Grounded in values, informed by local knowledge and science: The selection of valued components for a First Nation's regional cumulative effects management system

by

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Approval

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Abstract

Regional cumulative effects management systems monitor and seek to maintain or restore the condition of valued biophysical, social, economic and cultural components over time. Valued components – the elements that people individually and collectively consider to be important – are at the core of any cumulative effects management system. I propose a new methodology for identifying and selecting valued components for a First Nation's regional cumulative effects management system. The methodology explicitly incorporates Aboriginal perspectives, values and knowledge. Key features include implementation planning, clear decision-making criteria, and effective engagement with Aboriginal people. I worked in collaboration with the Metlakatla First Nation and its consultants to apply the methodology to identify high-priority valued biophysical components for a cumulative effects management system in Metlakatla's traditional territory on the north coast of British Columbia. Based on this pilot study, I assess the strengths of the methodology and suggest areas for improvement.

Keywords: Valued component, Cumulative effects, Cumulative effects assessment and management, Environmental assessment, Aboriginal governance, First Nation planning

With all my love and gratitude, to Stash Bylicki.

And

For all the sacrifices you have made throughout my life

to allow me to pursue my passions, to my mom.

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List of Acronyms

BC	British Columbia
BCEAO	British Columbia Environmental Assessment Office
BC JTST	BC Ministry of Jobs, Tourism and Skills Training
BC MOE	BC Ministry of Environment
BC OAG	Office of the Auditor General of British Columbia
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Agency
CEAM	Cumulative Effects Assessment and Management
CEF	Cumulative Effects Framework
CEM	Cumulative Effects Management
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EBM	Ecosystem-based Management
FLNRO	BC Ministry of Forests, Lands and Natural Resource Operations
FSC	Food, Social and Ceremonial
LNG	Liquefied Natural Gas
LRMP	Land and Resource Management Plan
MaPP	Marine Planning Partnership for the North Pacific Coast
MDC	Metlakatla Development Corporation
MGC	Metlakatla Governing Council
MSO	Metlakatla Stewardship Office
MSS	Metlakatla Stewardship Society
MTO	Metlakatla Treaty Office
NCSFNSS	North Coast-Skeena First Nations Stewardship Society
NEB	National Energy Board
NGO	Non-governmental Organization
PNCIMA	Pacific North Coast Integrated Management Area
VC	Valued Component
VC selection	Identification and Selection of Valued Components

Glossary

Basal Prey Species	Important prey for higher consumers in the food web and influence the structure and stability of food web dynamics (Foley et al., 2010). Marine ecosystem examples include microbes and small pelagic forage fishes.
Cumulative Effects	The spatial and temporal accumulation of impacts in an environment from multiple sources (Smit & Spaling, 1995). The effects can be additive, synergistic, interactive or irregular, and typically result from individually minor activities that become significant when considered collectively (Noble, 2010).
Cumulative Effects Assessment (CEA)	The process of systematically analyzing and assessing cumulative environmental change and identifying the total environment effects from all sources and activities on a set of valued components (Noble, 2010). CEA typically adopts a stressor-based approach which focuses on measuring and predicting the effects of development and human activities (Noble, 2013).
Cumulative Effects Assessment and Management	The process of systematically analyzing and assessing cumulative environmental change and utilizing that information to guide decisions about the potential implications of future land and resource use and planning options (Noble, 2013).
Cumulative Effects Management (CEM)	Connects assessment information to decision-making by outlining mitigation, monitoring and management strategies to prevent significant impacts to valued components (Noble, 2010). CEM adopts an effects-based approach which focuses on assessing the current condition relative to a reference state (Noble, 2013).
Environmental Assessment (EA)	The process of systematically analyzing, identifying and considering the impacts of an action (i.e., physical project or non-physical projects and policies) (Hanna, 2005).
Effects-based (Condition) Indicator	Metric that measures the current state or health of a valued component or measured cumulative change in a valued component (Noble, 2013).
Foundation Species	Species that provide the template from which most additional species interactions and dynamics emerge by creating habitat and refuge for large numbers of other species (Foley et al., 2010). Marine ecosystem examples include kelp forests and eelgrass beds.
Indicator	Metrics used to measure and report on the condition and trend of a valued component and/or the process(es) impacting the valued component (BC MOE, 2012).

Keystone Species	Species that have community-level effects that are often disproportionate to their biomass (Foley et al., 2010). Marine ecosystem examples include sea otters and the seastar (*Pisaster ochraceous*).
Liquefied Natural Gas	Natural gas which has been cooled to -160 degrees Celsius to keep it in liquid form for ease of storage and transport (BC Ministry of Energy, Mines and Natural Gas, 2013).
Local (Ecological) Knowledge	Knowledge held by a specific group of people about their local ecosystems, which includes the interplay between organisms and their environment (Raymond et al., 2010). Local Aboriginal or Indigenous knowledge is held by indigenous peoples and is unique to their culture and society (Raymond et al., 2010).
Major Project	A development project that is over $15 million (CDN) in capital costs (BC JTST, 2015). I also included mining exploration projects and clean energy projects in this definition.
Stressor-based (Stressor) Indicator	Metric that measures a human action/disturbance or cumulative stress to a valued component (Noble, 2013).
Top Predator Species	Important predator species that have strong effects on food web dynamics and play an important functional role in connecting distant ecosystems (Foley et al., 2010). Marine ecosystem examples include sharks and killer whales.
Traditional (Ecological) Knowledge	Subset of Aboriginal or Indigenous knowledge that includes knowledge and beliefs handed down through generations by cultural transmission and which is related to human-environment interactions (Raymond et al., 2010).
Valued Component	Components of the natural and human environment that are considered by the proponent, public, Aboriginal groups, scientists, and other technical specialists and government agencies to have scientific, ecological, economic, social, cultural, archaeological, historical, or other importance (BCEAO, 2013).
Valued Component Selection	The process of compiling and analyzing available information to identify environmental, economic, social, heritage and health values and selecting the values that are of greatest importance to society (BCEAO 2013).

Chapter 1.

Introduction

1.1. Research Context

As resource development expands globally, the problems of minimizing and managing the cumulative effects of development are becoming increasingly important in natural resource management and land-use planning. Even when the effects of a single development project on the environment are minor, the accumulation of these projects over time and within a given region can result in major environmental impacts (Theobald, Miller, & Hobbs, 1997). Cumulative effects can be defined as changes to valued components (VCs) due to past, present and future human activities (Smit & Spaling, 1995). VCs are the aspects of the natural and human environment that the public, scientists, industry proponents, government agencies and First Nations groups deem to be important (British Columbia Environmental Assessment Office (BCEAO), 2013). More simply, VCs are the things people care about, and want to protect or restore. Individuals and communities derive immense benefits from ecological systems and from the VCs that exist in and are supported by these systems. The capacity of terrestrial and marine systems to continue to provide social, economic and environmental benefits depends on effective cumulative effects management (CEM) (Office of the Auditor General of British Columbia (BC OAG), 2015).

Cumulative effects management has recently become a prominent and controversial issue in British Columbia (BC), Canada. The provincial government has announced plans to build and expand a major liquefied natural gas (LNG) industry (BC Ministry of Energy, Mines and Natural Gas, 2013). The people of the Metlakatla First Nation, located on the north coast of BC, will be affected in many significant ways by the proposed rapid LNG development and other projects in this region. As of March 2016,

61 major development projects were proposed in the traditional territory of the Metlakatla First Nation (Appendix A). A large proportion of these projects are related to LNG, including 5 natural gas pipelines, 16 natural gas terminal facilities and 5 large-scale port terminal expansions. The proposed projects in Metlakatla's traditional territory could have significant social, cultural, economic and ecological impacts, particularly when the impacts of past and existing developments are taken into account. Given the scale of industrial development proposed for the region, people of the Metlakatla First Nation are concerned about the cumulative effects on their land, waters, resources, people and culture.

In BC and the rest of Canada, cumulative effects are typically evaluated on a project-by-project basis through environmental assessment (EA) review processes as established under federal, provincial and territorial legislation, policies and agreements (see Chapter 2). However, deficiencies with the current approach to cumulative effects assessment and management (CEAM) have been documented in the academic literature (Canter & Ross, 2010; Duinker & Greig, 2006). In 2011, the BC government initiated the development of a province-wide cumulative effects framework (CEF) to supplement its assessment of cumulative effects in EAs of individual projects. This new CEF aims to identify a set of VCs across BC and assess the current and future condition of those VCs in order to support natural resource decision-making in the province (BC Ministry of Forests, Lands and Natural Resource Operations (FLNRO), 2014). However, a 2015 report of the Auditor General of BC found that, "the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) is not adequately addressing cumulative effects in its recent natural resource decisions in northwestern BC" (BC OAG, 2015, p. 3). That audit report identified substantial problems with decision-making processes in FLNRO's approach to CEM (BC OAG, 2015). The details of this report are discussed in Chapter 2 of this thesis. At a broad level, the audit found that the BC government has not provided FLNRO with the necessary decision-making powers to adequately address cumulative effects in the province (BC OAG, 2015). More specifically, BC's CEF lacks clear decision-making tools to support effective consideration of cumulative effects in FLNRO's natural resource use decisions (BC OAG, 2015).

An essential step in the development of a regional CEM system is the identification and selection of specific VCs (VC selection) to be monitored, maintained and improved. VCs, sometimes called valued ecosystem components, are the foundation of a CEAM system, with each subsequent step dependent on which VCs are initially selected. The BCEAO and the Canadian Environmental Assessment Agency (CEAA) provide guidelines for the selection of VCs in project-based assessment. However, the selection process itself and the principles and rationale for selecting specific VCs have not been extensively studied (Olagunju & Gunn, 2015). A methodological challenge of CEM is identifying well-defined VCs that are both responsive and measurable at a regional scale. Current practices for identifying VCs often do not explicitly incorporate local knowledge and Aboriginal values. Identifying what people individually and collectively value is inherently a subjective, social process; however, determining how those values are measured and impacted by industrial development can be a more objective, scientific process. Effective CEM requires a good understanding of the complementary roles that values and science have in VC selection.

For First Nations and other Aboriginal people, a well-designed CEM program would be an effective tool for supporting natural resource decision-making, and particularly for managing adverse impacts and maximizing potential benefits of industrial development in their territories. First, their values and goals would be incorporated in the evaluation of projects through the identification and monitoring of priority VCs over time. Information on priority VCs (i.e., current condition and trends) can be presented to proponents and government agencies to ensure that those VCs are considered in EAs. In addition, continual monitoring of the condition of priority VCs allows the First Nation to assess how project development and other activities are impacting those VCs. Second, assessing and monitoring priority VCs would provide First Nations' decision-makers with vital baseline and trend information as they seek to meet community and stewardship goals. Third, a well-designed CEM system explicitly connects monitoring and assessment information to decision-making through the development of management triggers and actions. A good CEM system provides an effective tool for First Nations to manage land and resources in their territories.

One of the major deficiencies of current CEAM systems and the VC selection process in particular, is the inadequate involvement of First Nations and other Aboriginal groups (Lawe, Wells, & Mikisew Cree, 2005; Whitelaw, McCarthy, & Tsuji, 2009). The VC selection process is inherently a values-based, subjective process. Its effectiveness depends on having a good understanding of individual and collective values and being able to identify the priority values given the specific development context of the region of interest. In recent years, engagement between academics and Aboriginal community partners in resource management research and practice has been increasing (Adams et al., 2014). Collaborative aboriginal-led research, a form of participatory action research, aims to produce practical and meaningful solutions to resource management issues by integrating scientific research with goals and strategies developed for and with Aboriginal communities (Adams et al., 2014). CEAM systems and the VC selection process should utilize Aboriginal-led research and management initiatives and principles to appropriately and sufficiently engage Aboriginal people in project review processes.

In this research, I propose a new methodology for identifying and selecting valued biophysical components for a First Nation's regional CEM system. The research is part of a project in which I collaborated with Compass Resource Management Ltd. and Metlakatla First Nation in the development of a values-focused CEM system, designed to manage and maintain priority VCs within Metlakatla's traditional territory. The proposed methodology for VC selection incorporates aboriginal values, identifies VCs with indicators that are both measurable and responsive at a regional scale and explicitly includes implementation planning as part of the VC selection process. I conducted a case study application of this methodology with the Metlakatla First Nation. Based on the results of this pilot study, I assess the strengths of the methodology and suggest areas for further improvement.

1.2. Overview of Research Objectives and Activities

The main goals of this research are to develop a new methodology for identifying and selecting VCs for a First Nation's regional CEM system, and to test that methodology in a pilot study with the Metlakatla First Nation's CEM program. Aboriginal

input and involvement in the VC selection process is particularly important to the research. In order to achieve these research goals, the research objectives are to:

1. Propose a new VC selection process for cumulative effects management in a First Nations context, designed to address the major deficiencies of current practices in BC;
2. Identify biophysical VCs in a case study application of the methodology in Metlakatla First Nation's traditional territory; and
3. Assess the strengths and weaknesses of the new methodology and discuss implications for First Nations in assessing and managing cumulative effects in BC.

These research objectives will be met by conducting a review of the literature on VC selection in EAs and CEAM, developing a VC selection methodology that addresses weaknesses of current practices in BC, and applying the methodology in a case study with Metlakatla First Nation's CEM program. The literature review will identify current practices for VC selection in CEAM in BC, and review the challenges and major deficiencies of current practices that have been described in the literature. I will then develop improvements for the new method in order to address the weaknesses of the current practices for VC selection and to reflect any best practice solutions found in the literature review. The proposed new methodology has six steps: (1) comprehensive issues scoping and a review of relevant documents (e.g., regional plans, proponent project applications, community plans); (2) identification of criteria for selecting VCs and indicators; (3) ongoing engagement with Aboriginal decision-makers and managers, research collaborators and content experts; (4) identification of criteria for implementation planning; (5) selection of priority VCs for a pilot CEM project; and (6) development of an implementation plan to include other candidate VCs into the CEM program. I apply the new methodology in a case study with Metlakatla First Nation to identify priority biophysical VCs for their CEM system in their traditional territory. I discuss strengths and areas for further improvement of the proposed methodology and the implications of this research for advancing regional CEAM, particularly in northwestern BC.

1.3. Report Structure

This report is divided into six additional chapters. The second chapter provides background on the existing institutions and processes for assessing and managing cumulative effects in northwestern BC. The third chapter provides an overview of the Metlakatla First Nation and its territory, including the proposed development projects and activities in the region. Chapter four describes the research methods, divided into four main components: (1) description of the current practices for VC selection in CEAM in BC, (2) identification of the challenges and major deficiencies of the current processes, (3) development of design and in-practice components for improving the process, and (4) description of the proposed new VC selection method. Chapter five describes the case study application of the new methodology for the Metlakatla First Nation`s CEM program on the north coast of BC. Chapter six discusses the findings from the case study results, focusing on identifying the strengths and areas for further improvement of the methodology. The report concludes with a research summary, followed by a discussion of research limitations, future research areas and potential implications of this work for First Nations' in CEAM.

Chapter 2.

Management of Cumulative Effects in Northwestern BC

2.1. Introduction

This chapter provides an overview of the institutions and processes currently used by the provincial and federal governments to assess and manage cumulative effects in northwestern BC, including in the traditional territory of the Metlakatla First Nation. Background information on cumulative effects and CEAM is provided, including the importance of VCs in CEAM and the weaknesses of current approaches to CEAM discussed in the literature. Cumulative effects are currently assessed and managed in BC directly through policy initiatives and project review processes, and indirectly through government agencies responsible for natural resource decisions at both the federal and provincial level. FLNRO is also in the process of developing a regional framework for cumulative effects management in the province (BC's CEF), which I will discuss in this chapter. The chapter concludes with a discussion of ways that First Nations in BC are managing cumulative effects in their traditional territories. The specific role of the Metlakatla First Nation in assessing and managing cumulative effects on the north coast of BC will be discussed in the subsequent chapter.

2.2. What are Cumulative Effects?

The problem of cumulative effects has been an important part of environmental sustainability discussions since at least the 1970s, and in that time, cumulative effects assessment (CEA) has become a recognized component of EA processes in Canada, the United States, and many other jurisdictions in the world (Noble, 2010). Multiple

definitions of cumulative effects exist among academics, government agencies and EA practitioners, but a good broad definition is that cumulative effects are the spatial and temporal accumulation of impacts in an environment from multiple sources (Smit & Spaling, 1995). The effects can be additive, synergistic, interactive or irregular, and may result from individually minor activities that become significant when considered collectively (Noble, 2010). More simply, cumulative effects are accumulated changes to our social, cultural, economic and environmental values or VCs from past, present and future human activities. Individual projects and other human activities do not operate in isolation of each other and the potential consequence of treating them as if they do is the continued deterioration of important environmental and social values.

A CEA systematically identifies the total environmental effects from all sources and activities on a set of VCs, whereas a CEM system connects assessment information to decision-making by outlining mitigation, monitoring and management strategies designed to prevent significant impacts to VCs (Noble, 2010). A CEAM framework incorporates elements of CEA and CEM, and includes the following steps: (1) scoping to identify and select VCs, (2) analysis of past, present and future conditions of selected VCs, (3) development of monitoring and mitigation strategies to restore or maintain the condition of selected VCs, and (4) documentation, communication and accountability to disseminate information to responsible authorities and stakeholders (Lucchetta & Steffensen, 2015). CEA typically adopts a stressor-based approach which focuses on measuring and predicting the effects of development and human activities, whereas CEM usually adopts an effects-based approach which focuses on assessing the current condition relative to a reference state (Noble, 2013). The primary objective of CEAM is to track and assess the condition of priority VCs, and to implement mitigation, monitoring and management strategies to maintain or improve the condition of VCs over time.

VCs are the foundation of any CEAM framework or system. An important component of the scoping stage in CEAM is VC selection and each subsequent step relies on this initial process. VCs are defined as meaningful or significant elements of the natural and human environment that the public, scientists, industry proponents, government agencies and First Nations groups deem to be important (BCEAO, 2013). The concept of “valued components” was created to provide focus for the EA process

and provide a way for the public and potentially impacted groups to identify the aspects of their environments that they value and want to protect (Canter & Ross, 2010). The VC selection process was developed to improve the effectiveness of the EA and CEA processes (Olagunju & Gunn, 2015). Instead of attempting to assess a project's impacts on all environmental values (i.e., the count everything approach), the VC-focused approach attempts to protect the sustainability of priority values (Duinker & Greig, 2006; Olagunju & Gunn, 2015). The VC-focused approach also promotes effective and efficient use of resources by focusing methods and analyses on the most critical project-environment interactions (BCEAO, 2013). In order for a CEAM framework to be effective, it requires a consistent and justifiable approach to identifying and selecting VCs; one that reflects the values of affected communities and stakeholders while incorporating measurable and responsive indicators and informative benchmarks.

2.3. Institutions Directly Assessing and Managing Cumulative Effects in BC

2.3.1. Federal and Provincial Legislation and Policy Initiatives

The assessment of cumulative effects is primarily legislated under project review processes in BC and Canada, which are directly associated with a specific development project under assessment (Clogg & Carlson, 2013b). This assessment does not extend to regional assessments for multiple development projects or activities (Clogg & Carlson, 2013b). In addition to project review processes, the main provincial tools for managing cumulative effects in BC are permitting and licensing processes for resource use or development, strategic land use planning, and more recently, BC's CEF. However, government ministries responsible for natural resource decisions are not required by any BC law or directive to explicitly manage cumulative effects when authorizing the extraction and use of natural resources (BC OAG, 2015).

Outside of the project review processes, two federal policy initiatives have been released that acknowledge the importance of a regional strategic approach to EA and natural resource development. Environment and Climate Change Canada (formerly Environment Canada) (2013) released the *Federal Sustainable Development Strategy*,

which has led to the implementation of several sustainable development initiatives across Canada. CEAA and the Privy Council office developed the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals* in 2010 to encourage government departments and agencies to "incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally-sound decision making" (CEAA, 2010, p. 2). Critics claim that this directive has rarely been adopted and implemented by federal government agencies (Clogg & Carlson, 2013b). Both policy initiatives acknowledge the importance of addressing the issue of cumulative effects, but neither provides clear comprehensive actions on how cumulative effects should be assessed and managed in Canada.

The Canadian Council of Ministers of the Environment (2009) released a guidance document on regional strategic environmental assessment in Canada, stating that, "an explicitly regional and strategic approach to environmental assessment is required – an approach that addresses the cumulative environmental effects of human development actions" (p. 6). Although this document provides clear instructions and direction on how to conduct regional strategic environment assessments, Clogg & Carlson (2013b) assert that it has not been implemented or incorporated into any legal framework in Canada or BC. The Canadian Council of Ministers of the Environment has also listed cumulative effects as a priority issue and has established a Cumulative Effects Working Group to develop tools and guidance to support jurisdictions in assessing, managing and monitoring cumulative effects (Canadian Council of Ministers of the Environment, 2014). The Canadian Council of Ministers of the Environment has been working on providing federal and provincial government departments and agencies with tools and guidance on effective regional strategic environmental assessment and CEAM; however, there is little evidence that these efforts have translated into meaningful laws.

2.3.2. Federal and Provincial Project Review Processes

Cumulative effects are primarily assessed through project review processes, established federally under the *Canadian Environmental Assessment Act*, S.C. 2012, c. 19, s. 52, and provincially in BC under the *Environmental Assessment Act*, S.B.C. 2002,

c. 43. If a proposed development project triggers a federal EA, section 19(1)(a) of the *Canadian Environmental Assessment Act, 2012* specifically requires a consideration of:

> the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out.

CEAA, one of the government authorities responsible for conducting federal EAs, has an operational policy document and two guidance documents on how to conduct a CEA (CEAA, 2007). CEAs as required under the *Canadian Environmental Assessment Act, 2012* are specific to a proposed project and are only required to consider the effects of other projects that are "certain" or "reasonably foreseeable" (CEAA, 2007). Due to the limited scope of federal project-level CEAs, it is difficult for proponents to assess cumulative impacts on selected VCs (Duinker & Greig, 2006).

The BCEAO in the Ministry of Environment (BC MOE) is the government authority responsible for provincial project review processes (Haddock, 2010). Under BC's *Environmental Assessment Act, 2002*, project-level EAs are not required to conduct a CEA (Clogg & Carlson, 2013b; Haddock, 2010). The Minister of Environment has discretionary authority to order the assessment of cumulative environmental effects and to direct the BCEAO to assess any policy, plan or procedure of the government (*Environmental Assessment Act*, 2002, s. 11(2)(b) and s. 49(a)). BCEAO (2013) guidelines state that a CEA must be considered if a project is shown to result in any residual adverse effects on the set of VCs. To be consistent with the federal process, the guidelines indicate that a CEA should consider other past, present and reasonably foreseeable projects and activities. The *Reviewable Projects Regulation* (BC Reg. 370/2002) under the BC *Environmental Assessment Act, 2002* clearly outlines which projects are reviewable. Entire industries, such as logging and oil and gas exploratory drilling, and projects below certain operating thresholds are exempt from review in BC (Clogg & Carlson, 2013b; Haddock, 2010). This project list and threshold approach to EAs and CEAs fails to account for the full range of activities and potential impacts to biophysical and social values. The exclusion of activities and projects at different scales prevents an effective and accurate assessment of cumulative effects in BC.

Several major deficiencies with the current legislated federal and provincial CEA processes have been identified in the academic literature:

1. Despite the availability of guidance and procedural documents, no consensus exists as to how cumulative effects should be assessed and managed (Duinker & Greig, 2006).

2. The primary focus of both federal and provincial EAs is project-based and site-specific. The focus on project-specific assessments fails to identify the full extent of impacts on biophysical and socioeconomic systems (Duinker & Greig, 2006).

3. The current approach to CEA is often short-term, narrowly scoped, and restricts both geographic and temporal boundaries within which impacts are assessed. No review process exists for examining cumulative effects of smaller natural resource authorizations (Forest Practices Board, 2011). Most CEAs only examine the "most likely" future development scenario rather than a range of possible scenarios (Duinker & Greig, 2006).

4. Limited guidance is provided for identifying and selecting relevant VCs that reflect the affected communities' values and concerns (Canter & Ross, 2010). Rationales and processes for selecting VCs are often inconsistent and are largely dictated by previously established project VC selections (Olagunju & Gunn, 2015).

5. There is inadequate stakeholder and First Nation involvement throughout the CEAM process (Booth & Skelton, 2011a; Canter & Ross, 2010; Duinker & Greig, 2006).

6. Limited scientific understanding exists of ecological impact thresholds of ecosystems and wildlife. In addition, baseline data are often unavailable and difficult to collect. (Duinker & Greig, 2006).

7. Responsibility for CEA lies with the project proponent, whose primary goal is usually to obtain approval for a project, and as a result, efforts to assess and manage cumulative effects are diminished (Duinker & Greig, 2006; Forest Practices Board, 2011).

Many of the problems with the current CEA system could be addressed by adopting a strategic regional approach to CEAM, rather than focusing on project specific assessments (Duinker & Greig, 2006). This regional approach would incorporate desired community goals, examine different development pathways, and utilize ecological impact thresholds.

2.3.3. British Columbia's Cumulative Effects Framework

In 2011, FLNRO initiated the development of BC's CEF, with full implementation planned for 2016 (FLNRO, 2014). BC's CEF reflects a trend within the provincial government, in which land use and resource management decision-making is moving away from a sector-focused approach towards a more integrated approach (Clogg & Carlson, 2013b; FLNRO, 2014). The CEF is not intended to change any legislation or regulations in BC; instead, it provides policy guidance, tools and protocols for assessing and managing cumulative effects in land use and resource management decision-making (FLNRO, 2014). The three main components of BC's CEF are: (1) values foundation, which includes a set of priority VCs and associated objectives, indicators and benchmarks; (2) assessment, which uses existing and collected data to determine the current condition of VCs and to assess foreseeable future conditions of VCs given the development scenario in a region; and (3) decision support, which includes an open access database of CEAM information for proponents, government agencies and the public, and common strategies for decision-makers to incorporate cumulative effects information in project review and natural resource authorizations (FLNRO, 2014). FLNRO has implemented the CEF in three pilot areas, including one in the North Skeena region in northwest BC (FLNRO, 2014). FLNRO claims that after the CEF has been fully implemented in BC, regular assessment and management of cumulative effects will occur throughout the province (FLNRO, 2014).

In 2015, the Auditor General of BC conducted an audit of the BC government and FLNRO to determine whether their current natural resource decision-making processes are effectively managing cumulative effects on important environmental values in the province (BC OAG, 2015). The audit specifically focused on FLNRO's activities in the Skeena Region of northwest BC because this region has the highest number of proposed development projects in BC, driven primarily by the LNG sector (BC OAG, 2015). The Auditor General of BC makes three conclusions:

1. The BC government has not provided FLNRO with clear decision-making powers (i.e., through existing legislation or directive) required to effectively manage cumulative effects.

2. FLNRO is not explicitly considering or actively addressing cumulative effects in its natural resource use authorizations, as evidenced by activities in the Skeena region.
3. In terms of BC's CEF, FLNRO has not clearly demonstrated how the CEF will be used to inform or support development or natural resource decisions in the province. Furthermore, the BC government has not provided a concrete plan for how the CEF will be used to coordinate decisions among different government ministries and agencies (BC OAG, 2015).

In order to address these issues of natural resource decision-making, the audit report provides recommendations to the BC government and FLNRO. Specific recommendations for BC's CEF are: (1) determine how the information provided by the CEF will be used to support natural resource decision-making; (2) provide tools to all the province's ministries responsible for natural resource management to improve coordination of the ministries' actions and decisions; (3) shorten the timeline for full implementation of the CEF; and (4) regularly report to the Legislative Assembly on the CEF. Ultimately, without a legal foundation and clear strategies for implementation, it is unlikely that BC's CEF will have a lasting, positive effect on land use and natural resource decision-making in BC.

Table 2.1. Summary of Institutions Directly Assessing and Managing Cumulative Effects in BC.

Institutions and Processes	Areas of Authority
Federal	
Legislation • *Canadian Environmental Assessment Act, 2012*	Federal project review process
Policy • (1) Federal Sustainable Development Strategy under the *Federal Sustainable Development Act*, S.C. 2008, c. 33 • (2) Cabinet Directive on the Environmental Assessment of Policy, Plan and Program	Varies depending on each policy • Overarching federal policy in areas of federal jurisdiction - All federal government agencies and departments' operations, policies, plans and programs
Government Priority • Canadian Council of Ministers of the Environment – Cumulative Effects Working Group	Federal and Provincial Ministries of the Environment policies, plans and programs
Environment and Climate Change Canada • Canadian Environmental Assessment Agency • National Energy Board	Environmental assessment of major projects including cumulative effects assessments

Institutions and Processes	Areas of Authority
• Canadian Nuclear Safety Commission	
Provincial	
Legislation • *BC Environmental Assessment Act, 2002*	BC project review process
Policy • BC Cumulative Effects Framework under the Ministry of Forests, Lands, and Natural Resource Operations	Varies depending on each policy • Overarching provincial policy in areas of provincial jurisdiction – All provincial government agencies and departments responsible for natural resource decisions
Ministry of Environment • BC Environmental Assessment Office	Environmental assessment of major projects in certain industries and for projects above certain thresholds, as per *Reviewable Projects Regulation* in the *BC Environmental Assessment Act, 2002*

2.4. Institutions Indirectly Assessing and Managing Cumulative Effects in BC

2.4.1. Federal and Provincial Government Ministries and Agencies

As discussed in the previous section, other than under the narrow provisions of the *Canadian Environmental Assessment Act, 2012*, federal and provincial government ministries and agencies are not required by any law to directly manage cumulative effects when making decisions about natural resource use or management (BC OAG, 2015). Decisions of individual government agencies are dictated by their own mandates and are not generally required to consider whether their decisions will be impacted by other sectors or will impact other sectors (BC OAG, 2015).

