

**CUMULATIVE EFFECTS INFORMATION AND ENVIRONMENTAL ASSESSMENT
DECISION-MAKING IN THE MACKENZIE VALLEY, NORTHWEST TERRITORIES**

by

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Abstract

The purpose of this research was to investigate environmental assessment processes and how information about cumulative effects is used in decision-making about resource development activities in the Mackenzie Valley, Northwest Territories. In the context of expanding resource development, an understanding of cumulative impacts, which result from the combination of environmental stressors, is of increasing importance for freshwater resource management and decision-making. Cumulative effects assessment is supported by literature as a way of improving and progressing the environmental assessment process for resource development projects; it evaluates environmental impacts in combination with other past, present, and foreseeable impacts. Cumulative effects assessment is important to fully understand and to anticipate the consequences of resource development, but since it requires multiple types of information and multiple scales of analysis it is difficult to integrate into project-based environmental assessments. In the Mackenzie Valley, monitoring cumulative impacts is part of environmental assessment legislation as well as comprehensive land claim agreements; however, it is unclear how information about cumulative impacts is being used by environmental assessment decision-makers.

This research included a document review of past environmental assessment reports and semi-structured interviews with representatives from organizations involved in environmental assessment. The objectives were to explore how cumulative effects information about freshwater is being used to guide decisions about resource development, identify the information organizations use and the information needed, and the key challenges for decision-making about cumulative effects. The results of this research highlight a weak connection between cumulative effects information and environmental assessment decision-making in the Mackenzie Valley and

provide insight into how to better facilitate the use of cumulative effects information. The results align with and support existing cumulative effects and environmental assessment literature fields, but also illustrate key issues in the unique regulatory setting of the Mackenzie Valley.

Lay Summary

The purpose of this research was to investigate environmental assessment processes in the Mackenzie Valley, Northwest Territories and how information about cumulative effects is used to guide decision-making about resource development activities. Environmental assessment is the process by which resource development activities, such as mines, are regulated and approved. Cumulative effects result from the combination of impacts on the environment over space and time. When making decisions about resource development activities it is important to consider cumulative effects. This research explored how information about cumulative effects is used by decision-makers and other organizations during environmental assessment, what information is available and what information is needed for decision-making, the key challenges, and the potential opportunities to improve decision-making. The results of this research highlight key issues for cumulative effects and environmental assessment in the Mackenzie Valley and support the existing literature field.

Preface

This research was made possible due to a collaboration between the Government of Northwest Territories Cumulative Impact Monitoring Program (CIMP), the University of Saskatchewan, and the Centre for Environmental Assessment Research at the University of British Columbia (UBC) Okanagan. The overarching research objectives were developed by Dr. Bram Noble and Dr. Kevin Hanna in response to a request from CIMP to develop a project to explore cumulative effects assessment for freshwater resources in the Mackenzie Valley. The decision was made to develop two complementary projects completed by two graduate students, one based at the University of Saskatchewan and one at UBC.

Lindsay Wong, a graduate student at the University of Saskatchewan, conducted a project focused on understanding the data characteristics that support cumulative effects assessments. I conducted this project focused on exploring environmental assessment and cumulative impact decision-making. CIMP was involved throughout the project design and provided input on early objectives, focuses, and approaches, as well as the interview framework. Lindsay and I worked together to coordinate interviews with key representatives where necessary, and to develop complementary research designs. This research and this thesis was completed independently, with guidance from my committee and supervisors, Dr. Kevin Hanna, Dr. Jon Corbett, and Dr. Bram Noble.

The research was conducted between October 2016 and July 2017. Preliminary results were presented in a poster at the Yellowknife Geosciences Forum in November 2017. This research project was discussed with the UBC Ethics Board and was exempt from behavioural ethics review due to the content of the interview questions and focus of the research.

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List of Abbreviations

CEA	Cumulative Effects Assessment
CIMP	Cumulative Impact Monitoring Program
EA	Environmental Assessment
EIR	Environmental Impact Review
GNWT	Government of Northwest Territories
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board
MVRMA	Mackenzie Valley Resource Management Act
NWT	Northwest Territories
VC	Valued Component
VEC	Valued Ecosystem Component

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This research would not have been possible without the guidance of my professors and many individuals in the Northwest Territories (NWT) and the encouragement of my friends and family. The advice and support of my supervisor, Dr. Kevin Hanna, throughout my research and also throughout my program and professional experiences was integral for my success. My co-supervisor, Dr. Jon Corbett, was an important source of encouragement and insightful feedback, which helped to shape my research. I also owe special thanks to Dr. Bram Noble for connecting me with this project and for providing valuable guidance as a member of my committee.

Immense gratitude is also owed to Lorraine Brekke and the NWT Cumulative Impact Monitoring Program (CIMP). Without Lorraine this research would not have taken place, and I am so grateful for her input throughout the project and for her hospitality during my field work. Thank you as well to Lindsay Wong for her excellent research and her company during Yellowknife trips. I am also grateful for the financial support I have received from the Social Sciences and Humanities Research Council, NWT CIMP, and the Northern Scientific Training Program.

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Dedication

To my first teachers, Cathy and Jim Arnold

Chapter 1: Introduction

Resource development is advancing at a rapid pace in the Northwest Territories (NWT), and an understanding of the environmental impacts of development activities is vital for informed decision-making. Environmental Assessment (EA) is a process of collecting and interpreting information to predict, mitigate, and manage the potential impacts of resource development projects (Hanna, 2016). It ideally contributes to sustainable environmental management and land-use planning (Hanna, 2016). While EA is widely practiced and well established in Canada, it has been criticized for being limited in scope (Ball et al., 2013b; Harriman & Noble, 2008). An EA is initiated in response to a proposed resource development project that is likely to have significant environmental impacts; however, the impacts of a development project do not occur in isolation and may be additive and synergistic over time with impacts from other projects and natural conditions (Hegmann & Yarranton, 2011). The effectiveness of EA in broader environmental management has been questioned due to its project specific focus and detachment from other spatial and temporal impacts (Harriman & Noble, 2008; Hegmann & Yarranton, 2011).

Cumulative Effects Assessment (CEA) is intended to address these issues and improve EA processes; it evaluates the environmental impacts of development activities in combination with other past, present, and foreseeable activities or stressors (Canadian Environmental Assessment Agency, 1999). Given the interconnected nature of freshwater resources and the increasing complexity of the impacts of development activities on freshwater, an understanding of cumulative effects at the watershed level is important (Ball et al., 2013b). However, the integration of cumulative effects information within project-based EA has proved to be challenging (Ball et al., 2013b; Harriman & Noble, 2008). CEA requires analysis of multiple

types of information compiled at a range of spatial and temporal scales, and is widely regarded to be better suited to regional landscape or watershed scales of analysis (Harriman Gunn & Noble, 2009; Hegmann & Yarranton, 2011; Noble, 2010). Information about cumulative effects may be more effectively gathered and analyzed at a broader scale, but informed decisions about the resource development activities evaluated through EA processes require the consideration of the cumulative effects (Hegmann & Yarranton, 2011; Noble, 2015).

This research was focused on the EA process and CEA in the Mackenzie Valley, NWT. The Mackenzie Valley refers to the resource management area which is governed by the Mackenzie Valley Resource Management Act (MVRMA) and excludes the northern Inuvialuit Settlement Area in NWT, which is governed by the federal Canadian Environmental Assessment Act. The geographic jurisdiction of the MVRMA is shown in Figure 1. Monitoring cumulative impacts is a requirement of MVRMA (1998, 146) as well as First Nation land claim and self-government agreements; however, it is unclear whether information about cumulative effects is being used to inform EA decisions. A recent NWT Environmental Audit (2015) has highlighted this weakness and the need to provide meaningful information to decision-makers. Increasing development pressures in NWT and the integrated nature of water resources have made impacts to water quality a priority area for cumulative effects study, monitoring, and management (CIMP, 2015). This project is conducted in collaboration with the Government of NWT (GNWT) and involves a close partnership with the Cumulative Impact Monitoring Program (CIMP), which was created in response to land claim obligations to monitor cumulative impacts in NWT.

The purpose of this research was to investigate environmental assessment decision-making in the Mackenzie Valley, NWT and the extent to which information about cumulative

effects to freshwater is used to guide decisions about resource development activities. The research objectives were to explore how cumulative effects are considered during EA, identify the information currently used and what information is needed when assessing and making decisions about cumulative effects, identify key challenges, and identify potential opportunities for improvement. The results provide insight into how to facilitate the use of cumulative effects information within decision-making, addressing a specific environmental management need in the Mackenzie Valley and contributing to CEA and EA research.

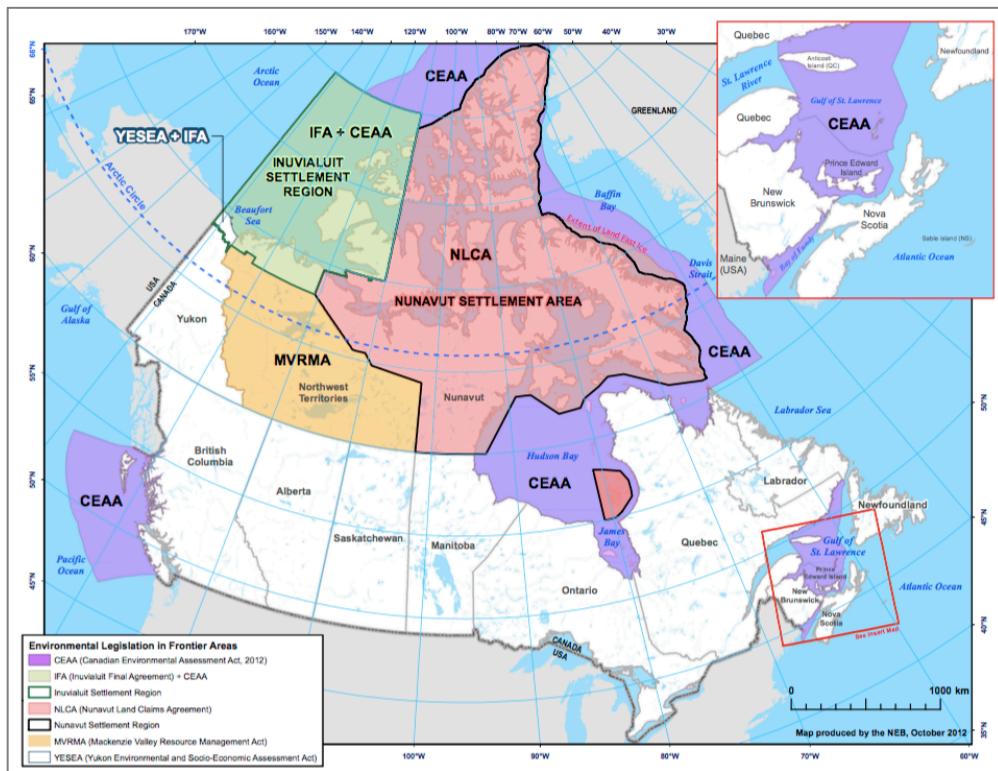


Figure 1: Map of Environmental Assessment legislation jurisdiction in Canada. The Mackenzie Valley resource management area is shown in orange. This map is a copy of a map available on the Government of Canada National Energy Board website entitled “Environmental Legislation in Frontier Areas”. This map has been used according to the National Energy Board website Terms of Use and has not been reproduced in affiliation with, or endorsement of, the National Energy Board. Map available at: <https://www.neb-one.gc.ca/nrth/nvrnmntlprtnrshp-eng.html> (accessed Dec. 13, 2017)

1.1 Research Questions and Study Design

This research project was designed to investigate the information needs of environmental assessment organizations and the practices and challenges in respect to cumulative effects. Specifically, this project investigated the following questions: 1) How are cumulative effects considered when making EA decisions regarding impacts to freshwater? 2) what information about cumulative effects is used, and what information is needed when making EA decisions regarding impacts to freshwater? 3) what key challenges exist for cumulative effects decision-making? and, 4) what opportunities exist to improve decision-making and EA processes?

A qualitative approach to data collection and analysis was considered appropriate given that this research sought to understand what information is considered within the structure of EA decision-making processes, which is dependent on organizational structures and the actions of decision-makers. This project involved two stages: 1) a document review of past EA decision reports and 2) conducting semi-structured interviews representatives from key organizations involved in EA. The goal of the document review was to identify how cumulative effects were evaluated in past EAs and the types of issues and information considered for decision-making. The results of the document review informed semi-structured interviews with representatives from decision-making and regulating organizations, and organizations that provide formal input during EA. The interviews were conducted to further investigate the ways that cumulative effects information is used and interpreted, the challenges faced by EA organizations, and opportunities for better integrating information into EA decision-making.

This research was focused in the Mackenzie Valley and seeks to provide practical information to improve EA processes. Building relationships with organizations in NWT was an important aspect of this project. CIMP has been an key partner for this research and has

provided resources, input on the research design, and helped to identify potential interviewees. During this research project I have taken three trips to Yellowknife. The first, during October 2016, was to meet with representatives from CIMP and EA organizations to discuss the project, the Mackenzie Valley EA process, the key objectives of this research, and make contacts for future interviews. The second trip during July 2017 was to complete semi-structured interviews. The third trip during November 2017 was to present the preliminary results of this research. Additional long-term dissemination of the results within NWT will be aided by CIMP; in addition to this thesis, a project summary report will be created that will be made publically available on CIMP's website and provided to interviewee organizations.

1.1.1 Conceptual Definitions of Key Terms

This thesis uses a number of terms which I will define here. Within this thesis, development projects are conceptualized as resource use activities which require the completion of an EA as defined under the MVRMA since its implementation (1998). EA decision-makers refer to the organization responsible for coordinating the EA process and issuing Reports of Environmental Assessment, which under the MVRMA, is the Mackenzie Valley Environmental Impact Review Board (MVEIRB). The MVEIRB is referred to in this thesis as the Review Board or the decision-making organization. Regulators refer to organizations that complete preliminary screening for development applications and issue water licenses and land use permits. Under the MVRMA, the regulating organization is the Mackenzie Valley Land and Water Board (MVLWB), although prior to 2014 also included the Sahtu Land and Water Board, the Gwich'in Land and Water Board, and the Wek'èezhìi Land and Water Board (Chamberlain & Haile, 2016). The MVLWB is referred to in this thesis as the Land and Water Board or the regulating organization. Interveners, or intervening organizations, are defined as government,

research, or First Nations organizations which are formally involved in the EA process to provide input on proposed projects, information about impacts, and recommendations to the Review Board. Proponents refer to the companies, organizations, or individuals that have submitted a proposal for a development project.

1.2 Theoretical Approach

This research is designed to respond to a weakness in the EA process which has been identified within the existing body of CEA and EA research and specifically highlighted in the Mackenzie Valley by CIMP, the NWT Environmental Audit (2015), and EA agencies. This research is designed as a policy/program evaluation for the effective use of cumulative effects information during EA. Policy evaluation has been conceptualized in many ways, but can be defined as the “careful assessment of the merit, worth, and value of administration, output, and outcome of environmental policies, which is intended to play a role in future practical action situations” (Mickwitz, 2006, 9, based on Vedung, 1997, 3). It is a dynamic process based on the application of systematic methods and qualitative inquiry to address questions about program operations and effectiveness (Wholey, Hatry & Newcomer, 2010). Policy evaluation may be guided by several criteria including impact, cost-benefit, and appropriateness, but is commonly centered on effectiveness; to what degree do the achieved outcomes correspond to the intended goals of the policy? (Mickwitz, 2006). This project is primarily focused on the implementation aspect of policy, or the “administration, output, and outcome” (Mickwitz, 2006, 9) and evaluating the use of cumulative effects information in practice. Policy evaluation is intended to be useful, purposeful, and “play a role in future practical action situations” (Mickwitz, 2006, 9). It does not necessarily produce results that are immediately transferrable into authoritative

decisions, but it must be grounded in a clear need and provide well-reasoned judgements based on evidence (Mickwitz, 2006).

The philosophical paradigm that guides this study is pragmatism. A pragmatic approach to research is focused on not only explaining and theorizing current structures and phenomena, but also on producing knowledge to guide actions and change (Maxcy, 2003). Pragmatism is concerned with the interaction between knowledge and action, and selects research methods which correspond to the practical problem at issue (Denzin & Lincoln, 2011). Pragmatism seeks to uncover constructive knowledge through inquiry and does not deny the existence of truth, but rather understands truth as knowledge that effectively addresses a problem or question (Denzin & Lincoln, 2011; Maxcy, 2003). This theoretical approach suits the ideals of policy evaluation and helps to ground this project in its goal of providing practical information about the effectiveness of CEA and decision-making for EA processes.

Both the document review and the interviews were approached empirically. The focus of this research is not on the individual experiences of decision-makers, but rather on the structure of decision-making within EA and the challenges, needs, and effectiveness of the organizations. The goal was to gain an understanding of the organizational structures and policy context of EA through the evaluation of EA documents and by engaging with representatives from the Review Board, the Land and Water Board, and intervening organizations. The results of this study are to be reflected on and shared with these actors with the goal of contributing to productive change for CEA in the Mackenzie Valley.

1.3 Thesis structure

Chapter 2 provides the scholarly context for this project. It includes a review of EA and CEA literature focusing on the Canadian context and implications for practice, as well as a brief

review of policy analysis and evaluation as it relates to research and environmental policy problems. Chapter 3 describes the process of resource management and EA in the Mackenzie Valley under the Mackenzie Valley Resource Management Act and an overview of the resource development history, which provides the specific policy context for this research as well as a description of the study area. Chapter 4 focuses on the methodology used in this research: a document review of EA decision reports and semi-structured interviews with key representatives of organizations involved in EA processes. Chapter 5 discusses the results of the document review in the context of the resource management process in the Mackenzie Valley. Chapter 6 describes the results of the interview analysis, building on the results described in chapter 5, and outlining the key practices, challenges, and processes for the use of cumulative effects information during EA. Chapter 7 is a summary and discussion of the results presented in Chapter 5 and Chapter 6 in the context of the CEA and EA literature discussed in Chapter 2, and presents a key recommendations and opportunities for improvement informed by the context of resource management in the Mackenzie Valley.

Chapter 2: Environmental Assessment, Cumulative Effects, and Policy Analysis

This chapter outlines the literature on EA and CEA and describes policy analysis and program evaluation as it relates to environmental policy problems and research. The literature review is focused on material that reflect recent knowledge. An emphasis on current literature is critical given that this research is designed to explore an existing policy and management challenge in the Mackenzie Valley.

The EA and CEA literature review traces the evolution of CEA, which was originally conceptualized as an “add on” to project based EA and is now widely accepted to be more suitable to regional and watershed scales of analysis. The review is focused on the Canadian context and emphasis is placed on watershed CEA and management and the application of CEA in practice and decision-making. Watershed CEA requires both scientific input and institutional capacity to sustain a regional framework and integrated management system. The latter has received less research attention, and this research project explores the need to improve the connections between CEA and decision-making and management in the specific context of the Mackenzie Valley.

The second part of this chapter is an overview of policy analysis and program evaluation, which informs the methodology and approach for this research. Policy analysis and evaluation seeks to address questions about program effectiveness and implementation. As a research process, it is focused in practical applications and employs a wide range of methods. Environmental policy and program evaluation seek to address questions about the success and utility of activities designed to improve and protect the environment, and research has identified the reflection and evaluation of practice and implementation as an important component of an effective EA system. This review is not intended to be an exhaustive account of the extensive

history of these disciplines, as they encompass many fields, methods, and theoretical approaches, but rather to provide background knowledge on policy analysis, research, and approaches that are specifically relevant for EA evaluation.

2.1 Environmental Assessment and Cumulative Effects

EA is a well-established aspect of environmental regulation in Canada. EA is a process of gathering information to predict and evaluate the potential impacts of development projects, and provide information used to generate mitigation measures to manage resource activities and to make decisions about whether and how projects should proceed (Hanna, 2016). In Canada, EA evolved throughout the 1970s and 1980s and was formally introduced through the federal Canadian Environmental Assessment Act in 1992 (Chamberlain & Haile, 2016). Today, EA is legislated at the federal level as well as within each province and territory. EA typically involves a series of stages: preliminary screening of the development project proposal to determine the extent of the review required, scoping to identify important areas of concern, assessment and prediction of impacts, review of the information, decision-making, and follow-up and monitoring (Hanna, 2016). EA is a scientific and analytical tool, but is intended to inform decision-making that protects the public interest and ecological sustainability. Ideally, EA functions as part of an integrated process for sustainable environmental management and planning; an effective EA should allow informed decisions to be made about individual projects, which contribute to broad environmental resource management (Hanna & Noble, 2015).

