the water managers and the government] are not concerned about our health and safety whereas they do with the cities. We are not a priority to the government.” In the words of another participant: “there is very little water security in our area because we are just two or three days away from running out of water at any given time. The land is a very poor land. Basically, we are on a land that nobody else wanted.” Other participants also explained that First Nations have the least water security in Canada because they do not have enough funds to fight for their water rights and they have no control over their water security challenges.

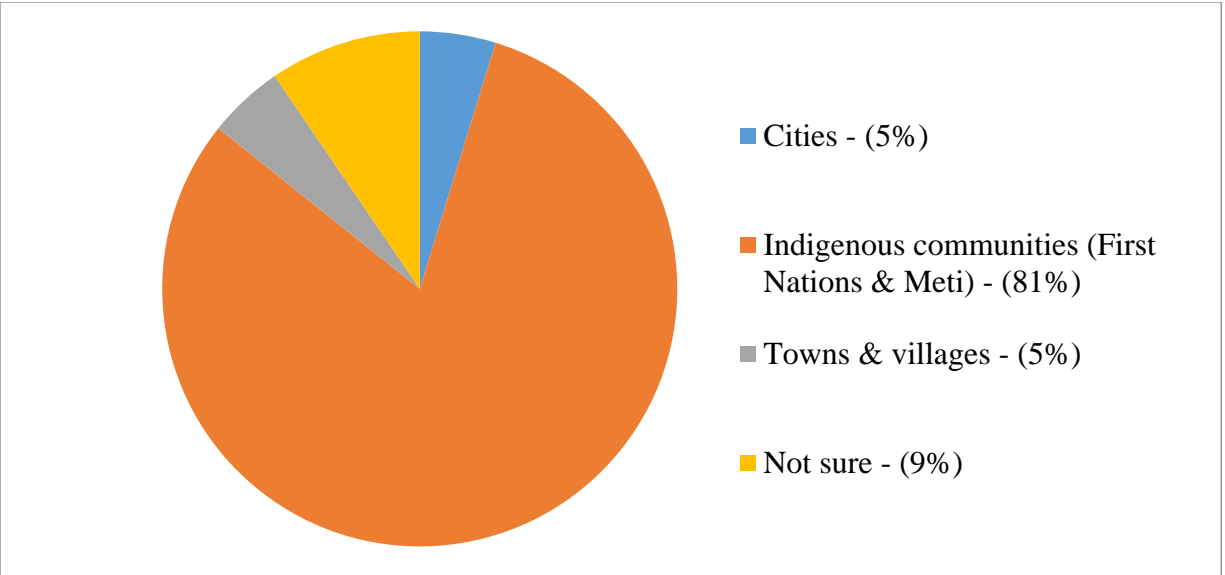


Figure 4.4: Participants reporting areas with least water security in Canada

As shown above, the vast majority of participants agreed that Indigenous communities have the least water security. Two participants noted that cities, as well as towns and villages, have the least water security, reasoning that these are the most polluted areas. No participant reported the industries or agricultural areas as areas with least water security for reason that these areas have the financial, technical, and human capacity to ensure that their water is secure.

4.4.1.1 Human activities affecting Indigenous water security

One of the trends in participant responses was the mention of human activities affecting their water security. In the words of one participant; “There are two dams that have blocked the waterways that used to be here. They [the water ways] are drying up. The fishing and hunting is limited now because they [fishermen and hunters] don’t have that same accessibility to the water [by] boats due to man-made structures that hold back water from [our community].” She further explained that human activities have altered the natural flow and function of the community water. Another participant said, “We are receiving contaminations from communities upstream. The water system was very clean in the past. I grew up drinking water straight from the lake and I was very healthy and never sick. Over the last 20 to 30 years there has been an explosion of development and the consumer waste has increased and that has had a serious effect on the water.”

Another trend noted among participant responses was the mention of agricultural activities affecting their water security. One participant stated that “[There is a] better water treatment facility in the community, though there are potential threats from agricultural activities. Our water used to be clean, but now there are herbicides and pesticides contaminating it”. Another participant stated, “We drank water directly from our river, but it is now contaminated with algae and other chemicals due to farming practices.” These practices he said were threats to their community’s water security.

Also noted among participant response was the mention of population increase on Indigenous lands. As stated by one participant, “my mum will not have water for three days. When Indian Affairs is planning with regard to their major capital they use population projections. However, they only use on-reserve population statistics and so only registered Indians that live on-reserve are actually counted. So they are missing a whole segment of the population. If there’s a projection in terms of water consumption and usage, that play a part in our low water pressure systems failing on reserves.” This participant further explained that there should be policy amendments to involve all occupants’ on-reserves in development plans to prevent unnecessary pressure on on-reserve infrastructures.