The three federal government ministries and agencies primarily responsible for natural resources are Environment and Climate Change Canada, Natural Resources Canada and Fisheries and Oceans Canada (DFO) (Sparling, 2014). The agencies' specific areas of authority are summarized in Table 2.2. The primary roles of these ministries in natural resource management are providing policy guidance, conducting research, developing national strategies for different sectors, and making decisions about natural resource use through authorizations and permits in federal forests, fisheries, mining and oil/gas exploration. The actions of these federal agencies can

interact with each other to protect or restore VCs or contribute to cumulative effects in a region.

The division of legislative power under the Canadian constitution places natural resources and land use in the provinces largely under provincial jurisdiction. A majority of the land in BC, 94% of the total land base, is provincial Crown land (BC OAG, 2015). The four provincial government ministries and agencies primarily responsible for managing BC's natural resources are: Ministry of Forests, Lands and Natural Resource Operations, Ministry of Environment, Ministry of Energy and Mines, and the Oil and Gas Commission under the Ministry of Natural Gas Operations (Sparling, 2014). These ministries are collectively responsible for authorizing the development of provincial Crown land or the use of natural resources in BC through permits, tenures, leases, licenses and notices of work and rights of way (BC OAG, 2015). The agencies' specific areas of authority are summarized in Table 2.2. Authorizations granted by provincial government agencies determine how the land and resources are used and managed; therefore, indirectly affecting CEAM in the province.

2.4.2. Federal and Provincial Marine and Land Use Planning Processes

Regional marine and land use planning is another indirect way for federal and provincial government agencies to manage cumulative effects in BC. Regional planning is the process of developing goals and objectives for a region and determining a set of tasks and timelines for meeting those goals (Gunton, 2006). Similar to CEM, regional plans focus on maintaining or restoring environmental and social values, and include mitigation, monitoring and management strategies. Ideally, a proposed project or activity will only be allowed if it fits into the broad environmental goals of the region, as outlined in regional marine and land use plans. As a result, planning processes have the capacity to either restrict or promote development activities.

The federal *Oceans Act*, S.C. 1996, c. 31 came into force in 1997 as part of the development of a national oceans strategy in Canada's marine, coastal and estuarine waters (DFO, 2002). DFO's framework for ocean planning consists of integrated management plans for each management area, with an ecosystem-based management

(EBM) approach and overarching goals, objectives and strategies for the area (DFO, 2002). One of the management areas is located in Metlakatla First Nation's traditional territory, the Pacific North Coast Integrated Management Area (PNCIMA) (Rutherford, Dickinson, & Gunton, 2010). A draft integrated management plan was released in 2013. The BC government and 18 BC First Nations formed a different marine planning process in the region, the Marine Planning Partnership for the North Pacific Coast (MaPP) (MaPP, 2015). MaPP (2015) also adopted an EBM framework in its marine use plans, but focuses more on operational objectives and strategies, including spatial zoning. MaPP's North Coast sub-region is located in Metlakatla's traditional territory and its plan was released in 2015.

In the 1990's, the BC government developed a novel approach to address natural resource conflicts among different user groups in the province: strategic land and resource planning (Frame, Gunton, & Day, 2004). Through collaborative planning processes, regional land and resource management plans (LRMPs) were developed for most of the land base in BC (Clogg & Carlson, 2013a). Many of these plans incorporate an EBM framework and spatial land use planning with associated goals, objectives and strategies for designated areas (Clogg & Carlson, 2013a). LRMPs explicitly provide recommendations for the types of projects, uses and activities that should be permitted in different designated areas; thereby, influencing the management of cumulative effects in BC's land base. The North Coast LRMP is located in Metlakatla First Nation's traditional territory.

Table 2.2. Summary of Institutions Indirectly Assessing and Managing Cumulative Effects in BC.

Institutions and Processes	Areas of Authority
Federal	
Environment and Climate Change Canada	Policy, research, expertise, regulations, and authorizations for: • Pollution and waste management • Wildlife including species at risk, biodiversity and conservation • Sustainable ecosystems • Water resources • National parks system
Natural Resources Canada	Policy, research, expertise, regulations, and authorizations for: • Energy, oil and gas activity in areas under federal jurisdiction

Institutions and Processes	Areas of Authority
	• Federal forests, minerals and metals • Arctic water resources • Major projects
Fisheries and Oceans Canada	Policy, research, expertise, regulations, and authorizations for: • Commercial harvest and processing of fish, shellfish & other organisms • Commercial and recreational harvest of fish • Aquaculture operations • Marine and freshwater ecosystems, and marine mammal protection • Major projects/activities in marine and freshwater • Marine transport PNCIMA integrated management plan
Provincial	
Ministry of Forests, Lands and Natural Resource Operations	Regulations, permits and authorizations for: • Land • Provincial Forests • Water • Minerals and other (non-major mines) • Range MaPP North Coast marine use plan North Coast LRMP
Ministry of Environment	Regulations, permits and authorizations for: • Pollution and waste management • Parks, wilderness areas and protected areas
Ministry of Energy and Mines	Regulations, permits and authorizations for: • Major mines • Minerals, coal, oil and natural gas
Ministry of Natural Gas Development • Oil and Gas Commission	Regulations, permits and authorizations for: • Lands, forests and water for oil and gas industry activity • Pollution and waste management

Note: Information for Indirect Federal Institutions from Sparling (2014) and Information for Indirect BC Institutions adapted from BC OAG (2015).

2.5. First Nations' Role in Assessing and Managing Cumulative Effects in BC

First Nations in BC have managed natural resources in their territories for millennia. When European colonial settlers came to this province, they displaced First Nations from much of their traditional territories and asserted control over resource

management. For most of the province, the colonial government did not enter into treaties with First Nations (Murphy, Duncan, & Piggott, 2008). In 1982, the Canadian constitution was amended to explicitly recognize and affirm existing Aboriginal rights (Murphy et al., 2008). Canadian courts have had to deliberate and decide what Aboriginal rights and title mean in BC and what they encompass. First Nations in BC have exerted influence over CEAM by exercising their rights and title on land and sea, engaging in project review processes, entering into modern treaties, and entering into planning agreements with proponents and the federal and provincial governments. Most importantly, First Nations are directly managing the land and resources in their traditional territories and building partnerships with each other to address the problems of cumulative effects and resource management.

In recent years, ground-breaking legal decisions have been delivered by Canadian courts concerning the recognition and protection of First Nations rights and title. Aboriginal rights are defined as rights (e.g., to fish for food, social and ceremonial (FSC) purposes) belonging to a specific group that result from the continued use and occupation of an area by Aboriginal peoples because they are the original peoples of Canada (Hansen, 2009a). Aboriginal title refers to the Aboriginal right to land or a territory (Hansen, 2009b). For the first time in Canadian history, the Supreme Court of Canada declared Aboriginal title in *Tsilhqot'in (William) v. British Columbia* ([2014] 2 S.C.R. 257). Aboriginal title encompasses the following rights: exclusive use and occupation of the lands, right to determine the use of the land, right to economic benefits of the land and right to manage the lands (*Tsilhqot'in v. British Columbia*, 2014).

Unresolved Aboriginal territorial claims and uncertainty around Aboriginal rights can create significant barriers to CEM and resource management decisions. One case in particular, *West Moberly First Nations v. BC (Chief Inspector of Mines)* ([2011] B.C.C.A. 247) tackles the issue of cumulative effects and the Crown's role in assessing and managing cumulative effects. The Supreme Court of British Columbia confirmed the need for the Crown to consider cumulative effects of development projects on Aboriginal rights and title as a part of its duty to consult and accommodate (*West Moberly v. BC (Chief Inspector of Mines)*, 2011). The appropriate scope of consultation for the use and management of natural resources should include past wrongs, cumulative effects or

future impacts if the permit or activity poses a potential adverse effect on Aboriginal rights (*West Moberly v. BC (Chief Inspector of Mines)*, 2011). The Crown's duty to consult and accommodate is reflected in BC's project review processes, where proponents and government EA bodies (i.e., BCEAO and CEAA) are required to engage with First Nations throughout the review process. However, BC First Nations have repeatedly voiced their opposition to an array of major project developments and strongly feel that their values and concerns are not being adequately addressed by BC EA processes (Pearse, 2009).

First Nations have entered into agreements with both federal and provincial governments concerning regional marine use and land use plans on the north coast of BC. The Council of Haida Nation, Central Coast Indigenous Resource Alliance and Coastal First Nations-Great Bear Initiative are recognized planning partners in the PNCIMA plan; whereas, individual Tsimshian First Nations on BC's northwest coast are recognized planning partners in the MaPP plan (MaPP, 2015; PNCIMA Initiative, 2013). In terms of land use planning on the north coast of BC, one of the recommendations from the North Coast LRMP was the implementation of the *Coast Land Use Decision* (MaPP, 2015). The *Coast Land Use Decision* represents collaboration between the BC provincial government and Coastal First Nations, with both groups committing to the implementation of EBM, land use zoning and collaborative governance in the North Coast region (MaPP, 2015). Many Coastal First Nations, including Metlakatla First Nation, have also entered into strategic land use planning agreements with the Province of BC (Province of BC & Metlakatla First Nation, 2006). A strategic land use planning agreement is intended to confirm the result of Government to Government negotiations on strategic land use planning and provide a framework for working collaboratively on implementation of the land use plan in the traditional territory of the First Nation (Province of BC & Metlakatla First Nation, 2006). The development of marine and land use plans and subsequent agreements with federal and provincial governments offers a concrete way for First Nations to influence natural resource decisions in their traditional territories.

First Nations often have a restricted mandate and limited ability to influence the use and management of certain resources in their traditional territories. One way to

overcome these barriers is to build partnerships and share knowledge and resources with other First Nations facing the same barriers. The Metlakatla First Nation is a part of two important First Nations partnerships on BC's northwest coast: North Coast-Skeena First Nations Stewardship Society (NCSFNSS) and the recently formed Tsimshian Environmental Stewardship Authority. NCSFNSS was created to work on projects of shared value, particularly through marine use planning and sustainable fisheries development (NCSFNSS, 2014). The Tsimshian Environmental Stewardship Authority was created in response to growing concerns about cumulative effects and LNG development in BC's North Coast region (Tsimshian Environmental Stewardship Authority, 2015). Their mandate is to work collaboratively to address issues of common concern, including cumulative effects (Tsimshian Environmental Stewardship Authority, 2015). First Nations utilize a wide range of tools and processes to assert their role in natural resource decision-making, and ultimately cumulative effects management in BC.

2.6. Chapter Summary

This chapter provided a brief overview of the various institutions in BC and Canada responsible for directly and indirectly assessing and managing cumulative effects in northwestern BC (Table 2.1 and 2.2). Three important institutions and processes that were not discussed in this chapter are impact benefit agreements, Prince Rupert Port Authority and environmental non-governmental organizations (NGOs) on the north coast of BC, including Pacific Salmon Foundation.

Chapter 3.

Overview of Metlakatla First Nation and Development in their Traditional Territory

This chapter provides a brief description of the geography, demography and development context of the study area: Metlakatla First Nation's traditional territory on BC's northwest coast.

3.1. Metlakatla First Nation and Traditional Territory

The Tsimshian peoples have traditionally inhabited the northwestern region of BC along the Nass and Skeena rivers (Halpin & Seguin, 1990). The Metlakatla and the Lax Kw'alaams are two distinct, present-day First Nations that represent one of the major Tsimshian groups; the Coast Tsimshian people (Metlakatla Governing Council (MGC), 2014). Metlakatla First Nation's traditional territory is 19,920 km^2 of land and sea in the North Coast region of BC (Figure 3.1) (Metlakatla First Nation, 2015). Metlakatla's traditional territory is recognized as common territory with the Lax Kw'alaams First Nation. The territory is located in the Skeena-Queen Charlotte Regional District, with major cities Prince Rupert and Terrace. The main Metlakatla reserve is called Metlakatla Village and is located on Tsimshian Peninsula, about 7 km west of Prince Rupert. As of 2015, the Metlakatla First Nation had 900 registered members, with 84 members residing in Metlakatla Village and 545 members residing within the traditional territory (Aboriginal Affairs and Northern Development Canada, 2015). Only a small percentage of Metlakatla First Nation members participated in the 2011 Canadian National Household Survey; therefore, limited demographic information is available on members (Aboriginal Affairs and Northern Development Canada, 2015).

The current economic base in the North Coast region is mainly forestry and forest-based manufacturing, mining and mineral processing and fishing (BC Ministry of Jobs, Tourism and Skills Training (BC JTST), 2015). Ocean-based industries remain a critical component of the region's economy through commercial fishing and processing, port activities, ferry transportation and marine tourism (Hotte & Sumaila, 2012). The most important employment sectors for Metlakatla First Nation members are tourism, commercial fishing, retail, band office and marine transportation (Ference Weicker & Company Ltd., 2009). High unemployment rates (24%) among Metlakatla members is an issue for the Metlakatla First Nation, particularly when compared to overall unemployment rates in Prince Rupert (15%) and in BC (8%) (Compass Resource Management Ltd., 2014).

The Metlakatla First Nation's traditional territory is located primarily in the Coastal Western Hemlock biogeoclimatic zone, which is characterized by temperate coniferous forests bordered by the Coast Mountains to the east and the Pacific Ocean to the west (BC Ministry of Forests, 1999). The mountains and ocean create the unique coastal climate and ecology found in this region. The Skeena River and estuary is an important ecosystem in Metlakatla's traditional territory, for ecological, economic and cultural reasons. Among other important attributes, this river system supports numerous populations of Pacific Salmon species. Members of the Metlakatla First Nation have historically traveled throughout their territory to access, gather and harvest resources (Metlakatla First Nation, 2009). To this day, the Metlakatla people are a marine-oriented community and predominately rely on marine and freshwater resources in their territory, as demonstrated by their traditional seasonal round of harvesting activities. In the winter, they hold feasts, trap small mammals and fish for eulachon. Harvesting herring roe and seaweed are the primary traditional activities during the spring, and Metlakatla families fish for salmon, collect summer berries and hunt in the summer. Autumn is dedicated to salmon processing and preserving, and closer to winter, clams and cockles are harvested from local beaches (Halpin & Seguin, 1990; Metlakatla First Nation, 2009). The marine and riverine areas in Metlakatla's territory provide the Metlakatla First Nation with diverse and abundant traditional resources. These foreshore areas are also the focus of industrial development in the region, particularly LNG processing and shipping

facilities. The potential impacts from LNG development could be significant for Metlakatla's important traditional resources.

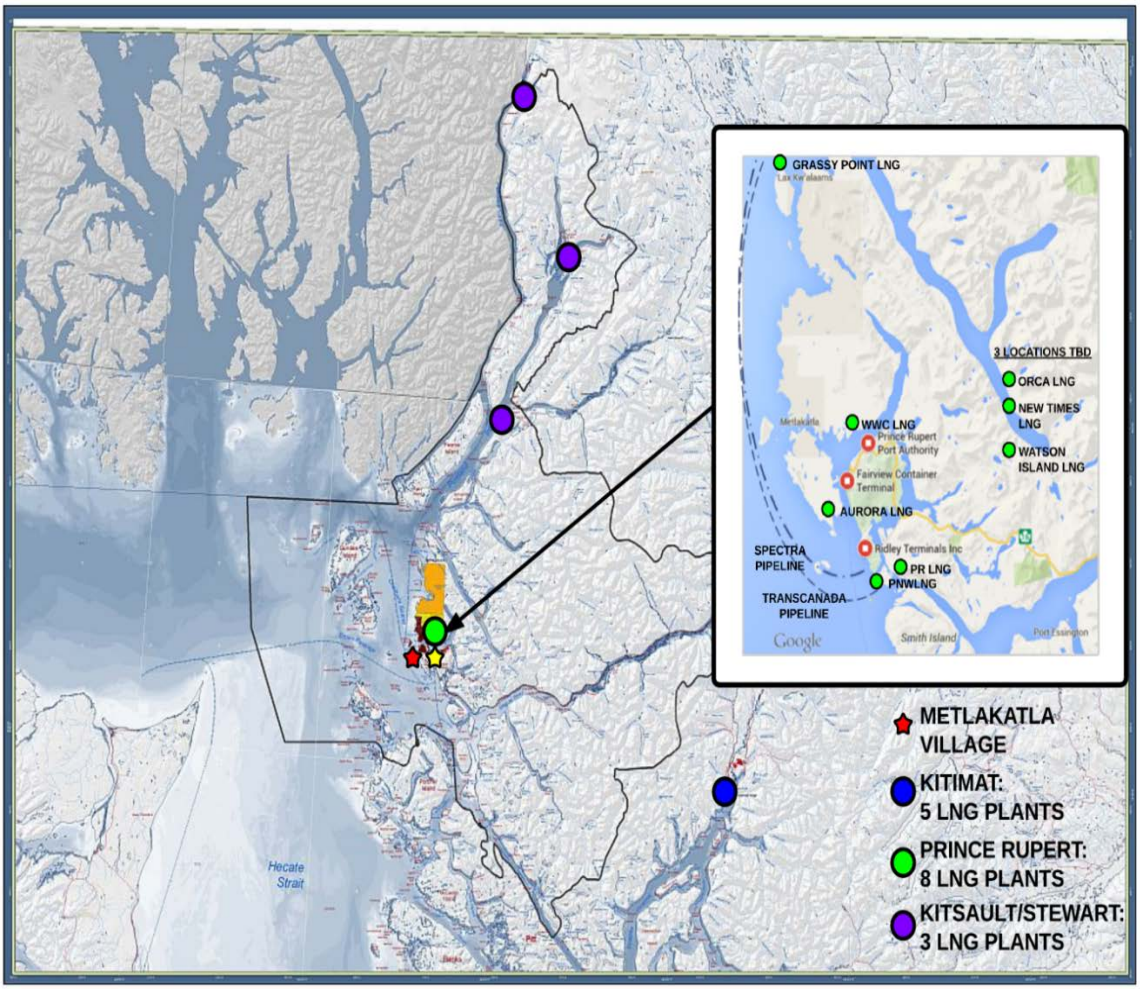

Figure 3.1. Location of Metlakatla First Nation's Traditional Territory and Proposed LNG Development on the North Coast of BC.

Note: Adapted from *Development and Project Applications*, by Metlakatla First Nation (2015), retrieved from http://www.metlakatla.ca/overview/stewardship/development-and-project-applications

The Metlakatla First Nation governance system is composed of four main departments: Metlakatla Governing Council, Metlakatla Development Corporation (MDC), Metlakatla Treaty Office (MTO) and Metlakatla Stewardship Office (MSO) under the Metlakatla Stewardship Society (MSS) (Table 3.1) (Metlakatla First Nation, 2009). The MGC represents the elected governing body of the Metlakatla First Nation with one elected Chief Councillor and up to six elected Councillors (Metlakatla First Nation, 2006).

As the primary governing body of the Metlakatla First Nation, the MGC developed the Metlakatla comprehensive community plan in 2010. The MGC worked with the membership to create a vision for the community, identify guiding principles that define a healthy, resilient, and prosperous community and develop overarching strategic goals and action plans to implement their community vision (MGC, 2010). The MDC is responsible for developing Metlakatla First Nation's economic strategies and initiatives. The Metlakatla First Nation is currently in Stage 4 of the BC treaty process, in which the MTO and provincial government negotiate the basis of the treaty, called an Agreement in Principle (Province of BC, 2015). These departments represent the decision-making authorities of the Metlakatla First Nation and they have the potential to influence and indirectly manage cumulative effects in the territory through resolutions, directives, policies, negotiations and programs administered by each of the departments.

The MSS and MSO are the primary governance authorities responsible for natural resource decision-making in Metlakatla's traditional territory. The MSS is a board of directors made up of members from each of the other departments, and oversees the activities of the MSO by managing their budget and strategic plans (MGC, 2014). The MSO is composed of three departments, each responsible for different areas of natural resource management: aquatics, land and marine planning, and EAs (MGC, 2014). Metlakatla's land and marine use plans outline Metlakatla's vision, mission and goals for their traditional territory and provide specific guidance for how the land, water and resources are accessed, used and managed. In accordance with Metlakatla's strategic land use planning agreement with the Province of BC, their strategic land use plan designates specific land use zones. Each zone has a unique set of associated objectives, allowable activities and management regime (MSS, 2013). Similarly, Metlakatla's integrated marine use plan has incorporated spatial planning to identify important marine management zones within their traditional territory, each with a set of objectives, allowable activities and management regime (MSS, 2011). The Metlakatla First Nation has established a comprehensive land and marine management system through the creation of the MSS and MSO, whose decisions, policies, programs and plans have a direct influence on CEM in their traditional territory.

Table 3.1. Overview of Metlakatla First Nation Governance System.

Metlakatla First Nation Departments	Responsibilities	Indirect or Direct CEM in Traditional Territory
Metlakatla Governing Council (MGC)	• Reserve land use and management • Social, health and education programs and services • Public works management • Financial management • Comprehensive community plan development and implementation	INDIRECT: • Passing resolutions and directives that enable the MSO and MDC to engage with project proponents • Implementing Comprehensive community plan's strategic goals and action plans
Metlakatla Development Corporation (MDC)	• Economic strategies and initiatives development o Impact benefit agreement negotiation with project proponents o Economic agreement negotiations with governments	INDIRECT: • Negotiating comprehensive project agreements with project proponents, often including measures for environmental monitoring and mitigation, and employment and training opportunities
Metlakatla Treaty Office (MTO)	• Inter-governmental matters including treaty administration and negotiation	INDIRECT: • Negotiating treaty with governments, where proposed treaty settlement lands could overlap with proposed projects and components negotiated through the treaty process could be impacted by proposed projects
Metlakatla Stewardship Society (MSS) • Metlakatla Stewardship Office (MSO)	• Aquatics management o Fisheries for commercial and FSC purposes o Marine and freshwater areas within traditional territory o Oil spill and emergency response o Debris monitoring • Metlakatla Coastal Guardian Watchmen Network	DIRECT/INDIRECT: • Direct management of aquatic resources and areas in traditional territory • Stewardship and monitoring activities to maintain and/or improve the condition of VCs in traditional territory
	• Land and marine planning o Strategic land use plan o Integrated marine use plan o Conservancy management plan	DIRECT/INDIRECT: • Specific guidance for how the land, water and resources are accessed, used and managed

Metlakatla First Nation Departments	Responsibilities	Indirect or Direct CEM in Traditional Territory
	• Environmental assessments o Provincial and federal environmental assessment participation in working groups and proponent consultations o Environmental assessment reviews	DIRECT/INDIRECT: • Influence and input into EA processes, affecting the outcome of VCs in traditional territory

Note: Adapted from *Metlakatla and Natural Resource Development* by MGC (2014), retrieved from http://www.metlakatla.ca/overview/stewardship/development-and-project-applications

3.2. Proposed Projects and Activities in Metlakatla's Traditional Territory

BC JTST (2015) regularly compiles a summary report on major projects in BC with capital costs over $15 million (CDN). In the September 2015 report, the North Coast region only accounted for approximately 10% of all proposed projects in BC, but the capital costs of these projects accounted for 63% of the total estimated capital costs of major development in the province (BC JTST, 2015). The BC JTST summary report does not include development projects with lower capital costs including forestry, quarries, oil and gas drilling or mining exploration projects (BC OAG, 2015). In addition, the North Coast region as defined by BC JTST includes areas beyond Metlakatla's traditional territory. I conducted a comprehensive review of federal and provincial government regulatory sources to compile an inventory of proposed major development projects in Metlakatla's traditional territory (Table 3.2). Given the focus on LNG development in the region, I also conducted a comprehensive review of government regulatory sources to compile an inventory of LNG projects proposed in their territory. As of March 2016, 61 major development projects were proposed in Metlakatla's traditional territory, of which 21 projects are directly related to LNG. This number includes proposed projects, projects on hold and projects that have recently started construction.

Table 3.2. Reviewed Federal and Provincial Government Regulatory Sources.

Reviewed Regulatory Source Type	Source
Environmental Assessment Project Review Lists	BC EAO Project Information Centre
	CEAA Project Registry
Major Project Inventories	BC JTST Major Projects Inventory

Reviewed Regulatory Source Type	Source
	BC FLNRO Major Natural Resource Projects Office
	Natural Resources Canada Major Projects Management Office Tracker
Sectoral Major Project Inventories	BC FLNRO Clean Energy Major Projects
	BC Ministry of Energy and Mines Exploration and Mining in BC Report
	BC Oil and Gas Commission Major Projects
	BC Hydro Major Projects
	BC Hydro Clean Energy Project Agreements
	BC Ministry of Transportation Projects
LNG Project Information	National Energy Board (NEB) LNG Export Licence Applications
	BC government's LNG in BC website • Created to engage with the public about proposed LNG in BC

Although LNG projects proposed in Kitimat are located outside of Metlakatla's traditional territory, I included them in the inventory because they have the potential to impact the Metlakatla First Nation through shipping routes. Energy projects account for 70.5% of total proposed major projects in Metlakatla's traditional territory and LNG projects account for 34% of total proposed major projects (Table 3.3). A comprehensive inventory of proposed projects in Metlakatla's traditional territory is provided in Appendix A.

Table 3.3. Summary of Proposed Major Projects by Industrial Sector in Metlakatla's Traditional Territory.

Industrial Sector	Proposed	On Hold	Started	Total	% of Total
Energy	35	5	3	43	70.5%
LNG	*21*	*0*	*0*	*21*	*34%*
Clean Energy	*8*	*5*	*3*	*16*	*26%*
Crude Oil	*4*	*0*	*0*	*4*	*7%*
Other	*2*	*0*	*0*	*2*	*3%*
Mining	8	1	0	9	15%
Port & Transportation	4	0	3	7	11.5%
Commercial and Industrial	2	0	0	2	3%
Total Proposed Major Projects	49	6	6	61	100%

Note: Clean energy projects include biofuel, biomass, hydroelectric (run-of-river and dam), wind and geothermal. Other energy projects include propane export terminals and transmission lines.

3.2.1. LNG Development in British Columbia

In 2012, the BC government announced plans to build and expand a new industry centered on LNG extraction, production and export. LNG is a form of natural gas that is cooled to ensure it remains in liquid form (Province of BC, 2012). The role of natural gas in global and domestic energy markets has increased significantly in recent years. Growth occurred in part as a result of increased demand from developing economies, such as China and India, transitioning their energy infrastructure to fuels, such as natural gas, that produce less greenhouse gas emissions than coal (International Energy Agency, 2013). The BC government argues that the province is well positioned to meet this demand. Recent advances in hydraulic fracturing technology have opened up unconventional shale gas deposits in BC's northeast, where natural gas is currently being extracted. BC's LNG strategy aims to have three LNG plants in operation by 2020 (Province of BC, 2012). The natural gas extracted in northeastern BC will be transported via pipelines to LNG plants along BC's coast for processing and shipping. The Prince Rupert area is a focus for LNG development, with 8 proposed LNG facilities and marine export terminals and 2 pipeline projects (Table 3.4). LNG projects in Prince Rupert, Stewart and Kitsault are located within Metlakatla's traditional territory.

Table 3.4. Proposed LNG Projects in Metlakatla's Traditional Territory.