An enduring theme in EA research is the limitations of its project-based nature and its tendency to be limited in scope (Ball et al., 2013b; Harriman & Noble, 2008; Sinclair, Doelle, & Duinker, 2016). One of the most prevailing issues for EA is cumulative effects; the impacts of development projects do not occur in isolation from the existing environmental context, and may

be additive and synergistic (Hegmann & Yarranton, 2011; Noble, 2010). A cumulative effect is defined by the Canadian Council of Ministers of the Environment as “a change in the environment caused by multiple activities and natural processes that accumulate across space and time” (2014, 1). CEA is increasingly advanced as a way of improving EA. CEA considers the environmental, social, and economic impacts of a development project in combination with other past, present, and future development projects and natural stressors that are also influencing or may influence a given environment (Hegmann & Yarranton, 2011). The foundations for CEA evolved during the 1970s and 1980s (Connelly, 2011). The landmark work by Beanlands and Duinker led to increased research, an improved understanding of cumulative effects issues, and the development of methodology and practice in Canada (1984). The assessment of cumulative effects became a required component of federal EA legislation (Canadian Environmental Assessment Act, 1992) and is also required in varying degrees by provincial and territorial processes.

CEA is well described in the literature and is theoretically strongly supported as an important component of impact assessment, but its application is limited and its success in practice is heavily critiqued (Canter & Ross, 2010; Duinker & Greig, 2006; Halseth, Gillingham, Johnson, & Parkes, 2016; Jones, 2016; Noble, 2015). CEA demands both extensive information to identify impacts, and institutional capacity for the implementation of CEA in decision-making and planning (Foley et al., 2017; Noble and Basnet, 2015). CEA is widely accepted to be best suited to regional analysis, but is often applied in practice as an addition to project-based EA (Duinker & Greig, 2006). Initiatives for regional monitoring and analysis are increasingly being implemented and evaluated to improve CEA.

2.1.1 Regional and Watershed Cumulative Effects Assessment

CEA arose out of the need improve EA and is often conducted as an addition to project-based assessments, however the scope of EA is often inadequate for an assessment of cumulative effects (Baxter, Ross, & Spaling, 2001; Duinker & Greig, 2006). EAs tend to be focused on the approval of the project in question, consider a specific set of project-based impacts, conducted at a limited spatial and temporal scale, and are typically accompanied by significant resource and time limitations (Duinker & Greig, 2006; Sinclair et al., 2016). Development proponents are highly motivated to gain quick approvals and EA lacks the processes and capacity for understanding multiple integrated impacts over space and time (Sinclair et al., 2016).

The traditional approach to assessing impacts under EA is a stressor-based analysis; key environmental stressors resulting from the project are identified, and their impact on Valued Ecosystem Components (VECs) are predicted (Beanlands & Duinker, 1984; Squires & Dubé, 2013). VECs are resources, species, or ecosystems that have been identified by stakeholders as critical (Beanlands & Duinker, 1984). The use of VECs allows for a focused assessment, but the principles behind CEA suggest an effects-based analysis where all environmental effects and states are measured and considered regardless of the source (Ball, Noble & Dubé 2013; Dubé, Muldoon, Wilson, & Maracle, 2013 ; Squires & Dubé, 2013). This presents a challenge for project based EA, which is centred on the specific site and activities being proposed by the proponent. For CEA, a baseline condition of the environmental context must be developed and all contributing factors assessed over long time periods (Squires & Dubé, 2013). A comprehensive CEA would combine information about project specific and regional states, and consider a range of scenarios within an effects-based analysis (Ball, et al., 2013a; Senner, 2011).

In response to the practical limitations of project based EA, the analysis of cumulative effects has been argued to be more effectively conducted within regional or strategic assessments (Duinker, Burbidge, Boardley, & Greig, 2013; Harriman Gunn & Noble, 2009; Hegmann & Yarranton, 2011; Noble, 2010). Research has evolved to focus on developing procedures to conduct CEA at a regional scale and initiatives for large scale cumulative effects frameworks defined by ecologically significant boundaries are increasingly being explored in many Canadian jurisdictions (Halseth et al., 2016; Noble, 2015). For instance, British Columbia's cumulative effects framework, which is being developed and implemented as a set of policies and decision support tools for identifying cumulative effects across the province (Government of British Columbia, 2016). While supported as more conducive to the goals of CEA, the effectiveness of these types of regional approaches and their relationship to project-based processes, where understanding cumulative effects is important, remains unclear (Harriman Gunn & Noble, 2009; Noble, 2017).

Freshwater resource management has been an important focus of CEA and regional assessments. The growing pressure on water resources in Canada and the interconnected nature of water systems have fueled efforts to implement watershed CEA (Ball et al., 2013a; Noble, Sheelanere, & Patrick, 2011; Squires & Dubé, 2013). Freshwater health is a function of the conditions and the changes that occur across the landscape within the watershed boundary and the watershed is well supported as an ideal scale for analyzing cumulative effects (Dubé et al., 2013a; Noble et al., 2011; Seitz, Westbrook, & Noble, 2011; Squires & Dubé, 2013). Watershed CEA is intended to examine the interactions between freshwater resources and landscape changes under different development scenarios as they accumulative over space and time,

addressing some of the failures of project-based EA to adequately understand cumulative effects (Noble et al., 2011; Seitz et al., 2011).

CEA at the watershed scale is technically demanding. Modeling and predicting integrated impacts over space and time requires significant data and scientific capabilities. Watershed CEA demands monitoring at local scales consistent with regional scales, obtaining the necessary baseline data for an assessment of accumulated watershed state, the use of modeling to predict future states, and the assessment of VECs at multiple scales over time (Canter & Atkinson, 2011; Dubé, 2003; Dubé et al, 2013a). Research has focused on advancing procedural and technical knowledge, including the development of frameworks for identifying VECs at multiple scales (Ball et al., 2013a), establishing accumulated states of water resources (Dubé, et al., 2013b), and applying effects-based analysis (Squires & Dubé, 2013).

There is an ongoing focus identifying the technical requirements for CEA and producing tools, frameworks, and procedures for watershed level assessment monitoring and analysis, but recent research has begun to explore the capacity and institutional requisites required for successfully implementing and applying watershed CEA within a resource management system (Chilima, Gunn, Noble, & Patrick, 2013; Foley et al., 2017; Gillingham, Halseth, Johnson, & Parkes, 2016; Kristensen, Noble, & Patrick, 2013; Noble & Basnet, 2015; Sheelanere, Noble, & Patrick, 2013). Significant practical and regulatory issues and requirements have been identified in Canadian jurisdictions (Foley et al., 2017; Gillingham et al., 2016; Kristensen, et al., 2013; Noble & Basnet, 2015; Sheelanere, Noble, & Patrick, 2013). For instance, Sheelanere, Noble, & Patrick (2013) and subsequently Noble & Basnet (2015) investigated regulatory capacity in Saskatchewan for conducting and sustaining watershed CEA and each identifies a gap between scientific support and practical implementation for CEA and management.

2.1.2 Cumulative Effects Assessment in Practice: Connections to Decision-making

There is inconsistency in the theoretical implementation of watershed CEA, the strategies, indicators, and approaches for assessment and the application at the policy and decision-making level. Cumulative effects are well described in literature and often included in EA legislation; it is clear that multiple stressors have combined impacts on the environment, including freshwater resources. However, implementation issues exist for CEA in practice, both in terms of obtaining adequate information to identify cumulative effects, and in effectively applying CEA to resource development decision-making and planning.

Put simply, the purpose of an EA is to generate information and inform decision-making. Cashmore notes that the role of scientific information in EA can be broadly conceptualized in two ways: as applied science, embedded in objective inquiry and the application of the scientific method, and/or as civic science, combining science and art and taking a more deliberative and participatory approach to information collection and the integration of societal values (2004). Evaluating the success of EA as a decision support tool is challenging since decisions about sustainability are embedded in societal values and subjective interpretations about what actions and impacts are acceptable (Cashmore, 2004; Hegmann & Yarranton, 2011; Jay et al, 2007). During an EA impacts are identified and predicted, but decisions must also be made about whether the impacts are significant, or unacceptable, and whether available mitigation methods are adequate. As noted by Cashmore, EA was created during a time when rational decision-making was the prominent theory, and the assumption that better scientific information will lead to better decisions is imbedded in much of the EA literature (2004). However, it is clear that there are many other factors that influence decision-making such as cognitive, behavioural, organizational, and political factors (Cashmore, 2004; Cashmore, Bond & Cobb, 2008; Kørnøv

& Thissen, 2000; Jay, Jones, Slinn & Wood, 2007). There have been calls for research to explore how to effectively provide information to decision-makers, understand the needs and capacity of decision-makers, and better define the goals of EA in terms of supporting sustainability and the public interest (Cashmore, 2004; Cashmore, Gwilliam, Morgan, Cobb & Bond, 2004; Foley et al., 2017; Jay et al, 2007).

These issues are also highly important for the effectiveness of CEA. As CEA shifts in research and practice towards regional frameworks, an important issue is the extent to which cumulative effects information is useful to and applied within project-based EA decision-making. CEA, is intended to address the limitations of project-based EA and to capture broader issues related to the interaction of impacts and the context in which they occur. CEA is an analytical tool, but is also embedded in complex decision-making about impact significance and societal goals (Hegmann & Yarranton, 2011). Sinclair et al propose that CEA requires the effective functioning of a technical lens, a law and policy lens, and a participatory lens (2016). Cumulative effects are of importance to broad policy-making and long term environmental management, but also to decisions about individual resource development projects (Sinclair et al., 2016). Ideally scales of impact assessment would be integrated; broader, regional information would provide direction for project-based EA. This relationship between regional and project-based processes is often referred to as “tiering” (Gunn & Noble, 2011). However, a common critique of independent regional and strategic cumulative effects monitoring strategies is that they tend to be isolated from project assessments and decision-making processes (Baxter et al., 2001; Foley et al., 2017; Gunn & Noble, 2011; Hegmann & Yarranton, 2011; Noble & Basnet, 2015).

The ability of watershed CEA to contribute to the effective environmental management of water resources is dependent on how and whether the information is applied and used within regulation and management. As put by Hegmann and Yarranton, “Much has been said and written on how to do a “good” CEA. However, not much has been said or written on how to use the results of CEA to “make a good decision”” (2011, 486). Establishing this effective link between decision-making and good scientific practice for CEA is an issue repeatedly identified in research (Atlin & Gibson, 2017; Duinker et al., 2013; Foley et al., 2017; Jones, 2016; Noble, 2015; Noble & Basnet, 2015; Seitz et al., 2011).

The need to improve the relationship between cumulative impact information and EA processes has been specifically identified in the Mackenzie Valley. An Environmental Audit is conducted by CIMP every five years to evaluate the EA process in the Mackenzie Valley. Past audits, and most recently the 2015 Environmental Audit, have highlighted the weak connection between cumulative impact monitoring information and EA decision-making. The vulnerability of water resources to development pressures have made freshwater quality a priority area for CIMP (CIMP, 2015). According to the State of the Environment Report for NWT, freshwater resources are under increasing stress due to the impacts of climate change, development, and demands for water (2015b). In addition, according to the NWT Water Stewardship Strategy, “Water is a vital component of cultural, spiritual, and social well-being for residents of NWT” (2010, 3). The extent to which the information gathered in regional cumulative impact monitoring programs functions effectively within project scale decision-making is unclear, but is an important question to explore for watershed management.

2.1.3 Summary

In areas where development is advancing at a rapid pace and the causes of environmental issues are becoming increasingly complex, an understanding of cumulative effects and how to manage them is increasingly important for ecological and social sustainability, including the sustainability of freshwater resources. Issues remain in terms of maximizing the utility of cumulative effects information for environmental resource management in part due to the isolation of cumulative effects monitoring programs from EA processes. Watershed CEA is an advancing research field and a priority for cumulative impact monitoring and management in the Mackenzie Valley. CEA could be a powerful tool for sustainability planning, but in order to be effective the assessment of cumulative effects must be both scientifically sound and applied within decision-making processes for development projects.

2.2 Policy Evaluation and Analysis

This brief description of policy analysis and program evaluation provides an overview of policy development, environmental policy problems, the approaches and methods for evaluation and relates it to EA processes. The review is not exhaustive and is focused on sources that reflect current thought on policy analysis and the applications for environmental policies and evaluations.

2.2.1 Policies, Programs, and Environmental Policy Problems

Policies are activities, regulatory measures, and laws by which governments or other organizations seek to reach goals and improve some aspect of public life (Crabbe & Leroy, 2008; Dunn, 2015). Policy development is influenced by multiple organizations, actors, and interests. The cycle of policy development is often described as a series of steps including agenda setting, defining the policy problems, policy formulation, policy decision, implementation, and

evaluation (Crabbe & Leroy, 2008). Decision-makers and other stakeholders influence the effectiveness and implementation of policies and programs (Crabbe & Leroy, 2008). Policy problems are often difficult to address and resolve due to complex, changing, or contradictory requirements (Head, 2008).

Environmental policies are activities which are intended to improve or to prevent harm to the quality of the natural environment (Mickwitz, 2006). However, increasingly environmental issues and policy approaches are crossing disciplinary boundaries and governments are viewing environmental issues in broader terms and considering social, cultural, and economic dimensions (Bruyninckx, 2009). Environmental policy problems may be particularly challenging as they tend to be complex, occur over long time frames, involve considerably uncertainty, take place geographically remote areas, have consequences which are unequally distributed, and often involve stakeholders that hold different belief systems and goals (Mickwitz & Birnbaum, 2009; Mickwitz, 2006). Research on environmental problems is often focused on descriptive biophysical indicators and measurements, but is increasingly turning towards questions about how environmental policies, initiatives, and processes affect these indicators (Ferraro, 2009).

2.2.2 Approaches to Research

Policy analysis and evaluation reflects a practical need to focus efforts on activities that are effective (Weiss, 1972, Stockman & Meyer, 2013). According to Vedung, evaluation implies “looking backwards in order to better steer forwards” (2017, 2). Policy analysis is a research method applied in academia and by practitioners. It is a reflective process that combines intuition as well as science and method (Bardach 2000). Policy analysis is complex and not consistently defined, but can be described as a series of stages. Bardach outlines an Eightfold Path to policy analysis: 1) define the problem, 2) assemble some evidence, 3) construct the

alternatives, 4) select the criteria, 5) project the outcomes, 6) confront trade-offs, 7) decide, and 8) tell your story (2000, xiv). These steps provide basic guidance on the tasks for policy analysis, but may not necessarily relevant to each problem or completed in this order (Bardach, 2000).

Policy analysis is not constrained by the accepted analytical and theoretical tools of one particular discipline; practitioners may choose from a wide variety of scientific methods, qualitative or quantitative approaches as long as the result is information focused on addressing a defined policy problem or goal (Dunn, 2015). It is both descriptive (how things are) and normative (how things ought to be) and may address a variety of interrelated questions including identifying policy problems, effective policy design, measuring policy impact, as well as policy performance and evaluation (Dunn, 2015, Weiss, 1972). Policy analysis and evaluation research should be reflective and based on evidence, but unlike many other social science research approaches it starts out with its purpose and “use” in mind (Dunn, 2015; Weiss, 1972). Research questions are often program derived and framed by the questions and challenges facing decision-makers and others involved in the program, not necessarily by the researchers (Newcomer, Hatry & Wholey, 2010; Weiss, 1972).

Policy or program evaluation is focused specifically on producing knowledge about the outcomes, value, and implementation of the program (Dunn, 2015; Vedung, 2017). Policy evaluation may be approached in several ways. The classic design for evaluation research is experimental or quasi-experimental, however there is no one accepted approach and the value of social science and combined approaches have become increasingly recognized for their use in providing detail and insight (Weiss, 1972; Dunn, 2015). Policy evaluation may take a deductive approach and begin with predefined criteria or frameworks or an inductive approach and begin

with observations through document reviews and field work in order to build knowledge (Crabbe & Leroy, 2008). Evaluation may seek to address several questions about the program including efficiency, impact, appropriateness, accountability design, and is often focused on effectiveness and whether the outcomes reflect the goals (Mickwitz, 2006). The results of evaluation research are not generally unequivocal and may not be immediately transferable into policy actions, but contribute knowledge that allows decision-makers and other stakeholders to apply their values more effectively within the program (Mickwitz, 2006; Weiss, 1972).

2.2.3 Environmental Assessment and Evaluation

Environmental policy and program evaluations may include a variety of approaches and are associated with specific methodological challenges (Crabbe & Leory, 2008). The impact and outcomes of environmental policies may be realized over large spatial and temporal scales, posing challenges for evaluators often tasked with analyzing the outcomes of short term or recently implemented policies and programs (Hilden, 2009; Bruyninckx, 2009). The availability of supportive data and the uniqueness of environmental problems to particular social, ecological, and political systems can also present methodological challenges (Mickwitz, 2006; Pullen & Knight, 2009).

A key focus of EA research is evaluation, and determining best practices, and what factors contribute to effective EA processes. An effective EA process can be defined in many ways and several sets of criteria have been developed through research that contribute to effective EA systems (see Sadler, 1996; Senécal et al., 1999; Gibson, Doelle, & Sinclair, 2015; Hanna & Noble, 2015). Essentially an effective EA process could be conceptualized as one which meets its goals; a process supported by legislation, that provides comprehensive information about impacts, is accountable and includes stakeholder engagement, and contributes

meaningfully to planning, decision-making, and long term objectives (Hanna & Noble, 2015).

The International Association for Impact Assessment, a global network of academics and practitioners, has developed a set of best practices for impact assessment and key principles for EA including specific principles for follow-up and evaluation, which include the evaluation of the effectiveness and utility of the EA system (Marshall, Arts, & Morrison-Saunders, 2005). Such evaluation and reflection on research and practice has been important for the evolution of EA as a process that now attempts to consider economic, social, and biophysical environments and cumulative effects (Pope et al., 2013). In addition, as CEA evolves and continues to be implemented in EA jurisdictions, the evaluation of its effectiveness and the extent to which it meets its goals is important for improving project-based processes and environmental management.

Chapter 3: Mackenzie Valley Resource Governance and Development History

This chapter describes resource governance and the current EA process in the Mackenzie Valley, NWT and characterizes the prominent industries and resource development history of the area. In the first part of the chapter, the assessment of resource development projects under the Mackenzie Valley Resource Management Act (MVRMA, 1998), and the implications of the management structure for Indigenous and public participation and CEA is described. The second part of this chapter is a brief description of the resource development setting and history of the Mackenzie Valley focusing on the most prominent industries, which are diamond mining and oil and gas development. This chapter grounds EA and CEA research in the specific context of the Mackenzie Valley and provides important background information for the results and discussion of this research.

3.1 Environmental Assessment under the Mackenzie Valley Resource Management Act

In 1998 (amended 2005) the Mackenzie Valley Resource Management Act (MVRMA) was approved by the federal Parliament of Canada to implement regional land claims and a legislative structure for resource management. The federal Canadian Environmental Assessment Act does not apply in the Mackenzie Valley except in cases where proposed development projects fall partially within a province or territory outside of the Mackenzie Valley area, or if a project is deemed to be in the national interest and specifically called up for a joint review (MVEIRB, 2004). Two land claim agreements have been negotiated and settled in the Mackenzie Valley: the Gwich'in Comprehensive Land Claim Agreement (1992), the Sahtu Dene and Metis Comprehensive Land Claim Agreement (1993). There is also one settled land claim and self-government agreement: the Tlicho Land Claim and Self Government Agreement (2003).

Figure 2 shows the extent of the Sahtu Dene, Tlicho or Wek'èezhìi, and Gwich'in areas as well as the unsettled region.