4.4.1.2 External factors affecting Indigenous water security

Some participants believed that many of the factors affecting their water security were beyond their influence, such as climate change, government regulations, and pollution. These participants made statements such as: “Recently, because I am becoming more aware of things, I know climate change is happening. I see that these extreme events are happening more and more frequently and of course that changes things that impact water. We used to drink water directly from the lake, but now it has been severely contaminated by external factors.” These participants explained further that climate change is causing extreme weather conditions, which is changing the natural landscapes affecting the state of water.

4.4.2 Areas with high water security in Canada

When asked who has the highest water security in Canada, thirteen participants stated that cities have high water security (see Figure 4.5). Three people believed that the industrial and

agricultural sectors have high water security since they have the finances to ensure they have access to the water they require. In the words of one participant, “Industry has high water security because they have the money.” Only one participant said that Indigenous communities have high water security. This participant stated that “All First Nation communities have high water security because they respect and honour water better than anyone else”. Finally, one participant explained that nobody in Canada has water security because “water contamination is happening everywhere and every day”.

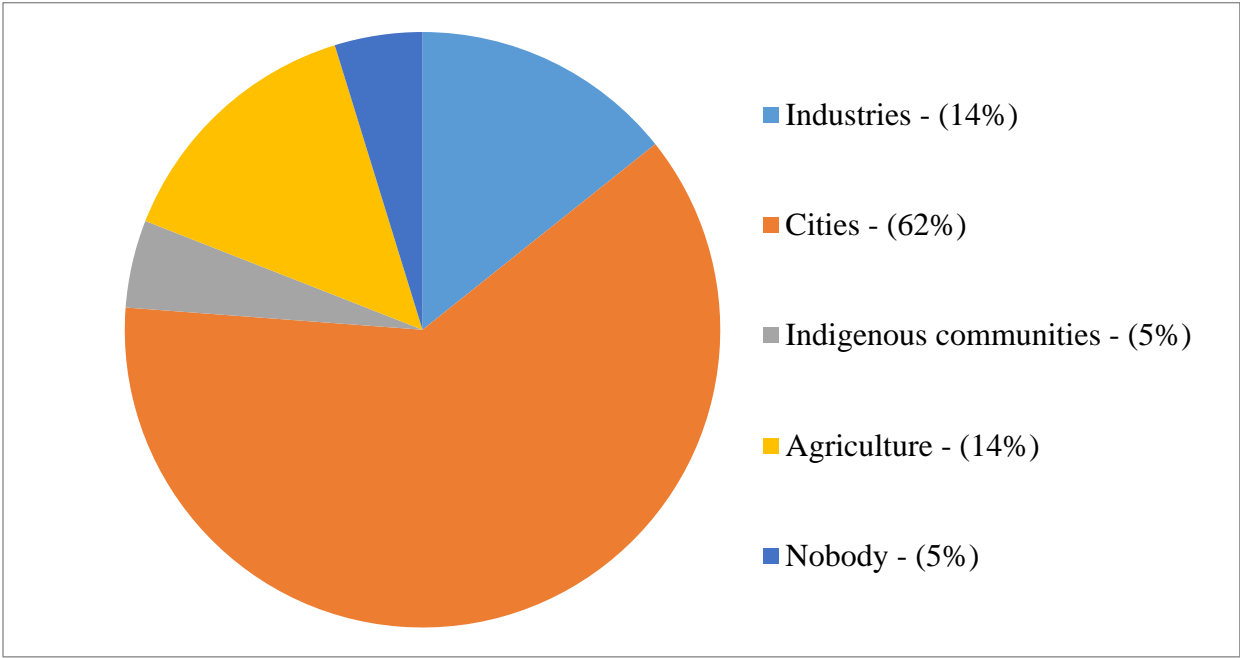


Figure 4.5: Participants reporting areas with greatest water security in Canada

4.5 Causes of Indigenous water insecurity

In summary, the dominant voice from participants noted the following contributing factors with respect to drinking water insecurity. These contributing factors were reported to be originating both on and off reserve:

- lack of water testing ;
- poor quality of drinking water treatment;
- inadequate drinking water distribution;
- excessive and uncontrolled water usage;
- excessive water chemical treatment;

- activities associated with farming ; and
- flooding and climate change.

4.6 The extent of control over water security problems and challenges in Indigenous communities

Participants were asked whether or not they could control the problems and challenges they identified in their community with respect to water security. Although a simple “yes” or “no” answer was expected, all of the participants went into great detail as to why they can or cannot control these challenges.

The participants who responded “yes” to this question explained that they had some control over these challenges because they were able to do frequent community water testing to make sure their water was safe. Others said that they had the human, financial, and technical resources to ensure the security of their water. One participant said that “We have policies set by our lands department that prevents leaking boats onto our river and boats that use gas are not allowed to operate on our river, so our community water is safe.”