Location	Project Name	Project Description	Est. Capital Cost ($ million CAD)
Prince Rupert	Aurora LNG Export Terminal Project	LNG Facility and Marine Export Terminal Capacity: 20-24 million tonnes/year	$3,500
Prince Rupert	Grassy Point LNG Project	LNG Facility and Marine Export Terminal Capacity: 20 million tonnes/year	$10,000
Prince Rupert	New Times LNG Project	LNG Facility and Marine Export Terminal Capacity: 12 million tonnes/year	Unknown
Prince Rupert	Orca LNG Project	LNG Facility and Marine Export Terminal Capacity: 24 million tonnes/year	Unknown
Prince Rupert	Pacific NorthWest LNG Project	LNG Facility and Marine Export Terminal Capacity: 19.68 million tonnes/year	$11,400
Prince Rupert	Prince Rupert LNG Project	LNG Facility and Marine Export Terminal Capacity: 21 million tonnes/year	$10,000
Prince Rupert	Watson Island LNG Project	LNG Facility and Marine Export Terminal	Unknown

Location	Project Name	Project Description	Est. Capital Cost ($ million CAD)
Prince Rupert	WCC LNG Project	LNG Facility and Marine Export Terminal Capacity: 30 million tonnes/year	$25,000
Hudson's Hope to Prince Rupert	Prince Rupert Gas Transmission Project	Natural Gas Pipeline System	$5,000
Northwest BC to Prince Rupert	Westcoast Connector Gas Transmission Project	Natural Gas Pipeline System	$6,000
10 Total Proposed LNG Projects in Prince Rupert			$70,900
Kitsault	Kitsault LNG Project	LNG Facility and Marine Export Terminal Capacity: 20 million tonnes/year	$34,000
Nasoga Gulf (N of Prince Rupert)	Nisga'a LNG Project	LNG Facility and Marine Export Terminal	Unknown
Stewart	Canada Stewart Energy Project	LNG Facility and Marine Export Terminal Capacity: 30 million tonnes/year	Unknown
3 Total Proposed LNG Projects in Other Areas in Metlakatla's Traditional Territory			$34,000
Kitimat	BC LNG (Douglas Channel) Energy Project	LNG Facility and Marine Export Terminal Capacity: 550,000 tonnes/year	$600
Kitimat	Cedar LNG Project	LNG Facility and Marine Export Terminal Capacity: 14.5 million tonnes/year	Unknown
Kitimat	Kitimat LNG Terminal Project	LNG Facility and Marine Export Terminal Capacity: 10 million tonnes/year	$4,500
Kitimat	LNG Canada Export Terminal Project	LNG Facility and Marine Export Terminal Capacity: 24 million tonnes/year	$25,000
Kitimat	Triton LNG Project	LNG Facility and Marine Export Terminal Capacity: 2.3 million tonnes/year	Unknown
Dawson Creek to Kitimat	Coastal GasLink Pipeline Project	Natural Gas Pipeline System	$4,000
Summit Lake to Kitimat	Pacific Northern Gas Looping Project	Looping Existing Natural Gas Pipeline System	$130
Summit Lake to Kitimat	Pacific Trail Pipelines Project	Natural Gas Pipeline System	$1,300
8 Total Proposed LNG Projects in Kitimat			$35,530
21 Total Proposed LNG Projects in Metlakatla's Traditional Territory			$140,430

3.2.2. Future Development Scenarios for the North Coast Region

It is not yet known which LNG facilities and pipelines will actually be approved, built and operationalized. The uncertainty stems from a variety of factors including changing oil prices, changing global demand for natural gas, and increasing concerns about environmental impacts from natural gas operations. In addition, all of the effects of Aboriginal rights and title claims have not been resolved. Scenario analysis is becoming an essential tool for CEAs because it provides a way to manage uncertainty when predicting the impacts of future project development. CEAs are inherently future-oriented; scenarios help discern desirable futures for the region of interest and improve the understanding of the range of potential impacts resulting from alternative futures (Duinker & Greig, 2007; Noble, 2008). LNG projects and activities only represent one type of industrial development in BC's North Coast region. Potential impacts from LNG development could interact with impacts from past, existing and future development projects and activities in the region.

In addition to LNG development on the north coast of BC, major projects are being proposed in other sectors, including clean energy, mining, port development and expansion, and transportation (Table 3.3). The combination of past, current and future projects and activities can contribute to cumulative effects on the region's VCs through a variety of stressors. MaPP's (2015) North Coast plan identified the following sources of impact in the marine environment:

- finfish and shellfish aquaculture farms;
- commercial fishing;
- coastal community populations and shoreline armouring;
- forestry, agriculture and urban land uses;
- marine dredging, drilling, dumping and/or construction;
- marine spills and pollution;
- chemical and biological sediment contamination;
- vessel traffic, including recreational boats; and
- climate change.

Clarke Murray, Agbayani and Ban (2015) utilized cumulative impact models to examine two major contributors to cumulative effects in marine ecosystems on BC's northwest coast: planned industrial development and global climate change. Planned industrial development included 48 different human activities such as agriculture, forestry, finfish and shellfish aquaculture, mining, industry and pipelines (Clarke Murray, Agbayani, & Ban, 2015). At a regional scale, climate change stressors (e.g., sea surface temperature and ocean acidification) resulted in the highest potential cumulative effects in the coastal marine environment, whereas at local scales, planned development resulted in higher potential cumulative effects (Clarke Murray et al., 2015). Estuaries and rocky intertidal habitats are at the greatest risk from cumulative effects because they are situated at the intersection of growing land- and marine-based activities and development. The Skeena estuary, in the heart of Metlakatla First Nation's traditional territory, requires improved cumulative effects management to prevent drastic negative impacts from planned development.

Developing future scenarios involves creating a narrative for a region and its potential development pathways, given the information that is currently available. The scenarios need to be plausible but structurally different in their descriptions of what the future might look like (Weber, Krogman, & Antoniuk, 2012). As a part of the Metlakatla CEM project, Compass Resource Management Ltd. developed five alternative future development scenarios for Metlakatla's traditional territory. The scenarios were first presented at a working session with Compass Resource Management Ltd. research collaborators, and then the scenario they deemed most probable was presented to Metlakatla First Nation decision-makers at an initial workshop in Prince Rupert to review the initial candidate list of VCs. These scenarios include (1) "moderate increase in industrial development, with a focus on port expansion," (2) "shipping epicentre," (3) "LNG boom and bust," (4) "missed the LNG boat," and (5) "moderate level of development with climate change impacts." Compass Resource Management Ltd. determined that the most probable development scenario in the next 20 years is the first scenario. This scenario predicts there will be 1-2 LNG facilities in the Prince Rupert area; commercial fishing and forestry remains depressed; container and shipping activities expand; vessel traffic increases; urban area footprint remains largely unchanged; greater recreational pressure from increased tourism; and greater First Nation control over land

and marine use management through treaties and impact benefit agreements. It is impossible to know which future scenario will be fully realized; however, understanding the type of development that can be expected in the region is an important part of the VC selection process. The most probable future scenario was used in the development of the new VC selection methodology as a way to describe the development context in the region over the next 20 years.

3.3. Chapter Summary

This chapter provided an overview of the Metlakatla First Nation and its traditional territory on the north coast of BC. The Metlakatla First Nation's governance system is composed of four departments, of which the MSS is primarily responsible for natural resource decision-making and directly managing cumulative effects in their traditional territory. The MSS manages cumulative effects through implementation of their strategic land use plan and integrated marine use plan and the activities of their EA department. This chapter also provided the development context for this region, particularly related to LNG development. These proposed major projects have the potential to interact with past and existing activities in Metlakatla's traditional territory; therefore, further contributing to cumulative effects in the region. The most probable future development scenario is a moderate level of industrial development, with increased port activity and shipping; however, the potential for a high level of industrial development remains as a viable alternative future.

Chapter 4.

New Methodology for the Identification and Selection of VCs

4.1. Introduction

This chapter explains the methods used in my research to develop the new methodology for the identification and selection of biophysical VCs in a regional First Nation's CEM system. I describe how VCs are currently identified and selected in CEAM, how I identified weaknesses associated with current practices and how I determined improvements needed in selecting VCs for CEAM in a First Nation context. My research methods consisted of four main components (Figure 4.1).

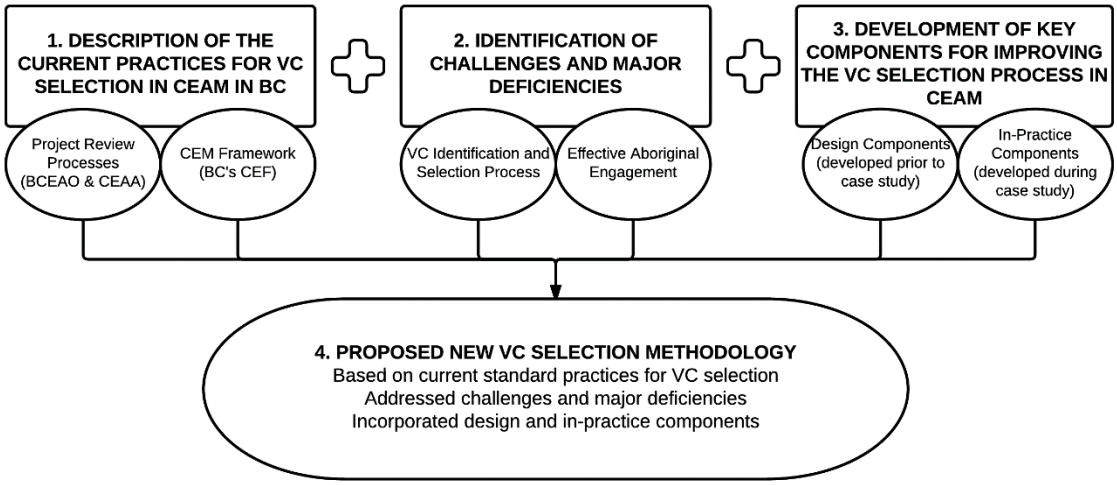

Figure 4.1. Four Main Components of Research Methods.

This research is participatory in nature, in that the new VC selection methodology was developed in collaboration with the Metlakatla First Nation and Compass Resource Management Ltd. We worked closely with the Metlakatla First Nation at the start of the CEM project to initiate and conceptualize this research. One of the purposes of the new

methodology was to identify priority biophysical VCs in their territory. As a result, my methods incorporate elements of the case study and I specifically refer to the Metlakatla First Nation at several points in this chapter. Adjustments may be necessary when applying the new methodology with other First Nations or other communities, in order to adapt the methodology to the context. It is important to work collaboratively with the First Nation and its members to ensure that the process is appropriate to the unique characteristics and goals of the community.

4.2. Current Practices for the Selection of Valued Components in CEAM in BC

The first step in developing the new methodology for the selection of VCs in CEAM is to understand the current practices in BC. I reviewed provincial and federal government legislation, policies and guidance documents to determine the current practices for VC selection in CEAM through project review processes and BC's CEF.

4.2.1. VC Selection in CEAM through Project Review Processes

The BCEAO (2013) *Guideline for the selection of valued components and assessment of potential effects* provides guidance for the selection of VCs and indicators in provincial project-based assessments that include CEAs. According to BCEAO (2013), indicators are defined as "the metrics used to measure and report on the condition and trend of a VC." The guideline asserts that the methods are based on the current accepted practice in EA in Canada and internationally (BCEAO, 2013). The recommended method for identifying VCs is "issues scoping," which involves a review of relevant documents and consultation with stakeholders. The goal of issues scoping is to determine the values and priorities of stakeholders (BCEAO, 2013). The outcome is an extensive list of stakeholders' issues, concerns and priority values. These issues are then categorized into five "pillars": environmental, economic, social, heritage and health effects (BCEAO, 2013). In order to narrow down this extensive list to a candidate list of VCs, the BCEAO (2013) recommends three steps (Figure 4.2). The criteria for well-defined VCs and their indicators are provided in Table 4.1. The BCEAO (2013) emphasizes the importance of clearly articulating and documenting the rationale for the

selection of each VC, including the source or stakeholder issue from which the VC originated. No additional specific guidance is provided for VC selection in CEA and it is implied that the same selected VCs in the project-based EA will be used in the CEA.

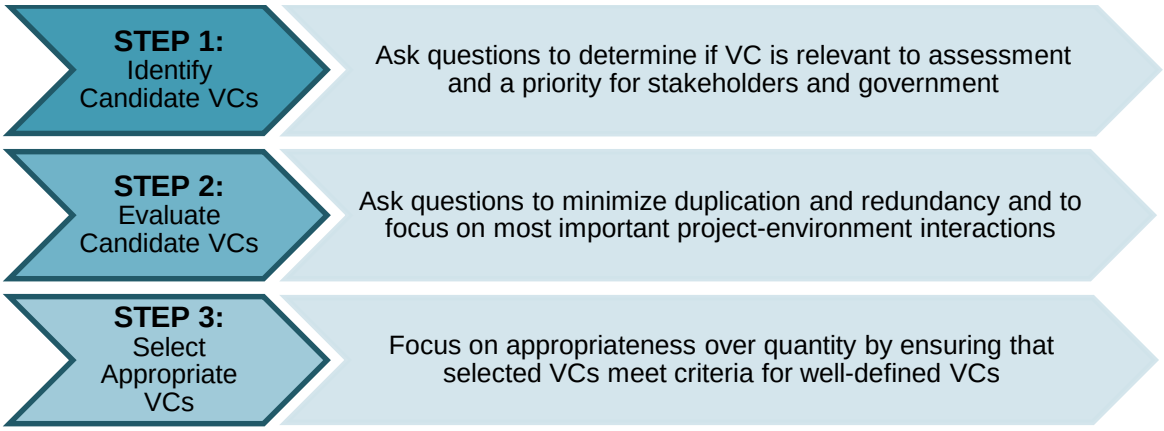

Figure 4.2. BCEAO Recommended Steps for Selecting VCs.
Note: Adapted from *Guideline for the Selection of Valued Components and Assessment of Potential Effects*, by BCEAO (2013), retrieved from http://www.eao.gov.bc.ca/VC_Guidelines.html

Table 4.1. BCEAO Criteria for Well-defined VCs and Indicators.

Criteria for Well-defined VCs	Criteria for Well-defined Indicators
Relevant • To at least one of the five pillars and clearly linked to the values, issues and concerns raised during comprehensive issues scoping	Relevant • Must relate directly or indirectly to the selected VC
Comprehensive • So that taken together, VCs selected should allow a full understanding of the important potential effects of the project	Practical • Must be a practical way to evaluate the indicator using existing or achievable data, predictive models or other means
Representative • Of the important features of the environment likely to be affected by the project	Measurable • Must produce useful data that informs our understanding of the potential effects on the VC
Responsive • To the potential effects of the project	Responsive • To the potential effects of the project • In terms of their response to the project
Concise • So that the nature of the project-VC interaction can be easily articulated and understood and redundant analysis is avoided	Accurate and Predictable • In reflecting changes to the VC • In terms of their response to the project

Note: Adapted from *Guideline for the Selection of Valued Components and Assessment of Potential Effects,* by BCEAO (2013), retrieved from http://www.eao.gov.bc.ca/VC_Guidelines.html

For the federal EA process, the CEAA has issued its own guidelines: *Technical guidance for assessing cumulative environmental effects under the Canadian Environmental Assessment Act, 2012* (CEAA, 2014). Unfortunately, these guidelines provide only limited guidance for identifying and selecting VCs for CEAs. The identification of VCs is primarily based on the results of the project-based EA, where only VCs for which residual effects from the project are expected are considered in a CEA (CEAA, 2014). The CEAA recommends three steps for selecting VCs (Figure 4.3).

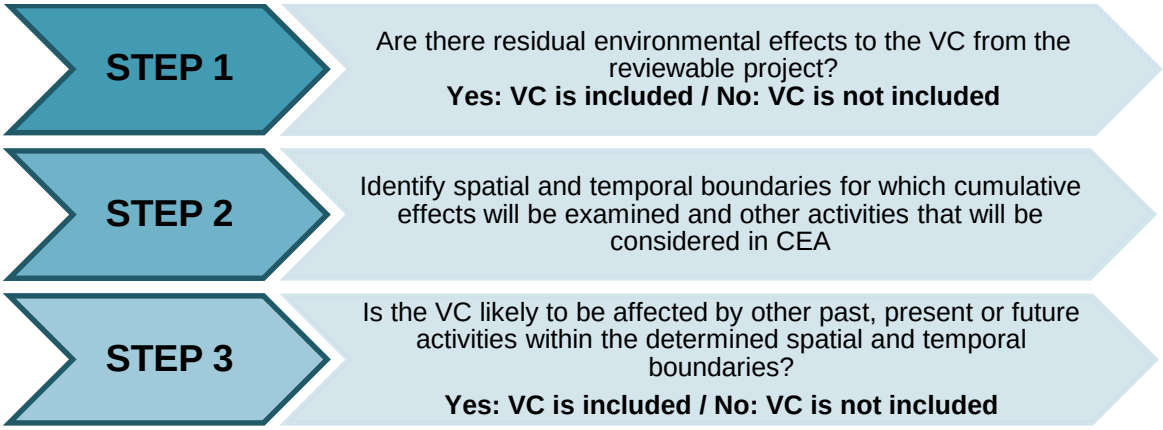

Figure 4.3. CEAA Recommended Steps for Selecting VCs.
Note: Adapted from *Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*, by CEAA (2014).

4.2.2. VC Selection in CEAM through BC's Cumulative Effects Framework

In 2012, the BC MOE issued a discussion paper called: *Values: A consistent approach to describing values in natural resource assessments* (BC MOE, 2012). The paper proposes a way to standardize the nomenclature of values and VCs for natural resource decision-making in BC. This approach defines, organizes and presents information on values in a systematic and consistent way in an effort to ensure that the same language concerning values is used across all government agencies responsible for natural resources (BC MOE, 2012). According to the BC MOE (2012), a standardized, consistent approach to describing values will ensure that everyone involved in the decision-making process, from stakeholders to ministers, has a clear understanding about the terms and methods for VC selection. The BC MOE's proposed values foundation uses a hierarchical structure to compile information on values, VCs,

indicators, benchmarks, and management targets (Figure 4.4). Developing a values foundation with standardized nomenclature is at the core of BC's CEF.

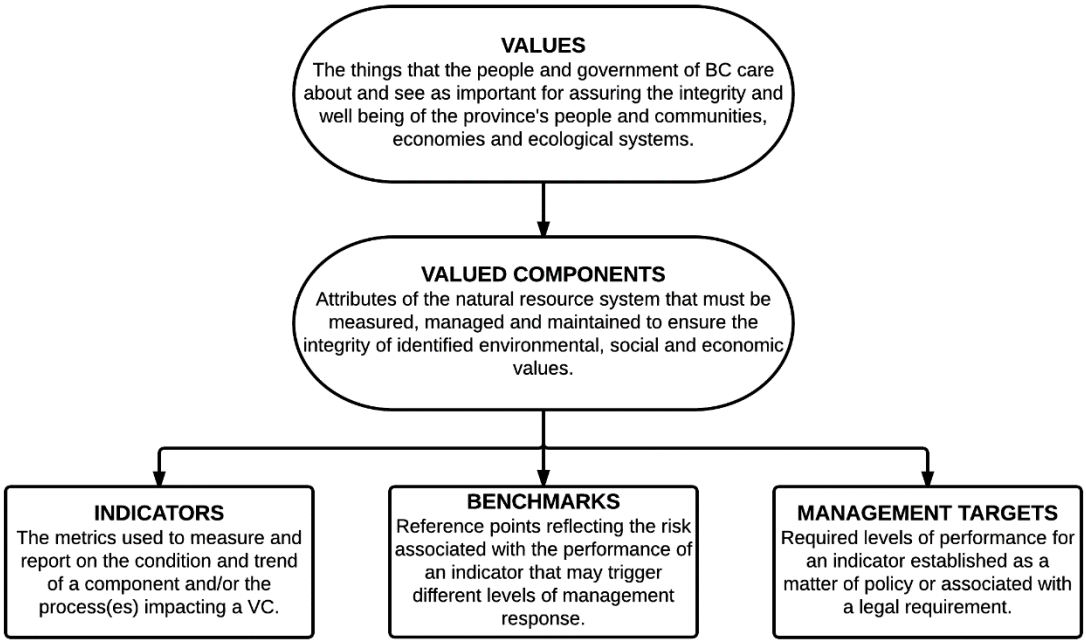

Figure 4.4. BC MOE Hierarchical Structure of a Values Foundation.
Note: Information from *Values: A Consistent Approach to Describing Values in Natural Resource Assessments,* by BC MOE (2012).

In 2014, FLNRO issued an overview report on its new CEF: *Addressing Cumulative Effects in Natural Resource Decision-making: A Framework for Success* (FLNRO, 2014). The report describes the ministry's methodology for identifying and selecting priority VCs for the CEF. FLNRO (2014) plans to identify a consistent set of values and VCs across BC, with a few regional exceptions, and these VCs will be assessed on a periodic basis in all regions. VCs that meet the following criteria will be prioritized for inclusion in the CEF's values foundation:

1. Existing legal or policy objective in current legislation, land use plans or other directives;
2. Previously identified as a priority in strategic agreements with First Nations or supports an Aboriginal or treaty right; and
3. Can be mapped and has existing, accessible and useable data (FLNRO, 2014).

The values are intended to be as broad as possible (i.e., a coarse filter approach) to focus on components that operate at a landscape or ecosystem scale, in the hope that maintaining these broad components will maintain finer scale components that are nested within the coarse filter values (FLNRO, 2014).

The BC OAG recently conducted an audit to determine whether FLNRO is adequately addressing the issue of cumulative effects through its natural resource use decisions in northwestern BC. The BC OAG (2015) made specific criticisms of FLNRO's approach to identifying and selecting VCs for BC's CEF:

1. Provincial strategic land use plans' objectives should not be used as a primary criterion for selecting priority VCs because they are outdated and incomplete.
    a. Land use plans do not address new pressures such as climate change and LNG
    b. Many land use plans were developed with limited or no participation from First Nations
2. Limited or incomplete information for the majority of selected VCs about:
    a. Current conditions (i.e., existing state of VC)
    b. Accepted conditions (i.e., amount of change to VC that is considered acceptable)
    c. Potential cumulative effects (i.e., how cumulative effects from natural resource development will affect VC).

Information on the current condition, accepted condition and potential cumulative effects from development on selected VCs needs to be made available to decision-makers to inform their actions concerning natural resource development, which will ultimately lead to more effective cumulative effects management in BC (BC OAG, 2015).

4.3. Challenges and Major Deficiencies with the Current Practices for VC Selection

The next step in developing the new methodology for VC selection in a First Nation's cumulative effects context is to identify challenges and major deficiencies with the current practices for VC selection. To do this, I reviewed published and unpublished

literature on VC selection in CEAM. I divided the challenges and deficiencies into two categories: (1) those related to the general VC selection process in CEAM and (2) those related specifically to Aboriginal engagement. The most common challenges identified for the VC selection process are conceptual and methodological challenges; whereas the most common challenges for effective Aboriginal engagement are institutional and administrative challenges.

Most of the available literature on VC selection in CEAM focuses on cumulative effects assessment rather than regional strategic approaches to cumulative effects management. Only a few articles explicitly discussed the issues and challenges with the VC selection process in CEAM. Instead, most of the reviewed papers discussed broad challenges in CEA, and the emphasis was often on the scoping phase of the process. A majority of the literature was from BC or Canada, with a few international examples. Few papers explicitly discussed issues with Aboriginal engagement in CEAM processes; most of the literature I reviewed about Aboriginal engagement dealt with EA processes. Appendix B provides a summary of the literature reviewed for this section.

4.3.1. Factors Influencing VC Selection in CEAM

The recurrent weaknesses and challenges with CEAM have been well-documented in the literature, but the individual processes within CEAM, such as VC selection, have not been studied as extensively. EA practitioners, regulators and academics emphasize the importance of the VC selection process to effective CEAM (Olagunju & Gunn, 2015). In addition, early and meaningful consultation and engagement with stakeholders and Aboriginal groups is considered to be important for effective CEAM (Lawe et al., 2005). If stakeholders and affected communities do not believe that their concerns and values have been explicitly considered and incorporated in the VC selection process, they are unlikely to grant proposed development the social license to operate (Lawe et al., 2005).

Only a handful of articles explicitly look at the reasoning behind choices to include or exclude particular VCs from analysis or monitoring in CEAM. However, these choices are being made on some basis by proponents, federal and provincial

government authorities and EA practitioners. The articles that I reviewed found that a similar set of influencing factors are being considered to inform VC selection (Bérubé, 2007; Olagunju & Gunn, 2015). I identified the following factors as the main influences on the selection of biophysical VCs in CEAM practice:

1. Perceived ecological significance (Olagunju & Gunn, 2015);
2. Perceived social or economic importance (Olagunju & Gunn, 2015);
3. Cultural importance (Olagunju & Gunn, 2015);
4. Regulatory concern, particularly with regard to species at risk (Ball, Noble, & Dubé, 2012; Canter & Ross, 2010; Olagunju & Gunn, 2015);
5. Regional importance (Bérubé, 2007);
6. Potential to be impacted by the reviewable project (Ball et al., 2012; Bérubé, 2007; Canter & Ross, 2010).

Olagunju and Gunn (2015) found that traditional use, educational, scientific and human health values were ranked low as influencing factors for selecting biophysical VCs in CEAM. Generally, it is difficult to know if selected VCs adequately represent the concerns and values of affected communities and Aboriginal groups due to limited documentation on the rationale for selection.

4.3.2. Challenges and Deficiencies of the VC Selection Process

Conceptual and Methodological Challenges

The conceptual challenges of the current practices for VC selection in CEAM relate mainly to a general lack of understanding among assessors and other participants about the nature and definition of VCs in a cumulative effects context. EA practitioners in BC and Canada use multiple definitions for VCs, and often stakeholders do not understand the distinctions among values, VCs and indicators (Ball et al., 2012; Bérubé, 2007; Canter & Ross, 2010; Olagunju & Gunn, 2015). In addition, no clear consensus has been reached among practitioners on the use of stressor-based or effects-based indicators for measuring VCs (Ball et al., 2012; Noble, 2013). Given that many scholars consider stressor-based indicators to be more appropriate for CEA and effects-based indicators to be better suited for CEM (see section 2.2), a lack of consensus of this issue

implies a poor understanding of the distinction between VCs for CEA and VCs for CEM (Noble, 2013).

The main methodological challenges of the current practices for VC selection in CEAM relate to a lack of standardized guidance and methodology for VC and indicator selection, particularly with regard to specific sectors and ecosystems (Ball et al., 2012; Bérubé, 2007; Canter & Ross, 2010; Olagunju & Gunn, 2013, 2015). For example, Ball et al. (2012) discuss the lack of standardized methodology for CEAs in watersheds. The lack of methodology for indicator selection may result in the use of VC indicators that are not measurable or responsive at the appropriate regional scale for CEAM (Ball et al., 2012; Bérubé, 2007). In BC project review processes, limited guidance is provided for VC selection in a cumulative effects context (BCEAO, 2013). The guidelines recommend that the same VCs selected in a project-based EA should be considered in the CEA, but only those VCs that are found to have residual effects in the EA should be included in the CEA. Another important methodological challenge of VC selection is limited data availability or access to data on candidate VCs, which includes information on the baseline condition, historic trends and regional data (Ball et al., 2012; Bérubé, 2007; Olagunju & Gunn, 2015). Understanding the current condition and historic trend for a candidate VC is important for determining if that VC is a high priority for monitoring and management. In addition, a high degree of uncertainty or a lack of data about a particular VC may be improperly used as rationale for excluding it from analysis or monitoring in CEAM. The potential outcome of excluding VCs with limited data is that those VCs could continue to decline below acceptable conditions without management intervention.

Major Deficiencies

My literature review on the limitations and challenges of the current practices for VC selection in a CEAM context identified four major deficiencies.

1. Inadequate public engagement and consultation
2. Lack of transparent decision-making criteria and rationale
3. Inconsistent use of influencing factors
4. Strong reliance on project-based EA processes for VC selection

Deficiency #1: Inadequate Public Engagement and Consultation

According to many analysts, public engagement and consultation, particularly with affected Aboriginal groups and communities, has had limited influence in VC selection processes (Ball et al., 2012; Canter & Ross, 2010; Olagunju & Gunn, 2013; Snell & Cowell, 2006). Often, no clear documentation is provided for where and how information from public engagement has influenced the final VC selection (Whitelaw et al., 2009). Canter and Ross (2010) found that there is less public engagement and consultation for VC selection in CEA than for VC selection in EA. Ball et al. (2012) report that for aquatic valued ecosystem component selection in Canadian federal EA, "23% of screening assessments reported some degree of public consultation. Of those, 17% indicated that consultation did not affect valued ecosystem component selection, and 17% indicated that consultation did or may have affected valued ecosystem component selection" (p. 472). Increased levels of public consultation may lead to the identification of a more diverse set of VCs, which could better reflect the diversity of stakeholders in the region of interest (Ball et al., 2012). As a consequence of inadequate public engagement and consultation, the VCs may not reflect the values and priorities of stakeholders and Aboriginal communities. Communities may conclude that their concerns and values are not being taken seriously, and may not agree with or support the final VC selection (Baker & McLelland, 2003; Booth & Skelton, 2011a).

Deficiency #2: Lack of Transparent Decision-making Criteria and Rationale

The rationales for VC selection are often not well-documented or understood, with limited use of well-defined criteria to guide the VC choices (Canter & Ross, 2010; Muir & Booth, 2012; Olagunju & Gunn, 2013, 2015). Olagunju and Gunn (2013) argue that the lack of clear decision-making criteria leaves VC selection to the discretion of government agencies and proponents. This deficiency results in multiple potential consequences for VC selection in CEAM:

1. Allows any environmental component to be considered for inclusion regardless of its importance (Olagunju & Gunn, 2013, 2015),
2. Generates comprehensive, inefficient VC lists that are difficult to monitor over time and require extensive resources (Antoniuk et

al., 2009; Bérubé, 2007; Compass Resource Management Ltd., 2012; Cooper, 2004),

3. Selects inconsistent VCs for projects in the same sector, region or watershed (Ball et al., 2012), and
4. Selects broad or generic VCs and indicators that are difficult to understand and measure (Compass Resource Management Ltd., 2012).