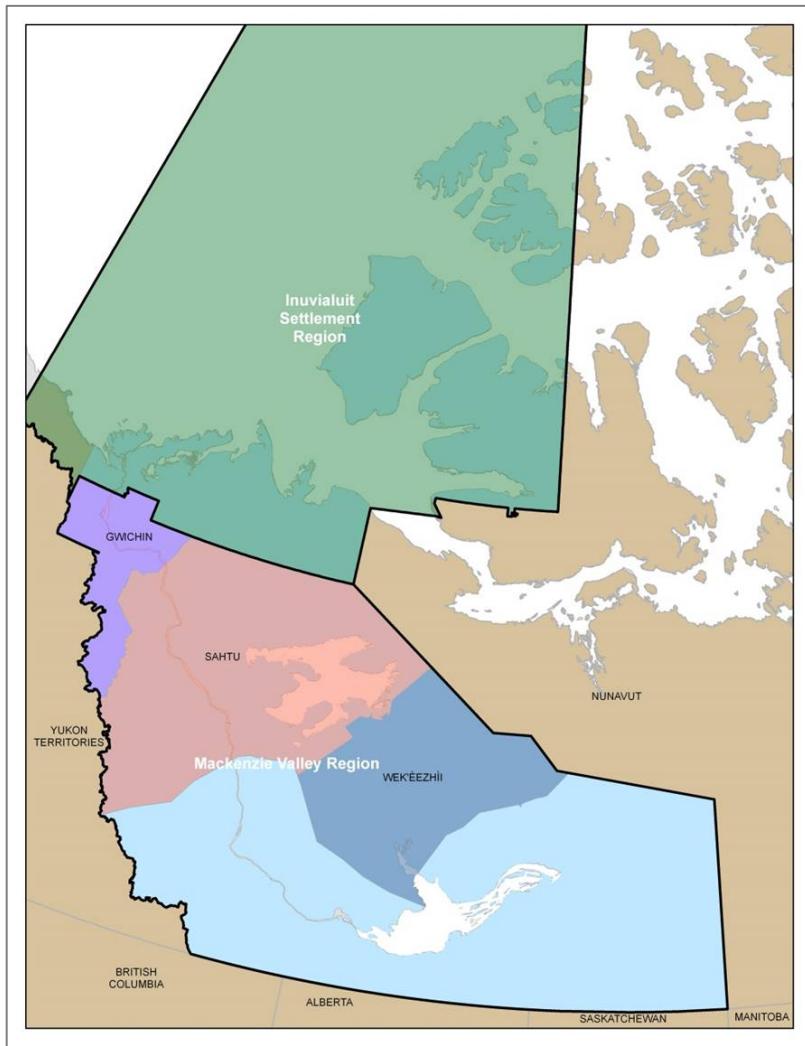


Figure 2: Regions in the Mackenzie Valley. Public access map image retrieved from the Mackenzie Valley Environmental Impact Review Board (2018).

EA in Canada is multi-jurisdictional; provincial and territorial processes may differ considerably in practice and scope. In terms of process, EA in the Mackenzie Valley has many aspects in common with other Canadian jurisdictions, but the distribution of responsibilities and decision-making between autonomous co-management boards is unique (Armitage, 2005; Chamberlain & Haile, 2016). The MVRMA created a network of co-management boards

responsible for land use planning, land and water regulations, environmental audits, preliminary screening, and EA. Co-management boards are intended to represent a partnership between governments and Indigenous people; half of the members of each co-management board are nominated by land claim organizations and half by territorial and federal governments (MVEIRB, 2004). The Land and Water Board (MVLWB) is responsible for land-use planning, permitting, licensing, developing terms and conditions, and overseeing inspection and compliance for resource use, while a separate board, the Review Board (MVEIRB), manages the EA process (MVEIRB, 2004). This structure is intended to incorporate mechanisms for Aboriginal ownership and regional self-governance while linking land-use planning, regulation, and assessment (Armitage, 2005; Couch, 2002; Ehrlich, 2010).

The Gwich'in and the Sahtu Regional Land Use Planning Boards are responsible for creating and implementing land-use plans for their respective settlement areas (MVEIRB, 2004). The Land and Water Board must comply with land-use plans when regulating resource use. The Land and Water Board is responsible for conducting preliminary screenings for proposed developments as well as permitting and licensing approved development projects. When the MVRMA was first introduced, three regional land and water boards were created: the Gwich'in Land and Water Board, the Sahtu Land and Water Board, and the Wek'èezhii Land and Water Board (MVEIRB, 2004). These three boards were also part of the larger MVLWB along with additional members from unsettled areas (MVEIRB, 2004). The MVLWB was responsible for activities in unsettled areas, in areas that are partially outside of the Mackenzie Valley, or that may impact more than one settlement area (MVEIRB, 2004). The 2014 Northwest Territories Devolution Agreement included provisions to centralize the responsibility for licencing and preliminary assessment, dissolving the three regional boards into the MVLWB, though this

action has been met with resistance and has been halted by an injunction (Tlicho Government v. Canada, 2015).

The three basic steps of regulation for development activities are preliminary screening, EA, and Environmental Impact Review (EIR). Preliminary screening functions to determine whether further review through an EA is required. If a development project requires an EA it is referred to the Review Board (MVEIRB). If after an EA an EIR is required, it is conducted by an independent panel established by the Review Board. If a project is approved at any stage, it is referred back to the Land and Water Board for regulation and licencing (MVEIRB, 2004). The basic steps involved in resource development approval are illustrated in Figure 3 and described in the sections below.

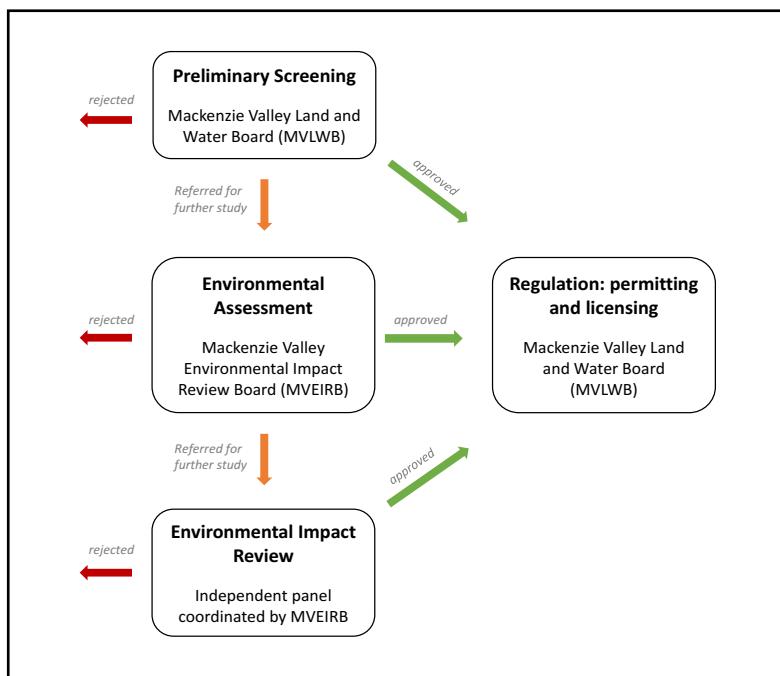


Figure 3: The resource management process in the Mackenzie Valley. Created by Lauren Arnold based on information found in “Environmental Impact Assessment Guidelines” (MVEIRB, 2004).

3.1.1 Preliminary Screening

The goal of a preliminary screening is to determine whether a proposed project is likely to have significant biophysical or social impacts or cause significant public concern. Per the MVRMA (1998), when an application for resource use is received, unless the proposed project falls under a limited set of exceptions, the Land and Water Board must notify the Review Board and begin a preliminary assessment (124). During preliminary screening, the proposed activity is examined by members of the Land and Water Board and by interveners, these may include First Nations, municipal, provincial, territorial, and/or federal governments (MVEIRB, 2004). Screening does not function to determine the specifics or details of potential impacts, but only whether they are reasonably likely to occur and if the project should be referred for further review (MVEIRB, 2004). Proponents are required to engage in community participation prior to submitting applications to the Land and Water Board (MVEIRB, 2004).

The Land and Water Board, and external reviewers, are required to consider the potential for impacts to the biophysical environment, the socioeconomic and cultural environments and the level of public concern. Reasonably likely significant impacts and/or significant public concern is adequate reason for the project to be referred for an EA (MVEIRB, 2004; also see Ehrlich, 2010). An impact on the environment is defined as, “any effect on land, water, air or any other component of the environment, as well as on wildlife harvesting, and includes any effect on the social and cultural environment or on heritage resources” (MVRMA, 1998, 111(1)). Public concern is defined as, “worry or anxiety within the relevant public” (MVEIRB, 2006, 10). Projects may also be called up for an EA directly by the Review Board during the preliminary screening or referred by a regulatory authority, First Nation governing body, or government. The majority of resource use applications received by the Land and Water Board are for routine

activities with insignificant impacts and are referred directly to the regulatory stage after preliminary screening is complete (MVEIRB, 2004).

3.1.2 Environmental Assessment

The Review Board (MVEIRB) is responsible for EA within the Mackenzie Valley. The purpose of an EA is to determine whether the project is likely to have significant adverse impacts and whether there are mitigation measures available to address these impacts. The general process for EA includes scoping, developing the terms of reference, information requests, impact review, decision-making, and recommendations. In addition to Review Board members and proponents, parties involved in the EA may include government organizations, First Nations, and monitoring and research organizations. These organizations are collectively referred to as interveners. Interveners provide information to the Review Board about impacts, review the information submitted by proponents, and often produce recommendations for mitigation measures and further studies. The Review Board has developed guidelines for EA (MVEIRB, 2004), social impact assessment (MVEIRB, 2007), and incorporating traditional knowledge (MVEIRB, 2005).

During EA, Review Board members must determine whether impacts are significant, whether the project needs to be altered, and evaluate available mitigation measures. Both the significance of impacts and the significance of public concern are subject to the judgement of the Review Board. An impact is deemed likely if it has a greater chance of occurring than not occurring (MVEIRB, 2006). In determining the significance of impacts, the Review Board is required to consider the magnitude, likelihood, geographical area, duration, frequency, reversibility, and the environmental component affected (MVEIRB, 2006). In determining the significance of public concern the Review Board is required to consider development scale,

proximity to communities, severity of worst case scenarios, the technology involved, proximity to sensitive or protected areas, harvesting areas, as well as any additional concerns voiced directly to the board (MVEIRB, 2006). In addition, the magnitude of public concern may be assessed by the frequency, geographic distribution, source (individuals or organizations), severity, and the nature of the concerns communicated to the Review Board (MVEIRB, 2006).

After the EA is completed, the Review Board produces a recommendation and the formal decision is made by the Minister. The 2014 Land and Resources Devolution Agreement, transferred the responsibility for formally approving water and land use licences and permits and EAs from the federal government to the Government of Northwest Territories (Chamberlain & Haile, 2016). Through the EA process the Review Board determines whether significant adverse impacts are likely. If no, the project is recommended for approval. If yes, the project is either recommended for approval with mitigation measures and conditions, the development is determined to be unjustified in the context of the likely impacts and the available mitigation measures and is recommended for rejection, or the Review Board recommends further assessment through an EIR (MVEIRB, 2004). If the Minister's decision differs from the Review Board recommendation, the project would be referred for an EIR (MVEIRB, 2004). An EIR is conducted by an independent panel and parallels the EA process, but is intended to provide a more detailed analysis of the development impacts. It is rare for a project to undergo an EIR, with only two examples in the Mackenzie Valley since the MVRMA came into effect in 1998 (MVERIB Public Registry). If the project is approved after either EA or EIR, it is referred to the Land and Water Board for permitting and licencing (MVEIRB, 2004).

3.1.3 Regulatory Phase: Permitting and Licensing

After the completion of a preliminary assessment and/or an EA resulting in approval, a project is referred to the regulatory phase for permitting and licensing. During regulation, the Land and Water Board develops terms and conditions for the project and guidelines for monitoring (MVEIRB, 2004). The Land and Water Board is responsible for overseeing compliance and inspections of activities and may host additional public consultations and community meetings. Water resource activities are subject to the MVRMA, the Waters Act (2014), and Waters Regulations (2014). Two types of water licenses are distinguished: type A and type B. The scope and the potential water use determines whether an activity requires a type A or type B license. Type A activities are larger scale, more likely to have significant environmental impacts, and are subject to more extensive review, which may include a public hearing (MVLWB, 2003). Type A water licenses may not necessarily require an EA, but must be approved by the Minister (MVLWB, 2003). Proponents of projects are typically required to submit annual reports that include monitoring data and information about the conditions of the license. Water licenses may be renewed or amended after they are issued if the development activities or timeline changes. Depending on the project and the potential changes, these activities may be reviewed within the Land and Water Board or referred for an EA.

3.1.4 Public and Indigenous Participation

Public and Indigenous participation is an important aspect of EA and regulation in the Mackenzie Valley. A public registry, which holds all technical information, comments, questions, applications, and reports, is created by the Review Board for each EA and the public may participate in hearings or provide written comments throughout the process (MVEIRB, 2004). The Review Board determines when hearings are needed, but early and ongoing

engagement, during preliminary assessment, scoping, and review is emphasized in EA guidelines (MVEIRB, 2005; MVEIRB, 2007). The MVRMA (1998) requires Indigenous engagement, and that all Indigenous knowledge and scientific information made available to the Review Board be considered (s.115.1). First Nation governments and organizations also typically act as formal interveners during EA or regulatory processes. Indigenous knowledge is utilized for helping to establish baseline conditions, but also for identifying key ecosystem components, predicting impacts, evaluating mitigation measures, and assessing public concern (Ehrlich & Sian, 2004; Hubert, Haefele, & Ehrlich, 2011; MVEIRB, 2005). Public concern and cultural and social impacts are given considerable legislative weight during preliminary screening and EA (MVRMA, 1998), and can result in EA referral or project rejection, independent of biophysical impacts (Armitage, 2005; Ehrlich, 2010; Fitzpatrick, Sinclair, & Mitchell, 2008).

3.1.5 Cumulative Effects Assessment in the Mackenzie Valley

The approach to CEA in the Mackenzie Valley is defined by the MVRMA and the Review Board guidelines for EA. Assessing and monitoring cumulative impacts is a requirement of the Sahtu (1993), Gwich'in (1992), and Tlicho (2003) agreements and the MVRMA (1998). An EA is required to “consider the impact of development on the environment including any cumulative impact that is likely to result from the development in combination of other developments” (MVRMA, 1998, 117(1)). According to the EA guidelines, cumulative impacts are defined as “those impacts (biophysical, socio-cultural or economic) that result from the impacts of a proposed development in combination with other past, present or reasonably foreseeable future developments” (MVEIRB, 2004, 80). The Review Board guidelines provide a broad overview of CEA (2004) and cite the federal Canadian Environmental Assessment Agency guidelines and the Cumulative Effects Assessment Practitioners Guide (1999).

The approach to CEA under the MVRMA is generally defined by the Review Board, but varies based on the specific project and environmental components that are identified as likely to be impacted. The Review Board, in consultation with stakeholders and interveners, identifies Valued Components (often abbreviated to VC) on which to base the assessment. The terminology of Valued Component, as opposed to Valued Ecosystem Component (VEC), is deliberate and important (MVEIRB, 2004). VC is intended to be inclusive to valued social components in addition to valued ecological components (MVEIRB, 2004). After VCs are identified, the review board determines what other past, present, and future developments will affect these components, predicts the effects of these combined activities, and identifies options to manage these impacts (MVEIRB, 2004). Methods of predicting cumulative effects are dependent on the VC and are guided by specialists and relevant government or monitoring bodies. The overall procedure for CEA parallels that of an EA, but typically includes a broader spatial and temporal scale and an adapted scope (MVEIRB, 2004).

In addition to the assessment of cumulative impacts within EA, the MVRMA stipulates that “the responsible authority (monitoring and audit) should monitor the cumulative impacts on the environment of concurrent and sequential use of land and water and deposits of waste” (1998, 146). The NWT Cumulative Impact Monitoring Program (CIMP) is a Government of NWT organization created in response to these obligations and to implement a regional program for cumulative impact monitoring (Armitage, 2005; Ehrlich, 2010). CIMP is intended to be a valley-wide regional program to monitor cumulative impacts and provide information to decision-makers and managers however, CIMP is not officially involved in the EA and regulation process. CIMP is guided by a steering committee of First Nations and relies on partnerships with research organizations, universities, and communities (CIMP, 2015). The key

activities of CIMP are to 1) develop key monitoring and research priorities 2) coordinate, conduct and fund research and monitoring 3) communicate results and information to decision-makers, and 4) facilitate an Environmental Audit every five years on the EA process (CIMP, 2015).

CIMP's approach to monitoring cumulative effects combines effects and stressor based approaches focused on key geographic areas. Monitoring is prioritized on key biophysical components. CIMP's priority areas for cumulative impact monitoring include fish, caribou, and water (CIMP, 2015). These areas were selected based on their importance to the people of NWT and the input of regulatory agencies. Cumulative impact monitoring is focused on key geographic "hot spots". This is a practical need given the size of NWT and the finite funding for monitoring, but also provides more focused data for key areas where there are past, current, or the potential for future development and cumulative impacts are most likely (CIMP, 2015). CIMP relies on partnerships and emphasizes the importance of Indigenous knowledge in cumulative impact monitoring and analysis. The MVRMA requires that all knowledge, including traditional knowledge, is considered both within the EA process and in monitoring and the identification of significant VCs (MVERIB, 2004). Indigenous knowledge based research, community based monitoring, and capacity building, are identified as priorities for CIMP (CIMP, 2015).

3.2 Resource Development in the Mackenzie Valley

The history of the Northwest Territories is characterized by complex federal and territorial government relationships and the expansion of resource exploration and development. The majority of the NWT Gross Domestic Product is derived from the mining and oil and gas industries (GNWT Bureau of Statistics). The future of these industries is heavily dependent on

the economic feasibility of projects in remote areas and the environmental management response to large scale sustainability issues; however, these industries are the central focus of assessment and land and water management planning, and are projected to remain significant in the future.

3.2.1 Mineral and Diamond Mining

The most economically significant component of resource development in NWT is mining. Diamond mining represents the largest portion of the mineral resource economy and is the primary focus for mining activities (GNWT Bureau of Statistics). Between 2000 and 2010 the total value of mineral production in NWT grew by over 200% in response to growth in diamond producing mines (GNWT Bureau of Statistics). There are three different permits available for mineral development: 1) prospecting permits, 2) mineral claims, which allow for exploration and prospecting, and 3) mineral leases, which allow for extraction, removal, and selling.

The State of the Environment Report provided by the Government of NWT describes the status of activities requiring land and water permits (2015b; 2015c). Land area under prospecting and mineral claims reached a peak in the 1990s. At the time, there were close to 22 million hectares of land held under mineral claims. The land area under mineral claims declined and reached a low between 2001 and 2004. Following this low period there was a renewed interest in diamond exploration and greater diversification of mineral exploration to include gold, base metals, rare earth elements, and uranium. Mineral exploration has now occurred in all NWT ecozones, but is focussed in the Thelon Basin and northeast of Great Bear Lake. Exploration remains driven by diamonds, but since 2008, with the decline of the global economy, both exploration and mineral claims have decreased.

Collectively the active diamond mines in NWT are the largest private contributors to the territorial economy (GNWT Bureau of Statistics). There are currently three active mines in NWT: the EKATI mine, the Diavik mine, and the Gacho Kue mine (NWT and Nunavut Chamber of Mines). The EKATI diamond mine was Canada's first underground and surface diamond mine. It officially began production in 1998 (NWT and Nunavut Chamber of Mines) and the Jay Pipe, the most significant undeveloped deposit, was approved for construction in 2016. With the development of the Jay Pipe the life span of the EKATI mine is projected to be extended until 2035 (NWT and Nunavut Chamber of Mines). The Diavik diamond mine has been in production since the early 2000s. Open pit mining at Diavik has concluded, but underground mining is ongoing and it is expected to have a life span to 2024 (NWT and Nunavut Chamber of Mines). The most recent diamond mine development, the Gacho Kue open pit mine, was officially opened during fall 2016 and, at the time of writing this thesis, is advancing towards commercial production. It is expected to operate until 2028 (NWT and Nunavut Chamber of Mines). Figure 4 shows the location of active and inactive mineral mines in the NWT and Nunavut including the EKATI mine, the Diavik mine, the Gacho Kue (Kennedy) mine, which are all in close proximity near Lac de Gras.