Participants who said “no” to the question explained that there are jurisdictional boundaries preventing them from handling contamination issues that are caused by factors that stem from a source outside of their reserve lands. Also, the provincial watershed authorities control most matters concerning water. The First Nation communities have little jurisdiction to protect their water.

Participants who said “yes and no” to the question explained that they are only able to control some water problems when allowed by the provincial government. However, they are able to handle some immediate community water issues without needing governmental approvals (see Figure 4.6).

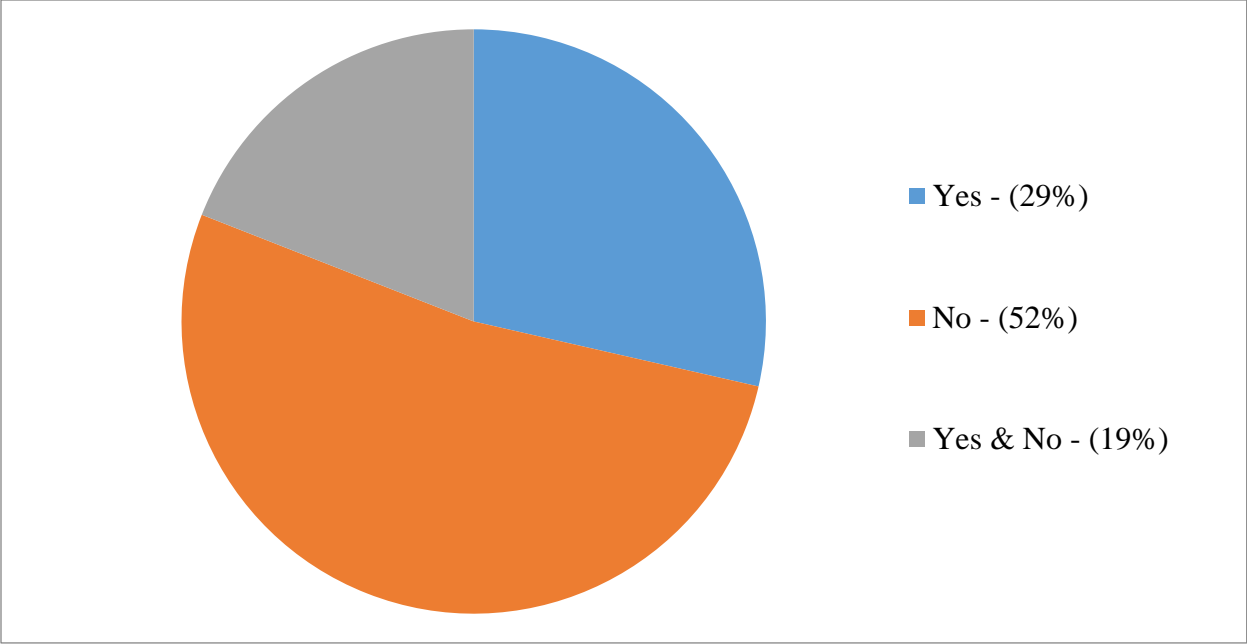


Figure 4.6: Participant perception of their control over water security challenges

When participants were asked whether they have control over the challenges to water security that were identified, eleven said no, six said yes and four were not sure. Those who said no explained that these challenges were beyond their control since all water issues are handled by the government. Others also explained that some of their community water problems (especially flooding issues) are caused by changes in climate and this is beyond their control. Those that did say “yes” were either individuals that had water quality testing kits at home or are treatment plant operators with some direct control over water quality based on their field of work. Figure 4.6 indicates that over half of the participants believed that they had no control over their water security challenges and problems. This implied that there is a sense of helplessness in their current situation.

5 DISCUSSION

5.1 Introduction

This chapter provides an analysis of the results of the data presented in the previous chapter in light of current literature and according to the themes that emerged. More specifically, the section will include sub-sections on each of the themes along with a discussion of participant perceptions that will be linked to the broader literature. A discussion will follow to describe Indigenous perspectives on water security based on participant response. Next will be a description of how Indigenous knowledge contributes and enriches the water security discourse.

Greater recognition of the water quality problem in Indigenous communities has become a focus of the water resources literature in Canada (Walter, 2012; Cook & Bakker, 2016; Patrick et al., 2017).

5.2 Interpretation of the term ‘water security’

The participants in this research were asked if they have heard of the term ‘water security’ and only four out of the twenty-one participants said that they had not heard of it. However, all the participants who confirmed being aware of the term heard it either in school, their field of work, conferences or from water management officials. This finding supports the conclusion that participants are well aware of the term water security and this is as a result of interactions other than their usual Indigenous environments. As stated in the results section, the participants explained the meaning of the term water security in relation to a) safety; b) Healthy sanitation (solid waste management); c) monitoring; and d) preservation of cultural identity. The background and work experience of the participant certainly impacted individual perspectives on the definition of water security.