Finding measurable and responsive indicators for overarching ecosystem VCs (e.g., biodiversity) can be challenging and these types of VCs are not easy for stakeholders to conceptualize and understand (Compass Resource Management Ltd., 2012; Snell & Cowell, 2006).

Deficiency #3: Inconsistent Use of Influencing Factors

I have discussed the main influencing factors for selecting VCs in CEAM practice; however, these influencing factors are often used inconsistently or inappropriately when deciding to include or exclude a VC (Olagunju & Gunn, 2013, 2015). An influencing factor can be given either too much or too little weight in the selection rationale. In addition, the inconsistent use of different influencing factors means two different projects in the same region or sector can end up with different selected VCs. Consistent VC selection in a watershed or ecosystem is critical for effective CEAM (Sheelanere, Noble, & Patrick, 2013). Factors that are often given limited consideration in VC selection include: ecological significance; social importance; cultural importance; traditional use; and development context in the region (Ball et al., 2012; Canter & Ross, 2010; Muir & Booth, 2012; Olagunju & Gunn, 2015; Weber et al., 2012). For example, clams and cockles are important traditional resources for many coastal First Nations, but limited consideration of traditional use in selection criteria will result in the exclusion of clams and cockles from further analysis or monitoring in CEAM. Factors that are typically given greater weight in VC selection include: individual project priorities; government agency mandate; and regulatory requirements (Ball et al., 2012; Olagunju & Gunn, 2013, 2015; Snell & Cowell, 2006). For example, species at risk are often included as VCs in CEAM because the protection of species at risk is a part of the mandates and responsibilities of Environment and Climate Change Canada and DFO. Snell and Cowell (2006) found that there is limited consideration of novel or complex environmental

components because they are perceived to be too difficult to monitor and require more resources and capacity.

Deficiency #4: Strong Reliance on Project-based EA Processes for VC Selection

The stakeholders in CEAM, their issues and values, the management priorities and the development context will vary from region to region. The selected VCs for a CEA or regional CEM system should depend on the context of the project or region in question. In practice; however, VCs for CEA are frequently based on VC lists from EAs for previous projects that are thought to be similar (Olagunju & Gunn, 2015). Only VCs selected in the project-based EA are considered for the CEA and only those VCs expected to have residual effects from the reviewable project are included in the assessment of cumulative effects (Ball et al., 2012; Baxter, Ross, & Spaling, 2001; Bérubé, 2007; Duinker & Greig, 2006; Olagunju & Gunn, 2013, 2015; Snell & Cowell, 2006). Consequently, VC lists are often incomplete or inappropriate, and do not resonate with the affected communities and Aboriginal groups. Moreover, the selected indicators are not always sensitive to cumulative effects and VCs are often assessed at inappropriate spatial and temporal scales. In other cases, due to the limited scope of federal CEAs, proponents are only required to examine the individual project's contribution to cumulative effects, which can be problematic for VCs that are particularly sensitive to cumulative effects at a regional scale (Duinker & Greig, 2006). For example, assume that a project-based EA finds residual effects on eelgrass from the project. Conceptually, the residual effects can be mitigated through various measures and the CEA concludes that the project's contribution to cumulative effects on eelgrass is not significant. However, this conclusion may not reflect the actual changes to eelgrass beds when the interactions of the project with the impacts of other proposed projects in the region are taken into account. The combined effect from various projects and activities on the sustainability of eelgrass could be significant.

4.3.3. Challenges and Deficiencies of Effective Aboriginal Engagement in Environmental Assessment

As previously explained, no reviewed papers explicitly discussed the challenges and deficiencies of effective Aboriginal engagement in CEAM. Instead, my literature

review focused more broadly on Aboriginal engagement in EAs. Given that cumulative effects are typically evaluated through EA processes, these challenges and deficiencies are likely to extend to CEAM practice.

Institutional and Administrative Challenges

The reviewed literature emphasizes the importance of engaging Aboriginal peoples in resource management and EA processes; however, challenges exist in the institutions and administrative processes for effective Aboriginal engagement (Baker & McLelland, 2003; Booth & Skelton, 2011a, 2011b; O'Faircheallaigh, 2007). Institutional challenges are associated with the systems in place for Aboriginal engagement (e.g., EA process), whereas administrative challenges are associated with the procedural aspects for engaging Aboriginal peoples. I chose to distinguish between these two types of challenges to separate the broader systematic problems of Aboriginal engagement from the operational constraints of these systems and processes.

The main institutional challenge of effective Aboriginal engagement in EA identified in the literature is that Aboriginal people are not sufficiently included in decision-making processes, and their views are not integrated in the decisions (Baker & McLelland, 2003; Lawe, Wells, & Mikisew Cree, 2005; O'Faircheallaigh, 2007; Plate, Foy, & Krehbiel, 2009). Aboriginal consultation and accommodation is an important component of many EA processes; however, there is often little indication of whether or how the results of Aboriginal engagement have influenced decision-making (Baker & McLelland, 2003; O'Faircheallaigh, 2007). Another institutional challenge is that EA processes cannot address broader issues of Aboriginal rights and title, trust between First Nations and governments, and overall community well-being (Booth & Skelton, 2011a; Lawe et al., 2005; O'Faircheallaigh, 2007; Weber et al., 2012; Whitelaw et al., 2009). This challenge contributes to a perceived lack of recognition of Aboriginal interests, values and knowledge in EAs. However, unless appropriate institutions are put in place to address these broader issues, the issues will continue to be raised through EA processes. Strategic approaches to CEAM could provide a platform to address broader community goals and regional well-being for First Nations communities in BC.

The two main administrative challenges of effective Aboriginal engagement in EA relate to a lack of resources and capacity, and inadequate timeframes for participation. The issue of resources and capacity for First Nations in EA processes has been well-documented. A lack of resources (e.g., financial resources, technical expertise, language barriers and human capacity) frequently prevents First Nations from effectively participating in consultation efforts (Baker & McLelland, 2003; Booth & Skelton, 2011a; Lawe et al., 2005; O'Faircheallaigh, 2007; Weber et al., 2012; Whitelaw et al., 2009). Insufficient timelines for preparing feedback and reviewing EA reports limit First Nations from effectively engaging with government agencies and proponents on project development plans (Baker & McLelland, 2003; Booth & Skelton, 2011a; O'Faircheallaigh, 2007). In addition, Aboriginal engagement is often limited to the phases of project review and approval rather than beginning at the planning phase and continuing into the operational phase of the development project (O'Faircheallaigh, 2007). These challenges prevent First Nations from adequately representing their interests and concerns to proponents and government agencies.

Major Deficiencies

My literature review on the limitations and challenges of the current practices for Aboriginal engagement in EAs highlighted four main deficiencies.

1. Little meaningful consideration of Aboriginal concerns and values
2. Poor integration of traditional and local knowledge
3. Limited available information on VCs and indicators specific to Aboriginal communities
4. Nature of engagement does not support collaboration or consensus building

Deficiency #1: Little Meaningful Consideration of Aboriginal Concerns and Values

Selected VCs, indicators and decision-making criteria in EAs generally do not meaningfully consider Aboriginal concerns and values. First Nations often perceive that government agencies and proponents are simply unwilling to take their concerns and values seriously; they do not see these concerns and values reflected in the decisions made about VC selection, analysis of potential effects, and mitigation and monitoring plans (Baker & McLelland, 2003; Booth & Skelton, 2011a; Lawe et al., 2005; Plate et al.,

2009; Whitelaw et al., 2009). In addition, First Nations often feel that they are treated as merely another stakeholder in the engagement process (Weber et al., 2012). First Nations place different values on healthy ecosystems than other affected stakeholders; healthy ecosystems are directly connected to their cultural identity and survival (Weber et al., 2012). Since the assessments of projects do not represent Aboriginal perspectives, issues and concerns, it should not be surprising that when the projects are approved, they do not receive First Nations support.

Deficiency #2: Poor Integration of Traditional and Local Knowledge

Several barriers exist that impede integration of traditional ecological knowledge and local Aboriginal knowledge into EA processes. These barriers include: (1) insufficient time to allow First Nations to incorporate traditional knowledge into EAs, (2) inability of EA practitioners and proponents to facilitate the use of traditional or local knowledge; and (3) reluctance of First Nations to reveal and publicize sensitive knowledge through EAs (Baker & McLelland, 2003; Lawe et al., 2005; O'Faircheallaigh, 2007). Local knowledge is site-specific knowledge held by a specific group of people about their local environment and is often based in their experiences interacting with the land and resources (Adams et al., 2014; Raymond et al., 2010). For Aboriginal peoples, this includes knowledge unique to their culture, and tends to focus on more recent human-environment interactions (Raymond et al., 2010). In contrast, traditional knowledge is passed down through multiple generations and is more deeply incorporated into cultural practices (Raymond et al., 2010). Traditional use studies, which are commonly used to incorporate traditional knowledge into EAs, tend to focus on a limited number of past and present resources and subsistence activities that do not accurately reflect how Aboriginal peoples use the land (Booth & Skelton, 2011a, 2011b). In addition, there is no clear guidance on how to properly integrate traditional or local knowledge with western-based knowledge in EA processes (Baker & McLelland, 2003). A consequence of this deficiency is limited vital background information for priority VCs including historic trends and current conditions. Traditional and local knowledge have the potential to fill critical knowledge gaps in the understanding of VCs and how they are affected by project development.

Deficiency #3: Limited Available Information on VCs and Indicators Specific to Aboriginal Communities

Limited baseline data and information are available on the status of various social, economic, cultural and ecological VCs and indicators in First Nations' communities (Weber et al., 2012). Understanding the current condition of VCs and knowing whether a VC is degraded or declining is important for determining if a VC is a priority for EA and resource management. A general lack of information on VCs and indicators specific to First Nations communities could result in those VCs not being considered a priority for maintenance or restoration. Weber et al. (2012) and Muir and Booth (2012) also found that culturally important VCs with measurable indicators are difficult to identify and define. As a result, culturally relevant VCs are often excluded from analysis in EA processes.

Deficiency #4: Nature of Engagement does not Support Collaboration or Consensus Building

The highly adversarial nature of EA processes in BC and Canada does not promote collaboration or consensus building with affected First Nations communities (Baker & McLelland, 2003; O'Faircheallaigh, 2007). O'Faircheallaigh (2007) found that proponents actively support division among different First Nations involved in the EA process rather than working towards collaboration and consensus. EA consultation and engagement often ends up focusing more on the project's benefits rather than meaningful consideration of First Nations' values and concerns (Lawe et al., 2005). Whitelaw et al. (2012) found that proponents do not provide follow-up to First Nations about how their feedback and input altered the EA process or how proponents explicitly addressed First Nations' concerns. The discourse is one-sided, adversarial and emphasizes opposing positions rather than common interests. The adversarial nature of the process may also contribute to reluctance among Aboriginal groups to release traditional knowledge into the public domain (Galbraith, Bradshaw, & Rutherford, 2007; O'Faircheallaigh, 2007).

4.3.4. Summary of Challenges and Major Deficiencies of Current Practices for VC Selection

Table 4.2. Summary of Challenges and Major Deficiencies in the Current Practices for VC Selection in CEAM and Aboriginal Engagement.

VC Selection Process in CEAM	Sources
Conceptual Challenges	
Nature and definition of values, VCs and indicators	Ball et al. (2012), Bérubé (2007), Canter & Ross (2010), Olagunju & Gunn (2013, 2015)
No clear consensus on use of effects-based or stressor-based indicators	Ball et al. (2012), Noble (2013)
Methodological Challenges	
No guidance on VC and indicator selection in cumulative effects context	Ball et al. (2012), Bérubé (2007), Canter & Ross (2010), Olagunju & Gunn (2013, 2015)
Limited data availability on candidate VCs	Ball et al. (2012), Bérubé (2007), Olajungu & Gunn (2015)
Deficiency #1: Inadequate public engagement and consultation	
Limited influence from public consultation on VC selection, especially when compared to EA VC selection process	Ball et al. (2012), Canter & Ross (2010), Olagunju & Gunn (2013), Snell & Cowell (2006), Whitelaw et al. (2009)
Deficiency #2: Lack of transparent decision-making criteria and rationale	
Rationale for VC selection not well understood or documented	Canter & Ross (2010), Muir & Booth (2012), Olagunju & Gunn (2013, 2015)
Deficiency #3: Inconsistent use of influencing factors	
Variable weight given to key influencing factors of VC selection, with some factors receiving inflated consideration over other factors	Ball et al. (2012), Canter & Ross (2010), Muir & Booth (2012), Olagunju & Gunn (2013, 2015), Snell & Cowell (2006), Weber et al. (2012)
Deficiency #4: Strong reliance on project-based EA processes for VC selection	
CEA VC selection based on similar project applications regardless of context	Ball et al. (2012), Baxter et al. (2001), Bérubé (2007), Duinker & Greig (2006), Olagunju & Gunn (2013, 2015), Snell & Cowell (2006)
No explicit consideration of cumulative effects	Ball et al. (2012), Baxter et al. (2001), BC OAG (2015), Olagunju & Gunn (2015)
Effective Aboriginal Engagement in EA	Sources
Institutional Challenges	
Poor integration of First Nations into decision-making processes	Baker & McLelland (2003), Lawe et al. (2005), O'Faircheallaigh (2007), Plate et al. (2009)
Broader issues of Aboriginal rights and title cannot be adequately addressed in EA	Booth & Skelton (2011a), Lawe et al. (2005), O'Faircheallaigh (2007), Weber et al. (2012),
Administrative Challenges	
Lack of community resources (financial, technical,	Baker & McLelland (2003), Booth & Skelton (2011a),

human capacity)	Lawe et al. (2005), O'Faircheallaigh (2007), Weber et al. (2012), Whitelaw et al. (2009)
Insufficient timelines for participation	Baker & McLelland (2003), Booth & Skelton (2011a), O'Faircheallaigh (2007)
Deficiency #1: Little meaningful consideration of Aboriginal concerns and values	
Perception that governments and proponents are unwilling to take Aboriginal concerns seriously	Baker & McLelland (2003), Booth & Skelton (2011a), Lawe et al. (2005), Plate et al. (2009), Whitelaw et al. (2009)
Deficiency #2: Poor integration of traditional and local knowledge	
Barriers to integration of traditional and local knowledge in EA processes	Sources: Baker & McLelland (2003), Booth & Skelton (2011a, 2011b), Lawe et al. (2005), O'Faircheallaigh (2007)
Deficiency #3: Limited available information on VCs and indicators specific to Aboriginal communities	
Lack of information on priority VCs and indicators specific to Aboriginal communities, often resulting in exclusion of those VCs from EA	Muir & Booth (2012), Weber et al. (2012)
Deficiency #4: Nature of engagement does not support collaboration or consensus building	
Dialogue between First Nations and proponents/governments is adversarial, divisive and one-sided	Baker & McLelland (2003), Lawe et al. (2005), O'Faircheallaigh (2007), Whitelaw et al. (2012)

4.4. Improving the VC Selection Process in CEAM

The third step in developing the new methodology for the identification and selection of biophysical VCs in CEAM is to identify the elements that are required to improve the current practices (Figure 4.5). The new methodology is founded on BC MOE (2012) and BCEAO (2013) guidelines for VC selection, but it expands on that foundation by incorporating principles of Aboriginal-led engagement (Adams et al., 2014) and ecological principles for marine planning (Foley et al., 2010). This section describes the design components that were developed prior to the application of this methodology in Metlakatla's traditional territory, and then discusses the in-practice components that arose during the case study application.

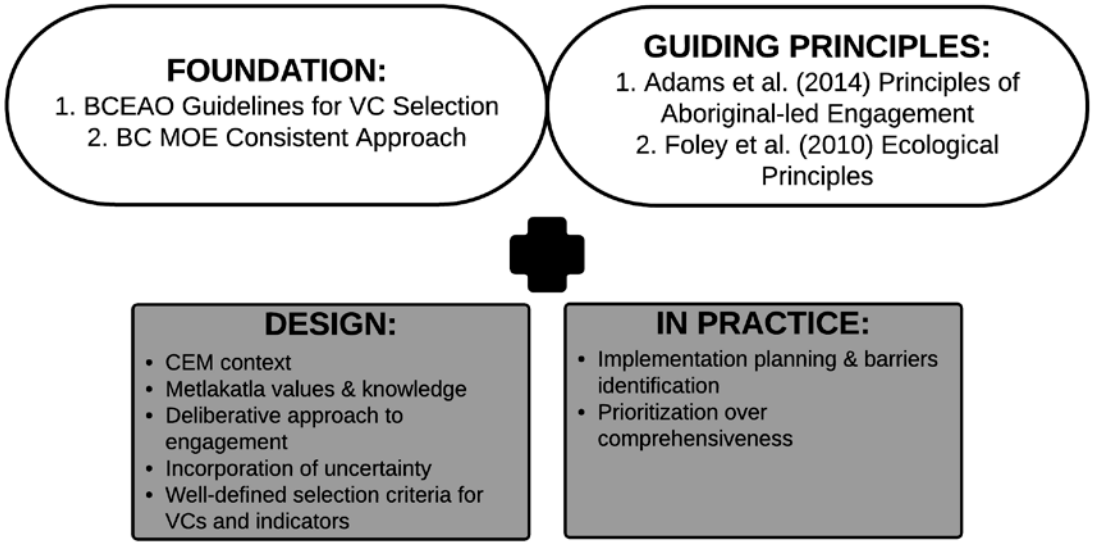

Figure 4.5. Four Components to Improve the VC Selection Process in CEAM.

4.4.1. Foundation for the New VC Selection Methodology

I decided to use BC MOE (2012) and BCEAO (2013) as the foundation for my new VC selection methodology for two reasons. Both guidance documents were well-researched and utilized extensive expert consultations. It can be argued that these guidelines represent the best that is currently being done in Canada for VC selection. In addition, the guidance documents provide comprehensive approaches to address some of the conceptual and methodological challenges in the current practices for VC selection in CEAM. However, these guidelines do not address some of the major deficiencies discussed in the literature. The modifications I made to develop the new VC selection methodology attempt to address these deficiencies, and these changes are discussed in more detail in the subsequent sections. I incorporated Adams et al.'s (2014) principles of Aboriginal-led engagement and research in the methodology in order to address the institutional and administrative challenges of effective Aboriginal engagement. Given that this methodology was to be applied to my case study to specifically identify biophysical VCs in the marine environment, I also incorporated Foley et al.'s (2010) ecological principles for marine spatial planning.

BC MOE: A Consistent Approach to Describing Values

The BC MOE (2012) report, *Values: A consistent approach to describing values in natural resource assessments*, provides a standardized framework for defining and organizing information on values, VCs, indicators, management triggers and targets (i.e., values foundation). The hierarchical structure that is described in these guidelines provides consistent nomenclature for a values foundation (Figure 4.4). The incorporation of this structure as the basis for the new methodology promotes clarity and common understanding for all participants of the distinctions among values, VCs and indicators. Also, using the same structure for a values foundation as BC's CEF ensures that the results from the application of this methodology can be compared to results of the CEF.

BCEAO: Guideline for VC Selection

The BCEAO (2013) *Guideline for the selection of valued components and assessment of potential effects* provides a standardized methodology for identifying and selecting VCs. BCEAO's recommended method for identifying an inventory of VCs is "issues scoping" which includes reviewing relevant documents and consulting stakeholders. This approach utilizes aspects of context scoping by ensuring that selected VCs reflect the social and ecological objectives of the region, the concerns and values of stakeholders, and the regional development context (Baxter et al., 2001). BCEAO's recommended steps for VC selection formed the basis of the steps in the new VC selection methodology (see Section 4.5). The BCEAO criteria for well-defined VCs and indicators formed the basis of the modified criteria used to identify an initial list of candidate VCs in the new methodology. In addition to BCEAO's assertion that their guidelines are based in best practice, the guidelines provide an approach to VC selection that is clear, specific and practical.

Guiding Principles

In order to address the institutional challenges of Aboriginal engagement in EA processes, I used Adams et al.'s (2014) principles of Aboriginal-led engagement and research in the new methodology. Adams et al. (2014) identify three foundational principles to guide Aboriginal-led engagement and research:

1. Incorporate local context when framing research questions

    - Recognition of new legal changes for First Nations authority in natural resource management and decision-making
    - Include local and traditional ecological knowledge
    - Recognition that communities are different and differ over time
2. Address research outcomes at the community scale
    - Consideration of broader social and ecological goals of the community in short and long-term
    - Consideration of how research fits into community's vision
    - Consideration of how research benefits local communities and addresses management decisions and monitoring needs
3. Respect for place
    - Respect the importance of the study area to the local community
    - Recognition that humans and their communities are a part of the study area

The new methodology for identifying and selecting VCs was developed in collaboration with the Metlakatla First Nation for use in Metlakatla's CEM initiative. I applied Adams et al.'s (2014) three principles by working collaboratively with my research partners, Metlakatla First Nation and Compass Resource Management Ltd., to integrate socially and culturally appropriate goals and strategies into the development of Metlakatla's regional CEM program. Furthermore, the Metlakatla First Nation is the primary decision-maker for the CEM program and for the new VC selection process. Decisions about whether to include or exclude a VC from the final priority list were made with input, feedback and confirmation from Metlakatla managers and decision-makers. More broadly, the CEM program provides a framework for addressing broader issues of community well-being and the compatibility of projects with Metlakatla's vision and goals for their traditional territory

This new methodology will be applied to a case study that specifically identifies biophysical VCs in Metlakatla's traditional territory. Given that the Metlakatla First Nation is a predominately marine-oriented community and that the type of development currently expected in the region focuses on the foreshore areas of their traditional

territory, the marine environment will be at the centre of their regional CEM program. Foley et al. (2010) developed a set of ecological principles for marine spatial planning that I adapted to marine CEAM:

1. Maintain native species diversity: number and composition of native species in an ecosystem
    a. Essential for maintaining ecosystem resilience and productivity
2. Maintain habitat diversity and heterogeneity: number and spatial arrangement of different habitat types in a given area
    a. Essential for promoting species diversity and habitat connectivity
3. Maintain key species: species with key roles in the ecosystem
    a. Keystone species, foundation species, basal prey species and top predators
4. Maintain connectivity among habitats: movement of individuals, nutrients or materials across different habitat types in a given area
    a. Essential for maintaining species diversity and populations

These principles were incorporated in the VC selection criteria to ensure that scientifically recognized elements of healthy marine ecosystems are maintained and restored by the Metlakatla CEM program.

4.4.2. 'Design' Components for Improving the VC Selection Process

I developed the following design components in order to: (1) address major deficiencies identified in the current practices for VC selection and Aboriginal engagement; and (2) reflect the best practice solutions identified in my literature review on the challenges and limitations of VC selection in CEAM.

1. Cumulative effects management context
2. Metlakatla values and local knowledge
3. Deliberative approach to engagement
4. Incorporation of uncertainty
5. Well-defined selection criteria for VCs and indicators

Design Component #1: Cumulative Effects Management Context

The new VC selection methodology was specifically designed for a regional First Nation's CEM system; therefore, it was important that the selected VCs be sensitive to cumulative effects from the development expected in the region and that the indicators be responsive and measurable at an appropriate regional scale (Compass Resource Management Ltd., 2012). The criteria used in the methodology to select VCs and indicators and the rationale for the choices to include or exclude a VC explicitly consider potential cumulative effects from development. This methodology was designed to be applied independently of any project-review process, which reduces the influence of project-based VC selection. In addition, the selected indicators in the methodology are effects-based indicators because they measure the condition of a VC; this is the most direct way to assess cumulative changes to a VC over time (Noble, 2013).

Design Component #2: Metlakatla Values and Local Knowledge

In accordance with the principles for Aboriginal-led engagement and research, the new VC selection methodology was informed by Metlakatla values and local knowledge. Metlakatla planning documents formed the basis of the comprehensive issues scoping step of the methodology, and workshops organized by Compass Resource Management Ltd. and Metlakatla decision-makers and managers helped to ensure that the selected VCs reflected their values and priorities. Local knowledge about important traditional resources, and the current condition and recent trends of candidate VCs was collected through Metlakatla planning documents and through engagement with Metlakatla managers and decision-makers. In particular, Metlakatla's traditional seasonal round of harvesting activities identified key traditional resources that members rely on throughout the year. Priority management issues identified in planning documents were informed by the experiences of local Metlakatla fishers and harvesters. In addition, the criteria used to select VCs explicitly consider the traditional importance of a VC to the Metlakatla First Nation.

Design Component #3: Deliberative Approach to Engagement

Several articles emphasize that consultation with stakeholders and Aboriginal groups must be open, participatory, transparent, inclusive and meaningful in order to

achieve effective engagement in the VC selection process (Cardinale & Greig, 2013; Compass Resource Management Ltd., 2012; Parkins, 2011). This level of engagement will help reduce the perception that Aboriginal issues and concerns are not being taken seriously. Parkins (2011) recommends a pragmatic, deliberative approach to engagement that focuses on extensive discussion and debate where participants are open to changing their preferences as new information and opinions are presented by other participants. This approach to engagement was adopted through the use of workshops with Metlakatla managers from all departments to select priority VCs for the regional CEM program. Selecting and prioritizing VCs is inherently a deliberative process and requires open dialogue within the First Nation to ensure the selected VCs reflect their values and advance their community's goals and vision.

Design Component #4: Incorporation of Uncertainty

My literature review highlighted a general lack of information and data on candidate VCs, particularly for First Nations' culturally relevant VCs. In recognition of this limitation, uncertainty was explicitly incorporated into the new VC selection methodology. The VC selection process is adaptive and iterative because actors and the development context in the region are changing. For example, the alternative future development scenarios that were developed for this project should be revisited as more information about project approvals becomes available. The Metlakatla First Nation must be willing to change initial VC choices based on any new information. In addition, a lack of information or data on a particular species or habitat does not automatically exclude it from consideration for the final VC list. Finally, where information is unavailable, particularly with regard to the current condition or historic trend of a candidate VC, local knowledge from Metlakatla decision-makers and managers is utilized to fill any gaps.

Design Component #5: Well-defined Selection Criteria for VCs and Indicators

I used BCEAO's selection criteria for VCs and indicators as the basis for my selection criteria (Table 4.1). I modified these criteria to reflect Metlakatla values and priorities, and to incorporate findings from my literature review. Documentation of the rationale for including or excluding candidate VCs is an essential component of the new methodology in order to be open and transparent about the decisions being made. My

literature review on the limitations and challenges of VC selection emphasized that the following criteria should be considered for good VC selection: current status of VC; potential likelihood of significant cumulative effects; importance of VC to stakeholders; combination of coarse-filter and fine-filter VCs to maintain ecological integrity; and comprehensive VC lists that are representative of the range of important values (Cardinale & Greig, 2013; Compass Resource Management Ltd., 2012; Cooper, 2004; Gunn & Noble, 2011). The following criteria were identified for good indicator selection: clear and understandable by stakeholders; practical and feasible to measure; responsive to changes in VC condition; sensitive to development impacts; appropriate given the spatial and temporal scale of VC; and consistent so that results can be compared over time (Antoniuk et al., 2009; Compass Resource Management Ltd., 2012; Noble, 2013). The selection criteria I developed for VCs and indicators were used to identify an initial list of candidate VCs and indicators for Metlakatla's regional CEM program.

4.4.3. 'In-Practice' Components for Improving the VC Selection Process

As I worked with the Metlakatla First Nation and Compass Resource Management Ltd. to develop and apply this new methodology for VC selection, I encountered additional challenges that resulted in the incorporation of new components to the methodology. The challenges were primarily associated with implementation concerns and the real world constraints of Metlakatla First Nation's limited resources and capacity. These new components, which I refer to as 'in-practice' components, reflected the reality of applying a new method to a novel situation. There are very few examples of successful implementation of regional CEM in Canada, and to my knowledge, no other First Nation in BC has initiated the development of its own CEM program in its traditional territory. The following in-practice components will be discussed:

1. Implementation planning and identification of barriers
2. Prioritization over comprehensiveness.

In-Practice Component #1: Implementation Planning and Identification of Barriers

One of the primary administrative challenges identified in my literature review on effective Aboriginal engagement in EA is the lack of resources, including capacity and financial resources. This challenge became evident during the application of the new methodology in Metlakatla First Nation's regional CEM program. Given that the Metlakatla First Nation was implementing a CEM initiative on their own, it was important to consider whether they had the resources to effectively track and monitor all selected VCs. Antoniuk et al. (2009) emphasize the importance of explicitly considering implementation issues and constraints when selecting VCs for a CEM system. A case study of the development of a cumulative effects assessment and management framework for the Northwest Territories found that starting with a pilot project of 2 or 3 priority VCs increased the likelihood of success (Antoniuk et al., 2009). Starting small with a pilot project can help build confidence among stakeholders and momentum to allow other VCs to be added to the system over time (Antoniuk et al., 2009). For the Metlakatla CEM system, information on implementation challenges and management considerations was included for each candidate VC to ensure that these issues were explicitly considered in any decision to include or exclude a VC. Identification of the barriers to successful implementation of a regional CEM system is a critical component of VC selection.