If global market conditions allow the extraction of minerals resources to be economically feasible, it is expected that prospecting and production activities will continue to have a significant role in the NWT economy (GNWT, 2015a; GNWT, 2015b). However, fluctuating commodity prices and the difficulty in financing projects in remote areas present challenges for diamond and mineral resource development (GNWT, 2015c). For instance, Snap Lake Mine, Canada's first completely underground diamond mine, officially opened in 2008 near the Diavik Mine (see Figure 4), but production was suspended in 2015 due to global market conditions

(NWT and Nunavut Chamber of Mines). All active diamond mines are projected to reach their life expectancy during the next 50 years which will have significant implications for the long-term economy in NWT and for communities as mines shift into follow-up and monitoring activities (GNWT, 2015a).

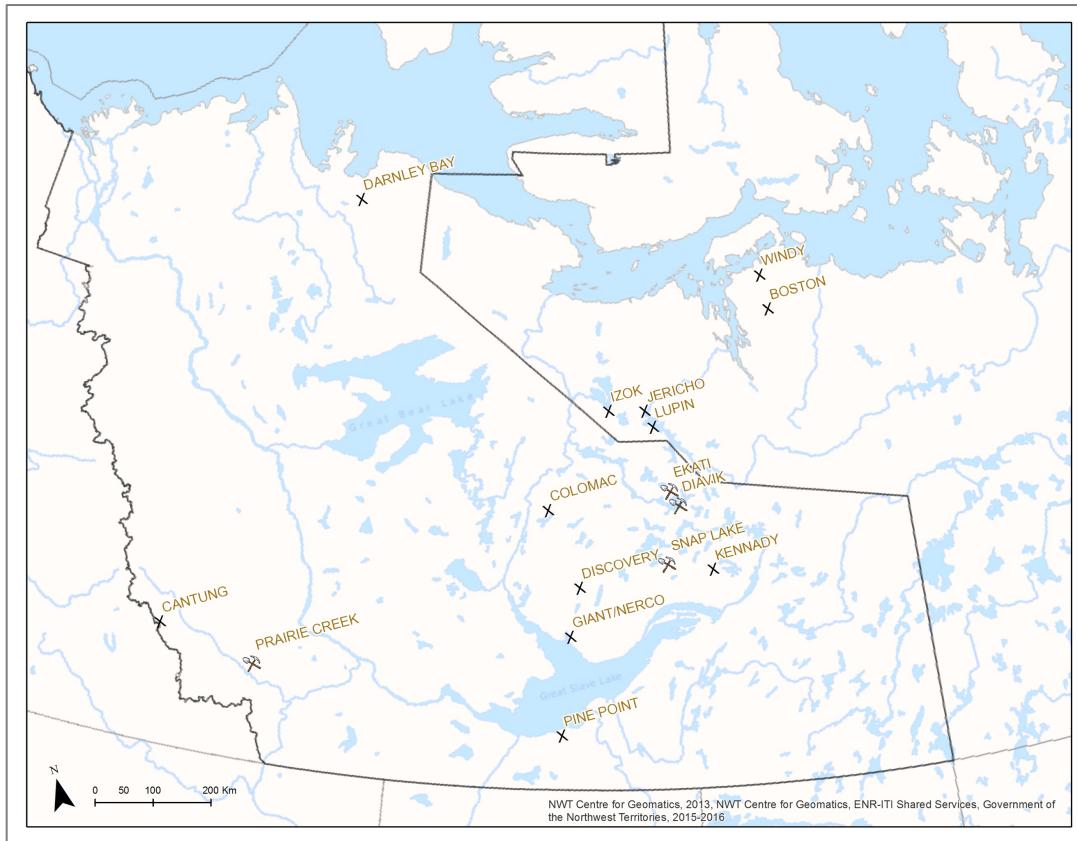


Figure 4: Location of Diamond Mines in the Northwest Territories. Map created by Lauren Arnold (2018) using the Government of NWT Centre for Geomatics Spatial Data Warehouse (<http://www.geomatics.gov.nt.ca>). Projection Lambert Conformal Conic. Copyright of the data is owned by the Government of NWT.

3.2.2 Oil and Gas Development

Oil and gas activities in NWT are regulated by three different types of permits, listed in order from the least to greatest potential for environmental impact: oil and gas exploration permits, significant discovery licenses, and production licenses (GNWT, 2015b). As with mining projects, additional land and water permits, issued by the MVLWB, may be required depending

on the specific nature of the activity and its location (MVEIRB, 2004). Natural gas is produced in three locations in NWT: Norman Wells, Inuvik, and Cameron Hills. Oil is produced in Norman Wells and Cameron Hills (GNWT, 2015b).

According to the Government of NWT State of the Environment report, the most significant increases in oil and gas exploration since 2000 have been in the Beaufort Sea which is within the Inuvialuit settlement region and is under the jurisdiction of the Canadian Environmental Assessment Act and the Inuvialuit Final Agreement (2015b). The majority of the production licences issued for oil and gas within the Mackenzie Valley have been for areas near Norman Wells, which is the most economically productive oil and gas development in NWT and is located on the Mackenzie Valley River, west of Great Bear Lake. Oil was discovered in the Norman Wells area during the early 1900s and Imperial Oil established the oil field, and a refinery during the 1930s (Bone & Mahnic, 1984). The town Norman Wells is the regional centre for the Sahtu region and has been heavily influenced and dependent on the boom and bust cycles of oil production during the past 80 years. In 2015 Imperial Oil applied for and was granted a water licence renewal that allows production for a further 10 years which coincides with the expected remaining life span of the oil reserves (MVEIRB Public Registry). As marketable oil resources are exhausted the key challenges and issues facing the area will be ensuring clean up, decommissioning, and the economic and social well-being of surrounding communities.

Natural gas is projected to be an important future focus for the NWT economy and there are ongoing searches for reserves. Natural gas is actively produced at Norman Wells, Cameron Hills, and Inuvik (GNWT, 2015b). Significant natural gas resources have been discovered in the Liard Basin onshore and to a lesser extent offshore near the Arctic Islands and exploration is

ongoing (GNWT, 2015b). A proposed natural gas pipeline project, The Mackenzie Valley Pipeline, was a significant point in NWT history (Gamble, 1978). The pipeline was proposed in the 1970s to carry natural gas from the Beaufort Sea through NWT to northern Alberta. The Mackenzie Valley Pipeline Inquiry is noteworthy for the voice that it gave to Indigenous people (Berger, 1977) and the pipeline is one of the only two projects reviewed under the MVRMA to be referred to an EIR. The need to settle land claim agreements and complete negotiations with Indigenous communities resulted in repeated delays for the pipeline approval and despite successfully going through EA and EIR under the MVRMA (MVEIRB Public Registry), it has not been built.

The future of oil and gas activities in NWT depends on both broad economic, social, and environmental factors. Within the Mackenzie Valley, production licences for oil and gas developments account for approximately 2 million hectares of land (GNWT, 2015b). While oil and gas activities range by region and depend on the trends of the global and Canadian economy, NWT may hold as much as 37 percent of Canada's marketable light crude oil and as much as 35 percent of its marketable natural gas (GNWT, 2015b). Due to the presence of these reserves it is likely that there will be increases in land held for oil and gas exploration and production in the Mackenzie Valley region, the Mackenzie Valley Delta, and the Beaufort Sea (GNWT, 2015a; GNWT, 2015b).

In the context of expanding development and large scale projects in NWT, engaging in early and meaningful consultation with Indigenous and northern communities is of increasing importance (2015 NWT Environmental Audit). In addition, EA and management is evolving to incorporate cumulative effects, climate change considerations, and broad sustainability goals (Burdge, 2008; Prowse et al., 2009). These changes in both theory and practice may have future

implications for environmental management and decision-making for resource development projects in NWT.

Chapter 4: Methodology

This chapter describes the methods used in this research. This research project used a qualitative approach and involved two stages: 1) a document review of all past EA decision reports completed in the Mackenzie Valley since the implementation of the MVRMA (1998) and 2) semi-structured interviews with decision-makers, regulators, monitors, and interveners.

The document review provides an overview of how cumulative effects have been considered in past EAs, the issues and VCs identified, and highlights key themes and challenges. Semi-structured interviews were used to validate the findings of the document review, and also to identify how the analysis of cumulative effects is approached by the organizations involved, the information needed for decision-making, and the key challenges for making decisions about cumulative effects during EA. Qualitative research tools, thematic analysis and coding, were used in both the document review and interview analysis. The focus of this research is how cumulative effects are assessed during the EA process; the goal of the interviews was to not to obtain the individual perspective of the interviewees, but to obtain an institutional perspective and explore the needs, challenges, and practices of the organization as part of the EA and regulatory process.

4.1 Document Review of Environmental Assessment Reports

Stage 1 of this research was a document review of past EA decision reports, which was completed between October 2016 and January 2017. The purpose of the document review was to identify the types of cumulative effects issues considered and explore how they are evaluated. Document review involves a systematic evaluation and interpretation of written texts to build empirical knowledge (Bowen, 2009). The procedure typically includes selecting documents, making sense of the data, and synthesizing results (Bowen, 2009). Document reviews are useful

to understand the context within which research participants operate, supplement other findings, illustrate questions that need to be addressed, and track changes and developments over time (Bowen, 2009).

Reviewing past EA decision reports is an established strategy in EA research, both as a part of a case study approach or within a larger scale review, as was completed here. For instance, systematic reviews of past EA decision documents have been used to evaluate the use of VECs within EA (Ball et al., 2013a) and to identify trend related changes within cumulative impact studies (Canter, Chawla, & Swor, 2014). In addition, using document reviews to gather information about organizational factors and to examine practice and performance is a key component of policy evaluation (Pullin and Knight, 2009). By analyzing completed decisions, assessments can be made about the effectiveness and efficiency of policy processes and in this case, how cumulative effects information is considered during EA.

4.1.1 Approach

The document review included all of the completed and available reports of EA in Mackenzie Valley since the implementation of the MVRMA in 1998. There are 36 such documents. As of September 1st, 2017, there are 37 completed reports of EA listed on the MVEIRB Public Registry, but one of these EAs (EA99-0061/0086) which was finalized in 1999, was omitted from the review because, for unknown reasons, the report of EA was not available on the public registry at the time this research was completed. The projects cover a range of different development types including mining and mineral exploration, oil and gas development, mine remediation, and construction. The projects also cover a range of outcomes including approval, rejection, and referral for an Environmental Impact Review (EIR). The documents reviewed are formally titled Reports of Environmental Assessment and Reasons for Decisions.

These are legal documents generated by the Review Board upon completion of an EA which summarize the history of the project, each stage of the assessment process, the arguments and submissions of interveners, the decision of the Review Board, and the recommendations for the project. All documents were accessed online from the MVEIRB Public Registry¹. The full list of projects and documents can be found in Appendix A.

The goal of the document review was to explore how cumulative impacts are considered during EA. Since the reports of EA are regulatory documents, the identification of cumulative impact information, issues, and decision-making is based on the written text and limited to instances where cumulative effects/impacts are explicitly referenced in the reports. While the focus of this study is cumulative impacts to freshwater, the document review analysis was not limited to freshwater cumulative impacts, and records the use of information about the cumulative impacts to other biophysical components and social and cultural systems. This was a practical need due to the limited discussions about cumulative effects, but also allows the review to provide context for an analysis of freshwater cumulative effects compared to other VCs.

4.1.2 Data Collection and Analysis

These 36 reports of EA are large documents, often hundreds of pages in length. To facilitate the review, all documents were imported into NVivo. Descriptive information including the year, type of project, the type of application, the outcome of the EA, and the type of license or permit required was recorded for each project. EA reports were cross referenced with the MVLWB Public Registry² to identify the types of licenses or permits associated with the proposed development. Using NVivo, a keyword search for “cumulative effect(s)”, and

¹ <http://reviewboard.ca/registry>

² <https://mvlwb.com>

“cumulative impact(s)” was completed for each document. The keyword search functioned as a guide to identify where in the document cumulative effects were discussed. For 8 of the reports, a key word search using NVivo was not possible as the documents were only available as scanned images. In these cases, the documents were reviewed manually for mention of cumulative impacts/effects and notes were typed before being organized into themes within NVivo.

The function of the key word search was not to form the basis of a true statistical analysis, but rather to assist in the thematic review; it allowed me to efficiently step through the documents and organize pieces of text relevant to cumulative effects. Since the reports are EA are written accounts of EA decisions, the review is limited to the impacts and VCs that were explicitly referenced in the final decision. Since the review included all completed EAs under the MVRMA, the project types ranged considerably as did the issues relevant to the assessment. In some cases, cumulative effects and freshwater impacts would be more relevant given the scale, location, and nature of proposed activity than in others. It is not therefore useful to draw concrete conclusions from the number of times cumulative impacts/effects were mentioned or the number of reports in which specific components were or were not discussed.

The portions of EA reports relevant to cumulative effects were coded thematically. Thematic analysis is a process of recognizing patterns and organizing information into categories (Bowen, 2009). Themes may be predefined, especially in cases where the document review is a supplementary research method, or emerge throughout the analysis through reflection on the data (Bowen, 2009; Richards and Morse, 2013). Descriptive themes store facts about data and analytic or topic coding is a reflective process by which data is sorted into conceptual themes (Richards and Morse, 2013). This review used some predefined descriptive categories for the

reports of EA, including the type of project, the EA decision, the year of the report, and the type of licence and permit involved. This review also included some analytic themes to guide the initial review, which included explicit sections of the EA devoted to cumulative effects, the VCs considered for cumulative effects, and mentions of cumulative impacts/effects within formal recommendations, measures, referrals or decision-making. Additional themes arose during the analysis and were built into categories. Document reviews are commonly used in combination with other qualitative methods, as was done here, for corroboration and more detailed insight (Bowen, 2009). The document review of EA reports is not intended to stand on its own, but rather to provide baseline information and inform the semi-structured interviews.

4.2 Semi-structured Interviews with Key Organizations

Stage 2 of this research included conducting and analyzing semi-structured interviews. Direct engagement with decision-makers and organizations involved in the EA process was fundamental to this research project since the aim was to understand and improve the use of cumulative effects information in EA. Semi-structured interviews combine a set of predetermined open ended questions with the opportunity to explore ideas as they arise (Adams, 2010; Yeo et al., 2013). Semi-structured interviews are appropriate when enough is known about the topic to frame questions in advance, and the act of structuring does not limit the discovery of data (Adams, 2010; Yeo et al., 2013). A basic structure is necessary for this research to investigate the key issues discovered in the document review and the organizational structures surrounding cumulative effects information, but the semi-structured approach allows enough flexibility for additional insight and themes to emerge.

4.2.1 Approach and Selection of Interviewees

I completed interviews with 17 individuals between July 3, 2017 and August 31, 2017. Of these, 11 were completed in person in Yellowknife during July 3-18, 2017 and 5 were completed over the telephone during July and August 2017. The function of the interviews was to explore the perspective of key organizations and the EA process. The EA process involves information submissions from many sources and organizations, which contribute to the decision-making processes. Given that the focus of the interviews was the policy process, it was important to conduct interviews with as many of the key organizations involved in EA as possible. The goal in selecting interviewees was to obtain representation from a complete profile of the organizations typically involved in EA, and not saturation by completing several interviews with individuals from one organization.

Interviewees included members of the Review Board (MVEIRB), the EA decision-making organization, and the Land and Water Board (MVLWB), the regulating organization, and members from organizations that act as interveners providing information and recommendations to decision-makers during an EA. Interviewees were identified using organizational and government websites where employees are listed publically and with the assistance of CIMP. The list of interviewee organizations is found in Table 1. The staff directly involved in EA from many intervening organizations is limited, and in some cases is one person. The aim was to obtain one or two interviewees from each organization, who could act as representatives and provide insight their organization's practices during EA. Interviewees were specifically asked to provide the perspective of the organization and not their own personal opinions.

Since the goal was to obtain the organizational perspective, selecting interviewees who could provide this insight was important. A collaborator from CIMP facilitated contact with the managers of the Review Board and the Land and Water Board who suggested the most appropriate individuals for the interviews. The Review Board provided two representatives for the interviews. The Land and Water Board opted for one interview with two individuals who could represent the organization. Intervener interviewees included representatives from the Government of NWT, Environment and Climate Change Canada, First Nation organizations and management boards, and independent monitoring agencies. One interview was also completed with a representative from CIMP. CIMP exists within the Government of NWT and does not act as an official intervener on its own during EA, but given its mandate of cumulative impact monitoring and research under the MVRMA it was important to include this perspective on CEA in the Mackenzie Valley.

Interviewees		
Decision-makers	2	Mackenzie Valley Environmental Impact Review Board (MVEIRB)
Regulators	2	Mackenzie Valley Land and Water Board (MVLWB)
Interveners	12	3 Government of NWT: - Department of Lands - Environment and Natural Resources - Conservation, Assessment, and Monitoring 1 Environment and Climate Change Canada 1 Independent Environmental Monitoring Agency (IEMA) 1 Yellowknives Dene First Nation 1 Gwich'in Tribal Council 1 Gwich'in Renewable Resources Board 1 Lutsel Kue First Nation
External monitoring organizations	1	Government of Northwest Territories Cumulative Impact Monitoring Program (CIMP)

Table 1: Interviewee roles and organizations

4.2.2 Interview Design and Analysis

The semi-structured interview questions were designed to further investigate and to validate the findings of the document review. The questions focus on four key areas: how cumulative effects are defined within agencies, what information and issues are considered for freshwater, the information needs of the agencies, and the practice and challenges of cumulative effects decision-making. Prior to the interview, each potential interviewee was contacted and provided with a summary of the project and a set of interview questions/topics for discussion. The summary and interview questions/topics for discussion were slightly modified to be specific to decision-making, intervening, and regulating organizations. All interview questions can be found in Appendix B. The pragmatic philosophical approach used in this research helped to guide the creation of the interview questions. During the interviews, participants were asked about their role and responsibilities, but the focus of the interviews and this research is the practices of the EA agencies themselves; participants were intended to act as a window into their organization and were not asked to share their personal opinions.³

Semi-structured interviews were audio recorded, with the permission of interviewees and transcribed verbatim. The interviews were then transferred into NVivo and coded both descriptively and analytically. Descriptive coding refers to facts about the data, which in this case included information about the organization, the role of the organization within EA and regulation, and the occupation of the interviewees (Richards and Morse, 2013). Topic and analytic coding is an interpretative and reflexive process to refine information into categories, which allows the exploration of themes and the development and comparison of new concepts

³ The interview framework and research design was shared with the Research Ethics Board at the University of British Columbia Okanagan and I received confirmation that due to the nature of the research and the questions asked, this project is exempt from behavioral ethics review.

(Richards and Morse, 2013). The themes that emerged throughout the analysis of the interviews built off those identified within the document review, and contributed new insight into the processes behind the EA reports and analysis of impacts. Coding qualitative data is an interpretive process which is, unavoidably, influenced by the subjectivity of the researcher. Qualitative research therefore demands that the researcher strive to make the process as transparent and as rigorous as possible (Bowen, 2009). The decisions that I made about key themes and coding were reflected on and recorded during the analysis, and discussed with supervisors throughout the project.

4.3 Limitations

The key limitations of this research are related to the scope and the size. The document review considered all available reports of EA, which allows broad insight into EA over a long-time frame, since the MVRMA was implemented in 1998. However, this approach did not allow for in depth analysis and detailed understanding of individual projects. The specific context and issues relevant to each development project were not considered in this review however, including all projects was useful for recognizing patterns and themes. In addition, the review was dependent on the key word search, which focused the review on instances where cumulative impacts/effects are explicitly mentioned. Given that the reports of EA are regulatory documents and cumulative effects are part of legislation this is a reasonable approach however, it is possible that organizations considered cumulative effects without specifically using these terms or in more generalized ways.

The semi-structured interviews allowed detailed exploration into organizational understandings of cumulative effects and the EA process. The approach used in this research, conducting interviews with key representatives to obtain the agency perspective, provided

focused and high quality information; however, a limitation of this approach is quantity. The number of individuals interviewed is small, due in part to the availability of the appropriate staff for interviews particularly from regulating and decision-making organizations. The number of potential interviews was also limited by the small number of staff directly involved in EA from many intervening organizations. Given this context, selecting interviewees who could represent their organization and designing interviews to explore the EA process and perspective of organizations was important.

The design of this research allowed for broad data collection through the document review and detailed follow up through the semi-structured interviews. This research was designed to specifically address environmental management challenges and the issues identified for cumulative effects in relation to the structure of EA in the Mackenzie Valley, and the results are aligned with that purpose. However, the effective uptake of cumulative impact information within EA decision-making it is also reflective of broader questions within the research field (Jones, 2016; Noble, 2015). While it is positioned in the unique jurisdiction of the Mackenzie Valley, this research contributes insight that could also be applicable in other settings.