5.2.1 Water security as safety

Those who explained the meaning of water security in terms of safety insisted that protecting water from all forms of contamination is necessary in order to provide a healthy flora and fauna. This aligns with the definition put forward by Finlayson & Horwitz (2015) and Zeitoun et al.

(2017), who recognized that water security exists when humans and ecosystems are free from sources of harm to water.

This group of participants had two main safety concerns. The first was the use of chemicals in the treatment of their drinking water. They explained that their water goes through a filtering system from the community's well which is highly treated with strong chemicals and distributed to their homes. This they explained may be dangerous to their health. One elder resorted to digging a well close to his house, using it as an alternative source of drinking water. He explained that the tap water connected to his home is used for other domestic purposes because he still tastes chemicals in the water and is concerned about his health. Though the elder could not mention all the chemicals he tasted in the tap water, he was certain about the use of chlorine. This is mirrored by the results of others researching the health hazards of chlorination by-products whose studies showed an increased risk of bladder and possibly colon cancer in people who drank chlorinated water for 35 years or more (Mills et al., 1998; Cantor et al., 1998; Levallois et al., 2012; Cheung, 2017; Parvez & Sundararajan, 2017). Also, Health Canada (2006) reported that several studies on humans found a link between long-term exposure to high levels of chlorination by-products and a higher risk of cancer. These studies confirm the legitimacy of the concerns raised by participants in this study regarding the safety of water from treatment plants. This signifies the fact that some Indigenous people from this group of participants are resorting to alternative sources of drinking water rather than using water provided through treatment plants due to their health concerns.

The second safety concern raised was about contamination from neighbouring farms. The participants said that the farmers use different types of fertilizers and other chemicals on their farm lands and risk contaminating their source water, especially during the spring season. They explained that their communities do not undertake frequent testing to ensure safety of their water and this is a concern to them because their individual testing kits have proven the presence of contaminants. A study by Corkal et al., (2011) explains that surface and groundwater sources are at risk of contamination from agricultural practices. The participants said they have reported this to the federal and provincial agencies but due to communication barrier between the community members and the water agencies, it is difficult to know what action is being taken.

5.2.2 Water security as healthy sanitation (solid waste management)

Some participants explained the meaning of water security in terms garbage disposal sanitation. Participants explained that they have had several boil water advisories and water contamination issues for an extensive period of time and therefore satisfactory sanitation, both around their water bodies and in their community, would be necessary to achieve water security. Some were still dealing with sanitation problems due to unauthorized dumping of household and commercial garbage in and around their communities during the time of the interviews.

O’Gorman & Penner (2018) established a significant association between water, sanitation, and health when it comes to illnesses related to water contamination. These authors explain that more health conditions or stomach problems of Indigenous people are likely to be reported over a period of time when the sanitation around their water bodies is in a deplorable state and they revealed that Indigenous communities recorded higher than average numbers in water-related illnesses in Canada. Sanitary drinking water is explicitly recognized by the United Nations General Assembly as a human right that is essential for the full enjoyment of life and all other rights (UN General Assembly, 2010) and it entitles everyone without discrimination to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use (Scanlon & Nemes, 2004; Cahill, 2005; McCaffrey & Neville, 2008; Boyd, 2011). For example, the right to health can only be guaranteed when people’s right to safe water is satisfied. The research findings revealed that the Indigenous communities’ water is being threatened as a result of unauthorized dumping and deplorable solid waste disposal conditions within and around them. This is a violation of human rights based on the studies done by these authors. However, Canada seems to be bluntly ignoring this fact.

5.2.3 Water security as monitoring

Participants from northern Saskatchewan explained their understanding of the term water security as continuously monitoring the quality of water. During the interview participants raised concerns about how poorly their community water has been managed over the years. A dam was built over their river yet they are unable to hunt or fish ever since it was completed because all the animals have either left the region or have gone extinct due to the change in the natural course of their community river. The findings aligns with a study done by Nguyen et al.,(2017)

which revealed that dams do have substantial impacts on the natural environment. This group of researchers in their study discovered that after the building of the Binh Dien Hydroelectric dam on the Huu Trach River in Vietnam, the villagers experienced a substantial reduction of land for crop production due to flooding. Eventually, only 25% of the villagers were able to fish and the harvesting of common pool resource such as honey and rattan from the forest was highly reduced (Nguyen et al., 2017).

Another participant explained that there are many boil water advisories in place at almost all of the Indigenous communities around the northern part of Saskatchewan due to the man-made dams and yet there are no emergency plans in place in case there is a shortage of drinking water, which happens very often. Participants further recommended that there should be some form of stakeholder stewardship and that effective communication among all stakeholders is necessary in order to be successful at monitoring the quality of water and to prevent contaminations.