In-Practice Component #2: Prioritization over Comprehensiveness

In recognition of potential resource constraints, the focus of VC selection shifted from comprehensiveness to prioritization. It was very clear that it would not be practical to track and monitor all VCs of concern. Indeed, best practices for VC selection in CEAM recommend prioritizing VCs of most concern given the context of the region (Antoniuk et al., 2009; Compass Resource Management Ltd., 2012; Cooper, 2004; Hegmann et al., 1999). The identified criteria for implementation planning were used as the basis for prioritization exercises at a final workshop with Metlakatla decision-makers to identify a final priority set of VCs.

4.4.4. Challenges and Major Deficiencies Addressed in the New VC Selection Methodology

Each of the elements of the new VC selection methodology is designed to address the challenges and major deficiencies in the current practices for VC selection in CEAM and Aboriginal engagement in EA processes (Table 4.3).

Table 4.3. Summary of Elements of the New VC Selection Methodology.

Elements of the New VC Selection Methodology	Challenges and Major Deficiencies Addressed
1. Foundation for the Methodology	
BC MOE (2012) Values: A consistent approach to describing values in natural resource assessments • Hierarchical structure of standardized nomenclature for a values foundation	*VC selection process* 1. Conceptual challenge: Nature and definition of VCs
BCEAO (2013) Guideline for the selection of valued components and assessment of potential effects • VC identification and selection methodology • Criteria for well-defined VCs and indicators	*VC selection process* 1. Methodological challenge: No guidance on VC and indicator selection 2. Deficiency #2: Lack of transparent decision-making criteria and rationale
2. Additional Guiding Principles	
Adams et al. (2014) Principles for Aboriginal-led engagement and research • Incorporate local context • Address outcomes at the community scale • Respect for place	*Effective Aboriginal engagement* 1. Institutional challenge: Poor integration of First Nations in decision-making 2. Institutional challenge: Broader Aboriginal issues
Foley et al. (2010) Ecological principles for marine spatial planning • Maintain native species diversity • Maintain habitat diversity and heterogeneity • Maintain key species • Maintain connectivity among habitats	*VC selection process* 1. Deficiency #3: Inconsistent use of influencing factors
3. Design Components	
Cumulative effects management context • VC selection criterion: sensitive to cumulative effects from development expected in the region • VC indicator criteria: responsive and measurable at the appropriate regional scale	*VC selection process* 1. Conceptual challenge: Distinction between effects-based and stressor-based indicators 2. Deficiency #4: Strong reliance on project-based VC selection process
Metlakatla values and local knowledge • Existing Metlakatla documents formed basis of comprehensive issues scoping • Ongoing engagement with Metlakatla managers	*VC selection process* 1. Deficiency #1: Inadequate public engagement and consultation 2. Deficiency #3: Inconsistent use of influencing

Elements of the New VC Selection Methodology	Challenges and Major Deficiencies Addressed
and decision-makers • VC selection criterion: traditional importance to Metlakatla First Nation • Use of local knowledge to fill knowledge gaps on candidate VCs	factors *Effective Aboriginal engagement* 3. Deficiency #1: No meaningful consideration of Aboriginal concerns and values 4. Deficiency #2: Poor integration of traditional or local knowledge
Deliberative approach to engagement • Workshops with Metlakatla managers and decision-makers facilitated deliberative forms of discussion and engagement	*VC selection process* 1. Deficiency #1: Inadequate public engagement and consultation *Effective Aboriginal engagement* 2. Deficiency #1: No meaningful consideration of Aboriginal concerns and values 3. Deficiency #2: Poor integration of traditional or local knowledge 4. Deficiency #4: Nature of engagement does not support collaboration or consensus building
Incorporation of uncertainty • Adaptive and iterative process • Use of local knowledge to fill knowledge gaps on candidate VCs • Development context based on future development scenarios that are open to change as more information becomes available about project approvals	*VC selection process* 1. Methodological challenge: Limited data availability *Effective Aboriginal engagement* 2. Deficiency #2: Poor integration of traditional or local knowledge 3. Deficiency #3: Limited available information on VCs and indicators specific to Aboriginal communities
Well-defined selection criteria for VCs and indicators • Specific VC and indicator selection criteria based in best practices • Clear decision-making criteria when a choice to include or exclude a VC needs to be made	*VC selection process* 1. Deficiency #2: Lack of transparent decision-making criteria and rationale 2. Deficiency #3: Inconsistent use of influencing factors
4. In-Practice Components	
Implementation planning and identification of barriers • Identification of barriers to successful implementation to guide final VC choices • Implementation challenges and management considerations were provided for candidate VCs	*Effective Aboriginal engagement* 1. Administrative challenge: Lack of community resources
Prioritization over comprehensiveness • Prioritization exercise conducted at final workshop with Metlakatla decision-makers	*Effective Aboriginal engagement* *1.* Administrative challenge: Lack of community resources

4.5. New VC Selection Methodology for a First Nation's Cumulative Effects Management System

The new VC selection methodology for a First Nation's regional CEM system is composed of six steps (Figure 4.6).

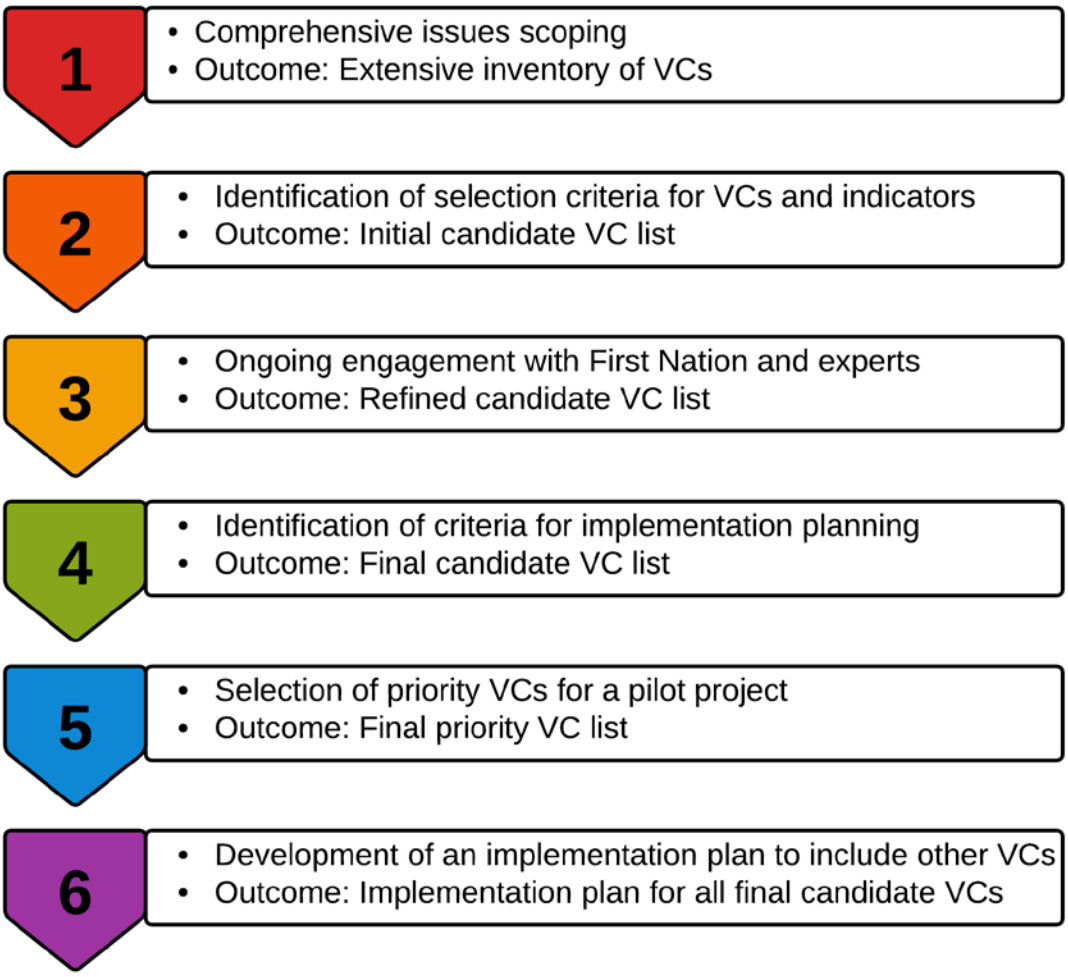

Figure 4.6. New VC Selection Methodology.

4.5.1. Step 1: Comprehensive Issues Scoping

In the first step of the new VC selection methodology, all possible VCs are comprehensively scoped to compile an extensive inventory of biophysical VCs. Comprehensive issues scoping involves reviewing all relevant and available documents to identify the issues, concerns and values that may be related to a specific project or

region of interest (BCEAO, 2013). Relevant document sources for review included: BCEAO project regulatory submissions; applicable provincial and federal legislation and regulations; BC land use plans; federal marine planning documents; other regional and local government plans; Metlakatla planning documents; other organizations' documents; and relevant academic literature. A VC from a reviewed document was included in the inventory if it was: (1) explicitly referred to as a value or management priority; or (2) frequently mentioned or emphasized as important to the Metlakatla First Nation. The extensive inventory included the following biophysical values information: values; VCs; location/scale; indicators; benchmarks; management targets; stressors; current monitoring efforts; and responsible government authority. This information was then organized into suitable and relevant categories as shown in Figure 4.7.

I organized the biophysical values information into ecosystem categories: marine system, terrestrial system, freshwater system and traditional resource system. The traditional resource system category includes information from the reviewed documents about the animal and plant species that the Metlakatla people use as traditional or cultural resources. Next, I organized the information into categories that reflect the systems currently used by government agencies responsible for resources in each ecosystem. For the marine environment, I used MaPP's categories for organizing VCs in the North Coast marine plan (MaPP, 2015). BC MOE developed a values master list as part of its efforts to implement a standardized, consistent approach to describing values. The BC MOE values master list formed the basis for my categories in the terrestrial and freshwater ecosystems. I chose to use these categories as the basis for my inventory in order to be consistent and comparable with other planning processes in the region. The inventory was further condensed to reduce redundancy: (1) VCs with similar wording were grouped under one VC; and (2) broad or vague VCs were removed from the inventory (e.g., long-term ecosystem integrity). Step 1 of the new methodology produced an extensive inventory of biophysical VCs.

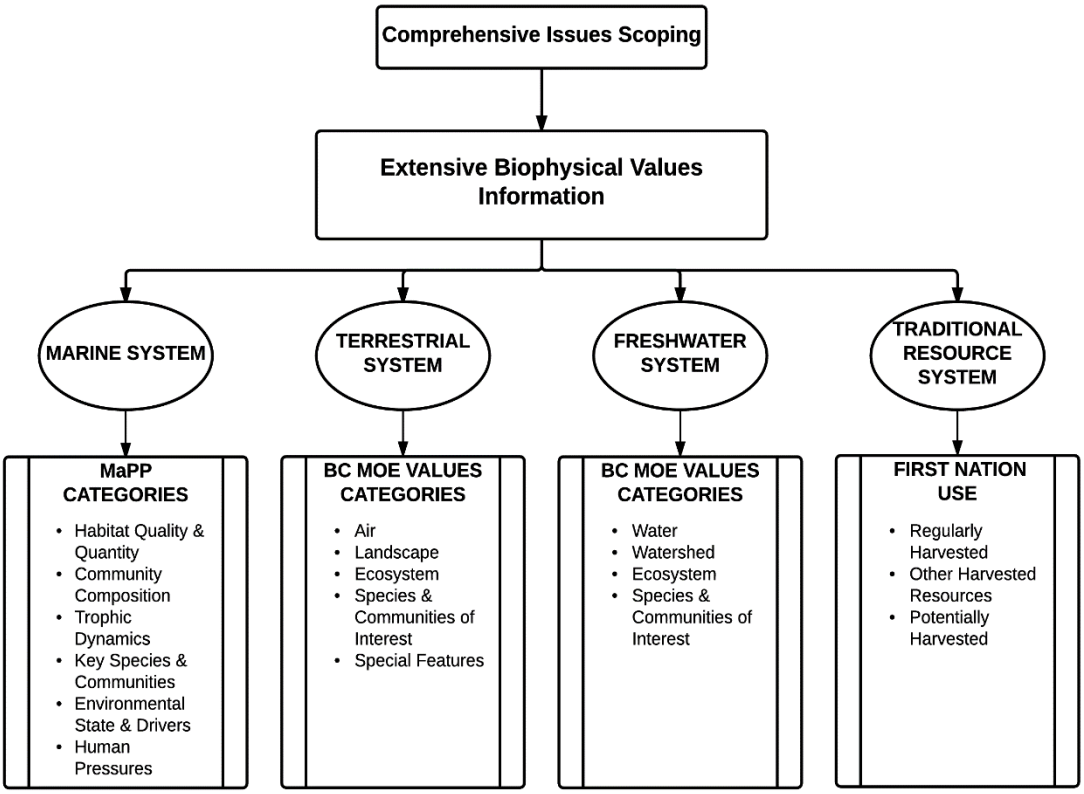

Figure 4.7. Categories for Compiled Biophysical Values Information.

4.5.2. Step 2: Identification of Selection Criteria for VCs and Indicators

The second step in the new VC selection methodology involved identifying well-defined selection criteria for VCs and indicators. The criteria were used to narrow down the inventory of biophysical VCs to an initial candidate list of VCs. I used the BCEAO criteria for VCs and indicators as a starting point, and then modified these criteria to address deficiencies in VC selection for CEAM identified in the literature (Table 4.1). The modifications I made deal with: (1) Metlakatla values and local knowledge; (2) cumulative effects management context; and (3) best practices for VC and indicator selection criteria. The modified selection criteria and rationale for VCs and indicators is provided in Table 4.4. Step 2 of the new methodology produced an initial candidate list of VCs and indicators (Table 5.1).

Table 4.4. Modified Selection Criteria and Rationale for VCs and Indicators.

VC Selection Criteria	
Modified VC Selection Criteria	Modification Rationale
Traditional Importance – as a traditional resource or has social, cultural or commercial importance to Metlakatla First Nation	Basis: BCEAO Criterion – Relevant • Explicitly incorporate Metlakatla First Nations' traditional resources • Explicitly incorporate Metlakatla values and priorities
Sensitive to Development Context – to the cumulative effects from development expected in the region • Based on most probable future development scenario over the next 20 years in the region	Basis: BCEAO Criterion – Responsive • Explicitly considers cumulative effects context • Explicitly considers development context
Responsive, Measurable and Practical Indicators – responsive to changes in the condition of VC over time, measurable at the appropriate spatial and temporal scales, and practical to implement	Basis: BCEAO Criteria – Responsive & Concise • Explicitly considers implementation issues • Explicitly considers cumulative effects context
Representative of Key Habitats – of the key habitats found in Metlakatla's traditional territory • Marine environment: coastal estuary, seafloor/subtidal, sandy shoreline/beach, rocky intertidal, kelp forest and eelgrass bed	Basis: BCEAO Criteria – Comprehensive & Representative • Explicitly considers ecological principles for maintaining structural components of ecosystem
Key Role in the Ecosystem – species has a key role in ecosystem in Metlakatla's traditional territory • Marine environment: keystone species, foundation species, basal prey species, and top predators	Basis: BCEAO Criterion – Representative • Explicitly considers ecological principles for maintaining structural components of ecosystem
Species at Risk – listed as a federal species at risk under the *Species at Risk Act*, S.C. 2002, c. 29	Basis: BCEAO Criterion – Representative • Explicitly considers ecological principles for maintaining structural components of ecosystem
Indicator Selection Criteria	
Modified Indicator Selection Criteria	Modification Rationale
Relevant – directly related to the VC, can inform the work of Metlakatla First Nation departments and reflects cultural values	Basis: BCEAO Criterion – Relevant • Best practice: clear and understandable by stakeholders
Practical and Manageable – easy to measure given resource constraints with readily available data sources or currently being monitored	Basis: BCEAO Criterion – Practical • Best practice: practical and feasible to measure
Measurable – generates useful data that can inform the understanding of the condition of the VC over time at appropriate scales	Basis: BCEAO Criterion – Measurable • Best practice: appropriate to spatial and temporal scale of VC

Accurate – in capturing or reflecting the change in the condition of VC over time	Basis: BCEAO Criterion – Accurate • Best practice: consistent measurements to compare results over time
Responsive – to the changes in condition of VC over time given the development context of the region	Basis: BCEAO Criterion – Responsive • Best practice: responsive to changes in condition of VC, sensitive to development impacts

An important component of identifying and selecting well-defined indicators was developing influence pathway diagrams (i.e., effect pathways diagrams) (Figure 4.8). Influence pathway diagrams outline the various ways in which proposed developments, human activities and management actions interact with VCs (Beanlands & Duinker, 1983; Compass Resource Management Ltd., 2012; Niemeijer & de Groot, 2008).

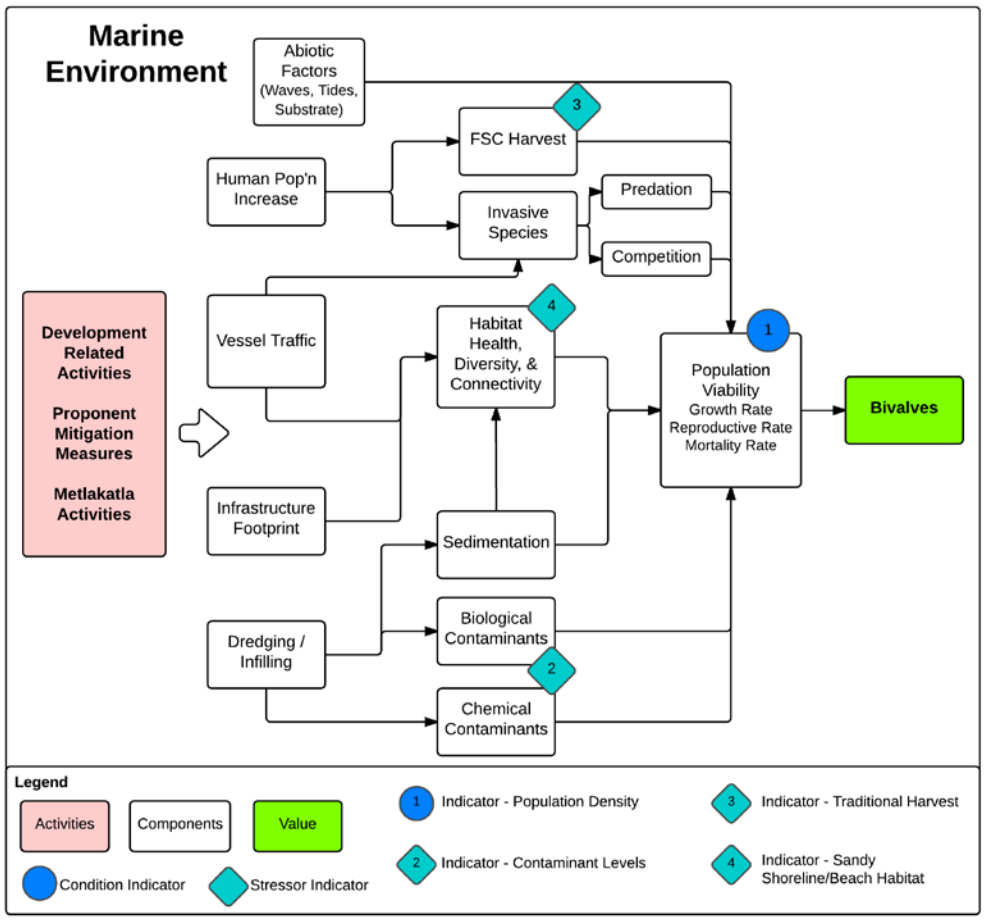

Figure 4.8. Influence Diagram for Bivalves.

Influence diagrams help identify stressor and condition indicators through cause and effect linkages. A well-defined stressor indicator (i.e., stressor-based) should measure

the impact from a specific development or human activity; therefore, it typically indirectly influences the state of VC. A well-defined condition indicator (i.e., effects-based) should measure the current state of a VC. An example of an influence diagram for bivalves is shown in Figure 4.8.

4.5.3. Step 3: Ongoing Engagement with the First Nation, Research Collaborators and Content Experts

The third step in the VC selection methodology focused on engagement, which involved interviews with content experts, working sessions with my research collaborators, and a workshop with Metlakatla managers organized by my collaborators to refine the initial candidate list of VCs and indicators. Interviews with content experts were structured around (1) a review of the initial candidate list of VCs and indicators, and (2) a set of questions to elicit comparable feedback and comments. The standardized set of questions was as follows:

- Is there anything missing from the candidate list of VCs? Any suggestions or recommendations on how to improve the list?
- Could you comment on the appropriateness of the indicators? Are they measurable and responsive to change?
- Are these VCs mutually exclusive? Are they going to be impacted by development in similar ways?

This information was then discussed and reviewed at working sessions with collaborators to refine the candidate list of VCs to a practical and manageable number for further consideration. Additional criteria that focus on implementation considerations were established to narrow down the candidate list to a manageable number:

- Does the VC have existing data in near-ready format?
- Does Metlakatla First Nation have the capacity (financial and human resources) to begin a monitoring program for the VC?
- Is there a partnership opportunity to implement a monitoring program for the VC?
- Does the VC serve as a foundation to allow for other VCs to be added over time?
- Will the VC be impacted by near-term development pressures?

The refined list of candidate VCs and indicators was then presented at a workshop organized by Compass Resource Management Ltd. and Metlakatla managers. The goal of the workshop was for Metlakatla First Nation decision-makers to review, provide feedback on, and ultimately confirm the VCs. The information presented for each candidate VC at the initial workshop included: rationale for selection; indicator choice; and key messages about implementation considerations. This step emphasizes the adaptive and iterative nature of the VC selection process and the importance of deliberative engagement. Dialogue and deliberation ensures that the VC selection process is on the right path through confirmation, input and feedback from our research partners and experts in the field. Step 3 of the new methodology produced a refined candidate list of VCs.

4.5.4. Step 4: Identification of Criteria for Implementation Planning

In the first workshop, Metlakatla managers expressed concern about their ability to track and monitor all candidate VCs given resource constraints. Instead of extending their limited resources across all candidate VCs, Metlakatla officials decided it would be more beneficial to initiate a pilot project that focuses on a few priority VCs. A pilot project would allow the Metlakatla First Nation to gain confidence, knowledge and experience in the process, and to build momentum to allow other VCs to be added over time. Management considerations and implementation challenges were identified for all refined candidate VCs, and this information was used to identify final candidate VCs:

- Is the VC a **priority** given the current development context and current perceived condition of that VC?
- Does the Metlakatla First Nation have an existing **mandate** to manage and affect change for this VC?
- If Metlakatla First Nation does not have an existing mandate, do they have the **ability to influence** change for this VC, particularly through partnerships?
- Does the Metlakatla First Nation have the **capacity** (financial and human resources) to implement a monitoring program for this VC? If not, are there available data for this VC that can be monitored by the Metlakatla First Nation?

4.5.5. Step 5: Selection of Priority VCs for a Pilot Project

The following information was presented for each final candidate VC at the final workshop organized by Compass Resource Management Ltd. and Metlakatla managers and decision-makers:

- Final candidate VC and indicator, and rationale for selection;
- Implementation pathway: Internal implementation or external implementation with partnerships;
- Potential implementation partners (e.g., government agencies, academic partners, NGOs, other First Nations); and
- Specific implementation challenges and management considerations.

Based on the information presented about barriers to successful implementation and other management considerations, the workshop members participated in a prioritization exercise. The exercise was developed to inform where Metlakatla decision-makers should focus their efforts for the initial pilot project on priority VCs. For each final candidate VC, each participant gave a score on a scale of 1 to 5 in the following categories:

1. **Level of priority for Metlakatla First Nation** (1=low priority and 5=high priority)
2. **Strength of Metlakatla First Nation mandate to address this VC** (1=no existing mandate and 5=strong mandate)
3. **Ability of Metlakatla First Nation to influence the management of this VC** (1=no ability and 5=entire control)
4. **Metlakatla capacity (financial and human resources) to address this VC** (1=no capacity and 5=high capacity)

The mean scores were calculated for each category for each candidate VC and these scores were used to guide deliberative dialogue among Metlakatla decision-makers. Step 5 of the new methodology produced a final priority list of VCs for a pilot project for Metlakatla's regional CEM program.

4.5.6. Step 6: Development of an Implementation Plan to Include Other Candidate VCs

The final step in the new VC selection methodology is to develop an implementation plan to include other candidate VCs into the CEM program over time. The four final priority VCs do not represent the full extent of Metlakatla First Nation's priorities and values. However, an explicit consideration of the constraints on resources and capacity for the Metlakatla First Nation made it clear that a focused pilot project would be a more feasible initial step toward developing the full CEM system. Developing a broader implementation plan after the pilot study is critical for the full implementation of the CEM program because it ensures that a strategy is in place to incorporate the other initial candidate VCs into the CEM system.

The first component in the development of a broader implementation plan is to identify management objectives, triggers and actions, and baseline data collection methods for each of the final priority VCs. This component requires establishing working groups composed of relevant content experts, Metlakatla decision-makers and community members. The working groups will be responsible for identifying management objectives, triggers and actions, and for confirming indicator choices. Once the pilot project is fully implemented and baseline data have been collected for the final priority VCs, a workshop should be organized with Metlakatla decision-makers and managers to discuss successes, lessons learned, and implementation challenges. This information will then be used in preparing the implementation strategy, which will incorporate other candidate VCs into the CEM program.

4.6. Chapter Summary

This chapter provided a description of my research methods, which had four main components: (1) description of the current practices for VC selection in CEAM, (2) identification of challenges and major deficiencies in the current practices and effective Aboriginal engagement in EA, (3) development of design and in-practice components for improving the VC selection process, and (4) development of the new VC selection methodology in a First Nation's cumulative effects context. The new VC selection

methodology is based on BC MOE (2012) and BCEAO (2013) guidance for VC selection, and is guided by principles of Aboriginal-led engagement and research and ecological principles for maintaining a marine ecosystem. Design components were developed prior to the application of this new methodology and in-practice components arose during the case study application. These elements combined to improve the current VC selection process by addressing challenges and major deficiencies and incorporating best practice solutions from my literature review. The proposed new VC selection methodology consists of six steps (Figure 4.6).

Although the new VC selection methodology uses the same definitions and structure for a values foundation as BC's CEF, it also incorporates new elements that compensate for shortcomings in the CEF's VC selection process. The BC OAG (2015) discussed issues with FLNRO's approach to VC selection in its CEF, including (1) strong reliance on outdated and incomplete land use plans, and (2) limited information on candidate VCs to inform choices. The new VC selection methodology addresses these issues by incorporating comprehensive issues scoping to identify VCs and explicitly considering uncertainty throughout the process. BC's CEF also plans to identify one set of VCs to apply throughout the province, which does not reflect the unique concerns and values of different regions. The new methodology provides a comprehensive and practical approach to identifying and selecting well-defined VCs with responsive and measurable indicators that explicitly incorporates the values, priorities and local knowledge of First Nations.

Chapter 5.

Case Study Application in Metlakatla First Nation's Traditional Territory

This chapter provides an overview of the Metlakatla First Nation CEM Program and describes the results of the case study application of the new VC selection methodology in Metlakatla's traditional territory. The new methodology was used to identify priority biophysical VCs for Metlakatla's CEM program.

5.1. Overview of the Metlakatla First Nation CEM Program

The Metlakatla First Nation CEM program is centred on a values-based foundation composed of values, priority VCs, condition indicators, and management triggers and actions (Compass Resource Management Ltd., 2015). The CEM program aims to track and assess the condition of the priority VCs and implement monitoring, mitigation and management strategies to maintain or improve the condition of the VCs over time. The purpose of the Metlakatla CEM program is to inform decisions at two levels: (1) at a local project scale through EA processes; and (2) at a territory-wide scale to influence land and marine use planning, and development goals and strategies (Compass Resource Management Ltd., 2015). Based on BC MOE (2012), the following terms are used for describing the values foundation, which is at the core of the Metlakatla CEM program:

- **Value:** The things that the Metlakatla First Nation and its people care about and see as important for maintaining the integrity and well-being of people, economies and ecosystems.

- **Valued Component:** Elements of the natural and human environment that will be measured, monitored, maintained or restored to protect the integrity of social, cultural, economic and environmental values.
- **Indicator:** Metric to measure the valued component.
    - **Condition Indicator:** Metric to measure the overall condition of a VC. Example: butter clam population density (individuals/m^2)
    - **Stressor Indicator:** Metric to measure the change in factors that exert pressure on the condition of a VC.
      Example: Contaminant levels affecting butter clam populations
- **Tiered Management Triggers:** Quantitative levels of performance associated with an indicator that are useful for interpreting the significance of changes in the condition of a value over time. Each tier triggers a different level of management response and action.
- **Tiered Management Zones:** Zones are delineated by management triggers and when a VC falls within a particular zone, it is subject to the associated set of management responses and actions.
- **Tiered Management Actions:** Protocols, strategies and policies that are specifically identified to maintain or restore the condition of a VC.