Chapter 5: Analysis of Environmental Assessment Reports

This chapter describes the results of the first stage of this research, a document review of EA decision reports completed in the Mackenzie Valley. Descriptive information about the resource development projects and the key VCs discussed regarding cumulative effects, which include caribou, social and cultural systems, and freshwater, are described. The overarching themes uncovered throughout the review are outlined, including the consistent recognition of the obligations to consider cumulative effects, the linkages between cumulative effects and public concern, and predominant challenges in terms of data availability, quality, and clear procedures for CEA.

5.1 Description of the Projects and Keyword Search

The document review included all 36 accessible reports of EA since the implementation of the MVRMA (1998). Reflective of the resource development history of the Mackenzie Valley, the EA reports were predominantly focused on diamond mining and oil and gas developments. Most of the EAs, were for resource exploration projects, including 8 related to diamond exploration, 7 related to oil and gas exploration, and 4 related to exploration for other minerals and metals. There were 12 EAs that were more directly focused on mining and oil and gas developments. In addition, there were 2 projects focused on timber harvests, 2 on mine or fuel clean-up, and 1 one on the construction of a bridge. There were 2 projects that underwent EIR following the EA. In total, 34 of the EAs resulted in the approval of the development proposal and the generation of a land use permit and/or water license, and 2 projects were rejected after completion of the EA.

All documents were downloaded from the MVEIRB Public Registry⁴ and imported into NVivo. A key word search for cumulative impact(s)/cumulative effect(s) was completed which allowed me to step through the documents and organize text into themes. The frequency of cumulative impact/effect mentions were highly variable. Of the 36 documents reviewed, 33 mentioned cumulative impacts/effects at least once and were further analyzed thematically. Descriptive and analytic themes were created for these reports including mentions in scoping, explicit sections of the EA devoted to cumulative impacts/effects, and referrals, rejections, and recommendations related to cumulative impacts/effects. Key descriptive themes are displayed in Table 2.

Cumulative effects/impacts mentioned								
No	Yes							
3	33							
Mentioned in scoping	Section for cumulative effects		Recommendations related to cumulative effects			Referrals/rejections due to cumulative effects		Water licence required
	yes	no	yes	no	yes	no	yes	no
	33	0	27	6	16	17	11	22
18								

Table 2: Results of Keyword Search and Descriptive Coding

The documents that included discussions of cumulative effects were further reviewed for the issues and information considered, and any recommendations or decision-making related to cumulative effects. Since the review covers a wide range of project types, the ecosystem components considered and their relative weight in the assessment varied according to the specifics of the project and the concerns identified by the public and by interveners. Documents

⁴ <http://reviewboard.ca/registry>

were cross referenced with water license and land permit information available on the MVLWB Public Registry⁵ to identify the types of permits and licenses required for the proposed development activity. According to the information available, a sample of 18 of the EAs reviewed were for proposals that required type A or type B water licenses (see Table 2).

5.2 Thematic Review Results

One of the objectives for the review of EA reports was to identify the key issues considered for cumulative effects. These issues are discussed in section 5.2.1. Overall, detailed discussions of cumulative effects were inconsistent, limited, and often generalized to reviews of cumulative biophysical impacts rather than focused on specific VCs. The predominant issues specifically discussed for cumulative effects were impacts to caribou and social and cultural systems. Since the focus of this research is freshwater cumulative effects, projects requiring water licenses were identified and discussions about cumulative impacts to water were specifically reviewed. Impacts to freshwater were raised within EA reports, however discussions specifically about the cumulative impacts to water were limited and, like other VCs, tended to focus on the quality and availability of data, the completeness of the studies carried out by proponents, and potential options for improved monitoring. This review sought to identify issues and themes and does not comment on the details of each proposed development or the general assessment of water quality or other key environmental components.

This review also sought to explore how cumulative effects are discussed within EA processes and decision-making. Key themes identified throughout the review included a consistent recognition of the legal obligations to consider cumulative effects, linkages between

⁵ <https://mvlwb.com>

cumulative effects and public concern, and the need for improved information, management, and planning to support CEA. These themes are discussed in section 5.2.2.

5.2.1 The Issues Considered for Cumulative Effects

It was common for cumulative effects to be discussed in a general way as an overarching theme or consideration applied to the assessment as a whole, rather than in relation to specific valued ecosystem components. Sections of EA reports explicitly focused on cumulative impact/effects were in many cases separated from the analysis of specific VCs and statements generalized to broad biophysical or social discussions about the potential interactions between nearby or foreseeable future development projects were common. For instance, “The Review Board examined the evidence and deliberated on each of the issues and impacts presented in section 4 below in regards to impacts from the proposed development alone and in combination with those of past, present and reasonably foreseeable future human activities” (EA0405-002, 2004, 13).

While cumulative effects were often discussed generally, there were examples of sections and discussions focused on specific VCs, particularly for large-scale projects. Cumulative effects discussions relating to caribou and social and cultural systems and freshwater are discussed in the following sections.

5.2.1.1 Caribou and Social and Cultural Impacts

Cumulative impacts to caribou were a common area of concern within the EA reports due to the status of caribou as a species under decline, as well as its significance to the traditional ways of life for First Nation communities. Within the EA reports, local and Indigenous knowledge were often used in combination with monitoring and quantitative data to assess wildlife cumulative impacts, and impacts to caribou were accompanied by discussions about

social and cultural impacts. The difficulty of monitoring and managing wildlife and caribou impacts due to the nomadic nature of herds and the lack of long term baseline studies was raised repeatedly. Critiques of proponent's assessment and the integration of wildlife monitoring programs was also common. For example, from the Snap Lake diamond mine EA, "There was a broad consensus among the Parties to the EA, including GNWT that developer's baseline data were not sufficient to support the cumulative effects assessment or to provide a valid baseline for comparison against future monitoring programs" (EA01-004, 2001, 149). Suggestions, measures, and recommendations to for wildlife impacts that were generated in explicit response to cumulative impacts predominantly focused on a lack of data and the need for improved monitoring and management programs. For example,

"(S29) The GNWT should develop cumulative effects thresholds relating to direct and indirect habitat loss for various wildlife species of management concern (e.g., caribou, grizzly bear, wolf, wolverine) as a wildlife management tool for use in responding to development in the Slave Geological Province" (EA01-004, 2001,154).

Cumulative effects issues related to social and cultural systems were often raised by interveners, notably First Nations governments and organizations. The most common issues were developments in culturally significant areas and impacts to cultural use of land and wildlife, and particularly the use of caribou by First Nations. In a few of the projects, measures and suggestions directly related to social and cultural cumulative impacts were proposed largely in response to the need for further study to understand cumulative impacts at multiple social scales and improve baseline information. For example, in the more recent Snap Lake Water License Amendment,

"The GNWT should work with diamond mining companies to develop socio-economic baseline studies. The GNWT, working with communities, should: assess the vulnerability if each community with a corresponding assessment of the community's resilience to socio-economic impacts and the capacity to adapt to them; assess the existing cumulative impacts on well-being at multiple scales (including individual, family, and community levels)...” (EA1314-01, 2014, 178).

The need to better link social dimensions with biophysical impacts and understand impacts to social and cultural systems was a key theme throughout the EA reports.

5.2.1.2 Freshwater

Of the 36 projects reviewed, 18 were for activities requiring a type A or type B water licence. Impacts to freshwater was part of the EA review in each of these cases and water quality is considered in depth in many reports, but discussions specific to cumulative impacts to water ranged considerably. Of these 18 reports, 12 included explicit discussions of cumulative impacts to water of varying length and detail, and 7 discussed cumulative impacts to aquatic ecosystems, fish, and/or fish habitat. In many cases, cumulative impacts to water quality and/or fish are mentioned in the reports, but the potential impacts were considered minor or insignificant and there is little detailed discussion. For example, four small scale diamond exploration projects were proposed in the Drybones Bay area during 2003-2004 (EA03-004, 2003; EA03-003, 2003; EA03-002, 2003; EA03-006, 2003). Cumulative effects were considered in each of these EAs due to the number of proposed developments in the area, but found to be insignificant given the limited physical disturbance,

“The Review Board accepts the conclusions of the developer, supported by DFO, GNWT, and INAC that no residual impacts are expected to result for fish and their habitat, assuming the mitigation measures proposed by SDC are implemented. As a result, the Review Board concludes that there will be no significant adverse impacts on the environment due to cumulative effects” (EA03-006, 2003, 43).

Discussions about water quality cumulative effects tended to focus on the quality and availability of data, monitoring needs, and the completeness of the studies carried out by proponents and interveners. For example, a lack of baseline data was specifically identified in the Pine Point Pilot Project EA,

“This environmental assessment uncovered no work done on cumulative effects of the large Pine Point operations for the past decade. The most recent studies of aquatic effects submitted for the public record were over a decade old (Evans et al: 1998), and the Review Board received no evidence of focused cumulative effects studies on the lands around Pine Point in the interim” (EA0607-002, 2006, 97).

In some cases, where there were multiple developments on a given watershed, cumulative effects were addressed in considerable depth and in relation to specific parameters, thresholds, and water quality indicators. Active diamond mines in the Mackenzie Valley are concentrated around Lac De Gras, with 3 such mines operating in the area: the Ekati mine, the Diavik mine, and the Gacho Kue mine. Given that there is more than one project in this watershed, cumulative impacts to water were raised as a concern and discussed in EA reports, in both recent and older EAs. The Jay Project is the most recent completed EA report in the Mackenzie Valley and is an expansion to the existing Ekati diamond mine near Lac De Gras and cumulative effects were important in the EA report: “Based on the evidence and submissions on the public record, the Review Board finds that the proposed Jay Project is likely to cause significant adverse impacts on the environment. This includes cumulative impacts from the potential effects of the Jay Project, combined with the effects of other activities” (EA1314-01, 2016). In another EA related to a diamond mine on Lac de Gras, the Sable, Pigeon, and Beartooth Kimberlite Pipes completed in 1999 (EA99-004), cumulative effects and data were also a prominent issue and included in recommendations,

“61) That DIAND and EC jointly initiate an evaluation of the cumulative effects of total loadings of nutrients and metals into Lac de Gras watershed, and that the resulting long term effects on this oligotrophic system. BHP and Diavik, and others, as requested, shall assist DIAND and EC by providing the monitoring and predictive data needed to examine the anticipated total loadings of contaminants into the Lac de Gras watershed” (EA99-004, 1999, 51).

A theme underscoring specific monitoring and management discussions was the need for more data to support the assessment of cumulative effects. Where recommendations, measures,

and/or commitments for water quality were made or proposed regarding cumulative impacts to water they were predominantly focused on the need for additional data and assessments. For example from the Prairie Creek Phase III Drilling Program EA (2004) and the Snap Lake Water License Amendment EA (2014),

“To properly manage the environment in the Prairie Creek area, the developer needs information on the actual combined effects of past and present developments. The Review Board is of the view a cumulative impacts monitoring program for the Prairie Creek watershed is required in order to prevent significant adverse cumulative impacts by the proposed development in combination with other developments. Effects on vegetation, fish and wildlife, as well as water quality in Canadian Zinc’s lease and claims area as well as a portion of Prairie Creek downstream should be monitored, evaluated, and managed through one program, rather than through disjointed programs for individually permitted developments” (EA0405-002, 2004, 34).

“De Beers will continue to conduct regional water quality monitoring as it has since 1999, and to report on the regional water quality three times a year reports to the MVLWB, a summary annual water license report the MVLWB, and annual AEMP report, as well as reporting to Aboriginal groups in the annual Environmental Agreement report. De Beers will also share data with the GNWT and Aboriginal Affairs and Northern Development Canada and communities as part of regional cumulative effects monitoring” (EA1314-02, 2014, B-1).

5.2.2 Key themes for Cumulative Effects Discussions in EA reports

Throughout the review, three key themes for cumulative effects discussions were identified: 1) the consistent recognition of the obligations for considering cumulative effects among organizations, but no consistent or coordinated approach for CEA, 2) the connection of cumulative impacts to discussions about public concern, and 3) extensive discussions of data challenges.

5.2.2.1 Obligations to Consider Cumulative Effects

In all of the EA reports where the word(s) “cumulative impact(s)” and “cumulative effect(s)” were found, they were mentioned early in the report in relation to the scope of the

assessment and the responsibilities of the MVEIRB per the requirements of the MVRMA. The following text, or similar variations, was present in each of these reports:

“In determining the scope of assessment, the Review Board was conscious of its obligation under subsection 117(2) of the MVRMA to consider: the impact of the development on the environment including the impacts of malfunctions of accidents; any cumulative effects that are likely to result from the development in combination with other developments; and, comments submitted by members of the public” (EA03-005, 2003, 13).

There is consistency in recognizing these obligations in the 33 reports that did mention cumulative impacts. For some EAs, these types of general references to legal obligations or concerns were the only specific mentions of cumulative effects throughout the entire EA report. The references to cumulative effects during scoping illustrates the legislative link between CEA and EA processes.

These types of general references to potential impacts demonstrates that there is consistent recognition of the requirements of the MVRMA, however detailed discussions about cumulative effects and the connection to specific biophysical components were much less consistent. There is an awareness of cumulative effects, but organizations are unclear or unaware about how to apply the concepts in practice due to lack of data, assessment tools, and coordinated approaches. The uncertainty in terms of the procedures for CEA as it relates to EA and VCs is well summarized by an excerpt from the Cameron Hills EA.

“Cumulative effects assessment is an evolving practice that tries to consider overall impacts on indicators of resources of interest. Notwithstanding progress that has been made over the last 20 years, proponents, regulators, stakeholders, and practitioners are still searching for the most appropriate method (or suite of methods) that can be consistently and economically applied to development proposals such as the Cameron Hills project” (EA03-005, 2003, 41).

5.2.2.2 Connection to Public Concern

The document review found that the language of cumulative effects is connected to social and cultural impacts and that cumulative effects are often discussed as a public concern. Interveners, notably First Nation organizations representing communities, often bring up concerns about the cumulative effects of development in relation to both large scale mining or extraction operations as well as small scale exploration projects. Under the MVRMA significant public concern is adequate justification for referring a proposal to EA or rejecting a project, and the review showed that potential social and cultural cumulative impacts related to development projects are being cited in referrals and recommendations.

About one third of the EAs explicitly referenced cumulative impacts within the reasons for referring the project for an EA after the preliminary assessment. In addition, for both projects which were referred for an EIR, the Gahcho Kue' Diamond Mine at Kennedy Lake (EA0506-008, 2006) and the Mackenzie Gas Project (EA03-007, 2004), cumulative effects were among the issues specifically identified for further study. The language of these referrals links cumulative effects with public concern. For instance, the four diamond exploration proposals in the Drybones and Wool Bay areas between 2003 and 2004 were referred to an EA due to "public concern about all developments in the Wool and Drybones Bay area; the contributions of all these developments to cumulative effects in the Wool and Drybones Bay area" (EA03-004, 2003; also see EA03-003, 2003; EA03-002, 2003; EA03-006, 2003). Given the limited biophysical disturbance associated with these exploration projects, cumulative effects discussions centered around social impacts due to the cultural significance of the Drybones Bay area to the Yellowknives Dene First Nation.

For both proposals that were rejected after EA, Screech Lake uranium exploration (EA0607-003, 2006) and New Shoshoni diamond exploration (EA03-004, 2003), social and cultural cumulative effects were specifically identified as a significant factor in the decision. As exploration projects, the immediate biophysical impacts were limited, but both projects were proposed in culturally and spiritually significant areas. For example, the New Shoshoni project was rejected due to the potential for cumulative cultural effects to the Yellowknives Dene First Nation related to the location of the exploration Drybones Bay,

“Considering all this evidence, the Review Board finds that the individual contribution of the NSV [New Shoshoni Ventures] development to cumulative effects will be significant and adverse. The Board also finds that the mitigation proposed by the developer is not adequate to reduce these impacts to an acceptable level. The location of the proposed program, entirely within Drybones Bay, will contribute significantly to the cumulative effects on both the tangible and intangible aspects of culture that are central to the social and cultural well-being of the YKDFN [Yellowknives Dene First Nation]” (EA03-004, 2003, 61).

Cumulative effects issues raised by interveners, communities, and First Nations can carry significant weight in decision-making and the assessment process.

5.2.2.3 Data Challenges, CEA Studies, and Coordinated Approaches

Important themes identified throughout the discussions of cumulative effects were general concerns raised about the quality and availability of data to support CEA, the adequacy of the proponent’s analysis, and the lack of consistent guidance and procedure for CEA. These types of issues were raised in a general sense, and for specific VCs including caribou/wildlife, social and cultural, water, and air quality.

The Review Board and interveners routinely identified challenges in terms of obtaining enough reference data and interpreting data to understand cumulative effects. Understanding the potential impacts from reasonably foreseeable future developments is particularly challenging. For example these issues are discussed in the Pine Point Pilot Project EA,

“Given the remaining levels of public concern and the lack of up-to-date information, the Review Board concludes that environmental impact assessment of future larger and longer-term mining developments will require updated cumulative effects data on the ecosystem health of the nearshore Great Slave Lake in the Pine Point region and on the lands in the historic mining area as well. If, as seems likely, the Pine Point mineral trend again becomes a viable longer-term (10 or more years) mining area, the developer and the responsible government authorities should be conducting cumulative effects assessments prior to further mine expansions” (EA0607-002, 2006, 97).

Interpreting the impacts of individual projects within a broader picture of cumulative effects is a key issue for EA decision-making. Critiques of the cumulative effects studies and a lack of confidence in the assessments produced by proponents were common within the EA documents. Under the MVRMA proponents are required to consider cumulative effects within their proposal and Developers Assessment Report, which outlines the studies done and the assessment of potential impacts. Intervenors and the Review Board raised issues of inconsistency, incompleteness, and lack of data for CEA,

“Criticism of the developer’s cumulative effects assessment focused on the short length of baseline studies, the lack of incorporation of traditional knowledge, and lack of data to support the developer’s predictions of cumulative effects from other developments” (EA0607-002, 2006, 91).

In some cases, discussions about data availability and the CEA studies conducted were detailed. For example, in the Snap Lake Diamond Mine EA (EA01-004, 2001), there is a specific section in the report focused on monitoring and management in response to concerns about cumulative effects raised by intervenors.

“There is an overall lack of coordinated environmental baseline information for developments in the Slave Geological Province and access to information is also currently a challenge in NWT. The current levels of baseline information collection by government agencies does not appear to the Review Board, to be sufficient to support environmental impact assessment decisions of resource development projects within the Slave Geological Province.” (EA01-004, 169).

The Review Board shared the concerns of intervenors about data availability and the quality of the assessments, but recognized the need for coordinated efforts. The Review Board agreed that

aspects of the proponent's cumulative effects submission were incomplete, however also recognized that addressing issues with baseline data is not the responsibility of the proponent alone and that government must play an active role.

"However, in the area of cumulative effects assessment, it is the Board's view that the information required is not the sole responsibility of the developer and that a joint industry government partnership should be established for the collection of cumulative effects data" (EA01-004, 168).

The development of measurements and recommendations in response to a lack of data, baseline condition, and inadequate analysis for cumulative effects was common throughout many of the EAs. In many cases, these issues are raised in response to questions about specific VCs, most often in response to caribou and wildlife impacts, however monitoring and management measures were also proposed in response to a need to improve the general understanding of the ecological setting of the development and legacy of development activities. For example, the following suggestion was proposed within the Pine Point Pilot Project EA,

"Suggestion #10: The NWT Cumulative Impacts Monitoring Program, with the assistance of Indian and Northern Affairs Canada and other government authorities, should initiate a comprehensive review of existing research findings that can contribute to a greater understanding of how the historic mine workings at Pine Point east of the Buffalo River has impacted the surrounding region" (EA0607-002, 2006, 98).