However, it is important to note that limited media coverage could undermine public and stakeholder interest in addressing water-related issues faced by many Canadian Indigenous communities (Lam et al., 2017). The participant's main concern was that the Saskatchewan Water Security Agency has failed to consult the community members on water issues, even though every decision they make directly affects them. One of the participants, an elder, explained that most decisions are made for them and that they only find out about it during its implementation or when the project is well advanced. He said that there has always been a gap in communication between the stakeholders, which has contributed to their persistent water problems. Effective communication among stakeholders in water management is important because stakeholder dialogue allows room to discover what beneficiaries can or cannot achieve (Bendell, 2017). He further states that "nobody really believes in aboriginals and our complaints are only taken seriously when there is an emergency." This elder was convinced that there would be no problem monitoring the quality of their drinking water if there were effective communication among all stakeholders (especially between the provincial government and the Water Security Agency).

Cronmiller & Noble (2018) explained that long-term, regional environmental monitoring that is joined with a shorter-term, more localized monitoring, when carried out under the right regulations, is foundational to understanding and effectively managing cumulative environmental

effects, including factors that influence water security. They further explain that it is very common to see shifted priorities and competing mandates on projects due to lack of transparency, credibility, and lack of commitment by the agencies involved, which has led to a lot of uncertainties about the stability of institutions to support long-term environmental monitoring.

Numerous studies have shown that data obtained from long-term monitoring is often fragmented or insufficient in many regions in Canada, such that its usefulness in guiding decisions about cumulative environmental effects is compromised, which makes it unreliable (Federal, Provincial, and Territorial Governments of Canada, 2010; Vörösmarty et al., 2010; World Wildlife Fund Canada, 2017). Institutional arrangements to support project monitoring are important, since its absence leads to failure to effectively protect the general environment (Irvine et al., 2015; Cronmiller & Noble, 2018). Effective dialogue among Indigenous communities and stakeholders would greatly help because it will build trust and clear the way for successful project monitoring. Also, involving Indigenous people will help steer the decision-making process towards the protection of lands and all environmental resources that will help to reduce the water contamination issues.

Wilson et al., (2018) recommend that focusing on a community-based monitoring program that protects the waters and lands within Indigenous communities will help to generate reliable data that is useful for decision-making and governance, which is rooted in an understanding of stewardship and responsibility. The community-based monitoring programs focus on Indigenous people's role as "knowledge holders" but does not limit them to just gathering data. However, it is a means of asserting sovereignty through the practice of stewardship and by gathering data that inform internal and external planning and decision-making (Wilson et al., 2018). Their research findings suggested that data quality and credibility, trust, legitimacy, and relevance to decision contexts are key to linking community-based monitoring data to decision-making. They recommended that Indigenous governments must take a leading role in community-based monitoring programs, they can build various networks between Indigenous governments by using bridging organizations; and community-based monitoring programs should be closely joined with Indigenous environmental governance strategies. This research indicates that involving Indigenous communities in monitoring their water quality will help resolve the

persistent problems and help to restore water security. Data collected during the interviews revealed that participants are well aware of the fact that stakeholder stewardship and effective communication is important to effectively solve their water woes. This awareness might mean that this group of participants are willing to take over leading roles in community-based monitoring programs if they are given the opportunity to do so.

5.2.4 Water security as cultural identity

Many participants described the meaning of water security as preserving their cultural identity. These participants were mostly at the central part of Saskatchewan and to this group, water security meant securing water for their future generations and preserving their identity. They explained that some community cultural ceremonies are put on hold whenever there is boil water advisory in place. Cultural identity is the feeling of belonging to a group and having strong cultural identity is important to mental health and wellbeing (Vietze et al., 2018). An individual with a strong sense of their history and traditions will build a positive cultural identity for themselves. This will provide a sense of belonging and self-esteem, which supports personal wellbeing (Vietze et al., 2018). To this group of participants, preserving water for future generations means preserving cultural ceremonies that provide-a sense of community and cultural belonging.

There have been several developmental theories that have stressed the importance of context for identity development (Erikson, 1968; Phinney, 1989; Syed & McLean, 2018). The influence of main settings for shaping competence and personality among the family, childcare arrangements, schools and peer groups have been emphasized by Bronfenbrenner and Morris (2006). Within these aforementioned settings, close relationships are important for identity development (Galliher & Kerpelman, 2012). If water security means preserving cultural identity to Indigenous communities but these communities have the highest recorded water contamination problems in Saskatchewan and in Canada as a whole, then it is important to find plausible ways to reduce water-contamination. To this group of Indigenous people, showing respect for water teaches their younger ones to show respect for Elders and also to their neighbours.