The values foundation is categorized into five pillars: economic prosperity, social/health, environment, cultural identity and governance. Phase 1 of the CEM program involved the identification and selection of priority VCs and responsive condition indicators that are practical to measure over time. Phase 2 of the Metlakatla CEM program is currently underway and involves initial assessment of the final priority VCs identified in Phase 1 of the program. Phase 2 activities include identifying management triggers, zones and actions for each of the final priority VCs and implementing individual monitoring programs to determine the current condition of the final priority VCs.

Compass Resource Management Ltd. was hired by the Metlakatla First Nation as consultants to develop the CEM program. Given that the VC selection process is an integral part of the development of Metlakatla's CEM program, I worked closely with my research collaborators at Compass Resource Management Ltd. throughout this project. Compass Resource Management Ltd. was responsible for VC selection in the socio-economic pillars, whereas my research selected biophysical VCs in the environmental pillar. The general framework of the new VC selection methodology was also used for the socio-economic pillars. The socio-economic and biophysical VC selection processes

were carried out concurrently. In addition, Compass Resource Management Ltd. organized and facilitated both workshops with Metlakatla First Nation decision-makers and managers. I attended those workshops to present my work on the biophysical VCs. I interacted regularly with Compass Resource Management Ltd., and as a result, the case study in this chapter includes frequent mention of their work in the socio-economic pillars.

5.2. Step 1: Comprehensive Issues Scoping

The first step of the VC selection methodology is a comprehensive review of relevant documents to compile an extensive inventory of biophysical VCs in Metlakatla's traditional territory. I focused my review initially on existing Metlakatla-related documents from studies and plans conducted by or on behalf of Metlakatla First Nation including: land and marine use plans, community plans, traditional use studies, and socio-economic and biophysical studies. This review was supplemented by a review of government documents and NGOs' reports. Examples of relevant government documents are BC land use plans, and federal marine use plans and strategies. Other documents that were reviewed include regulatory submissions from the Metlakatla and other coastal First Nations in EA processes, proponent project applications and relevant academic literature. The list of reviewed documents can be found in Appendix C. From this comprehensive review, I generated an extensive inventory of VCs across all ecosystem types in Metlakatla's traditional territory (Figure 5.1).

Two important decisions were made during this step to reduce the number of VCs for consideration as candidate VCs for the CEM program. First, I decided to focus on marine ecosystems for the initial stage of the Metlakatla CEM program. It is not currently feasible for the Metlakatla to track and monitor the condition of all possible VCs across all ecosystem types. This level of effort would require substantially more resources than the Metlakatla First Nation has available. I focused on marine ecosystems because the Metlakatla First Nation is a marine-oriented community and relies heavily on a variety of marine resources for traditional, cultural, social and economic purposes. Also, the type of development expected in the region is primarily associated with port expansion and LNG marine terminal development; the expected

cumulative effects of such development will likely impact the marine system more significantly than other areas of Metlakatla's traditional territory. The second important decision was to focus on a species approach to VC selection rather than a habitat approach. Metlakatla fisheries managers recommended focusing on key species because they are the elements of the natural environment that Metlakatla people rely on as traditional and commercial resources. As a result, the Metlakatla consider species to be a more direct representation of Metlakatla values. Species are the elements of the environment that the Metlakatla First Nation value, whereas habitats are valued for their support of the species that Metlakatla people care about. Finally, individual species can be more easily managed by Metlakatla First Nation given their existing mandate, technical knowledge and capacity. After these two decisions were made, the inventory of biophysical VCs included 85 key species VCs.

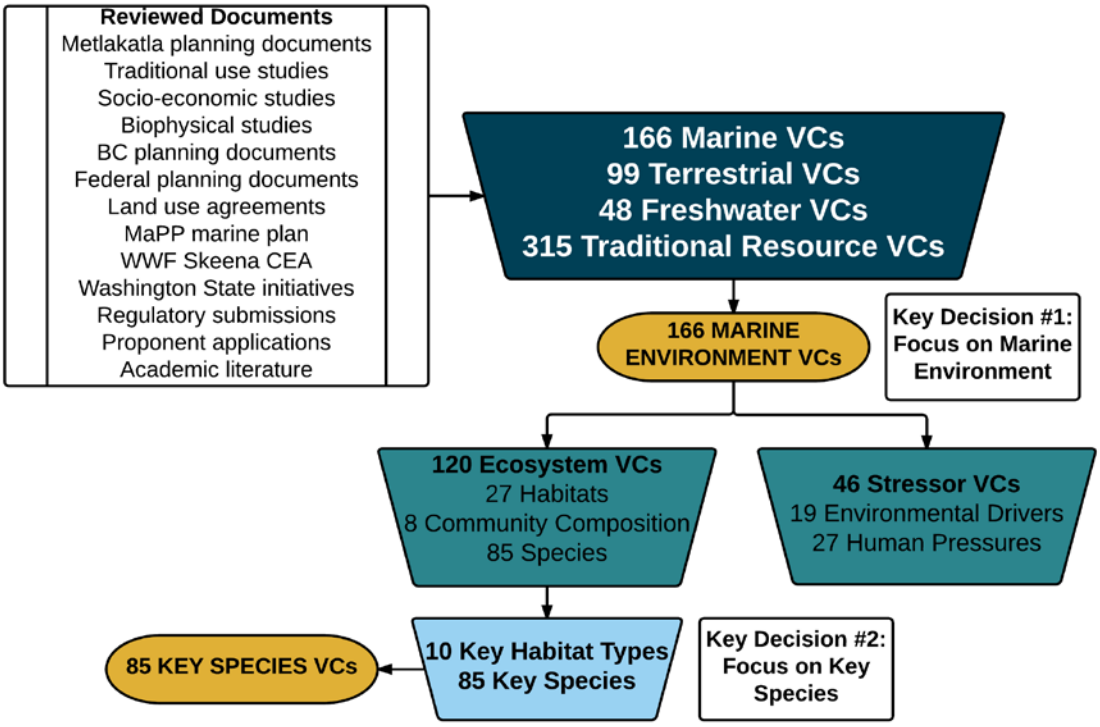

Figure 5.1. Extensive Inventory of Biophysical VCs in Metlakatla's Traditional Territory.

5.3. Step 2: Identification of Selection Criteria for VCs and Indicators

Step 2 of the VC selection methodology is the identification of selection criteria for VCs and indicators, and the selection of an initial candidate list of biophysical VCs based on the criteria. The selection criteria are shown in Table 4.4. I applied these criteria to the key species identified in the VC inventory and selected 6 Tier 1 candidate VCs and 8 Tier 2 candidate VCs (Table 5.1). Tier 1 VCs represent the highest priorities for the Metlakatla First Nation, and collectively as a candidate list; these species fulfill all the VC selection criteria. Tier 2 VCs were selected to complement Tier 1 VCs, and when taken together with Tier 1 VCs, represent the broader ecological state of the marine environment in the region. A total of 14 initial candidate VCs were identified in step 2.

Table 5.1. Initial Selected Tier 1 and Tier 2 Candidate VCs.

Tier 1 Candidate VCs: Productive Marine Environment – Species Diversity: Key Species	
Valued Component	Selection Rationale (VC Selection Criteria)
Sockeye Salmon (*Oncorhynchus nerka*) *Species type:* Anadromous fish species *Species captured:* Pacific Salmon species, Steelhead trout, Eulachon *Candidate indicator:* Population abundance (# adults returning to spawn)	• *Traditional importance:* Culturally, traditionally & economically important resource • *Sensitive to development context:* Various life stages in coastal waters, Skeena estuary and watershed • *Responsive, measurable & practical indicators:* Regularly monitored by DFO and other NGOs with well-defined indicators • *Representative of key habitats:* Coastal estuary habitat • *Key role in the ecosystem*: Nutrient link among marine, freshwater and terrestrial systems
Eelgrass (*Zostera spp.*) *Species type:* Habitat-forming marine plant species *Species captured:* Marine birds, Dungeness crab, Pacific herring, Juvenile Pacific salmon species, Other fish and invertebrate species *Candidate indicator:* Eelgrass distribution (areal extent of eelgrass beds in hectares)	• *Traditional importance:* Supports and provides habitat for important traditional marine resources • *Sensitive to development context:* Eelgrass beds are located in proximity to proposed LNG projects; eelgrass are sensitive to sedimentation impacts from foreshore development activities • *Responsive, measurable & practical indicators*: Not regularly monitored; increasing research on indicators • *Representative of key habitats:* Eelgrass habitat • *Key role in the ecosystem:* Foundation species - important spawning and nursery habitat
Red Laver Seaweed (*Porphyra spp.*) *Species type:* Marine plant species *Species captured:* Abalone, Sea urchin, Other	• *Traditional importance:* Cultural keystone species and important traditional resource • *Sensitive to development context:* Potential impacts

invertebrate species *Candidate indicator:* Seaweed distribution (areal extent of seaweed distribution in hectares)	from foreshore development are not established • *Responsive, measurable & practical indicators:* Not researched; monitored by Metlakatla Fisheries • *Representative of key habitats:* Rocky intertidal habitat • *Key role in the ecosystem:* Potential prey for invertebrate species
Eulachon (*Thaleichthys pacificus*) *Species type:* Anadromous forage fish species *Species captured:* Pacific herring, Other forage fish species *Candidate indicator:* Population abundance (# of adults returning to spawn)	• *Traditional importance:* Important traditional resource • *Sensitive to development context:* Various life stages in coastal waters, Skeena estuary and watershed • *Responsive, measurable & practical indicators:* Not regularly monitored or researched • *Representative of key habitats:* Coastal estuary habitat • *Key role in the ecosystem:* Basal prey species – Vital prey source for many marine species; ecological link between marine and freshwater systems • *Species at Risk:* Special concern
Northern Abalone (*Haliotis kamtschatkana*) *Species type:* Shellfish species *Species captured:* Sea otter, kelp, Red sea urchin, Other invertebrate species *Candidate indicator:* Population density (# exposed individuals/m^2)	• *Traditional importance:* Culturally & traditionally important resource • *Sensitive to development context:* Key pressures from predation and poaching, which could increase with a growing local population • *Responsive, measurable & practical indicators:* Regularly monitored by DFO and Environment and Climate Change Canada with well-defined indicators • *Representative of key habitats:* Kelp forests, Rocky intertidal habitat • *Key role in the ecosystem:* Closely associated with sea otter/sea urchin/kelp forest ecosystem dynamic • *Species at Risk:* Endangered
Pacific Harbour Porpoise (*Phocoena phocoena*) Species type*:* Marine mammal species *Species captured:* Other marine mammal species *Candidate indicator:* Relative population abundance (# individuals & spatial distribution of habitat use)	• *Traditional importance:* Not considered an important traditional resource • *Sensitive to development context:* Inhabit coastal waters and sensitive to anthropogenic noise, contaminants, poor water quality and declining food availability from foreshore development activities • *Responsive, measurable & practical indicators:* Currently monitored by DFO and NGOs and increasing research on condition indicators • *Representative of key habitats:* Coastal estuary habitat • *Key role in the ecosystem:* Top predator species • *Species at Risk:* Special concern
Tier 2 Candidate VCs: Healthy Environment – Environmental Quality	
Valued Component	Selection Rationale
Marine Biodiversity	• Overall measure of ecosystem resilience and

Candidate indicator: No defensible indicator	productivity
Clean Water *Candidate indicator:* Marine water quality (changes in dissolved oxygen (mg/L))	• Vital to many marine organisms • Important component of all marine ecosystems • Overall measure of ecosystem health
Primary Production *Candidate indicator:* Phytoplankton abundance (Chlorophyll-a measurement)	• Coastal estuaries are bottom-driven ecosystems and phytoplankton are the base of the marine food web • Overall measure of ecosystem function
Tier 2 Candidate VCs: Productive Marine Environment – Species Diversity: Key Species	
Valued Component	Selection Rationale
Chinook Salmon (*Oncorhynchus tshawytscha*) *Species type:* Anadromous fish species *Candidate indicator:* Population abundance (# adults returning to spawn)	• *Traditional importance:* Culturally, traditionally and economically important resource • *Sensitive to development context:* Juveniles spend most time in estuarine habitat compared to other Pacific Salmon species; sensitive to foreshore development • *Responsive, measurable & practical indicators:* Regularly monitored by DFO and other NGOs with well-defined indicators • *Representative of key habitats:* Coastal estuary habitat • *Key role in the ecosystem*: Nutrient link among marine, freshwater and terrestrial systems; important prey for marine mammals
Pacific Halibut (*Hippoglossus stenolepis*) Species type: *Groundfish species* *Candidate indicator:* Population abundance	• *Traditional importance:* Culturally, traditionally and economically important resource • *Sensitive to development context:* Long-living and slow-growing; sensitive to stressors in deep waters and coastal waters • *Responsive, measurable & practical indicators:* Regularly monitored by DFO • *Representative of key habitats:* Seafloor/subtidal habitat • *Key role in the ecosystem:* Predator species
Butter Clam (*Saxidomus gigantea*) *Species type:* Bivalve species *Candidate indicator:* Population density (# individuals/m^2)	• *Traditional importance:* Culturally, historically and traditionally important resource • *Sensitive to development context:* Sensitive to marine pollution and contamination • *Responsive, measurable & practical indicators:* Not regularly monitored and researched • *Representative of key habitats:* Sandy shoreline/beach habitat • *Key role in the ecosystem:* Common prey species
Red Sea Urchin (*Mesocentrotus franciscanus*) *Species type:* Marine invertebrate species *Candidate indicator:* Population density (#	• *Traditional importance:* Traditionally and economically important resource • *Sensitive to development context:* Sensitive to changes in local environment and first to show signs of stress

individuals/m^2 and spatial distribution	• *Responsive, measurable & practical indicators:* Currently monitored by DFO and other groups • *Representative of key habitats:* Kelp forests, Rocky intertidal habitat • *Key role in the ecosystem:* Keystone species interaction with sea otters and kelp forests
Rhinoceros Auklet (*Cerorhinca monocerata*) *Species type:* Marine bird species *Candidate indicator:* Population abundance (# adults in breeding colonies)	• *Traditional importance:* Not considered an important traditional resource • *Sensitive to development context:* Sensitive to anthropogenic light from increased shipping activities • *Responsive, measurable & practical indicators:* Regularly monitored by Canadian Wildlife Service with well-defined indicators • *Representative of key habitats:* Rocky intertidal habitat • *Key role in the ecosystem:* Common marine predator • *Species at risk:* Vulnerable migratory seabird species

Note: Sources include expert elicitation, Metlakatla local knowledge, DFO (2007) & MaPP (2015).

5.4. Step 3: Ongoing Engagement with the First Nation, Research Collaborators and Content Experts

The third step in the VC selection methodology involved ongoing engagement with content experts (through interviews), research collaborators (through working sessions), and Metlakatla First Nation managers and decision-makers (through an initial workshop organized by Compass Resource Management Ltd. and Metlakatla First Nation). The goal of this step was to revise the initial candidate VC list to create a smaller refined candidate VC list. Consultants with Compass Resource Management Ltd. and I discussed the initial VCs with several content experts who had extensive knowledge on particular species of interest and/or the Skeena watershed and estuary ecosystems. The content experts included NGO biologists, academics, environmental consultants, government scientists, other biologists working with other First Nations, and Metlakatla Fisheries managers and scientists. The findings from the content expert interviews informed a series of working sessions with our research collaborators at Compass Resource Management Ltd. The full suite of initial candidate VCs from all five pillars were discussed at these working sessions. No representatives from the Metlakatla First Nation were present at these working sessions; however, the project manager from Compass Resource Management Ltd. was working with the MSS on a daily basis in their

office in Prince Rupert. The project manager informed the MSS of all decisions made at these working sessions to receive feedback and confirmation. The decisions to either include or exclude a VC were based on the following criteria: importance as a traditional resource for Metlakatla people; sensitivity to the development context in the region; availability of existing data from current monitoring efforts; availability of appropriate condition indicators; and mutual exclusivity of candidate VCs (Table 5.2).

Table 5.2. Summary of Decisions to Include or Exclude a VC from the Refined Candidate VC List.

Valued Component	Include in VC List	Rationale for Exclusion or Inclusion
Pacific Salmon species representative – Sockeye salmon or Chinook salmon	Chinook salmon	• Both species are important traditional resources • Chinook salmon are more sensitive to the type of development expected in the area because they spend more time in estuarine habitat than other Pacific salmon species
Eelgrass bed habitat representative – Dungeness crab or eelgrass	Dungeness crab (*Metacarcinus magister*)	• Both species represent the same habitat type and will likely be impacted in similar ways (i.e., not mutually exclusive) • Dungeness crab are the species that Metlakatla First Nation harvest and value
Pacific harbour porpoise	No	• Not a priority value for Metlakatla First Nation • Monitoring Pacific harbor porpoises could be costly and difficult to conduct because they are elusive • Changes in the population might not be detected by candidate indicator
Red laver seaweed	Yes	• Important traditional resource • Not sensitive to development expected in region • Changes in distribution might not be detected by candidate indicator
Northern abalone	Yes	• High priority for Metlakatla and important traditional resource • Since their population numbers are currently extremely low, habitat quality and quantity is not likely a limiting factor • Limiting factor for Northern abalone is sea otter reintroduction and poaching
Butter clam	Yes	• Important historic, cultural and traditional resource • Management priority for Metlakatla First Nation due to contaminant concerns • Representative of bivalve species and sandy shoreline/beach habitat

After the initial candidate list of VCs across all five pillars was presented to Metlakatla managers within the MSS, they requested that we reduce the total number of candidate VCs in order for it to be manageable for implementation by the Metlakatla First Nation. A consensus decision was made by my research collaborators with Compass Resource Management Ltd. and me to narrow down the total list of candidate VCs across all five pillars to 15 VCs. Table 5.3 provides a summary of the five initial implementation criteria that were used to identify the refined candidate list of VCs.

Table 5.3. Summary of Initial Implementation Criteria Results.

Candidate VC	Existing Available Data	Metlakatla Capacity	Partnership Opportunity	Serves as Foundation	Sensitive to Development
Chinook Salmon	Yes	No – technically advanced	Yes – DFO, Pacific Salmon Foundation	Yes – for other Pacific salmon species	Yes – juveniles in estuarine habitat
Dungeness Crab	Limited DFO data available	No – costly, labour & time intensive	Yes – DFO, Coastal Guardian Watchmen Network	Yes – for eelgrass	Yes – juveniles in eelgrass beds
Eulachon	No	No – costly, labour & time intensive	Yes – DFO, Coastal Guardian Watchmen Network	Yes – for other forage fish species	Yes – estuarine habitat
Butter Clam	No	Yes	Yes - DFO	Yes – for other bivalve species	Yes - contaminants
Northern abalone	Yes	Yes	Yes - Coastal Guardian Watchmen Network	No – unique species at risk	No – limiting factors are predation
Red laver seaweed	No	No – No data collection methods	No – not a priority for other groups	Yes – for other marine plant species	No

The 15 refined candidate VCs across all five pillars were presented at an initial workshop organized by Compass Resource Management Ltd. and Metlakatla managers and decision-makers (Table 5.4). The biophysical VCs included in this list were: (1) chinook salmon; (2) dungeness crab; (3) eulachon; and (4) butter clam. The workshop attendees included Metlakatla decision-makers and managers from all Metlakatla First Nation departments. At the end of the workshop, participants provided their final

thoughts on the CEM program itself and the refined candidate VCs. Compass Resource Management Ltd. compiled these thoughts into the following common themes:

- The refined candidate list of biophysical VCs represent Metlakatla First Nation values and priorities;
- The Metlakatla CEM program is a long-term, ongoing program that will change with new information or a different development context or set of actors;
- Monitoring marine species is a complex process and could require partnerships with government, other First Nations, NGOs or community groups; and
- The total list of refined candidate VCs across all pillars (the outcome of step 3 above) is too large for successful implementation.

Table 5.4. 15 Refined Candidate VCs across All 5 Pillars

Pillar	Refined Valued Component
Cultural Identity	FSC Participation
	FSC Consumption
	Tsimshian Cultural Knowledge
Social/Health	Physical and Mental Health
	Access to Healthcare
	Adequate Housing
Economic Prosperity	Economic Resilience
	Wealth Distribution
	Economic Self-sufficiency
Governance	Ability to Steward
	Governance/Management
Environment	Chinook Salmon
	Dungeness Crab
	Eulachon
	Butter Clam

5.5. Step 4: Identification of Criteria for Implementation Planning

The fourth step in the new VC selection methodology is the identification of a final candidate list of VCs based on criteria for successful implementation of the Metlakatla CEM program: priority, mandate, ability to influence, and capacity and

resources. These four criteria for implementation planning were used to identify final candidate VCs: chinook salmon and butter clam (Figure 5.2). The reasoning for these choices is described below for each of the four biophysical VCs considered in this step.

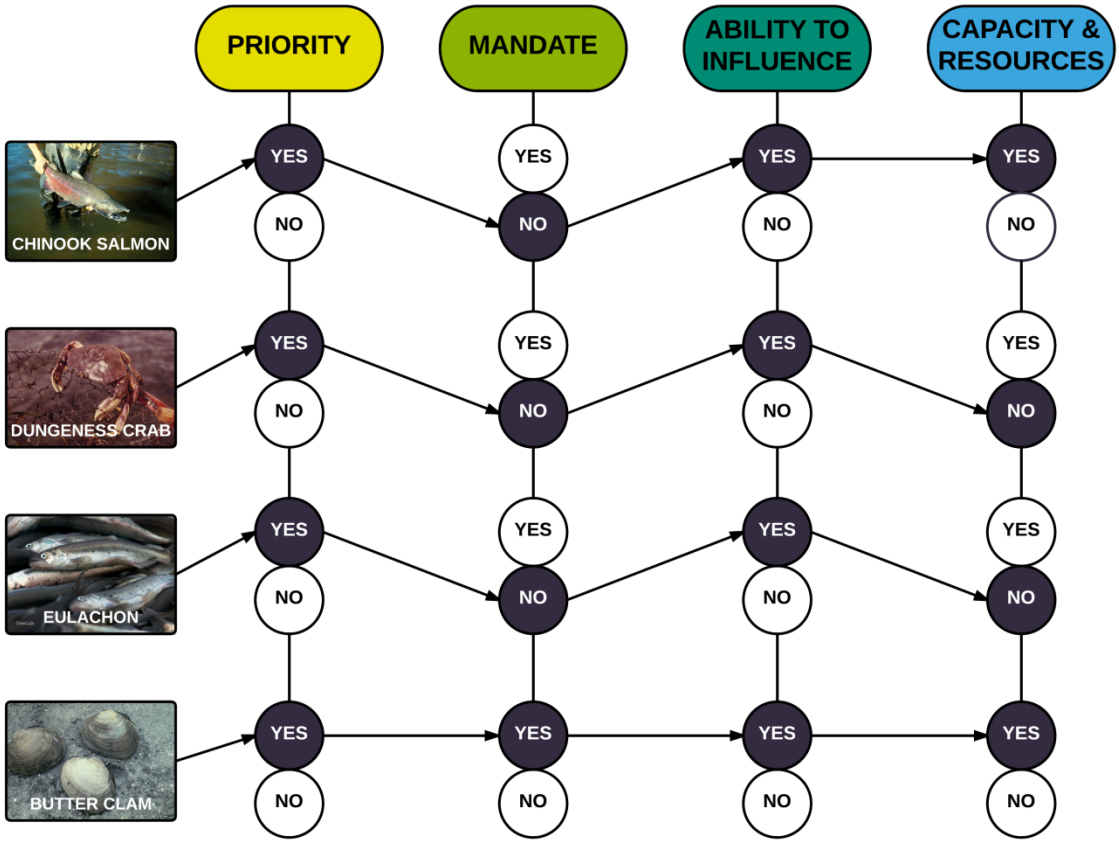

Figure 5.2. Application of Criteria for Implementation Planning on Refined Candidate VC List.

5.5.1. Chinook Salmon

Chinook salmon were considered a priority for the Metlakatla First Nation because they are particularly sensitive to development impacts in the Skeena estuary. The Metlakatla First Nation does not have a direct mandate to manage chinook salmon, as this falls under DFO's responsibilities. However, the Metlakatla do have the potential to influence change for chinook salmon through MSS-led stewardship programs and collaboration with DFO. Finally, extensive data are available on population abundance and habitat assessments for chinook salmon from DFO and Pacific Salmon Foundation. It is not likely that Metlakatla First Nation have the capacity or resources to actively

monitor the condition of chinook salmon because this is a wide-ranging, complex species that requires highly technical population models.

5.5.2. Butter Clam

Butter clams are a priority for Metlakatla First Nation because this species is highly sensitive to the cumulative impacts of contaminant pollution from foreshore development. In addition, Metlakatla First Nation has a mandate from DFO to manage FSC fisheries on beaches within their traditional territory. The commercial fishery for butter clams on the north coast of BC has been closed since 1963, and only Metlakatla members have access to butter clam harvesting within their territory (MSS, 2014; Pellegrin, Boutillier, Lauzier, Verrin, & Johannessen, 2007). As a result, the Metlakatla fisheries department has the ability to influence the condition of butter clam populations through harvesting allocations and other management interventions. Although limited data exist for butter clam populations, standardized monitoring protocols are relatively easy to implement on local beaches.

5.5.3. Dungeness Crab

Dungeness crabs are an important traditional and commercial resource for the Metlakatla First Nation and its people. Juvenile dungeness crabs rely on eelgrass habitat for rearing and protection, and these habitats could potentially be impacted by sedimentation and destruction from foreshore development. The Metlakatla First Nation does not have a mandate to manage dungeness crabs, but they have the ability to influence change for this species through MSS-led stewardship programs. Only limited catch data are available from DFO and implementation of a monitoring program would be costly, labour intensive and time consuming.

5.5.4. Eulachon

Eulachon are an important part of the Metlakatla First Nation's traditional seasonal round and continue to be a valued traditional food for the community. Eulachon have been identified as a high priority for the MSS and they could be impacted by

foreshore development in the Skeena estuary. The Metlakatla First Nation does not have a mandate to manage eulachon, but they have the ability to influence change through MSS-led stewardship programs. Limited data and knowledge are available on Skeena River eulachon, which makes them a difficult species to monitor.

5.6. Step 5: Selection of Priority VCs for a Pilot Project

The final step in the VC selection methodology is to hold a final workshop with Metlakatla managers and decision-makers to identify a priority list of VCs for implementation in a pilot CEM project by the Metlakatla. Table 5.5 provides the information presented at the workshop on the two final candidate biophysical VCs.

Table 5.5. Summary of Information Presented at Final Workshop with Metlakatla Decision-makers.

Final Candidate VC and Indicator	Rationale for Selection	Implementation Pathway	Implementation Challenges	Management Considerations
Chinook salmon *Indicators:* (1) Spawner abundance (2) Critical juvenile habitat	• Important traditional and economic resource • Sensitive to changes in estuary • Important linkage to other ecosystems	External pathway with partnerships • Pacific Salmon Foundation • DFO • Other First Nations	• Data quality is poor in many cases • Data collection and analysis is highly technical	• Data regularly collected and managed by DFO • Data have been synthesized by Pacific Salmon Foundation
Butter clam *Indicator:* Population density	• Important traditional resource • Clam gardens are a historic resource • MSS priority • Sensitive to environmental change	Internal pathway within Metlakatla First Nation	• No available baseline data • Important biological considerations – natural variability in population density	• Partnerships useful when developing protocol • Capacity depends on # of survey sites • Establish working group

Workshop participants represented the following groups within Metlakatla First Nation: Metlakatla Governing Council, Metlakatla Treaty Office, Metlakatla Development Corporation, Metlakatla Stewardship Society, Metlakatla Aquatics/Fisheries Department,

Metlakatla Stewardship Office, Metlakatla Land and Marine Use Planning Department, and Metlakatla managers and staff. These participants were asked to look at all the final candidate VCs across all five pillars, consider the information we presented and decide which VCs they should direct capacity and resources toward in the pilot project of the Metlakatla CEM program. The mean score of this prioritization exercise conducted at the final workshop was used to guide deliberative discussion among workshop participants. The final priority VC list across all five pillars included:

- Butter clam (environmental), *Candidate indicator: population density*
- Economic self-sufficiency (economic prosperity)*, Candidate indicator: high school completion rate*
- FSC activity (cultural identity), *Candidate indicator: FSC participation rate*
- Adequate housing (social/health), *Candidate indicator: Core housing need.*

5.7. Step 6: Development of an Implementation Plan to Include Other Candidate VCs

Phase 2 of the Metlakatla CEM program (Step 6) involves conducting the pilot project and developing a broader implementation plan to expand the program to include other candidate VCs. For butter clams, the Metlakatla First Nation has formed a technical working group consisting of content experts, along with Metlakatla fisheries managers and harvesters. An initial working session has been organized by Metlakatla managers and the CEM program coordinator. The goal of this initial session is to confirm the indicator choice for butter clams and identify management objectives. Once the indicator choice has been confirmed, the next step will be to design a community-based monitoring program for butter clams to determine the current condition of butter clams in Metlakatla's traditional territory and to reassess the condition at regular intervals. The Metlakatla butter clam working group is currently finalizing its choices for butter clam condition indicators, confirming the management objectives for butter clams, and initiating the development of a community-based monitoring program. They are planning to collect baseline data for butter clams in late summer 2016.