5.3 Summary

This research is designed to provide insight into the EA decision-making process, the information needs of decision-makers regarding cumulative impacts to freshwater, and how this process might be improved. The document review included all completed EA reports since the implementation of the MVRMA and therefore included a wide time frame and range of projects. The extent to which cumulative effects are relevant and discussed is inconsistent. The document review highlighted that there is consistency in recognizing the legal obligations to consider cumulative effects, and that concerns are frequently raised by communities and interveners and

addressed through the lens of public concern. Discussions about cumulative effects were often generalized and underscored by a lack of data and supportive analysis, as well as critiques of the assessments done by proponents. Impacts to caribou and social and cultural systems dominated cumulative effects discussions. Recommendations specific to cumulative effects for all VCs, including freshwater, were focused on improved monitoring and management. The key findings from the document review and the challenges identified in terms of data availability and the quality of CEA, were used to design the questions for the semi-structured interviews.

Chapter 6: Analysis of Interviews

This chapter describes the results of semi-structured interviews with EA decision-makers, regulators, monitors, and interveners. The results are presented according to overarching themes that were identified throughout the interview analysis: 1) uncertainty in terms of the process, responsibility, and definitions for cumulative effects, 2) challenges in terms of data availability, compatibility, and quality for predicting impacts, 3) a lack of interpreted information about the acceptable level of change to support decision-making, and challenges in managing cumulative effects through a project based assessment, and 4) establishing connections to broader resource management.

6.1 Process, Responsibility, and Definitions for Cumulative Effects

6.1.1 The Process and Responsibility for CEA

At the beginning of each interview participants were asked about their current position and the role of their organization within the EA and regulatory process. The analysis of impacts within an EA is initially driven by proponents and interveners. Proponents are required to collect data, consult with communities, and submit an analysis of the potential impacts of the proposed activity. Interveners review and comment on the assessment done by proponents, may present their own data and assessments, and may provide recommendations and suggestions. Intervener organizations differ in their procedures for participating in EA. The Government of NWT (GNWT) for instance, has multiple departments each focused on different VCs and the GNWT response is coordinated by the Department of Lands into a cohesive submission. First Nations organizations have their own processes and may have separate planning boards or a specific staff responsible for reviewing the submissions during EA. All of the data presented by proponents

and interveners is uploaded to the MVEIRB Public Registry⁶. Review Board members and staff review all the information on the registry, conduct public hearings, and determine the significance of impacts, evaluate mitigation measures, and produce recommendations.

As described by interviewees, the presentation of information specific to cumulative effects during EA is often led by the proponent due to the requirements under the MVRMA. In general, interveners do not complete an analysis of cumulative effect themselves and do not see it as within their responsibilities, or ability, to specifically do so, but would comment on and consider cumulative effect within their evaluation and suggestions depending on the nature of the project and the available time and resources. Most intervener interviewees pointed to CIMP as the responsible party for CEA within the Mackenzie Valley. However, according to CIMP's mandate and the interview conducted with a CIMP representative, the role of the organization is to monitor and assess cumulative impacts within the Mackenzie Valley; CIMP it is not an official intervener within EA and does not comment independently from GNWT on specific development projects.

During interview, the MVLWB was clear that while the assessment of cumulative effects is not within their mandate and responsibilities as the regulating organization, cumulative effects information is important for informing the regulatory process. Cumulative effects data is not explicitly sought out by staff during regulatory stages, although may be important for decision-making processes such as drafting water licenses or establishing specific water quality monitoring programs. In terms of preliminary screening, cumulative effect may be important, but at this point the focus would be about evaluating the potential for impacts and concern, which corroborates the observations from the document review and linkages between cumulative

⁶ <http://reviewboard.ca/registry>

effects and public concern. The Review Board (MVEIRB) is required to consider cumulative effects within their evaluation of the evidence and interviewees emphasized this obligation, but as the decision-making body they do not independently collect and conduct assessments of data.

Taken together the semi-structured interviews suggest that there is uncertainty in terms of the process and responsibility for assessing cumulative effects as they relate to proposed development projects; as stated by one interviewee, “our biggest challenge is that no one is really doing it.” There is a general awareness of the importance of cumulative effects among the parties involved in EA and regulation, but there is no organization who specifically sees the assessment and analysis of cumulative effects as part of their mandate, jurisdictions, and/or abilities within a specific EA process.

6.1.2 What is a Cumulative Effect?

Each interviewee was asked whether, and how, their organization defines cumulative effects. There is no consistent definition of cumulative impacts/effects across the organizations involved in EA. No intervener organizations had an official or accepted definition, but some had informal understandings or stated that they would defer to available federal legislation and/or Review Board guidance. Interviewees from the Review Board and the Land and Water Board referenced the EA guidance produced by the Review Board, in which cumulative effects are defined as, “those impacts (biophysical, socio-cultural or economic) that result from the impacts of a proposed development in combination with other past, present or reasonably foreseeable future developments” (MVEIRB, 2004, Appendix H, 80). Conceptually, cumulative effects were described by all interviewees to include both natural and human/development induced impacts. However, in practice within EA, discussions of cumulative effects were described as variable and typically limited to a project-based focus.

The legislated definition of cumulative impacts within MVRMA, referenced by the Review Board and the Land and Water Board, includes the combined impacts of industrial activities. However, a Review Board interviewee recognized that this may not always align with how cumulative effects is conceptualized by interveners,

“...normally if you are using the water you just care how clean the water is or how clean the water isn’t, not whether it was company x, company y, or company z that polluted it...So parties [interveners] tend to take a cumulative view of stuff because they are experiencing the real world and the real world includes the additive sum of effects.”

The EA process is tied to a particular development activity and focused on the specific consequences of that activity, but concerns from interveners and communities about the state of VCs are not necessarily isolated to the activity in question. This was also brought up in the interviews with interveners, notably First Nations organizations, which were less likely to approach cumulative effects as a separate area of focus during the EA and instead take the view that “everything is cumulative.”

Many interviewees described CEA as in its infancy in the Mackenzie Valley. Cumulative effects are often discussed within EA processes and brought up by communities, interveners, and decision-makers, but there is a lack of consistent language, approaches, and scope for CEA.

“...cumulative effects seems almost like it is in its infancy and it is sort of just airy fairy. I mean everyone talks about it ...but when you sit someone down and you ask well what is one, is this one here? they will say well I don’t know.”

There is variation between organizations in how cumulative effects are approached and conceptualized and a lack of common language, approaches, scope, and understanding. It was evident from the interviews that there is no coordinated effort for understanding cumulative effects as they relate to individual projects, instead organizations are considering cumulative effects according to their own internal processes on a project-by-project basis.

Interviewees were also asked specifically about whether their organization has any definitions, established approaches, or internal guidelines for cumulative impacts to freshwater. No intervener organization identified available guidance or approaches specific to freshwater cumulative effects. The lack of definitions and established guidance for cumulative effects, and for freshwater cumulative effects specifically, corroborates the results of the EA report document review where cumulative effects were discussed inconsistently and generally. Also aligning with the results of the document review, impacts to caribou and social and cultural systems was a more common area of focus for cumulative effects in the professional experience of interviewees. Freshwater cumulative effects were described as a factor in some specific EAs and many interviewees brought up examples of the proposals and EAs completed for mining near Lac De Gras. Most intervener interviewees from GNWT, aside from the interviewee from Environment and Natural Resources, were unable to comment on freshwater in detail as it is outside of the core focus of their department. Where possible interviewees were asked to focus their answers on freshwater, however it was important that interviewees speak to the typical practices of their organization and in many cases commented on cumulative effects more generally. Therefore, the themes discussed in the following sections are not necessarily exclusively relevant to freshwater cumulative effects.

6.2 Data and Information

A key objective of this research is to explore what information is considered and what information is needed when making decisions about cumulative effects and freshwater within an EA process. A large portion of the interviews questions focused on these topics (Appendix B). It is useful here to distinguish data and information. As put by one interviewee, “when you say data I am thinking about raw monitoring data, I am not thinking about the processed information

that results from the analysis of that data.” While these terms have been used interchangeably in this thesis thus far, data, in this case, refers to raw facts, and information refers to data that has been analyzed and interpreted to be meaningful. The relationship between data and information was described in interviews to be highly important for decision-making processes. The results of the interviews suggest that during an EA, data to support CEA and information to feed into decision-making processes about the significance of cumulative effects are both limited and supplied almost entirely by the proponent. Challenges exist for both decision-making and intervening organizations in obtaining and interpreting both technical data and information about the potential cumulative effects of proposed projects

6.2.1. Data Availability, Usability, and Compatibility

All interviewees identified a key challenge in the availability of data to support the predictions and assessment of cumulative effects. When asked about whether there is the data available to their organization to identify potential cumulative impacts all interviewees described baseline data as limited. When asked about how data is shared between proponents, interveners, monitors, and decision-makers interviewees highlighted additional issues associated with the coordination and connection between data sources. Interviewees consistently brought up challenges in terms of the technical predictions for cumulative effects, and data availability, usability, and compatibility.

6.2.1.1 Predicting a Cumulative Impact

Compiling and analyzing data to predict cumulative impacts is a scientific and logistical challenge. Interviewees explained that since EA is driven by a proposed development project, the collection of data tends to be focused on a project-based scale. There may be some large-scale projects contributing to cumulative impacts, but it may also be a question of “a thousand

cuts”; the result of several small-scale projects operating in an area over time. In addition, representatives of the Review Board described defining and including reasonably foreseeable developments into assessments as challenging particularly in industries where the future of developments may be subject to fluctuating market conditions and not established or readily shared at the time of EA. Understanding cumulative effects is limited by a lack of adequate data to understand baseline conditions and the predicted effects across space and time.

Interviewees, particularly interveners, emphasized the challenge of obtaining sufficient data to support an analysis and determine whether there are likely cumulative impacts resulting from a proposed project. As said by a representative from an intervening organization, “How am I supposed to prove or demonstrate that a project that hasn’t been undertaken yet is going to have a major negative impact, you can’t...it is really burdensome and we don’t have the resources to do that.” An EA is focused on a proponent and specific project, so the identification of a VC impacted cumulatively is not enough, the relative contribution of the project in question and mitigation measures must be identified. Establishing whether a VC is impacted and to what extent is challenging for organizations, and for cumulative effects there are additional challenges in determining the extent to which the project under review may be contributing to combined impacts.

6.2.1.2 “Nobody collects data except the proponents”

It was evident during the interviews that interveners and decision-makers are highly dependent on the proponent to supply baseline data and monitoring information for assessing impacts. Data for CEA is ideally compiled at multiple spatial and temporal scales, but the data available for CEA is almost exclusively supplied from proponents and focused on their specific project; according to an intervener interviewee “...nobody collects data except the proponents.”

Baseline data is typically collected at a limited spatial and temporal scope according to the proponents' resources and needs, which is not often sufficient to establish a reference condition. Proponents typically conduct baseline studies over 1-2 years prior to their proposal, which was consistently characterized by interviewees as insufficient for determining the presence and extent of biophysical impacts.

Interviewees explained that data from proponents is typically readily shared on the MVEIRB Public Registry, but in pdf formats with little metadata, which makes additional analysis difficult. In addition, since the data is produced by each individual proponent, the data from different projects and projects currently operating is not always compatible and useable to support CEA, which requires regional analysis. Proponents, understandably collect data that is suited to their own resources and needs, and the requirements for monitoring generated through past EAs may not necessarily be consistent. As described by one intervener interviewee, "... the gaps that we have and the information that sometimes proponents and developers send to us cannot really be used to build a cumulative impact assessment for that specific area."

Some intervening organizations, particularly GNWT, have internal monitoring programs and there are also some community monitoring programs, but these were described as limited and "piecemeal" across the territory and may not be compatible with each other or the data provided by proponents. Interviewees identified that in some areas, for instance Lac de Gras where there are multiple active large scale mines, there is more water quality monitoring and more data available than other areas where there are little or no existing development. The regional data collected by CIMP could be utilized in EA processes by interveners, but it may not be useful for the specific site and project under assessment. CIMP focuses their resources on key geographic hotspots and VCs. According to the CIMP interviewee, given the limited resources

for monitoring it is challenging to try to “crystal ball” where future development activities might occur and produce supportive data in advance of project proposals.

6.2.1.3 Northern Data Challenges

The Mackenzie Valley is a large area with a small population and relatively low density of development when compared to many southern Canadian jurisdictions. These conditions were described as contributing to a lack of baseline data. Unlike in many southern Canadian jurisdictions there are often not multiple projects in an area actively contributing to monitoring. In areas that are undeveloped and sparsely populated, data may be almost non-existent making it nearly impossible to establish a reference condition,

“The issue in the north is that developments are few and far between... it might be easier when you are somewhere where there are more developments, more easily quantifiable, where they are in proximity, or they are going to be intersecting.”

Impacts in remote areas may also be less visible and subject to less public concern than those that occur in more populated areas. Many organizations characterized the ability to predict cumulative impacts as limited, but important for the Mackenzie Valley where development is still quite sparse, but beginning to advance. As said by an intervener interviewee “everything here is pretty much pristine. It’s not like down south where everything is impacted already...so for us it’s just trying to monitor but also put in some measures that are preventative.”

Interviewees also pointed out a lack of research initiatives for broad data collection in the north. The establishment of many of these areas now undergoing early exploration has been quite recent and as such they have received less scientific and research attention than many southern more developed areas. A lack of data means that even though there may be concern or questions about cumulative effects raised, there is limited data or measurements available to support the analysis or predictions required to answer those questions. The unique ecological

setting can also present challenges. Freshwater bodies in northern ecosystems may be quite different than in southern areas in terms of composition, productivity, and the species that they support. As described by an intervener interviewee,

“there is so little in the way of research on the robustness of water bodies here or systems, like what can you do to a lake up here before you start really changing it? ...I think the concern is that by the time we get baseline data everything has changed.”

6.2.2 Information and Significance

EA decision-making requires data to support the technical predictions about impacts, but also information about the significance of impacts and what these potential impacts mean for VCs. The relationship between data and information is important, but both are limited for cumulative impacts and highly dependent on the submissions of organizations and the structure of impact analysis within EA.

6.2.2.1 Determining Significance; “How much is too much?”

Interviews with representatives from the Review Board (MVEIRB) provided insight into the decision-making process and challenges for cumulative effects. Under the MVRMA, the Review Board is required to consider cumulative effects when making their recommendations. MVEIRB must determine the significance of the impacts of a project after reviewing the information presented during the EA. The EA process is quasi-judicial and Review Board, and the Land and Water Board during the regulatory process, are intended to be neutral and objective decision-making bodies. Each EA process is a “blank slate.” The Review Board relies on proponents, interveners, and the public to provide data and information about impacts, which is added to the public registry. The Review Board must make a reasonable decision after considering all of the assessments and submissions that are uploaded on to the public registry for that particular project. The Review Board can, but does not often independently bring data into

the process and interpret it on their own because they must be neutral and cannot be biased for or against the proposed project.

As described by an interviewee from the Review Board, the approach used to determine significance involves defining what is an acceptable and unacceptable level of change or impact for a VC, determining where the predicted impact of the proposed project falls on that spectrum, and then evaluating mitigation measures and options available to pull the impact to the acceptable side of the line. Determining significance requires both scientific data about the nature of impacts, and also value-based information and interpretations about whether or not they are acceptable.

“...when we are making decisions about significance, it is not just a technical decision, or a number of parts per million. It has to do with applying societal values and the acceptability of the proposed change. So part of it is a scientific question, what is going to happen and then the other part is, is that ok? And that is not a scientific question that is a values question and often the people who are most comfortable talking about the prediction are the least comfortable talking about whether it is ok or not because it is not scientific. So trying to get useful qualitative descriptions of a reasonable limit of acceptable change...is hard.”

Interviewees from intervening organizations described challenges in determining what the acceptable development thresholds are related to cumulative effects; “how much change is too much? How much is acceptable? ...the challenge is in getting people to agree and in quantifying that”. Defining an acceptable impact or level of change for determining significance is dependent on who is asked. First Nations, communities, interveners, and proponents might have vastly different perceptions about the significance of impacts. An example brought up by interviewees is the water quality of Lac de Gras and the difficulty of understanding what is meant by substantially unaltered and an acceptable limit of change. The water quality in Lac de Gras, is widely regarded to have been originally close to distilled water; as described by one intervener interviewee, “the practices among land users historically, you know you are out there

and you take a cup and you scoop the water...you drink it.” Over time, water quality has been impacted by mining developments. Though the water quality has changed, if compared to acceptable thresholds for contaminants and nutrients in southern jurisdictions, it could be interpreted as acceptable. However, compared to its original state it may not be seen as acceptable, particularly to First Nation communities and traditional land users, “the notion of it being safe to drink doesn’t necessarily match up with regulators notions of safety.”

6.2.2.2 Painting pictures

The Review Board interviews illustrated that data about predicted impacts is only part of what is required for decision-making. Accompanying information and interpretations about what the data means for impact significance are required to inform decision-making. Intervenors may upload data to the public registry, but the importance it has for the Review Board decision depends heavily on whether intervenors provide interpreted information on its meaning for the assessment. As put by one Review Board interviewee,

“...the extent to which parties run with it [data] effects the weight of the evidence, the weight that the [Review Board] can give it. If it is just a bunch of stuff that the [Review Board] put on [the public registry] itself and no one cares about it then the [Review Board] has a bit of a hard time in its quasi-judicial role to say we have got all of this evidence and you know away we go...when we have [an intervener] trying to be helpful and they take all these reports and throw them on [the public registry], like here is this great report from the experimental lakes about arsenic and some other thing, we are like OK fantastic but that has almost no weight for us and we can’t do anything with it unless you tell us.”

The interpretation of impacts is typically led by the proponent since they are required to assess the impacts and cumulative effects of their proposed activities. Intervenors comment on the assessment done by proponents, but without adding their own assessments and supportive information little additional information is available to inform decision-making. As said by a Review Board interviewee, “...we can get all the information we want but we can’t do that much with it unless an [intervener] or someone says that they care, and it matters, and kind of connects

those dots, between that value-based acceptability stuff and the evidence that is needed to support those decisions.” In addition to a lack of supportive data to complete the technical analysis, information is often lacking for cumulative effects to support decision-making processes. The awareness of the need for information among intervener interviewees was inconsistent. One interviewee equated this process and the need for interveners to participate as painting a picture,

“...the public registry is the palette of paint. The [proponent] is going to paint the picture of approved with no measures. And they might bring 5 colours to the palette, the public registry. [interveners] will sit there and they will say well you should paint a different picture [proponent] and you should add a bit of colour. But the [proponent] is never going to add any more colour because 5 colours is all that you need for a reasonable decision. What [interveners] need to do is they need to start bringing 10 more colours to the palette and, and paint their own picture.”

As discussed in previous sections, the data available for CEA is limited and largely provided by the proponent. Part of the challenge for understanding cumulative effects is the availability of data, but another part is a lack of information to accompany the data presented during the EA. The EA process was described as heavily dependent on the effective participation by intervening organizations in contributing and interpreting data to support assessments of significance and decision-making.

6.2.2.3 Capacity Challenges

Four of the semi-structured interviews conducted were with representatives from First Nation governments resource management organizations that are involved in EA and/or regulation processes. Each organization has their own specific conditions, processes, approaches, and regional settings, but there were consistent challenges identified for First Nation interveners including adequate time and resources to consult and provide input during EA and the effective uptake of traditional knowledge within the review of impacts and their significance.

First Nation intervening organizations described organizational challenges and limited personnel and resources to support their participation in EA and regulatory processes. As previously stated, the availability of data is often not adequate for technical predictions of cumulative effects, but the EA process is heavy with reports and submissions; in terms of data, for First Nation organizations one interview explained that “there is too much and not enough”. In some First Nation organizations, there are few, or one person, whose job is to review all reports, data, and information presented during EA. Without adequate resources to review the evidence, the ability to provide meaningful comments and input is limited. As put by one interviewee, “I would give a resounding “no” on my confidence in the amount of baseline data, and our ability to get through data when it is presented to us.” While the EA legislation supports the inclusion of First Nations, the ability for First Nation organizations to effectively participate in the process is restricted by time and resources.

As noted earlier, First Nation organizations in general did not define and consider cumulative impacts as a separate issue and instead hold the view that “everything is cumulative.” While it is a practical and scientific challenge for organizations to assess cumulative effects within a project-based EA, cumulative effects are intuitive for communities and First Nations observing the impacts of multiple developments over time on their local scale. There are persistent challenges for EA regulators in obtaining sufficient technical data to identify cumulative effects, but also in incorporating value-based information about local factors and determining what types of impacts are acceptable. Understanding how community based and Indigenous knowledge can support and be effectively utilized during decision-making is a key issue for CEA. As said by one intervener interviewee, “The [Review Board] has done a better job than most regulators in Canada and looking at the traditional knowledge and that sort of

perspective, but there is still gaps and there is still a lot to be learned.” First Nation organizations described challenges in the effective uptake of traditional knowledge and drawing the line about what kinds of impacts are acceptable,

“...that is something that you don’t see in legislation, it is not structured in a way that allows you to say at some point this waterbody just can’t support any more period, it doesn’t matter how they try to offset it...this area just can’t take anymore.”