5.3 Indigenous perspectives on the term water security

Indigenous perspectives can influence how one relates to water and it is important to recognize and accept these differences (Bartlett et al., 2012; Stefanelli et al., 2017). As stated in the results section, the themes that emerge based on participant perspectives on the term water security were a) water has a personality of a woman; b) water can be secure if humans protect it, and c) ethical decisions are important in water security. These perspectives imply that this group of participants see water security in a different light as compared to what is found in mainstream, Western-science literature. Hurlbert & Gupta (2015) confirms that the Government of Canada and other water agencies continue to approach water problems with limited participation from Indigenous people. These authors explain that the involvement of all stakeholders allows for a better chance of improving environmental conditions. It is argued here that inclusion of ‘rights holders’, First Nations, is also critical to improving the water problem in many First Nations communities. They also expounded that this will build trust and confidence in the social structure within which people interact (Hurlbert & Gupta, 2015). Therefore, inculcating these identified perspectives during decision-making processes will help improve the often deplorable water conditions among Indigenous communities in Canada.

5.4 Participant perception of areas with least and high water security in Canada

Data collected during the interviews revealed that Indigenous communities have the least water security in Canada. Research done by Sarkar et al., (2015) showed that communities with least water security have the tendency to be more prone to mental stress and multiple serious health outcomes. The results from the interviews confirm that the Indigenous communities represented by these participants are more at risk to health issues.

5.4.1 Construction of man-made dams

The interviews revealed that the participants in the northern part of Saskatchewan are negatively impacted by the construction of the E.B. Campbell Dam. The interviews revealed that the dam has caused very low levels of water at the surrounding communities and this has greatly affected their livelihood. Constructing a dam is usually associated with financial, ecological and social costs, but few careful assessments have been made of the full range of the impact of their

construction, which tends to create adverse environmental and social problems (Fahim, 2015). Frederiksen & Mundial (1992) reported that it is essential to involve all water users when creating development plans and that it is better to concentrate on stakeholder involvement and to create awareness in order to maximize feedback by engaging the public before, during, and after implementing any plans. The participants reported that they were not properly involved when these dams were being constructed and that SaskPower has failed to involve them even after its construction, even though it has drastically altered their water levels causing most of their areas to be uninhabitable. Dams are beneficial in a lot of ways but sometimes the problems are not realized until after their construction and they may involve adverse effects on both the environment and on human health (Fahim, 2015). Diversions of source water by dams can severely alter the water and land with disastrous impacts. Building dams and diverting rivers and streams can also significantly reduce the flow and therefore the renewal rate of these bodies of water, radically altering their biological and chemical properties. The artificial Toban Lake was created by the E.B. Campbell Dam and while it has contributed to power generation, the City of Nipawin and the resort fishery it has not helped the downstream community of Cumberland House.

Miller & Spoolman (2009) point to the example of the Aral Sea that has shrunk in size and increased in salinity to the point that it is not usable by local inhabitants due to over fifty years of diverting lake water to irrigate cotton crops. The surrounding area is bleached with salt and uninhabitable, and the salty sediment that is kicked up by the wind has caused health problems for local inhabitants. There is a moderately successful effort to restore the Northern Basin, but 26 of the 32 native fish species have already gone extinct and therefore any recovery efforts will likely not return the lake to its former state (Miller & Spoolman, 2009). Concerns raised by the participants in this study are similar to those found in the work of Fahim (2015) and Miller & Spoolman (2009), since they were facing similar problems.

During the interview the participants expressed their dissatisfaction with how issues have been handled since the construction of the dam. A woman who has lived in the community for over twenty years said, “The water security agency and SaskPower have not spoken to our community about water security.” She said that she believes their failure to communicate is one of the major problems in resolving their water issues. She said, “How can I be an informed stakeholder if I

don't know what I am supposed to do? We continue to abuse our water because we don't know anything." In risk perception, building trust in institutions is an important determinant and has been shown to influence the acceptability of potential hazards and the regulators' decisions (Pidgeon et al., 2003; Cave et al., 2013). I believe the participants will be more prepared and less stressed if those managing the dams are upfront with them concerning information about the operation of the dam and its impact on the communities around it. The interviews revealed that the dam has driven away all the animals in the area, which has affected the livelihood of some people in this group of participants. Most of these people near the dam are hunters and with no game to hunt their lifestyle has been highly affected.

5.4.2 Infrastructure to support population growth

Population increase is affecting Indigenous water security. However, the legislation that determined who could be registered as a "Status Indian" was gender-biased against women who married non-Status men until the mid-1980s (Furi & Wherrett, 2003; Brownlie, 2006; The Government of Canada, 2011; Hurley & Simeone, 2014). Also in 1951, a centralized Indian Register was established to consolidate all existing band membership data into a single list and everyone who was classified as a Status First Nations was documented irrespective of where they live and whether they are institutionalized or not (Indigenous and Northern Affairs Canada, 2010). Also, First Nations (bands) must submit death certificates and report on individuals' decision to leave the country or move from a reserve as part of their funding requirements.