Once the pilot project has been implemented and the baseline data have been collected, the Metlakatla First Nation should begin the development of a broader

implementation plan to incorporate other candidate VCs in the future. The initial candidate VCs identified in step 2 of the new VC selection methodology (Table 5.1) would be a good starting point when deciding which VCs should be incorporated at later phases of the CEM program. This implementation plan should also expand the application of the new VC selection methodology to terrestrial and freshwater ecosystems in Metlakatla's traditional territory.

5.8. Chapter Summary

This chapter provided the results of the case study application of the new VC selection methodology for Metlakatla's CEM program (Figure 5.3).

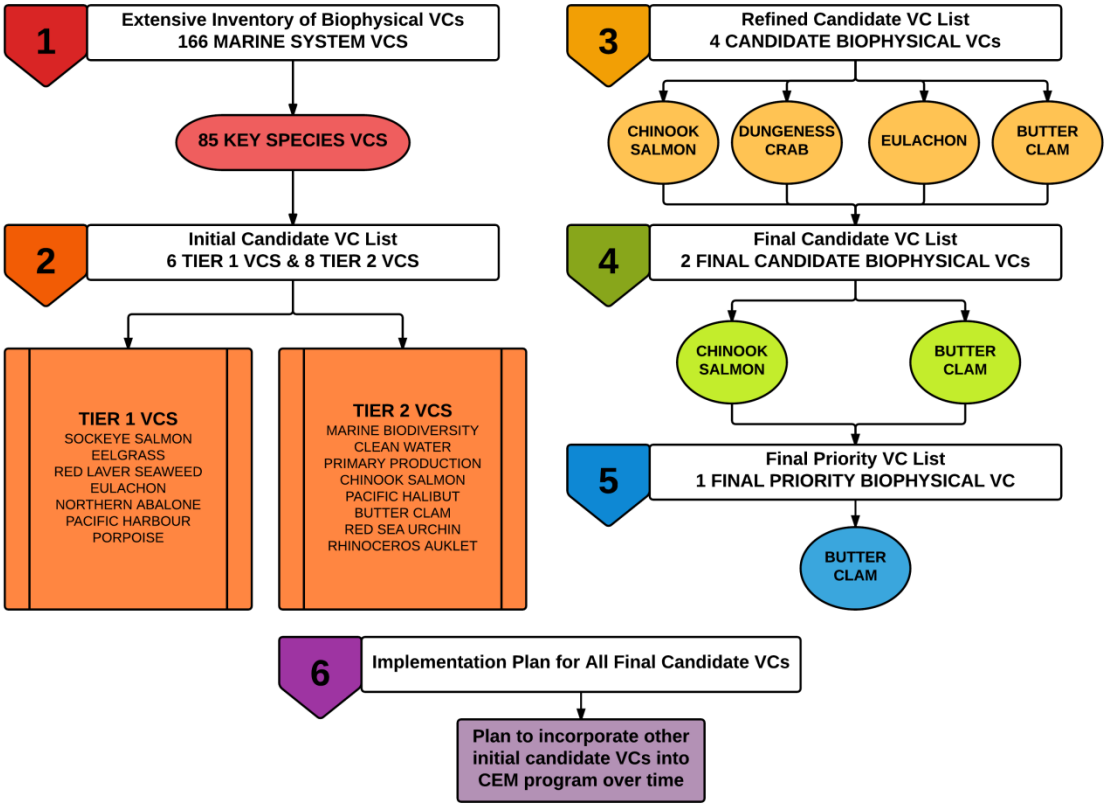

Figure 5.3. Summary of Metlakatla First Nation Case Study Application Results.

Chapter 6.

Discussion

6.1. Introduction

In this research, in collaboration with Metlakatla First Nation and Compass Resource Management Ltd., I sought to develop a methodology that was scientifically defensible, but could also be effectively used by Metlakatla First Nation in their CEM program. One of the key components of developing this methodology was determining how the elements of the new methodology could address the challenges and major deficiencies of the current practices for VC selection (Table 4.3). In this chapter, I discuss the strengths of the new VC selection methodology and identify areas for further improvement. The discussion is divided into three areas: (1) decision-making process for VC selection; (2) effective Aboriginal engagement in VC selection; and (3) VC selection and CEM implementation.

6.2. Decision-making Processes for VC Selection

VC selection is inherently a process of social choice and trade-offs where key decisions are made successively to include or exclude a VC from analysis or monitoring in CEAM. In order for stakeholders, community members and the public to accept the final VC choices, the decision-making process needs be clear, transparent and justifiable (Cardinale & Greig, 2013; Compass Resource Management Ltd., 2012; Parkins, 2011). One of the key findings of Olagunju and Gunn's (2015) study on VC selection in CEAM was that VC lists often lack a strong supporting rationale and reasoning. Well-defined decision-making criteria and rationale are incorporated throughout the VC selection methodology developed in my research, as demonstrated in the Metlakatla case study. For example, step 2 involves the identification of well-defined criteria for selecting VCs

and indicators. These criteria are then used to identify an initial set of candidate VCs. Another critical component of the new VC selection methodology is documentation of the decisions made and their supporting rationale. For example, the decisions to focus on the marine environment and to adopt a species approach to VC selection in the Metlakatla case study are clearly communicated with specific rationales (see Section 5.3). The use of well-defined decision-making criteria and clear documentation of those decisions is one of the strengths of the new methodology.

One of the main challenges of effective CEAM is selecting VCs that are relevant and representative of the region and its inhabitants, and selecting indicators that are measurable and responsive at the appropriate regional scale (Ball et al., 2013; Canter & Ross, 2010; Noble, 2013). Given that the new VC selection methodology described here was designed for a First Nation's CEM system, it is important that the selected VCs be relevant to that First Nation and representative of their traditional territory. These attributes were explicitly incorporated into the VC selection criteria. In the case study, the candidate VC had to have a traditional importance to the Metlakatla First Nation and be representative of the key marine habitat types found in their traditional territory. The ongoing engagement with Metlakatla managers and content experts also confirmed the relevance and representativeness of the candidate VCs. In addition to providing clarity and transparency to the VC selection process, the use of well-defined criteria resulted in the selection of VCs that are more likely be to supported by the community and that reflect their values and priorities.

A lack of good baseline information and data on candidate VCs can impair the selection of VCs and indicators. My literature review on the current practices for VC selection identified data availability and uncertainty as methodological challenges (Ball et al., 2012; Bérubé, 2007; Olagunju & Gunn, 2015). Incorporating mechanisms to deal with uncertainty was a design element of the new VC selection methodology, as evidenced by the iterative and adaptive nature of the process. In addition, local Aboriginal knowledge was used to fill information gaps concerning the current conditions of VCs. Even so, the results of the case study application show that uncertainty and lack of information had a significant role in decisions to exclude certain VCs from the final priority VC list. For example, eulachon was identified as an important traditional resource

for the Metlakatla First Nation, representing coastal estuary habitats and forage fish species, and sensitive to the type of development expected in the region. Although eulachon met the VC selection criteria, limited information existed on eulachon populations in the Skeena watershed including current conditions, spawning locations, and historic trends. Incorporating uncertainty into the methodology meant that eulachon would not be excluded automatically from the candidate VC list based on a lack of information. In this specific case, local knowledge was not used to fill knowledge gaps due to time constraints and limited access to local eulachon harvesters. Eulachon was eventually excluded from the final candidate list due to a lack of existing knowledge about the species. Two considerations were particularly important in this decision: (1) no measurable and responsive indicator could be identified from literature or content experts, and (2) a monitoring program would be costly and require extensive technical knowledge and resources. An iterative and adaptive VC selection process opens the door for previously excluded VCs to be considered for implementation in the future. However, this example shows how limited data availability and knowledge gaps do still impose constraints on decision-making in VC selection.

6.3. Effective Aboriginal Engagement in VC Selection

The challenges and major deficiencies of Aboriginal engagement in EA processes have prevented proper consultation with First Nations and meaningful accommodation of their interests (Pearse, 2009). First Nations have been poorly integrated in EA decision-making processes and these processes have insufficiently addressed broader development and planning goals for First Nations' communities (Baker & McLelland, 2003; Lawe et al., 2005; O'Faircheallaigh, 2007; Plate et al., 2009). For CEAM, an alternative approach is an action-oriented, First Nation-led CEM initiative, such as the Metlakatla CEM program. The Metlakatla First Nation has clear decision-making authority over which VCs to monitor over time and can select management interventions to improve the condition of those VCs. The new VC selection methodology is guided by principles of Aboriginal-led research and engagement, and explicitly incorporates Aboriginal values and local knowledge throughout the VC selection process. The potential benefits of these design components include:

- Opportunity to build capacity for resource management actions and programs, particularly for the First Nation partner;
- Development of culturally and socially appropriate resource management initiatives that can garner support from local Aboriginal communities;
- Development of resource management initiatives that address broader development and planning goals for the First Nation; and
- Potentially improved resource management plans and programs (Adams et al., 2014; Housty et al., 2014).

The incorporation of local Aboriginal knowledge was a critical component of the new methodology. The use of traditional ecological knowledge and local knowledge can improve the understanding of ecosystems and wildlife, including the current conditions and historic or recent trends of priority species (Adams et al., 2014; Dowlatabadi, Boyle, Rowley, & Kandlikar, 2004; Drew, 2005). Local knowledge is based in multi-year observations about local ecosystems, which is particularly valuable in areas with limited scientific data and knowledge. Due to its long range view, local and traditional knowledge is able to connect local observations to patterns and processes over a territory-wide scale (Adams et al., 2014). For example, local knowledge about the long-term effects of harvesting, climate change and shifts in algal bloom formations provide insights into the condition of local fish populations. Knowledge about the historical land use patterns in a region can help determine when certain VCs are in danger of crossing an unacceptable threshold (Dowlatabadi et al., 2004). In this way, local knowledge can be used to identify management priorities. For example, bivalves were identified as a management priority in Metlakatla's integrated marine use plan based on local observations from community harvesters (MSS, 2011). Government agencies have not monitored the population status of bivalves on the north coast of BC since the closure of the commercial bivalve fishery in 1963 (Pellegrin et al., 2007). As a result, limited data were available on the current condition of bivalve populations on beaches in Metlakatla's traditional territory. Local observations from Metlakatla harvesters cited poor water quality near bivalve beaches and frequent beach closures due to high fecal coliform levels (MSS, 2011). As a result, concerns over biological and chemical contamination and their impacts on butter clam population status become a primary issue for this candidate VC.

In recognition of the deliberative nature of the VC selection process, the new VC selection methodology adopts a deliberative approach to engagement as one of its design components. A deliberative approach to engagement focuses on constructive and extensive debate and discussion of the best available information to make justifiable and well-informed decisions that are supported by all participants (Cooper, 2004; Parkins, 2011). In the case study application, the workshops with Metlakatla managers and decision-makers facilitated deliberative discourse about which VCs to include or exclude from the final VC list. The potential benefits of a deliberative approach to engagement are: (1) a balanced integration of scientific information and community values, and (2) facilitation of an open discussion about the diversity of community values and the uncertainty of scientific information (Parkins, 2011). Another important benefit of deliberation is the potential for social learning among participants; individuals and departments can improve their understanding of issues, facts, areas of contention, and areas of shared priorities (Schusler, Decker, & Pfeffer, 2003).

One important factor in successful deliberative engagement is the willingness of participants to take part and change their preferences based on the discussion, new information and statements made by other participants (Parkins, 2011). Deliberative forms of engagement also emphasize stakeholder diversity and inclusion, particularly with regard to individuals or groups that are frequently excluded from decision-making processes (Parkins & Mitchell, 2007). A critical component for future applications of the new methodology will be to ensure that broader portions of the First Nation membership, such as youth and elders, are included in ongoing deliberation during the VC selection process (Christensen & Krogman, 2012). Furthermore, Schusler et al. (2003) identify the following characteristics of deliberative forms of engagement that are important for social learning among participants: open communication, diverse participation, constructive conflict, democratic structures, multiple sources of information and knowledge, lengthy engagement, and good facilitation. I found that good facilitation, clear presentation of the best available information, and equal representation from all relevant Metlakatla departments were important to the success of the workshops held with Metlakatla decision-makers. It was important to have participants from all departments (i.e., MGC, MDC, MTO and MSS) to ensure that a broad range of values and priorities were reflected in the final VC list.

6.4. VC Selection and CEM Implementation

Regional, strategic approaches to CEAM have been initiated on several occasions in Canada, including the Northwest Territories' cumulative effects assessment and management framework and the Great Sand Hills regional CEA in Saskatchewan. Noble (2015, p.5) states that "many regional cumulative effects initiatives fail at the point of implementation or lose the long-term support of those involved." Recurrent issues of concern such as access to financial and human resources, have prevented the successful implementation of regional CEAM in Canada (Noble, 2008, 2013). The Metlakatla CEM program is a novel First Nation-led regional CEAM initiative, and during the case study, issues of implementation arose as a primary concern from Metlakatla decision-makers. As a result, the two 'in-practice' components were added to the VC selection methodology: implementation planning and prioritization over comprehensiveness. Implementation planning involves identifying potential barriers to success and directing limited resources to areas of highest priority. Starting small with a pilot project of four priority VCs should build the confidence of managers and the Metlakatla community in the program and increase the likelihood of successful implementation (Antoniuk et al., 2009). Ideally, with each successful monitoring program in place for priority VCs, the momentum will build among the community to continue to expand the CEM program and include other VCs over time. It is not practical to track and monitor the condition of all candidate VCs at the start of the program; therefore, prioritization ensures that the most important VCs are selected (Antoniuk et al., 2009; Cardinale & Greig, 2013; Compass Resource Management Ltd., 2012; Cooper, 2004). Too much emphasis on comprehensiveness can lead to redundant, inefficient lists with too many VCs that require extensive resources to monitor over time (Bérubé, 2007; Compass Resource Management Ltd., 2012; Snell & Cowell, 2006). A focus on implementation planning also has allowed the Metlakatla First Nation to simply get started on their CEM initiative, instead of waiting to gather knowledge, resources and capacity to monitor the comprehensive list of VCs. Explicit consideration of implementation challenges is a critical component of VC selection.

One of the strengths of the new VC selection methodology is the identification of criteria for implementation planning. At the final workshop with Metlakatla decision-

makers, Compass Resource Management Ltd. and I provided information about how these criteria could affect the implementation of a monitoring and management plan for each of the final candidate VCs. The workshop participants then used this information to prioritize which VCs would be included in the pilot project for the Metlakatla CEM program. The effect these criteria have on preventing the successful implementation of priority VCs will likely change as the development context changes, or as Metlakatla's treaty negotiations come to a close, or as other factors affect the capacity of the Metlakatla and its possible collaborators. For example, after applying the implementation planning criteria to each of the refined candidate VCs, one of the most important limiting factors for the inclusion of biophysical VCs in the pilot project was the existing mandate of the Metlakatla First Nation. The Metlakatla First Nation does not have a direct mandate to manage these species, except for butter clams. The issue of mandate may be a critical influencing factor when considering the incorporation of other biophysical VCs into Metlakatla's CEM program. There are numerous factors influencing these criteria and they will vary for each individual organization or First Nation.

Although at first it may seem odd that the application of the methodology in the case study reduced the priority biophysical VCs for the marine environment to a single species – butter clam (Figure 5.3) – the objective was to develop a priority set of VCs that could be part of a feasible pilot project for the Metlakatla CEM program, given the existing resources available. The entire process actually identified 14 candidate VCs from an inventory of 166 VCs in the marine environment, but only one was selected for the pilot project. Also, in addition to the marine VC, the pilot project will include VCs from the socio-economic pillars: economic prosperity, social/health, and cultural identity. The broader implementation plan to be developed under step 6 of the methodology will expand the CEM program to include more of the candidate VCs in the future. However, the focus of the case study application on implementation and resource constraints does raise potential concerns about trade-offs made in the decisions to exclude or include specific VCs from the final list. An area for further research as the pilot project unfolds is the extent to which effectiveness was sacrificed for practicality.

There are strategic benefits to the implementation of a butter clam monitoring and management plan as the first phase of the Metlakatla CEM program, such as the

potential to build confidence in the program among Metlakatla managers and members. This may make it easier for other candidate VCs to be included in future phases of the CEM program. The VC selection process was designed to be iterative and adaptive, so that the Metlakatla First Nation can change the VC choices when new information is presented, or additional resources become available, or the development context changes. For example, the current condition of butter clam populations might be determined to be stable; in which case, the Metlakatla First Nation might choose to incorporate another biophysical VC into the CEM program. Second, the marine environment only represents a portion of Metlakatla's traditional territory. The new VC selection methodology will be applied to both freshwater and terrestrial systems to identify other priority biophysical VCs. Finally, it is important to recognize that the environmental pillar is only one of five pillars of Metlakatla values in the CEM program. Currently, socio-economic VCs and indicators have not been well-integrated into CEAM practice although social, cultural and economic values are critical components of community and regional well-being (Weber et al., 2012). In particular, important Aboriginal cultural values are often excluded from monitoring and analysis in CEAM (Muir & Booth, 2012; Weber et al., 2012). One of the strengths of the Metlakatla CEM program is its broad consideration of environmental, social, cultural and economic values and recognition that Metlakatla's capacity and resources need to be shared among priority VCs across all pillars.

6.5. Chapter Summary

The primary strengths and areas for further improvement of the new VC selection methodology are summarized in Table 6.1.

Table 6.1. Summary of Areas of Strengths and Further Potential Improvements for the New VC Selection Methodology.

Strengths	Areas for Improvement
Decision-making Processes in VC Selection	
Clear well-defined decision-making criteria and rationale • promotes a transparent and justifiable process that stakeholders can support	Lack of baseline information and data can impair VC selection • particularly an issue for complex species with limited knowledge and Aboriginal cultural values

Strengths	Areas for Improvement
• ensures relevant and representative VCs are selected that resonate with affected stakeholders	• prevents identification of responsive and measurable indicators
Effective Aboriginal Engagement in VC Selection	
Principles of Aboriginal-led engagement and research and clearly defined decision-making role for First Nation partner: • ensures research objectives and methodology are socially and culturally appropriate for the First Nation research partner • ensures First Nation partner directly benefits from the research outcomes • presents opportunity to increase capacity and resources for First Nation partner	Deliberative approach to engagement is dependent on several influencing factors: • good facilitation • clear presentation of the best available scientific information • equal representation from all key stakeholders • willingness to participate and change preferences based on new information and discussions
Explicit incorporation of Aboriginal values and local knowledge in VC selection process • ensures relevant VCs are selected that resonate with First Nations communities • improves available baseline information on candidate VCs	
VC Selection and CEAM Implementation	
Explicit implementation planning, including identification of barriers and prioritization • ensures that consideration for capacity and resource constraints are part of the deliberation process • allows the CEM program to begin instead of being delayed by efforts to find more resources or information • allows for early successes, learning by doing, and confidence building among community managers and members	Focus on implementation and practicality over comprehensiveness • will lead to tradeoffs and potential compromises, particularly among different pillars of values • can result in a VC list that is not representative of the ecological state of the ecosystems through exclusion of VCs that have either a key role in the ecosystem or represent a key habitat • can result in a VC list that does not completely reflect the priority values of the affected stakeholders and communities

Chapter 7.

Conclusion

7.1. Research Summary

Land use and resource management in BC has been shaped by historic land use patterns and the order in which development project applications are submitted and approved (Forest Practices Board, 2011). One consequence of this pattern of industrial development is that the cumulative impacts on environmental, social, cultural and economic VCs have not been properly accounted for in decision-making. Cumulative effects are the additive or synergistic biophysical and socioeconomic effects from human activities in combination with effects from past, present, and future activities (Noble, 2010). Cumulative effects are typically evaluated through federal and provincial EA processes, and the failures of these processes have resulted in uncoordinated land use patterns. In addition to project review processes, cumulative effects are indirectly managed through natural resource use authorizations, management actions, and land and marine use planning processes. FLNRO has also recently developed a province-wide CEF that is intended to be used to assess and manage cumulative effects from human activities including government actions.

The BC government recently announced plans to develop an LNG industry in the province, with processing and shipping facilities planned along the north coast of BC. As of March 2016, 61 major development projects were proposed in the traditional territory of the Metlakatla First Nation on the north coast of BC and 21 of these projects were directly related to LNG. In response to increased development proposed in its traditional territory, the Metlakatla First Nation initiated the development of a CEM program. The CEM program adopts a regional, strategic approach to managing cumulative effects from industrial development by tracking and monitoring priority VCs over time, with the

goal of maintaining or restoring the condition of those selected VCs. VCs are the core of Metlakatla's CEM program; however, VC selection in CEAM is an understudied aspect of cumulative effects and EA research (Olagunju & Gunn, 2015).

My research aimed to develop a comprehensive and practical methodology to select priority biophysical VCs in a cumulative effects context that explicitly incorporates Aboriginal values and local knowledge. More specifically, the new VC selection methodology was intended for application in Metlakatla First Nation's recently developed CEM program. The new VC selection methodology is founded on current VC selection best practices, but it addresses challenges and major deficiencies identified in the current practices for VC selection and effective Aboriginal engagement, and it incorporates key design elements for improving current practices (Figure 4.1). The proposed methodology has six steps, which include comprehensive issues scoping to identify VCs, well-defined selection criteria to identify candidate VCs and indicators, the selection of priority biophysical VCs through ongoing engagement with a First Nation, experts and collaborators, and additional criteria to address implementation considerations (Figure 4.6). The final step in the new methodology emphasizes the expansion of the work on VC selection after the pilot project. A broad implementation plan should be developed to incorporate other candidate VCs into the CEM program over time. The case study application of the methodology in Metlakatla's traditional territory identified an extensive inventory of 166 marine VCs and selected four priority VCs across all Metlakatla value pillars, including butter clams as the biophysical VC (Figure 5.3). These four priority VCs will be implemented in a pilot project of the Metlakatla CEM program for further analysis and monitoring.

The new methodology provides clear and specific guidance on how to identify and select VCs in a First Nation's cumulative effects context. The strengths of the methodology include the use of well-defined criteria and rationales for decision-making and explicit consideration of Aboriginal values and local knowledge throughout the VC selection process. A critical aspect of the final priority VC list in the case study is that it reflects the values and priorities of the Metlakatla First Nation and its members. Regional CEM initiatives are long-term endeavours that require extensive capacity and resources for successful implementation (Noble, 2015). In order for the Metlakatla CEM program to

be successful, it needs to be able to maintain long-term support from Metlakatla departments and community members. A focus on implementation planning in the new VC selection methodology encourages a long range perspective from everyone involved and emphasizes the importance of starting small, gaining initial victories and building confidence in the CEM program.

7.2. Research Limitations

The limitations of this research are primarily related to the development of the proposed methodology for a specific purpose, the Metlakatla CEM program. The community-driven nature of the new methodology could pose limitations for its application in other communities and First Nations. The first step of the VC selection methodology involved a comprehensive review of relevant documents. The usefulness of such a review in identifying VCs depends on the extent to which documentation exists concerning values and priorities in region under examination. In my case study, the Metlakatla First Nation had extensive existing documentation including a comprehensive community plan that outlined their community's goals and vision, and an integrated marine use plan with specific management priorities for marine resources. In contrast, the terrestrial and freshwater values of their traditional territory were not as well-documented. The knowledge gaps in the terrestrial part of Metlakatla's traditional territory constrained the identification and selection of priority terrestrial and freshwater VCs. This limitation would apply to any situation or organization where the new VC selection methodology is used. Additional preliminary steps are needed when working with communities without planning documents for their traditional territory, region or community. For example, if a First Nation has not developed a comprehensive community plan or a territory-wide land and marine use plan, additional preliminary steps might include focus groups, surveys or workshops with the community. These methods could be used to identify a vision and set of goals for the region and specific characteristics that define a healthy, resilient, and prosperous community for them. Another limitation of this research was the short timelines imposed by the need to identify VCs for the pilot Metlakatla CEM project. There was not enough time to conduct interviews to collect traditional ecological knowledge, and local knowledge was not

collected to fill all knowledge gaps for candidate VCs (e.g., eulachon). The time constraints also limited the involvement of Metlakatla community members in the engagement process, particularly when compared to the involvement of Metlakatla managers and decision-makers. The research did not include a survey or other means of assessing the views of the broader Metlakatla membership about whether the selected VCs represented Metlakatla community members' values and priorities. Future research could test and adjust the VCs based on such direct input from the membership.

7.3. Future Research

My research on developing and applying a new VC selection methodology is part of an ongoing research partnership between the School of Resource and Environmental Management and the Metlakatla First Nation on cumulative effects management on the north coast of BC. Other research projects that have been initiated through this partnership with Metlakatla First Nation include an identification of best practices for a CEAM framework to guide the development of the Metlakatla CEM program, and development and application of a census of the Metlakatla First Nation membership to collect baseline socio-economic information for the CEM program. The identification and selection of priority VCs for the Metlakatla CEM program is only one component of the overall project, with more work to follow. The next phase of the CEM program involves advancing the pilot project and identifying management objectives, triggers, and actions for as many of the final priority VCs as is feasible. Some future areas of work directly related to the next phases of the Metlakatla CEM program include: (1) developing a community-based monitoring program for butter clams, (2) developing an implementation strategy for the incorporation of other candidate VCs into the program, and (3) developing tools and protocols for how information from the CEM program will be used to support decision-making processes for the Metlakatla First Nation. Other research areas that build on my research with the Metlakatla First Nation and Compass Resource Management Ltd. are: future research related to the advancement of VC selection in CEAM, and future research related to Aboriginal governance and CEAM.

This research has identified challenges and major deficiencies of the current practices for VC selection in CEAM and Aboriginal engagement in broader EA

processes. An area for future work is developing an evaluation of the new VC selection methodology to determine if, in practice, it does address all the major deficiencies of the current practices. This evaluation could incorporate follow-up interviews with Metlakatla decision-makers and community members to determine if the selected final priority VCs and initial candidate VCs fully and accurately represent their values, concerns and priorities. Another area of research involves the broader application of this new methodology outside of the Metlakatla First Nation case study. Given the community-driven nature of the research in developing the new methodology, adjustments should be made to the methodology when considering its applicability in other areas such as project-review processes or in communities with multiple stakeholder groups. Moreover, the new methodology was developed specifically for selecting biophysical VCs; the new methodology needs to be revised for the identification and selection of socio-economic VCs. Further work is needed to explore the potential broader uses of the new VC selection methodology. An area of increasing interest is the effectiveness of a CEM program in supporting First Nation natural resource decision-making. A well-designed CEM program can potentially support decision-making in multiple areas, from treaty strategy to negotiating impact benefit agreements.

7.4. Concluding Remarks

7.4.1. Balance between Science and Values in VC Selection

CEAM practitioners continue to debate the roles and integration of values and science in the VC selection process for CEAM. Olagunju and Gunn (2013, 2015) state the VC selection process is often values-ridden, resulting in VC lists that are driven by public pressure and stakeholders' preferences rather than scientific evidence. In contrast, Weber et al. (2012) and Parkins (2011) argue that final VC lists do not reflect the values and concerns of affected communities and Aboriginal groups because VC selection is driven by technocratic choices. The results from the case study application of the new VC selection methodology in my research demonstrate that a balance between science and values is needed to ensure that final VC choices are scientifically defensible and reflect Metlakatla First Nation's values and priorities. VC identification,

the process of identifying which VCs should be considered for inclusion in a CEM system, requires comprehensive collection of information from scientific studies, experts, and local and traditional knowledge. On the other hand, VC selection, the process of choosing which candidate VCs are included in a CEM system, is inherently a deliberative process of social choice that requires ongoing engagement with decision-makers, community members and content experts. During the case study application, it became clear that (1) both science and local knowledge have critical roles in VC identification by providing decision-makers with the best available knowledge on candidate VCs to inform their choices, and (2) values play a critical role in VC selection through deliberative discussion of community concerns, goals and priorities to guide those choices. The new VC selection methodology is a process of social choice that is grounded in values but informed by local knowledge and science.

7.4.2. Implications for First Nations' in Assessing and Managing Cumulative Effects in BC

First Nations authority and influence over land and resource management in their traditional territories is increasing, due to their assertion of rights and the recognition of those rights by Canadian courts. The Metlakatla First Nation directly and indirectly manages cumulative effects in their traditional territory through a variety of mechanisms, including the newly developed CEM program (see Section 3.2 and 5.2). The Metlakatla-led CEM initiative has the potential to be an effective tool for supporting Metlakatla First Nation natural resource decision-making, both at an individual project scale through EA response and at a territory-wide scale through land and marine use planning (Compass Resource Management Ltd., 2015). The Metlakatla CEM program also has the potential to advance CEAM on the north coast of BC. The case study application of the new VC selection methodology emphasized the importance of partnerships for tracking and monitoring the condition of VCs over time. Many of Metlakatla's priority VCs are shared values among other Coastal First Nations, NGOs, government agencies and local community groups. For each candidate biophysical VC, information was provided on current monitoring effort, potential data sources and partnership opportunities. In recognition of the capacity and resource constraints that every organization struggles with, combining resources, technical knowledge and capacity with other groups or

leveraging existing monitoring programs and data may be advantageous for all parties involved. The Metlakatla CEM program enables the development of collaborative partnerships that work to improve the condition of important regional VCs, particularly species with complex life histories that will benefit from coordinated action by multiple stakeholders.