Reconciling differing perspectives and world views in terms of cumulative impacts is challenging, but important for determining significance, mitigation, and making decisions about the future of a project.

6.3 Managing Cumulative Effects and Environmental Assessment Decision-Making

If EA is to result in informed decisions about development projects and function as a management and planning tool, information about cumulative effects needs to be considered; however, interviewees identified limitations in managing cumulative effects through EA processes as the scope and decision-making capacity is constrained to one project. As previously discussed, there are challenges in obtaining data, predicting impacts, and determining significance, but there is also the question of how to make decisions and regulate individual projects that contribute to cumulative effects in a given area.

The EA process is focused on the actions of the particular project, which may be small and have little impact when considered on their own, but if a VC or area is already being impacted by other developments or natural factors the contribution may be significant. Several interviewees brought up, in varying ways, the point that “the VC does not care what is impacting it.” This underscores the importance of effects based analysis for impact assessment, but poses challenges for decision-making. The VC may not care what is impacting it, but the management process does because an EA is connected to a proponent; “the users of the VEC don’t care what

the sources of the impact are normally...from a management perspective it is important to understand who is doing what.” Sustainable management may require making decisions about cumulative effects, which have emerged over time, and are not entirely connected to the proponent’s actions. As put by two interviewees,

“So if you have you know a hypothetical watershed and there is a bunch of projects that come online over time, how do you structure it so that you are not punishing later entrants... this is always industry’s argument saying well if I am the 10th entrant into this, the cumulative or the incremental effect of my project is small, but if my project is the one that pushes some contaminant level over the edge I shouldn’t have to be the only one responsible for it.”

“... you are limited by the scope of that specific review, and you can only assess a project on that project’s basis...you get to questions of I guess, fairness. Why does this developer have to be subject to all of this consideration?”

In an area where development is expanding there may be multiple active projects and proponents proposing new developments. In addition, there may be natural factors that have contributed to cumulative impacts that may influence the significance of the impacts from a proposed project, “the need for a project to do more mitigation may arise from a situation that is not the fault of industrial development.”

In addition to questions of “fairness” and how regulate cumulative effects without placing the burden on newer proponents, there are logistical challenges in making decisions about cumulative effects through EA that were identified through interviews with interveners and the Review Board. The scope of EA limits the extent to which decisions and recommendations can be made; “we cannot make measures for other developers who are not in the EA”. There may be significant cumulative effects in an area that are uncovered through an EA process, but measures and recommendations can only be produced for the proponent undertaking the EA despite that there may also be other projects which are already licensed or permitted also contributing,

“...if we don’t understand well, the relative contributions of the different factors that are contributing to a cumulative effect, then it can be hard to decide what piece is left for the next project or how stringent to be on the new project in order to be protective.”

In addition, the ongoing assessment cumulative effects after EA is not guaranteed. Once the EA is complete and if the project is approved it transfers into the regulatory stage where specific parameters, thresholds, and monitoring requirements are set by the Land and Water Board based on recommendations produced through the EA. According to the interview with Land and Water Board representatives, depending on the project cumulative effects may be an important consideration during the regulatory phase, but data and management challenges remain persistent.

Chapter 7: Discussion and Conclusion

This chapter discusses the results of this research in the context of each of the research questions, the existing literature, and the management process in the Mackenzie Valley. The second part of this chapter discusses the conclusions of this research and recommendations for improving EA and use of cumulative effects information in the Mackenzie Valley, which are based on the results of this project and literature on best practices for CEA and EA.

7.1 Discussion of Research Questions

The purpose of this research was to investigate EA decision-making and how information about cumulative effects to freshwater is used to guide decisions about resource development. Given the interconnected nature of freshwater resources, understanding cumulative effects at the watershed level is vitally important for resource management. A key issue for CEA and is the connection to decision-making processes; is information about cumulative effects being used for decision-making and resource management? These issues are present in the EA process in the Mackenzie Valley. Monitoring cumulative effects is a required part of the MVRMA and land claim agreements, however there is a weak connection between cumulative effects information and EA decision-making, which has been identified by the 2015 Environmental Audit coordinated by the Government of NWT, as well as identified by CIMP and EA organizations, and corroborated by the results of this research. Through an extensive document review and interviews with key representatives from organizations involved in EA this project sought to address the following questions:

- 1) How are cumulative effects considered when making EA decisions regarding impacts to freshwater?

- 2) What information about cumulative effects is used and what information is needed when making EA decisions regarding impacts to freshwater?
- 3) What key challenges exist for cumulative effects decision-making?
- 4) What opportunities exist to improve decision-making and EA processes?

The key themes identified throughout this research are discussed below in relation to each research question. The last research question is addressed section in 7.2 of this chapter, which is focused on recommendations and opportunities for improving EA and decision-making.

1) How are cumulative effects considered?

The first question that guided this study was to understand how cumulative impacts to freshwater are considered during EA in the Mackenzie Valley. The review of past EA reports and the analysis of the semi-structured interviews revealed that there is not a consistent approach among organizations for CEA. Cumulative effects are predominantly evaluated on a project-based basis, as a result of the existing EA requirements in the MVRMA (1998, 117(1)). Intervener organization involved in EA are concerned about cumulative effects and consider them to some extent within their analysis, but remain unclear in terms of the definition for cumulative effects, who is responsible for CEA, and the best approach for evaluating cumulative effects during EA.

There is broad agreement in CEA research as well as within best practices guidance for EA, that CEA requires the synthesis of multiple types of information complied at multiple spatial and temporal scales, and is better suited to regional or watershed scales of analysis than as a component of a project-based EA (Canadian Environmental Assessment Agency, 2017; Harriman Gunn & Noble, 2009; Hegmann & Yarranton, 2011; Noble, 2010). However, the relationship between project-based processes and information about sustainability and

cumulative effects is important. Regional assessments have been supported for their potential to better evaluate cumulative effects and are being explored by many Canadian jurisdictions to varying degrees, but the successful implementation for regional assessments in practice and the integration with different levels of impact assessment remains challenging (Gunn & Noble, 2009; Halseth et al., 2017; Harriman & Noble, 2008). Capacity challenges and issues in terms of organizational structures, coordination, and leadership for CEA have been identified in many jurisdictions (Noble & Basnet, 2015; Sheelanere et al., 2013; Sinclair et al., 2016).

The limitations of project-based processes for understanding and managing cumulative effects were reflected in the findings of this research. The results of the document review and interviews suggest that there is consistent recognition of the obligations to consider cumulative effects. However, CEA is evaluated on a project-by project basis and organizations are siloed, isolated from each other, in respect to the assessment of impacts. While the importance of cumulative effects is well recognized, the project-based lens has presented issues in terms of site specific and proponent driven data that is not integrated with broader objectives and management goals, and a limited scope for management and decision-making. The Mackenzie Valley has not implemented an approach for regional CEA, but does have an existing regional cumulative impact monitoring program (CIMP). However, this research has shown that the cumulative effects data being generated is not effectively linked to EA and not necessarily readily usable for assessing and making decisions about the cumulative impacts of development projects. There is awareness of cumulative effects among organizations involved in EA, but regional monitoring and project-based assessment needs are not well connected.

Capacity and organizational challenges for the effective implementation of CEA were also well illustrated in the results of this research. The process for CEA in the Mackenzie Valley

and the roles of various organizations are ambiguous. Through the interview analysis, it became clear that there is an absence of guidance for CEA. Cumulative effects are applied as a general consideration to EA, but there is no established definition among the organizations involved in EA processes for cumulative impacts/effects, and limited internal definitions. The lack of common language means that in practice the consideration of cumulative effects often lacks depth, and there is inconsistency in how organizations understand and evaluate cumulative effects. The specific focus on freshwater was difficult to achieve in the document review and in some of the interviews due to the generalized approach for considering cumulative effects within EA. In addition, the connection between cumulative effects and public concern was well illustrated during the document review and within interviews, but the roles of various types of information within CEA is unclear.

There is uncertainty in terms of the responsibility for CEA in the Mackenzie Valley. Research has identified the existence of a lead agency or group of agencies as an important indicator for the capacity to implement CEA and management (Noble & Basnet, 2015; Sheelanere et al., 2013). There is no organization in the Mackenzie Valley who specifically views the assessment of cumulative effects as part of their mandate and/or abilities and detailed consideration within EA processes is limited. While CIMP takes responsibility for monitoring and has been striving to actively provide information to decision-makers and regulators, there is no organization who specifically identifies a role in completing CEA and no coordinated effort across the Mackenzie Valley. Initiatives by CIMP and EA organizations to evaluate and improve their processes for data and cumulative effects are isolated and the connection to assessment is unclear.

2) What data and information is available and what is needed?

The document review highlighted the key environmental issues considered for cumulative effects and a significant portion of the interviews focused on exploring what data/information is available and what is needed to understand cumulative effects within EA. It was evident that there are considerable limitations in terms of data availability to support the assessment of cumulative effects for all VCs, including freshwater. In addition, it became clear that there is also a need for information and interpretations of the significance of cumulative impacts as they apply to development projects, and active participation from organizations to support CEA and its connection to EA decision-making.

Watershed CEA requires baseline data to identify past trends, multi-scaled monitoring, and coordinated data collection and management (Noble & Basnet, 2015). A key theme that arose throughout the document review was a lack of baseline data, inadequate studies, and unclear and inconsistent procedures for CEA. These results were corroborated through the interviews where issues in terms of data availability and compatibility were consistently brought up by representatives of intervening organizations, decision-makers, and regulators. Baseline data is limited across the Mackenzie Valley and predominantly provided by proponents over a limited time frame and geographic extent. Additional sources of data including government monitoring, community monitoring, were described as poorly connected, which creates a challenge for building an assessment of cumulative effects. An ongoing focus in watershed CEA research is the technical predictions of cumulative impacts and building sufficient reference conditions to adequately understand changes over time and space (Canter & Atkinson, 2011; Dubé, 2003; Dubé et al., 2013a). This research suggests that these issues are predominant in the Mackenzie Valley, particularly where development and population density is low.

The results of this research provided insight into the process for CEA in the Mackenzie Valley; CEA is driven by proponents and interveners comment on the proponent's assessment. The data challenges for CEA are significant, but the effective *use* of the data is also important. The EA process requires the interpretation of data and “painting pictures” about the significance of impacts to connect scientific data to decision-making. The effectiveness of the EA process depends on the active participation of intervening organizations, including First Nation organizations and communities who are observing impacts on their local scale. Research focused on the capacity of organizations to implement and sustain CEA and management has highlighted the need to evaluate CEA in practice and its connection to decision-making, in addition to improving technical ability to understand and predict cumulative effects (Hegmann & Yarranton, 2011; Noble, 2015). The results of this research suggest that for the EA process in the Mackenzie Valley, establishing this connection between CEA and decision-making requires addressing intervener participation and capacity for providing data and for evaluating and the significance of cumulative effects in the context of broader management goals.

3) What are the key challenges for cumulative effects decision-making?

The challenges for decision-making include the lack of data and information, but also the logistical challenges in terms of the relationship between project-based EA and cumulative effects management. The need for CEA to adequately understand impacts, particularly in settings where there are multiple developments and in the context of broad natural issues such as climate change, have been well argued in research (Halseth et al., 2016). However, in practice the relationship between CEA and EA is a complex one. The issues identified by interviewees in making recommendations and decisions about cumulative effects within a project-based process limited to a specific site and proponent, illustrate enduring issues for the management of

cumulative effects (Halseth et al., 2017). CEA is conceptually beyond the scope of a project-based EA; however, an effective EA is well integrated into planning and management and informed by information about cumulative effects (Duinker & Greig, 2006). Identifying the relative contribution of projects to cumulative effects is important for management, but the technical predictions to support this type of information are often limited. The results of this research reinforce a need identified in literature to better define the relationships between different forms of impact assessment to support integrated management systems (Harriman & Noble, 2008; Pope et al., 2013; Sinclair et al., 2016). In addition, this research highlighted decision-making challenges in defining acceptable thresholds and understanding the significance of cumulative effects. These findings are reflective of recent calls in the literature to better understand the effectiveness of CEA in supporting decision-making (Atlin & Gibson, 2017; Duinker et al., 2013; Foley et al., 2017; Jones, 2016; Noble, 2015; Noble & Basnet, 2015; Seitz et al., 2011). The regulation of development projects requires sound technical data and predictions, but also interpretations of the significance of impacts in the context of ecological and social conditions and goals. The effectiveness of CEA as a decision support tool depends on its ability to meet the information needs of EA organizations, but also on the extent to which decision-makers, regulators, and interveners make use of it (Hegmann & Yarronton, 2011).

Another dimension of the challenges for decision-making is the lack of accepted definitions, guidance, and approaches for understanding cumulative effects during EA within the Mackenzie Valley management system. The approaches of intervening organizations and proponents in CEA, and the ways that cumulative effects are conceptualized by organizations is variable. Intervening organizations are predominantly addressing cumulative effects on an ad hoc basis according to their specific mandates, resources, and VEC focuses. Cumulative effects

are ideally not exclusively studied and managed through an EA process, but a well-executed CEA should function as a useful tool for the decisions made through EA. The challenges for CEA in practice are generating the information that is needed and building the capacity among organizations to use this information within EA and broader resource management systems.

7.2 Recommendations and Conclusions

A key theme that underscores CEA research is the relationship between EA processes and cumulative effects. It is clear that over time development activities and natural conditions contribute to cumulative effects, and that characterizing these effects requires a broad spatial and temporal scope. Paradoxically, decisions about resource development projects are often made through EA, which is typically not conducive to the regional scope required and generating the complete set of data and information needed for CEA (Jones, 2016). The results of this research support the research field and illustrate these issues within the specific context of resource management the Mackenzie Valley. Informed by the results of this study and EA and CEA literature, this research offers five recommendations. These recommendations are focused on improving the EA process and the use of cumulative effects information for EA decision-making, and also on addressing the data/information needs of EA organizations and decision-makers:

- 1) Establish consistent approaches, definitions, and CEA guidance for EA organizations
- 2) Improve coordination among organizations and leadership for CEA
- 3) Build capacity for interveners to comment on cumulative effects and increase resources for First Nation interveners
- 4) Improve the connectivity and compatibility of existing data sources and the monitoring that occurs during and following EA

- 5) Explore opportunities for regional assessments of cumulative effects and strategic plans to support the decision-making process for individual projects

7.2.1 Opportunities to Improve the Environmental Assessment Process

This research evaluated the EA process for how information about cumulative effects is considered, and uncovered key challenges in terms of the unclear approach for CEA and organizational factors. CEA requires both scientific input and institutional arrangements. The way cumulative effects information is handled during EA process could be improved by establishing consistent approaches, definitions, and guidance, and building capacity and collaboration across organizations. Most of the challenges identified in this research are not unique to the Mackenzie Valley and have been identified within other jurisdictions and CEA and EA literature. Making better use of existing guidance about cumulative effects and best practices could help to address these issues.

The importance of cumulative effects is well recognized and understood by organizations, but the EA process lacks a consistent approach for cumulative effects and the organizational capacities for a coordinated assessment that contributes to decision-making. Developing an accepted definition for cumulative effects would help to build a common understanding across organizations involved in EA, which could facilitate more specific and focused discussions of cumulative effects as they relate to development projects. In addition, detailed guidelines about CEA and the roles of organizations could help to direct the analysis of cumulative effects and improve its consistency during EA. In practice, no organization has a defined role to complete an assessment of cumulative effects. Clearly defined roles and responsibilities for organizations involved in EA in respect to cumulative effects would help to facilitate a more coordinated approach. The process in the Mackenzie Valley could benefit from

cross organizational conversations about the process for cumulative effects and a lead organization or group of organizations to coordinate the assessment and establish procedures and goals.

The uptake of information about cumulative effects during EA could also be aided by guidance for interveners about cumulative effects, and by building capacity among organizations. Improving the data available to support CEA through regional frameworks or better monitoring is important, but the data generated also needs to be effectively integrated into EA. Guidance for interveners that explain the need for information and submissions that directly support decision-making processes could improve the availability of information for decision-makers and assist interveners in formulating their responses and comments on cumulative effects. Additional information support tools, such as online data portals or analysis tools, and improved awareness and capacity by organizations to use them may be helpful initiatives. For example CIMP data, and forums such as the NWT Discovery Portal⁷ and the Inventory of Landscape Change⁸, which allow visualization and access to existing monitoring information, could be leveraged for use in specific project assessments and their utility for understanding cumulative effects could be explored. In addition, the evaluation of impacts is highly dependent on the effective participation of interveners. First Nation organizations may be well positioned to provide information about the significance of impacts, baseline conditions, and effects-based information which is important for CEA, and could benefit from increased resources to improve participation and capacity during EA.

⁷ <http://nwtdiscoveryportal.enr.gov.nt.ca/geoportal/catalog/main/home.page>

⁸ <http://www.enr.gov.nt.ca/en/services/cumulative-impact-monitoring-program-nwt-cimp/inventory-landscape-change-webviewer>

While the lack of coordinated approaches, definitions, and guidance is a challenge for CEA practice in the Mackenzie Valley, there are existing materials and literature that could be utilized by organizations involved in EA to improve their capacity and consistency for CEA. For instance, CEA guidance materials from the Canadian Council of Ministers of the Environment (2009; 2014), the recently published EA review from the Canadian Environmental Assessment Agency (2017), British Columbia's new cumulative effects framework (2016) and existing CEA and EA literature. While CEA remains a challenge in Canadian and international EA jurisdictions, it is not a new concept. There are guidance materials and a robust literature field available to address these issues, but there must be an initiative among organizations to take responsibility for their approaches to CEA and explore opportunities to implement best practices in the Mackenzie Valley.

7.2.2 Addressing Data and Information Needs

In addition to exploring how cumulative effects are considered, this research sought to identify the data/information about cumulative effects that are used, and needed, for EA decision-making. The limitations of project-based assessment for CEA and the deficits in both data and information that have been identified within the results of this study, suggest that addressing the connectivity and compatibility of existing data sources and exploring regional and strategic approaches for CEA would be productive for improving the assessment of cumulative effects and better meeting the needs of organizations. However, it is also important to recognize that questions about how development projects should proceed and what actions should or should not take place will never be answered by having “enough” data. Generating more or better data will not necessarily lead to better decision-making; the effectiveness of CEA also depends on the willingness and ability of organizations to use the information provided

(Hegmann & Yarrington, 2011). Exploring decision-making support tools and information systems to assist intervening organizations and decision-makers in analyzing and interpreting information for strategic decision-making may be a helpful initiative in the Mackenzie Valley.

Addressing the data and information needs of EA organizations requires improved monitoring and assessment at broader spatial and temporal scales however, there are also some steps that could be taken at the project level to improve the data sources currently available and being used during EA. This research identified issues with the usability of existing data due to variable and short-term monitoring, little metadata, and poor data quality. Introducing guidelines, data standards, and priorities for monitoring completed during and as a result of EA would help to provide baseline data and improved connectivity and compatibility between existing data sources to better support the assessment of cumulative effects. Such guidance for proponents and other monitors would help to better define the data that should be provided by proponents and interveners during EA and improve the quality and usability of such data sources. Developing clear priorities in terms of the indicators and the data about freshwater and water quality that are important during EA and subsequent monitoring would also facilitate impact evaluation and coordination among organizations. These challenges are not unique to the Mackenzie Valley. There is a body of research within the field that is focused on developing and assessment frameworks for CEA at the watershed level (see Ball et al, 2013b; Canter & Atkinson, 2011; Dubé et al, 2013; Dubé & Munkittrick, 2001) that could be used to help develop approaches for CEA in the Mackenzie Valley.