Development plans and funding to support Indigenous communities' infrastructures are solely based on those registered in the centralized Indian Register. However, if on Indigenous land or reserves there are other occupants who are not Indigenous, they are excluded from these plans. This means that funds and resources provided for these communities sometimes do not support the correct population size, which tends to put pressure on the few that are provided for them. One of the participants explained that their community's population size has doubled since the implementation of low-pressure pipe systems that were meant to distribute water to their homes. All their community wells were decommissioned, leaving them with no alternatives while the low-pressure systems have not been working as intended due in part to the population increase. They have reported the issue to INAC on several occasions, but the problem still persists. Canadian law dictates the timing, financing and design of all community infrastructures in

Indigenous communities. This research shows that future projections should take into account population growth in order to avoid pressure on existing infrastructure. Any substantial revisions of the Indian Act in the future should take this into account.

5.5 The extent of control over water security problems and challenges in Indigenous communities

Data collected during the interviews validates the statements of Boyd (2011), The Expert Panel (2009), and Chambers (2018) that, despite the positive steps being taken to handle Indigenous water problems, the federal government has failed to provide enough funding to Indigenous communities, especially those of First Nations, to ensure that their water systems' quality and quantity are comparable to that of non-Indigenous communities. Though some participants mentioned that their water conditions have greatly improved over the years, there are still problems with the maintenance of their treatment plants due to delayed or unavailable funding from the federal government. They believed that this is the reason for the recurring boil water advisories.

Treatment plants in Indigenous communities and both their maintenance and general upkeep are fully funded by the government. However, if there are delays and cuts in annual funding due to issues beyond the control of the Indigenous communities, it affects them and eventually has negative effects on their water.

Chambers (2018) research confirms that although the Walkerton Inquiry in 2000 exposed longstanding systemic problems with the provision of safe drinking water that required a review of provincial regulations, the protocols have failed, since the First Nations community still faces the same water problem after seventeen years due to the federal government's frequent intrusion as 'colonial masters' and its failure to live up to its constitutional responsibilities. This research found that the management of water facilities on Indigenous lands occupied by the participants of this study are solely based on available funds from the federal government and this could be playing a major role in the delays of their maintenance, which is frequently required.

Several changes in their community's drinking water were observed by participants for over ten (10) years. For some of the participants there had been a little improvement in their water condition over the years but for others, the condition of their drinking water has worsened and

there are now more frequent boil-water advisories. In his recent study Chambers (2018) revealed that the water problems of the First Nations community are unresolved after seventeen years and he argued that this is likely caused by “colonialism, racism, and a fundamental failure of the federal government to live up to its constitutional responsibilities”. This might be true but the government has failed to solve the water problem from a different angle that actually includes Indigenous perspectives. It is essential to involve all water users when developing plans and it is better to focus on involving all stakeholders (Frederiksen & Mundial, 1992). As mentioned above, the participants strongly believe that if their water is treated consistently and effectively their drinking water could be better, but the main problem is that they do not have control over all issues concerning their water due to strict governmental regulations.

The interviews support the conclusion that Indigenous communities should be allowed greater control over their drinking water, including monitoring, testing, and setting operational standards. This approach would be a giant step toward water security for many Indigenous communities. The present situation of state (INAC) control over funding and water infrastructure has largely removed community members from any decision-making authority. Rather than building local water security, many First Nations continue to endure “water insecurity” as a result of colonial dependency.

The results also present two divergent perspectives. On the one hand, an Indigenous perspective holds that water security includes a strong spiritual relationship to the life-giving and medicinal powers of water. This perspective represents a ‘way of knowing’ water that is specific to traditional knowledge suggesting that Indigenous people hold an intimate connect to water security. And yet, on the other hand, most respondents felt that Indigenous people had the least water security when measured against other actors and sectors in society. While most respondents believed that to have water security required a deeper, more spiritual connection to land and water they also believed that First Nation’s water was under a high degree of stress from over-exploitation and contamination. These two divergent perspectives serve to illustrate the power of ‘two-eyed seeing’. Bartlett et al., 2012 explained that there are valuable outcomes to any given situation if one is prepared to bring two or more perspectives into play. Those who are familiar with two different knowledge systems can combine the two various ways of knowing to meet a challenge or resolve a problem at hand (Bartlett et al., 2012). Interviewees

expressed the strengths of Indigenous knowledge and ways of knowing water as well as the strengths of western knowledge and ways of knowing water (Bartlett et al., 2012; Arsenault et al., 2018).

6 CONCLUSION

This chapter concludes this thesis by discussing the significance of the research as well as the contribution made to the water security discourse. In addition, limitations of the research are provided as well as recommendations for future research.