The Metlakatla CEM program was primarily initiated by the MSS and largely developed independently of other CEAM processes in BC, in particular BC's CEF. The Forest Practices Board (2011) argues that "assessment alone, no matter how well founded, is of no value unless it is used to inform decision-making" (p. 6). The information produced by the Metlakatla CEM program (e.g., current condition of priority VCs and potential management triggers) should support decision-making in all Metlakatla departments. Each Metlakatla department has the ability to influence natural resource decision-making for the Metlakatla First Nation through a variety of mechanisms (see Section 3.2). An important area for future work is integrating the Metlakatla CEM program into each of the different departments: MGC, MDC, MTO and MSS. Challenges that could prevent the successful integration of the CEM program into Metlakatla departments include:

- Different departmental mandates and goals resulting in different near-term and long-term priorities;
- Resource and capacity constraints; and
- Lack of communication channels in place to disseminate information and coordinate action on priority VCs.

Another area for future work is the integration of the Metlakatla CEM program into broader CEAM processes in BC. Several factors outside Metlakatla First Nation's control influence the maintenance or restoration of priority VCs. The information produced by the Metlakatla CEM program has the potential to inform decision-making at the provincial and federal level, particularly with regard to project approvals and planning processes. Implementation strategies for the integration of the Metlakatla CEM program into the Metlakatla First Nation and broader CEAM processes in BC will be critical for the success of the CEM program itself.

Based on the main findings of this research, recommendations for improving the current practices for VC selection in BC can be made at two levels: (1) specific methodological recommendations and (2) broader conceptual recommendations. The results from the case study application of the new VC selection methodology demonstrated the strengths of each of the 'design' and 'in-practice' components. These components aimed to address specific major deficiencies of the current practices, particularly a lack of decision-making criteria, implementation challenges and limited consideration of Aboriginal values and local knowledge. Methodological recommendations include incorporating the strengths of the proposed methodology into the current practices for VC selection in project-based CEAs. Outside of project-review processes, VC selection is also a critical component of BC's newly developed CEF. The CEF's values foundation is composed of a standardized set of VCs across the province. This approach to VC selection maintains the province's perceived need for consistency and ensures that important shared values across BC are protected. On the other hand, a standardized set of VCs across the entire province ignores interests, priorities and values that are specific to individual regions in BC. Each region is characterized by its own development context, demography and landscape, and these differences should be captured by BC's CEF approach to VC selection. Antoniuk et al. (2009) recommends developing a tiered values foundation to balance regional and provincial interests. A broader conceptual recommendation for BC's CEF is to develop a tiered values foundation for each region in BC, which would be composed of BC-wide VCs and regional VCs. The new VC selection methodology could be used to identify and select the priority regional VCs for the tiered values foundation. Further work is needed to consider the potential advantages and disadvantages of using the new VC selection methodology in CEAM processes outside of Metlakatla First Nation.

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Appendix A.

Major Projects Inventory in Metlakatla First Nation's Traditional Territory

Table A1. Total Major Projects Proposed in Metlakatla's Traditional Territory with Estimated Capital Costs and Current Status (as of March 2016).

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
Kitimat	Crude Oil Energy	Enbridge Northern Gateway Project *Proponent:* Northern Gateway Pipelines Inc. *Description:* Bitumen/ Condensate Pipeline System & Marine Export Terminal	Proposed • CEAA (NEB): Approved	$4,400
Kitimat	Crude Oil Energy	Kitimat Clean Oil Refinery and Pipeline Project *Proponent:* Kitimat Clean Ltd. *Description:* Bitumen Refinery & Pipeline System	Proposed • No current EA submissions	$32,000
Kitimat	LNG Energy	BC LNG (Douglas Channel) Energy Project *Proponent:* Douglas Channel LNG Consortium *Description:* LNG Facility & Marine Export Terminal	Proposed • EA not required • NEB LNG Export License Approved • FLNRO: Permitting-Pre-application	$600
Kitimat	LNG Energy	Cedar LNG Project *Proponent:* Cedar LNG Export Development Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions • NEB LNG Export License Approved • FLNRO: Permitting-Pre-application	Unknown
Kitimat	LNG Energy	Coastal GasLink Pipeline Project *Proponent:* Coastal GasLink Pipeline Ltd. *Description:* Natural Gas Pipeline System	Proposed • BCEAO: Certificate Issued • CEAA: EA not required	$4,000
Kitimat	LNG Energy	Kitimat LNG Terminal Project *Proponent:* Chevron Corp. &	Proposed • BCEAO: Certificate	$4,500

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
		Woodside Energy Ltd. *Description:* LNG Facility & Marine Export Terminal	Extension • CEAA: Approved • NEB: LNG Export License Approved • FLNRO: Review & Permitting	
Kitimat	LNG Energy	LNG Canada Export Terminal Project *Proponent:* LNG Canada Development Inc. *Description:* LNG Facility & Marine Export Terminal	Proposed • BCEAO: Certificate Issued • CEAA: Approved • NEB: LNG Export License Approved • FLNRO: Review & Permitting	$25,000
Kitimat	LNG Energy	Pacific Northern Gas Looping Project *Proponent:* Pacific Northern Gas Ltd. *Description:* Looping Existing Natural Gas Pipeline System	Proposed • BCEAO: Pre-application	$130
Kitimat	LNG Energy	Pacific Trails Pipelines Project *Proponent:* Chevron Corp. & Woodside Energy Ltd. *Description:* Natural Gas Pipeline System	Proposed • BCEAO: Certificate Extension • CEAA: Approved	$1,300
Kitimat	LNG Energy	Triton LNG Project *Proponent:* AltaGas Ltd. & Idemitsu Canada Corp. *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions • NEB: LNG Export License Approved	Unknown
10 Total Proposed Major Projects in Kitimat				$71,930
Kitsault Area	Clean Energy	Alice Arm Hydropower Project *Proponent:* Sprott Power Corp. *Description:* Cluster of Hydroelectric Facilities	On Hold • EA not required • FLNRO: Authorized	$90
Kitsault Area	Clean Energy	Anyox Hydro Electric Project *Proponent:* Anyox Hydro Electric Corp. *Description:* Run-of-river Hydroelectric Facility	Proposed • EA not required • FLNRO: Permitting-Pre-application	Unknown
Kitsault	Clean Energy	Kinskuch Hydro Project (Jade	Proposed	$360

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
Area		Lake Power Project) *Proponent:* Syntaris Power Corp. *Description:* Hydroelectric Facility & Transmission Line	• BCEAO: Pre-application • CEAA: EA not required	
Kitsault Area	Clean Energy	Kitsault River & Homestake Creek Hydro Project *Proponent:* Kitsault Hydroelectric Corp. *Description:* Run-of-river Hydroelectric Facilities	Construction Started • EA not required • FLNRO: Permitting-Pre-application	$21
Kitsault Area	Clean Energy	Trout Creek Hydro Project *Proponent:* Kitsault Hydroelectric Corp. *Description:* Run-of-river Hydroelectric Facility	Proposed • EA not required • FLNRO: Permitting-Pre-application	Unknown
Kitsault Area	Clean Energy	West Kitsault Hydro Project *Proponent:* Kitsault Hydroelectric Corp. *Description:* Run-of-river Hydroelectric Facility	Proposed • EA not required • FLNRO: Permitting-Pre-application	Unknown
Kitsault Area	LNG Energy	Kitsault LNG Project *Proponent:* Kitsault Energy Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions • NEB: LNG Export License Approved • FLNRO: Permitting-Pre-application	$34,000
Kitsault Area	Mining	Big Bulk Gold-Copper Mine *Proponent:* LCT Holdings Ltd. *Description:* Porphyry Mining Exploration Project	Mine Exploration Project • No current EA submissions	Unknown
Kitsault Area	Mining	Dolly Varden Gold-Silver Mine *Proponent:* Dolly Varden Silver Corp. *Description:* Precious Metals Mining Exploration Project	Mine Exploration Project • No current EA submissions	Unknown
Kitsault Area	Mining	Homestake Ridge Gold-Silver Mine *Proponent:* Homestake Resource Corp.	Mine Exploration Project • No current EA submissions	Unknown

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
		Description: Precious Metals Mining Exploration Project		
Kitsault Area	Mining	Kitsault Mine Project *Proponent:* Avanti Kitsault Mine Ltd. *Description:* Open Pit Molybdenum Mine	Proposed • BCEAO: Certificate Issued • CEAA: Approved	$1
Nasoga Gulf	LNG Energy	Nisga'a LNG Project *Proponent:* Nisga'a Nation *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions	Unknown
12 Total Proposed Major Projects in Kitsault Area				$34,472
Prince Rupert	Clean Energy	Biocoal Production Plant *Proponent:* Global Bio-Coal Energy Inc. *Description:* Biocoal Production Plant	Proposed • No current EA submissions	$30
Prince Rupert	Clean Energy	Mount Hays Wind Farm Project *Proponent:* Katabatic Power Corp. *Description:* Wind Farm	Proposed • EA not required • FLNRO: Authorized	Unknown
Prince Rupert	Crude Oil Energy	ESE Synthetic Crude Pipeline *Proponent:* Eagle Spirit Energy Holdings & Aquilini Group *Description:* Synthetic Crude Pipeline System	Proposed • No current EA submissions	$18,000
Prince Rupert	LNG Energy	Aurora LNG Export Terminal Project *Proponent:* Nexen, Inpex Corp. & JGC Corp. *Description:* LNG Facility & Marine Export Terminal	Proposed • BCEAO: Pre-application • CEAA: In Progress • NEB: LNG Export License Approved • FLNRO: Permitting-Pre-application	$3,500
Prince Rupert	LNG Energy	Grassy Point LNG Project *Proponent:* Woodside Energy Holdings Pty Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • BCEAO: Pre-application • CEAA: In Progress • NEB: LNG Export	$10,000

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
			License Approved • FLNRO: Permitting-Pre-application	
Prince Rupert	LNG Energy	New Times LNG Project *Proponent:* NewTimes Energy Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions • NEB: LNG Export License Approved • FLNRO: Permitting-Pre-application	Unknown
Prince Rupert	LNG Energy	Orca LNG Project *Proponent:* Orca LNG Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions • NEB: LNG Export License Approved • FLNRO: Permitting-Pre-application	Unknown
Prince Rupert	LNG Energy	Pacific NorthWest LNG Project *Proponent:* Petronas, Progress & APEX *Description:* LNG Facility & Marine Export Terminal	Proposed • BCEAO: Certificate Issued • CEAA: In Progress • NEB: LNG Export License Under Review • FLNRO: Review & Permitting	$11,400
Prince Rupert	LNG Energy	Prince Rupert Gas Transmission Project *Proponent:* TransCanada Pipelines Ltd. *Description:* Natural Gas Pipeline System	Proposed • BCEAO: Certificate Issued • CEAA: EA not required	$5,000
Prince Rupert	LNG Energy	Prince Rupert LNG Project *Proponent:* BG Group *Description:* LNG Facility & Marine Export Terminal	Proposed • BCEAO: Pre-application • CEAA: In Progress • NEB: LNG Export License Approved • FLNRO: Permitting-Pre-application	$10,000
Prince Rupert	LNG Energy	Watson Island LNG Project *Proponent:* Watson Island	Proposed • No current EA	Unknown

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
		LNG Corp. *Description:* LNG Facility & Marine Export Terminal	submissions • FLNRO: Permitting-Pre-application	
Prince Rupert	LNG Energy	WCC LNG Project *Proponent:* Imperial Oil Resources Ltd. & ExxonMobil Canada Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • BCEAO: Pre-application • CEAA: In Progress • NEB: LNG Export License Approved • FLNRO: Permitting-Pre-application	$25,000
Prince Rupert	LNG Energy	Westcoast Connector Gas Transmission Project *Proponent:* Spectra Energy & BG Group *Description:* Natural Gas Pipeline System	Proposed • BCEAO: Certificate Issued	$6,000
Prince Rupert	Other Energy	Ridley Island Propane Export Facility *Proponent:* AltaGas LPG Limited Partnership *Description:* Propane Export Facility	Proposed • No current EA submissions • NEB: Propane Export License Under Review	Unknown
Prince Rupert	Mining	Scotia Gold-Silver Mine *Proponent:* Glenmark Capital Corp. *Description:* Precious Metals Mining Exploration Project	Mine Exploration Project • No current EA submissions	Unknown
Prince Rupert	Port Expansion	Canpotex Potash Terminal Project *Proponent:* Canpotex Terminals Ltd. & Prince Rupert Port Authority *Description:* Potash Export Terminal	Proposed • CEAA (Prince Rupert Port Authority): Approved	$775
Prince Rupert	Port Expansion	Fairview Terminal Phase II Expansion Project *Proponent:* Prince Rupert Port Authority & Canadian National Railway Company *Description:* Existing Fairview Container Terminal Expansion	Construction Started • CEAA (Prince Rupert Port Authority): Approved	$200

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
Prince Rupert	Port Expansion	Ridley Terminals Expansion *Proponent:* Ridley Terminals Inc. *Description:* Coal Terminal Expansion	Construction Started • CEAA (Prince Rupert Port Authority): Approved	$200
Prince Rupert	Transportation	Tsimshian Peninsula Project & Tuck Inlet Road *Proponent:* City of Prince Rupert *Description:* Bridge Connections	Proposed • No current EA submissions	$181
Prince Rupert Area	Clean Energy	Banks Island North Wind Energy Project *Proponent:* Katabatic Power & Deutsche Bank AG *Description:* Wind Farm & Transmission Line	On Hold • BCEAO: Pre-application • CEAA: EA not required	$400
Prince Rupert Area	Clean Energy	Mount McDonald Wind Power Project *Proponent:* Rupert Peace Power Corp. *Description:* Wind Farm	On Hold • BCEAO: Withdrawn	$1,000
Prince Rupert Area	Clean Energy	NaiKun Offshore Wind Energy Project *Proponent:* Naikun Wind Development Inc. *Description:* Wind Farm & Transmission Line	On Hold • BCEAO: Certificate Extension • CEAA: Approved	$2,400
Prince Rupert Area	Clean Energy	Quottoon Cluster of Hydroelectric Projects *Proponent:* Sequoia Energy Inc. *Description:* Cluster of Hydroelectric Facilities	Proposed • No current EA submissions	$120
23 Total Proposed Major Projects in Prince Rupert				$94,206
Stewart	LNG Energy	Canada Stewart Energy Project *Proponent:* Canada Stewart Energy Group Ltd. *Description:* LNG Facility & Marine Export Terminal	Proposed • No current EA submissions • NEB: LNG Export License Approved • FLNRO: Permitting-	Unknown

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
			Pre-application	
Stewart	Mining	Bear River Gravel Project *Proponent:* Glacier Aggregates Inc. *Description:* Aggregate/Gravel Mine	Proposed • BCEAO: Pre-application • CEAA: EA not required	$20
Stewart	Mining	Premier Gold-Silver Mine *Proponent:* Ascot Resources Ltd. *Description:* Precious Metals Mining Exploration Project	Mine Exploration Project • No current EA submissions	Unknown
Stewart	Mining	Red Mountain Underground Gold Project *Proponent:* IDM Mining Ltd. *Description:* Underground Gold Mine	Proposed • BCEAO: Pre-application • CEAA: In Progress	$10
Stewart	Mining	Swamp Point Aggregate Mine Project *Proponent:* Ascot Resources Ltd. *Description:* Aggregate Mine & Ship Loading Facility	On Hold • BCEAO: Certificate Issued	$27
Stewart	Port Expansion	Port of Stewart Terminal Expansion Phase 3 *Proponent:* Stewart World Port *Description:* Log Export & Mineral Terminal Expansion	Construction Started	$70
Stewart	Port Expansion	Stewart Bulk Terminals Wharf Expansion Project *Proponent:* Soucie Construction Ltd. *Description:* Export Terminal Expansion	Proposed • BCEAO: Certificate Extension	$15
7 Total Proposed Major Projects in Stewart				$142
Terrace	Clean Energy	Biocoal Production Plant *Proponent:* Global Bio-coal Energy Inc. *Description:* Biocoal Production Plant	On Hold • No current EA submissions	$30
Terrace	Clean Energy	Dasque Creek Cluster Hydro Project	Construction Started • EA not required	$75

Location	Industrial Sector	Project Name, Proponent & Description	Status	Capital Cost ($ million CAD)
		Proponent: Verasen Inc. *Description:* Hydroelectric Facility	• FLNRO: Authorized	
Terrace	Clean Energy	Geothermal Power Plan *Proponent:* Enbridge, Borealis Inc. & Kitselas First Nation *Description:* Geothermal Power Plant	Proposed • No current EA submissions	$30
Terrace	Clean Energy	Middle Creek (East) Hydro Project *Proponent:* Swift Power Corp. *Description:* Run-of-river Hydroelectric Facilities	Construction Started • EA not required • FLNRO: Approved	Unknown
Terrace to Kitimat	Other Energy	Terrace to Kitimat Transmission Project *Proponent:* BC Hydro *Description:* Transmission Line	Proposed • EA not required	Unknown
Terrace	Industrial Development	Industrial Development Park *Proponent:* City of Terrace *Description:* Forestry-based Manufacturing	Proposed • No current EA submissions	$15
Terrace	Industrial Development	Skeena Industrial Development Park *Proponent:* City of Terrace *Description:* Bioenergy Manufacturing	Proposed • No current EA submissions	Unknown
Terrace	Transportation	Northwest Regional Airport Expansion *Proponent:* Northwest Regional Airport *Description:* Airport Terminal Expansion	Proposed • No current EA submissions	$15
8 Total Proposed Major Projects in Terrace				$165
TBA in Northwest BC	Crude Oil Energy	Bitumen Refinery Project *Proponent:* Pacific Future Energy Corp. *Description:* Bitumen Refinery	Proposed • No current EA submissions	$10,000
1 Proposed Major Project with Undetermined Location in Northwest BC				$10,000
61 Total Proposed Major Projects in Metlakatla's Traditional Territory				$210,915

Appendix B

Literature Review Summary

Table B1. Literature Review for the New VC Selection Methodology

Source	Type	Focus	Jurisdiction
Challenges and Major Deficiencies Literature Review: VC Selection Process in CEAM			
Antoniuk et al. (2009)	Federal Government Report • Natural Resources Canada & Department of Indian Affairs and Northern Development	VC Selection Process in CEAM	• Canada/Federal • Northwest Territories
Ball et al. (2012)	Journal Article	VC Selection Process in Watershed CEA	• Provincial • Saskatchewan
Baxter et al. (2001)	Journal Article	Scoping Stage in CEA	• Canada/Federal
BC OAG (2015)	BC Government Report	VC Selection Process in CEAM	• Provincial • British Columbia
Bérubé (2007)	Journal Article	Scoping Stage in CEA • Hydroelectric Projects	• Canada/Federal • Quebec
Canter & Ross (2010)	Journal Article	Scoping Stage in CEAM	• Canada/Federal
Compass Resource Management Ltd. (2012)	BC Government Report • BCEAO	VC Selection Process in CEA	• Provincial • British Columbia
Cooper (2004)	International Government Report • European Commission	VC Selection Process in CEA	• International • European Union
Duinker & Greig (2006)	Journal Article	Scoping Stage in CEA	• Canada/Federal
Muir & Booth (2012)	Journal Article	Aboriginal Engagement in CEA and EA	• Aboriginal Context • British Columbia
Noble (2013)	Federal Government Report • Department of Indian Affairs and Northern Development	VC Selection Process in CEAM	• Canada/Federal • Northwest Territories

Source	Type	Focus	Jurisdiction
Olagunju & Gunn (2013)	Journal Article	VC Selection Process in CEA	• Canada/Federal
Olagunju & Gunn (2015)	Journal Article	VC Selection Process in CEA • Road Projects	• Canada/Federal
Parkins (2011)	Journal Article	Engagement in CEA	• Canada/Federal • Alberta • Ontario
Snell & Cowell (2006)	Journal Article	Scoping Stage in CEA and EA	• International • United Kingdom
Weber et al. (2012)	Journal Article	Scoping in CEA • Forestry	• Aboriginal Context • Canada • International
Whitelaw et al. (2009)	Journal Article	Scoping in CEA and EA • Mining	• Aboriginal Context • Northern Canada
Challenges and Major Deficiencies Literature Review: Effective Aboriginal Engagement in EA			
Baker & McLelland (2003)	Journal Article	Aboriginal Engagement in EA • Mining	• Aboriginal Context • Provincial • British Columbia
Booth & Skelton (2011)	Journal Article	Aboriginal Engagement in EA	• Aboriginal Context • Canada/Federal • Provincial • British Columbia
Lawe et al. (2005)	Journal Article	Aboriginal Engagement in CEA and EA • Oil/gas Activities	• Aboriginal Context • Provincial • Alberta
Muir & Booth (2012)	Journal Article	Aboriginal Engagement in CEA and EA	• Aboriginal Context • British Columbia
O'Faircheallaigh (2007)	Journal Article	Aboriginal Engagement in EA	• Aboriginal Context • Canada/Federal
Plate et al. (2009)	NGO Report • New Relationship Trust	Aboriginal Engagement in EA	• Aboriginal Context • Canada/Federal • Provincial • British Columbia
Weber et al. (2012)	Journal Article	Aboriginal Engagement in CEA • Forestry	• Aboriginal Context • Canada • International
Whitelaw et al. (2009)	Journal Article	Aboriginal Engagement in CEA and EA	• Aboriginal Context • Northern Canada

Source	Type	Focus	Jurisdiction
		• Mining	
Best Practices and Potential Improvements: VC Selection Process in CEAM			
Antoniuk et al. (2009)	Federal Government Report • Natural Resources Canada & Department of Indian Affairs and Northern Development	VC Selection Process in CEAM	• Canada/Federal • Northwest Territories
Cardinale & Greig (2013)	International Report • International Finance Corp.	Scoping Stage in CEAM	• International • Emerging Markets
Compass Resource Management Ltd. (2012)	BC Government Report • BCEAO	VC Selection Process in CEA	• Provincial • British Columbia
Cooper (2004)	International Government Report • European Commission	VC Selection Process in CEA	• International • European Union
Foley et al. (2010)	Journal Article	Ecological Principles for Marine Spatial Planning	• United States
Gitxaala First Nation & Calliou Group (2014)	First Nation Report • Gitxaala First Nation	VC Selection Process in EA	• Aboriginal Context • Provincial • British Columbia
Gunn & Noble (2009)	Journal Article	Scoping Stage in Regional Strategic Environmental Assessment	• Canada/Federal
Hegmann et al. (1999)	Federal Government Report • CEAA	Scoping Stage in CEA	• Canada/Federal
Noble (2008)	Journal Article	Scoping Stage in CEAM	• Canada/Federal • Saskatchewan
Noble (2013)	Federal Government Report • Department of Indian Affairs and Northern Development	VC Selection Process in CEAM	• Canada/Federal • Northwest Territories
Parkins (2011)	Journal Article	Engagement in CEA	• Canada/Federal • Alberta

Source	Type	Focus	Jurisdiction
			• Ontario
Best Practices and Potential Improvements: Effective Aboriginal Engagement in EA			
Adams et al. (2014)	Journal Article	Aboriginal Engagement in Resource Management	• Canada • British Columbia
Christensen et al. (2010)	Journal Article	Aboriginal Engagement in CEA	• Canada/Federal • Yukon Territory
Housty et al. (2014)	Journal Article	Aboriginal Engagement in Resource Management	• Canada • British Columbia
Karjala & Dewhurst (2003)	Journal Article	Aboriginal Engagement in Resource Management • Forestry	• Provincial • British Columbia
Spyce et al. (2012)	Journal Article	Aboriginal Engagement in CEAM	• Canada/Federal • Yukon Territory
Weber et al. (2012)	Journal Article	Aboriginal Engagement in CEA • Forestry	• Aboriginal Context • Canada • International

Appendix C

Comprehensive List of Reviewed Relevant Documents

Table C1. Comprehensive List of Reviewed Relevant Documents in Step One of the New VC Selection Methodology

Relevant Document Type	Relevant Document Name
Existing Metlakatla Documents	
Land and Marine Use Planning Documents	Coastal First Nations and BC Reconciliation Protocol Agreement (2006)
	Coastal First Nations and BC Land and Resource Protocol Agreement (2006)
	Metlakatla First Nation and the Province of BC Strategic Land Use Planning Agreement (2006)
	Metlakatla First Nation Draft Strategic Land Use Plan (2013)
	Metlakatla First Nation Draft Integrated Marine Use Plan (2011)
	BC Parks North Coast Protected Areas Map in Metlakatla First Nation Traditional Territory
Community Plans	Metlakatla First Nation Community and Economic Profile (2009)
	Metlakatla Governing Council Community Profile
	Metlakatla Government Council Comprehensive Community Plan (2010)
	Metlakatla Governing Council Strategic Priorities 2013 – Health (2013)
	Metlakatla Stewardship Office Natural Resources Information Sheet
	Metlakatla First Nation Seasonal Round
Traditional Use Studies	Pacific NorthWest LNG Project Traditional Use Study and Traditional Land Use (2013)
	Prince Rupert LNG Project Traditional Use Study and Traditional Land Use (2013)
Socio-economic Studies	Compass Resource Management Ltd. (2014) Socio-economic Impact Assessment
	Ference Weiker (2009) Socio-economic Assessment and Analysis PNCIMA
	Ference Weiker (2009) Community Survey Results for PNCIMA
	Northwest Tribal Treaty Nations (2010) Regional Economic Strategy
	Skeena Native Development Society (2006) Labour Market Census
	Metlakatla First Nation Community Sustainability Index (2011)
	Metlakatla First Nation Community Marine Food Needs (2009)

Relevant Document Type	Relevant Document Name
Biophysical Studies	Pottinger Gaherty Ltd. (2014) Biophysical Impact Assessment
	Pottinger Gaherty Ltd. (2014) Disposal At Sea Report
Metlakatla Stewardship Office Regulatory Submissions	BCEAO Project Application Information Requirements, Environmental Impact Statements and other EAO documentation
Existing Federal and Provincial Government Documents	
Land and Marine Use Planning Documents	BC North Coast Land and Resource Management Plan (2005)
	Coast Information Team (2004) EBM Handbook
	MaPP North Coast Marine Plan (2015)
	MaPP Cumulative Effects Framework (2014)
	MaPP Phase I and Phase II Plan (2014)
	MaPP Institutional Indicators Guidesheet (2014)
	MaPP Economic Indicators Guidesheet (2014)
	MaPP Physical Indicators Guidesheet (2014)
	MaPP Social Indicators Guidesheet (2014)
	MaPP Human Wellbeing Indicator Guidesheet (2014)
	MaPP Ecological Indicator Guidesheet (2014)
	PNCIMA Integrated Management Plan (2013)
	DFO (2012) PNCIMA Ecological Risk Assessment Framework
	DFO (2007) PNCIMA Ecosystem Review
	Canada-BC Marine Protected Area Network Strategy (2014)
	National Framework for Canada's Network of Marine Protected Areas (2011)
	Pierce Lefebvre Consulting (2011) BC Master Values List
Other North Coast First Nations Documents	
Regulatory Submissions from Nisga'a, Gitanyow, Gitwangak, Lax Kw'alaams, Kitselas, Kitsumkalum, Haisla, Gitxaala, Gitga'at, Haida Nations	BCEAO Project Application Information Requirements, Environmental Impact Statements and other EAO documentation
Proponent Project Applications and Environmental Assessment Reports (BCEAO)	
LNG Projects	Aurora LNG Export Terminal Project
	Coastal GasLink Pipeline Project
	Grassy Point LNG Project
	Kitimat LNG Terminal Project
	LNG Canada Export Terminal Project
	Pacific Northern Gas Looping Project
	Pacific NorthWest LNG Project

Relevant Document Type	Relevant Document Name
	Pacific Trails Pipeline Project
	Prince Rupert Gas Transmission Project
	Prince Rupert LNG Project
	Westcoast Connector Gas Transmission Project
Other Major Projects	Kitsault Mine Project
	Crab/Europa Hydroelectric Development
	NaiKun Offshore Wind Energy Project
Existing NGO Documents	
NGO Reports	West Coast Environmental Law (2013) Regional Cumulative Effects Management in British Columbia: A Legal Discussion Paper
	World Wildlife Fund Skeena Cumulative Effects Assessment
Other Jurisdiction Documents	
Washington State, US	Puget Sound Partnership's Vital Signs
	Washington State Integrated Ecosystem Assessment