Evident in the results of this research, organizations and decision-makers involved in EA also need data/information that is beyond the scope of the available project-based studies. Implementing regional assessments and interpretations of cumulative effects at the watershed

level, completed outside of the EA process could help address these needs and generate data to support the EA decision-making process. Ideally, a regional approach to CEA would also provide the opportunity to ask questions about cumulative effects and outline priorities and plans for impact management which would provide information beyond the confines of an individual EA process. There has been support within research for grounding regional assessments within strategic frameworks for land use and sustainability planning, to provide information that is useful to inform decision-making (Canadian Environmental Assessment Agency, 2017, Duinker & Greig 2006; Halseth et al., 2016; Harriman & Noble, 2009). The relationship between regional, strategic, and project based processes, often referred to as “tiering”, is essential; ideally regional, broader initiatives provide direction for project-based EA (Gunn & Noble, 2011).

According to the Canadian Council of Ministers of the Environment,

“R-SEA [Regional-Strategic Environmental Assessment] is envisaged as a means to assess the potential environmental effects, including cumulative effects, of strategic policy, plan and program alternatives for a region. In doing so, R-SEA can support the preparation of a preferred regional development strategy and environmental management framework, and inform subsequent project-based environmental assessment and decision processes” (2009, 5).

The relationship between regional and project-based approaches for cumulative effects and the extent to which they effectively contribute to each other is important. The implementation of regional and strategic initiatives and successful tiering in practice remains a significant challenge (Gunn & Noble, 2011; Noble & Hanna, 2015; Therivel & Ross, 2007), however these approaches have the potential to address some of the issues predominant for CEA in the Mackenzie Valley.

An effective regional CEA could improve data availability and the efficiency of project-based assessments. Regional cumulative effects data could reduce the need to complete an extensive CEA for each individual EA (Canadian Environmental Assessment Agency, 2017).

This would take some of the burden off proponents for collecting data suitable for an analysis of cumulative effects, which is outside of the scope of the project under assessment. Regional data could also improve data availability for the regulatory stage of resource management and for smaller projects and water licences that do not require an EA, but still may contribute to cumulative effects. In the Mackenzie Valley, regional assessments may be particularly useful as resource development is advancing in key industries, such as diamond mining and oil and gas, to characterize the cumulative effects of these industries and provide data for areas where future resource development is likely. Well-executed regional assessments could also help to address broad scale impact issues, such as climate change, provide the opportunity to begin conversations about cumulative effects prior to EA, and supply background information about cumulative effects and issues that are of importance to communities in the region. Due to the structure of the MVRMA and the importance of community and Indigenous participation, the Mackenzie Valley may be well positioned to implement a CEA framework inclusive of socio-economic and cultural components, which is an area of increasing interest for CEA and EA research (Joseph, Zeeg, Angus, Usborne & Mutrie, 2017; Mitchel & Parkins, 2011).

As CEA evolves to provide better data and regional and strategic approaches are explored, a persistent issue is its connection to decision-making and project-based EA (Noble 2017). This research has illustrated a weak connection between information about cumulative effects and EA decision-making in the specific context of the Mackenzie Valley. CEA is a technical and analytical tool, but its underlying purpose is to support sustainable planning and social and ecological health, which involves normative decision-making about what actions should or should not be allowed to occur. There are challenges related to the technical analysis, monitoring, and generating cumulative effects data that meets the needs of EA organizations, but

there are also challenges in using CEA to make decisions. The effectiveness of CEA depends on addressing both these issues. Cumulative effects decisions will not be improved by addressing data deficits alone, and it is important to also reflect on organizational structures, institutional capacity, and to explore support tools for decision-makers that help define impact significance. Information support systems and tools could be helpful to inform decision-making that is more accountable to strategic goals and cumulative effects. As put by Hegmann and Yarranton, “...the future of CEA as a tool to assist decision-making is dependent on the evolution of decision-making to make better use of it” (2011, 489).

7.2.3 Summary

This research was designed as a program evaluation for the use of cumulative effects information in EA decision-making. Using multiple methods, it investigated the information needs of EA agencies and the practices in respect to assessing cumulative effects, and uncovered several challenges for CEA and EA decision-making. Some of these issues can be addressed directly through the actions of EA organizations and data monitors, while others, for instance effectively managing cumulative effects and the potential for implementing regional assessments, are more complex and require reflection on a broader policy level beyond the scope of EA. In a setting such as the Mackenzie Valley where resource development is advancing at a rapid pace, CEA could be a powerful tool for sustainability planning. Given existing legislation, monitoring initiatives, and the motivation across organizations and communities to better understand cumulative effects, there are opportunities to improve CEA practice and its connection to EA decision-making.

CEA is an evolving aspect of impact assessment research and practice. The results of this research provide broad insight into the EA process and the key issues for cumulative effects

information that could be followed up on by future research and evaluations by the organizations involved in EA. This research was designed with a pragmatic approach and in partnership with CIMP. The preliminary results of this research have been shared with CIMP and the EA organizations that participated in the interviews. The results are directly relevant for management and organizations in the Mackenzie Valley, but also contributes to CEA and EA literature fields by reinforcing the need to focus on CEA practice and connections to decision-making, and offering insight into the processes and challenges within the Mackenzie Valley.

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Appendix A: List of Reports of Environmental Assessment

Proponent	Project	Environmental Assessment #	Year	Report of Environmental Assessment Link
In case of any issues with the links below refer to the Public Registry: http://reviewboard.ca/registry/				
Dominion Diamond Ekati Corporation	Jay Project	EA1314-01	2016	http://reviewboard.ca/registry/ea1314-01
De Beers Canada Inc.	Snap Lake water licence amendment	EA1314-02	2014	http://www.reviewboard.ca/registry/project.php?project_id=675
Alex Debogorski	Diamond Exploration	EA1112-001	2011	http://reviewboard.ca/registry/ea1112-001?project_id=627
TNR Gold Corp.	Moose Property	EA1011-002	2010	http://reviewboard.ca/registry/ea1011-002?project_id=92
Avalon Rare Metals Inc.	Nechalacho Rare Earth Element Project	EA1011-001	2010	http://reviewboard.ca/registry/ea1011-001?project_id=87
Fortune Minerals Ltd.	NICO Project	EA0809-004	2009	http://reviewboard.ca/registry/ea0809-004?project_id=72
Canadian Zinc Corporation	Prairie Creek Mine	EA0809-002	2008	http://reviewboard.ca/registry/ea0809-002?project_id=70
Giant Mine Remediation Directorate, AANDC	Giant Mine Remediation Project	EA0809-001	2008	http://reviewboard.ca/registry/ea0809-001?project_id=69
Selwyn Resources Ltd.	Mineral Exploration at Howard's Pass (Selwyn Project)	EA0708-001	2007	http://reviewboard.ca/registry/ea0708-001?project_id=48
Ur Energy Inc.	Screech Lake	EA0607-003	2006	http://reviewboard.ca/registry/ea0607-003?project_id=42
Tamerlane Ventures Inc.	Pine Point Pilot Project	EA0607-002	2006	http://reviewboard.ca/registry/ea0607-002?project_id=38
De Beers Canada Inc.	Gahcho Kue Diamond Mine	EA0506-008	2005	http://reviewboard.ca/registry/ea0506-008?project_id=30
Paramount Resources Ltd.	SDL 8 2-D Geophysical Program	EA0506-007	2005	http://reviewboard.ca/registry/ea0506-007?project_id=29
Canadian Zinc Corporation	Prairie Creek Phase III Drilling Program	EA0405-002	2004	http://reviewboard.ca/registry/ea0405-002?project_id=3

Proponent	Project	Environmental Assessment #	Year	Report of Environmental Assessment Link
				In case of any issues with the links below refer to the Public Registry: http://reviewboard.ca/registry/
Imperial Oil Resources Ventures Ltd.	Dehcho Geotechnical Survey	EA03-009	2003	http://reviewboard.ca/registry/ea03-009?project_id=10
Dehcho Bridge Corporation	Mackenzie River Bridge	EA03-008	2003	http://reviewboard.ca/registry/ea03-008?project_id=7
Imperial Oil Resources Ventures Ltd.	Mackenzie Gas Project	EA03-007	2003	http://reviewboard.ca/registry/ea03-007?project_id=13
Snowfield Development Corp.	Drybones Bay mineral exploration	EA03-006	2003	http://reviewboard.ca/registry/ea03-006?project_id=23
Paramount Resources Ltd.	Cameron Hills Extension Project	EA03-005	2003	http://reviewboard.ca/registry/ea03-005?project_id=19
New Shoshoni Ventures Ltd.	Drybones Bay mineral exploration	EA03-004	2003	http://reviewboard.ca/registry/ea03-004?project_id=15
North American General Resources Corp.	Wool Bay exploration drilling	EA03-003	2003	http://reviewboard.ca/registry/ea03-003?project_id=16
Encore Renaissance Resources Corp (formerly Consolidated Goldwin Ventures Inc)	Drybones Bay Preliminary Exploration	EA03-002	2003	http://reviewboard.ca/registry/ea03-002?project_id=4
Northrock Resources Ltd.	Summit Creek Exploration Well	EA03-001	2003	http://reviewboard.ca/registry/ea03-001?project_id=18
Western Geco Canada Ltd.	Mackenzie River 2D Seismic Program	EA02-002	2002	http://reviewboard.ca/registry/ea02-002?project_id=47
Paramount Resources Ltd.	Cameron Hills Gathering System	EA01-005	2001	http://reviewboard.ca/registry/ea01-005?project_id=54
De Beers Canada Inc.	Snap Lake Diamond Mine	EA01-004	2001	http://reviewboard.ca/registry/ea01-004?project_id=6
Canadian Zinc Corporation	Prairie Creek Phase II Mineral Exploration Drilling Program	EA01-003	2001	http://reviewboard.ca/registry/ea01-003?project_id=35

Proponent	Project	Environmental Assessment #	Year	Report of Environmental Assessment Link
				In case of any issues with the links below refer to the Public Registry: http://reviewboard.ca/registry/
Canadian Zinc Corporation	Underground Decline and Pilot Plant	EA01-002	2001	http://reviewboard.ca/registry/ea01-002?project_id=39
Patterson Sawmill Ltd.	Pine Point Area Timber Harvest Proposal	EA00-005	2001	http://reviewboard.ca/registry/ea00-005?project_id=21
Paramount Resources Ltd.	Cameron Hills Exploratory Drilling Project	EA00-004	2000	http://reviewboard.ca/registry/ea00-004?project_id=31
Paramount Resources Ltd.	Liard East Exploratory Drilling Program	EA00-003	2000	http://reviewboard.ca/registry/ea00-003?project_id=64
Canadian Zinc Corporation	Prairie Creek Phase I Mineral Exploration Drilling Program	EA00-002	2000	http://reviewboard.ca/registry/ea00-002-0?project_id=51
Canadian Zinc Corporation	Fuel Cache Retrieval and Clean-up development	EA00-002	2000	http://reviewboard.ca/registry/ea00-002?project_id=41
ExplorData Ltd.	Liard Seismic survey	EA00-001	2000	http://reviewboard.ca/registry/ea00-001?project_id=8
Ranger Oil Ltd./Canadian Forest Oil Ltd./Chevron Oil Resources Ltd.	Integrated P-66A/N61/K-29 Gas Wells and Pipeline Tie-in	EA99-0061/0086	1999	This project was not included in the review since the report of EA was available on the registry
BHP Diamonds Inc.	Ekati - Sable, Pigeon and Beartooth Pipes expansion	EA99-004	1999	http://reviewboard.ca/registry/ea99-004?project_id=2
Bruce Domes	Timber Harvest Proposal	EA99-003	1999	http://reviewboard.ca/registry/ea99-003?project_id=44

Appendix B: Interview Information Sheets and Questions

Information Sheet and Interview Questions for Interveners and CIMP:

Introduction

This project is focused on decision-making under the MVRMA and specifically the extent to which information about cumulative impacts to water quality is considered. As part of the larger CIMP sponsored project, my work will help to identify what information decision-makers use, what information is needed, key challenges, and potential support tools or methods of communication that might be helpful for decision-making when considering cumulative impacts.

My goal is to speak to individuals who are directly involved and experienced in the environmental assessment processes from preliminary assessment through to decision-making and regulation. Thank you for agreeing to be interviewed. I have attached a list of the topics for discussion. I understand that some questions or topics may be of more relevance to your agency than others, but any insight that you can provide would be greatly appreciated. The proposed topics for discussion are structured around a few key areas: defining and understanding cumulative impacts to water quality, the information needs of the agency in respect to cumulative impacts during assessment and regulatory processes, and decision-making practices and challenges. We may not cover all questions, and questions may change slightly as the research project unfolds. The focus of these interviews is the needs, practices, and challenges of the agency. You will not be asked to provide personal opinions.

Topics for Discussion

Defining Cumulative Impacts and Key Issues

1. How are cumulative impacts defined by your agency?
 - Has your agency identified any challenges with this definition?
2. How are cumulative impacts to water quality defined by the agency (e.g. regulations, policies, other objectives, statements, or guidelines)?
3. What issues/data are most important for the agency when assessing cumulative impacts to water quality within environmental assessment (EA) and regulatory processes?
 - Are there any questions about cumulative impacts that consistently emerge across projects?
 - Can you provide some examples from specific projects?
 - Have there been any reviews or evaluations of what data is most important when assessing cumulative impacts issues for water quality?

Information Needs

4. What types of data are typically available to the agency for assessing cumulative impacts to water quality?
 - Is the availability of data to the agency similar across projects?
5. Is there baseline data available to the agency to identify potential cumulative impacts to water quality?
 - Is that data consistently available?
 - Have any reviews or evaluations identified additional types of baseline data needed?
6. How is cumulative impact data obtained by the agency during an EA or regulatory process?
 - Has the agency experienced any challenges in obtaining sufficient data for assessing cumulative impacts to water quality? If so, what challenges?
7. How is cumulative impact data shared between proponents, data managers, and decision-makers during an EA or regulatory process?
 - What is a typical timeline for interaction between review boards and your agency?
 - How are information needs communicated to data monitors and managers?
 - Has your agency identified any challenges with this process?

Decision-making

8. How does the agency make recommendations about the significance of cumulative impacts to water quality during a EA or regulatory process?
 - procedures, guidelines, or defined thresholds for cumulative impact decision-making?
9. How is cumulative impact data packaged and communicated to board members (Mackenzie Valley Land and Water Board and the Review Board) during an EA or regulatory process?
 - Has the agency identified any challenges in terms of communicating information to decision-makers?
10. Has the agency identified any challenges in assessing and making recommendations about cumulative impacts? If so, what challenges?
 - Has the agency identified any potential solutions to address those challenges?

Information Sheet and Interview Questions for Decision-makers (MVEIRB):

Introduction

This project is focused on decision-making under the MVRMA and specifically the extent to which information about cumulative impacts to water quality is considered. As part of the larger CIMP sponsored project, my work will help to identify what information decision-makers use, what information is needed, key challenges, and potential support tools or methods of communication that might be helpful for decision-making when considering cumulative impacts.

My goal is to speak to individuals who are directly involved and experienced in the environmental assessment decision-making processes from preliminary assessment through to decision-making and regulation. Thank you for agreeing to be interviewed as a representative of the Mackenzie Valley Environmental Impact Review Board. I have attached a list of the topics for discussion. I understand that some questions or topics may be of more relevance to your agency than others, but any insight that you can provide would be greatly appreciated. The proposed topics for discussion are structured around a few key areas: defining and understanding cumulative impacts to water quality, the information needs of the agency in respect to cumulative impacts during assessment and regulatory processes, and decision-making practices and challenges. We may not cover all questions, and questions may change slightly as the research project unfolds. The focus of these interviews is the needs, practices, and challenges of the agency. You will not be asked to provide personal opinions.

Topics for Discussion

Defining Cumulative Impacts and Key Issues

1. How are cumulative impacts defined by your agency?
 - Has your agency identified any challenges with this definition?
2. How are cumulative impacts to water quality defined by the agency (e.g. regulations, policies, other objectives, statements, or guidelines)?
3. What issues/data are most important for the agency when assessing cumulative impacts to water quality within environmental assessment (EA) processes?
 - Are there any questions about cumulative impacts that consistently emerge across projects?
 - What are some examples from specific projects?
 - Have there been any reviews or evaluations of what data is most important when assessing cumulative impacts issues for water quality?

Information Needs

4. What types of data are typically available to the agency for assessing cumulative impacts to water quality?
 - Is the availability of data to the agency similar across projects?
5. Is there baseline data available to the agency to identify potential cumulative impacts to water quality?
 - Is that data consistently available?
 - Have any reviews or evaluations identified additional types of baseline data needed?
6. How is cumulative impact data obtained by the agency during an EA or regulatory process?
 - Has the agency experienced any challenges in obtaining sufficient data for assessing cumulative impacts to water quality? If so, what challenges?
7. How is cumulative impact data shared between proponents, interveners, data managers, and decision-makers during an EA or regulatory process?
 - What is a typical timeline for interaction between boards and data managers?
 - How are the information needs of your agency communicated to data monitors and managers?
 - Has your agency identified any challenges with this process?

Decision-making

8. How does the agency make decisions about the significance of cumulative impacts to water quality during a EA or regulatory process?
 - procedures, guidelines, or defined thresholds for cumulative impact decision-making?
9. How is cumulative impact data packaged and communicated to board members (decision-makers) during an EA or regulatory process?
 - Has the agency identified any challenges related to this process?
10. Has the agency identified any challenges in making decisions about cumulative impacts? If so, what challenges?
 - e.g. Additional information/data needed to support cumulative impact decision-making?
 - Has the agency identified any potential solutions to address those challenges?

Information Sheet and Interview Questions for Regulators (MVLWB):

Introduction

This project is focused on decision-making under the MVRMA and specifically the extent to which information about cumulative impacts to water quality is considered. As part of the larger CIMP sponsored project, my work will help to identify what information decision-makers use, what information is needed, key challenges, and potential support tools or methods of communication that might be helpful for decision-making when considering cumulative impacts.

My goal is to speak to individuals who are directly involved and experienced in the environmental assessment decision-making processes from preliminary assessment through to decision-making and regulation. Thank you for agreeing to be interviewed as a representative of the Mackenzie Valley Land and Water Board. I have attached a list of the topics for discussion. I understand that some questions or topics may be of more relevance to your agency than others, but any insight that you can provide would be greatly appreciated. The proposed topics for discussion are structured around a few key areas: defining and understanding cumulative impacts to water quality, the information needs of the agency in respect to cumulative impacts during assessment and regulatory processes, and decision-making practices and challenges. We may not cover all questions, and questions may change slightly as the research project unfolds. The focus of these interviews is the needs, practices, and challenges of the agency. You will not be asked to provide personal opinions.

Topics for Discussion

Defining Cumulative Impacts and Key Issues

11. Does the Mackenzie Valley Land and Water Board have an official definition of cumulative impacts? If so how are cumulative impacts defined?
 - How are cumulative impacts to water quality defined (e.g. regulations, policies, other objectives, statements, or guidelines)?
 - Has the agency experienced any challenges with these definitions?
12. How are cumulative impacts to water quality considered at the preliminary assessment stage?
 - How is the decision made to refer projects on the basis of cumulative impact concerns?
13. What issues and data are most important to the agency for considering cumulative impacts to water quality during regulatory processes?

- Are there any questions about cumulative impacts that consistently emerge across projects?
- What are some examples from specific projects?
- Have there been any reviews or evaluations of what data is most important when assessing cumulative impacts issues for water quality?

Information Needs

14. What types of data are typically available to the agency for considering cumulative impacts to water quality during regulatory processes?
 - Is the availability of data consistent across projects?
15. How is information about cumulative impacts obtained by the agency during regulatory processes?
 - Has the agency experienced any challenges in obtaining sufficient data for understanding cumulative impacts to water quality? If so, what challenges?
16. How is communication coordinated between monitors/data managers and board decision-makers?
 - What is a typical timeline for interaction between boards and monitors/data managers?
 - How are the information needs of your agency communicated to data monitors and managers?
 - How is cumulative impact data shared between proponents, data managers, interveners and decision-makers during a regulatory process?

Decision-making

17. How does the agency make decisions about cumulative impacts to water quality during a regulatory process?
 - procedures, guidelines, or defined thresholds for cumulative impact decision-making?
18. How is information about cumulative impacts packaged and communicated to the agency during regulatory processes?
 - Has the agency identified any challenges related to this process?
19. Has the agency identified any challenges in making decisions about cumulative impacts at the regulatory stage? If so, what challenges?
 - e.g. Additional information/data needed to support cumulative impact decision-making?
 - Has the agency identified any potential solutions to address those challenges?