6.1 Research significance

This research first identified the different interpretations of the term water security based on a review of the academic literature. From that review, it was determined that little research was available on the subject of an ‘Indigenous water security’. Using the participant interview method, it was possible to gain a perspective, albeit a limited sample size from a specific region in Canada, on the meaning of water security from Indigenous peoples. Based on the interview responses, the term water security holds much meaning that goes well beyond the more common interpretations from a western-science perspective of water quality and water quantity. It became readily apparent during the interviews that two divergent perspectives on the term water security would evolve. These two perspectives represent both a utilitarian, western-science perspective and an Indigenous perspective linked to customary tradition. This “two-eyed” seeing approach opened new ways of negotiating water security and a widening of the water security discourse into new and liberating interpretations (Arsenault et al., 2018).

The first perspective is from western science. This utilitarian interpretation was initially offered among all the participants and linked to either water quality or quantity or both. The responses provided the meaning of water security to include access to safe, reliable and abundant water including the ability to monitor water conditions. This definition matched closely to that of the convention of western-science. However, this definition was expanded by many participants to include the protection of water from contaminants as well as linking water security to food production, health care, and sanitation.

The second perspective on water security was from traditional knowledge. Participants consistently described their relationship with water that included the medicinal or healing powers of water. Participants described water as a life form, a source of spiritual strength, and a center-piece for Indigenous culture. As a result of this close relationship, Indigenous people as ‘keepers

of the water' should be consulted and involved in water management decision-making. In particular, it was stated by the participants that Indigenous women must be involved in water management and planning. The perspective of women in particular as water keepers is consistent with Chiefs of Ontario (Lavalley, 2006). This perspective opened new interpretations of the term water security to include stewardship and care for water as a means of showing respect for ancestors, women, and "mother earth". These two divergent perspectives, western-science and Indigenous, open new imaginaries of water security that include the spirit world, medicinal power, cultural connectivity, and stewardship – all aspects not found in 'western science' teachings of water security.

6.2 Contributions

The literature on water security cautions against generalizing the definition of the term 'water security' due to the varying context of disciplines within which it is used (Grey & Sadoff, 2007; Horwitz & Finlayson, 2011; Zeitoun et al., 2011; de Loë et al., 2007). Water security is examined through the use of various approaches based on the scale at which it is viewed and the discipline under which it is assessed. This research supports this by showing that many Indigenous people perceive the term 'water security' from two worldviews. This research has contributed to the understanding that water security is a relational term, meaning different things to different people, with multiple meaning to some people. Understanding the potential role of Indigenous perspectives in water security will serve to enhance the water security discourse, allowing for inclusion of different perspectives of Indigenous people and an extension of the 'relational' application now present in the current literature.

The results of this research reveal the willingness of Indigenous people to help monitor their community water and therefore federal and provincial water agencies should consider increased financing and capacity building for water monitoring in Indigenous communities for this purpose.

6.3 Limitations and future research

The interviews conducted for this research were focused on a small sample size of Indigenous people. This limited the potential number of possible participants who could contribute their

perceptions on defining the term ‘water security.’ Expanding the sample size to include more individuals with varied backgrounds could yield even broader insights into the water security perspectives held by Indigenous people. The literature cited in this research strongly suggests that water security issues are political and steered by jurisdictions of control between various levels of government. However, this research failed to interview chiefs or band councillors in the communities to gain a political, jurisdictional perspective. Furthermore, there are opportunities for expanded research on the gendering of water security, more specifically on the role women play in Indigenous water security.

6.4 Knowledge mobilisation

This Master’s thesis will be sent to all participants through a URL link. All participants will also receive a pamphlet that states the results of this research. The research will be presented at Indigenous community conferences, Indigenous water forums, and academic conferences. Peer reviewed journal publications will serve to communicate the results of this research to the academic community.

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Figure 3.1 REFERENCE

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APPENDIX

Questions for key informants

1. What does water mean to you?
2. What is your relationship or connection to water?
3. How would you describe the condition, or situation, of water in your community?
4. In your opinion, has the condition of water in your community changed over your life time? In what way(s) has it changed?
5. What do you feel has caused changes to your water?
6. Are these changes something you or your community can control? Why? Why not?
7. Have you heard of the term 'water security'?
8. If yes, where did you first hear this term? From whom?
9. What do you think the term 'water security' means?
10. What do you think the term water security should mean?
11. Do you feel you have water security?
12. Do you feel your community has water security?
13. Who do you feel has the most water security in Canada? Industry? Cities? First Nations? Agriculture? The Environment?
14. Who has the least water security in Canada? Industry? Cities? First Nations? Agriculture? The environment?
15. Is there anything from Indigenous traditional knowledge that you feel might add to the definition of water security? What needs to be considered?
16. Who else should I be interviewing?