Integrating socio-economic objectives for mine closure and remediation into impact assessment in Canada

Draft Report for the SSHRC Knowledge Synthesis Grant: Informing Best Practices in Environmental and Impact Assessment

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Executive summary

Background: the issue

The cyclical and volatile nature of resource economies means that particular extraction sites may be subject to sudden closure and abandonment, often leaving behind considerable social and environmental problems. There are an estimated 10,000 or more abandoned mines across Canada, ranging from small workings to large, complex post-industrial sites. Two federal Auditor General's reports (2002 and 2012) highlighted abandoned mines as being among Canada's most toxic sites, representing major public liabilities in the billions of dollars. In addition to these legacy sites, the many current and planned mineral developments across Canada's northern mining belt are forecast to close in the coming two decades.

Mine closure regulation and assessment practices vary widely across Canada, particularly surrounding socio-economic impacts. Typically, closure and remediation receive scant attention during the impact assessment phase of major mineral development projects, with the focus instead placed on mitigating the initial ecological and social impacts of development and operations. Public assessments and reviews of closure and remediation plans for active mines (where they occur) rarely include Indigenous knowledge, values or land uses as part of setting remediation goals and standards.

In the context of both historical, ongoing, and anticipated mineral development activities in Canada, a better understanding of the state of knowledge surrounding **the role and practice of impact assessment for mine closure and remediation** is required. This emphasis on mine closure and reclamation (rather than mineral development proposals more generally) reflects the particular knowledge and policy challenges associated with this final (and frequently longest) phase of the mining cycle, including: addressing long-term environmental and social impacts; financial securities for post-closure liabilities; post-remediation monitoring and relinquishment of closed sites; and the often complicated regulatory arrangements surrounding operating versus abandoned mines. In addition, while the majority of impact assessments (IA) occur at the front end of large-scale mining projects and do not include detailed discussions or evaluations of closure and remediation, in recent years some high-profile mine remediation projects have themselves been subject to full IA reviews.

Objectives

This Knowledge Synthesis Report investigates and illuminates the gaps in environmental and social impact assessment practices for mine closure and remediation. In particular, we assess: i) whether and how mine closure and remediation are incorporated into environment and impact assessment processes (in Canada); ii) public participation and oversight of mine closure and remediation (through environment and impact assessment processes); and iii) the various regulations, policies, and practices of mine closure and remediation, as reflected in actual closure plan documents. To understand the state of knowledge related to these issues, we undertook a systematic literature review (Section 3) using major scientific databases to identify and assess studies related to mine remediation, public participation, and impact assessment. Second, we undertook a review of mine closure plans (Section 4), with a focus on major mining developments in the Canadian North, to analyse how they have undergone regulatory review or

environmental assessment, and consider how they incorporate community engagement, socio-economic impacts, and Indigenous participation in remediation planning. Finally, we summarize and link the results of these analyses and discuss their implications for both environmental assessment and mine closure and remediation.

Methodology and results

The systematic literature review (Section 3) entailed a targeted search through over 20 databases encompassing environmental studies, policy studies, anthropology, sociology, dissertation and thesis catalogues, and other grey literature. In addition, a database of 'known' or familiar literature was compiled by the researchers and reviewed using the same screening protocol as our systematic search. Search strings focused on a range of terms related to public engagement, mining, remediation, and environmental assessment. The search and screening process yielded a total of 14 sources for detailed synthesis and analysis. The lack of common research design among the studies reviewed suggests the topic and field of study is fragmented. Analysis of both the systematic review and 'known' literature demonstrates that much of the potentially relevant research does not directly address impact assessment, closure, *and* community engagement, but rather focuses on one of those three topics, with passing or contextual mentions of the others.

The closure plan review (Section 4) entailed a qualitative comparison of closure plans from mines operating in Yukon (1), the Northwest Territories (3), Nunavut (3), Nunavik (2), and Labrador (1) (see Table 4). Instead of examining closure plans from all provinces and territories, these five regions were chosen due to the inconsistent availability of closure plans across Canada. In addition to evaluating the accessibility of these plans for public scrutiny, these closure plans were systematically assessed based on the evidence of public engagement; inclusion and use of community knowledge; acknowledgement of socio-economic impacts of closure; and plans to mitigate impacts. These practices vary widely between closure plans and jurisdictions, but in general public, consultation and engagement of community knowledge and social impacts in closure planning are vague and inconsistent. There does not appear to be a clear relationship between impact assessment processes and closure plans, and there are significant gaps in the policies governing both.

Key messages

- mine closure and remediation is often the *longest and most complex phase of the mining cycle*, yet receives the least attention during project assessment and approval
- the long-term, even perpetual nature of post-mining impacts is a major *sustainability challenge* and contributes to *cumulative impacts* in extractive regions
- the mitigation of *social impacts of mine closure and remediation* is poorly addressed in closure and remediation policy
- *community engagement and public scrutiny* of closure plans, including during the project assessment phase, is crucial to equitable and effective closure and remediation practice
- particular attention is required to the *legacies of mining and mine remediation for Indigenous communities* in the context of settler colonial relations and more recent practices related to negotiated agreements
- future research is required to integrate and enhance knowledge of these issues and to make recommendations for impact assessment and closure policy and practice

Evidence Brief

"Integrating socio-economic objectives for mine closure into impact assessment in Canada"

This Knowledge Synthesis Report investigates and illuminates the gaps in environmental and social impact assessment practices for mine closure and remediation. Mine closure and remediation is often the longest and most complex phase of the mining cycle, but typically receives the least direct scrutiny during project assessments. This report highlights the key issues and impacts associated with mine closure and remediation, with a particular focus on *socio-economic impacts and community engagement* in closure planning and assessment. It does so through a systematic literature review of international research and grey literature addressing mine closure, remediation, public engagement, and impact assessment. In addition, the report includes a detailed qualitative review of closure planning documents from selected major mineral developments in Northern Canada in relation to closure policy and regulation in these jurisdictions. The goal of this review is to assess current research and practice and to highlight significant implications for mine closure policy and impact assessment practice.

Key findings

- mine closure and remediation is often the *longest and most complex phase of the mining cycle*, yet receives the least attention during project assessment and approval
- the long-term, even perpetual nature of post-mining impacts is a major *sustainability challenge* and contributes to *cumulative impacts* in extractive regions
- research into the role of impact assessment policy and practice for mine closure, remediation, and public engagement is sparse and fragmentary

Policy implications

- the mitigation of *social impacts of mine closure and remediation* is poorly addressed in closure and remediation policy
- *community engagement and public scrutiny* of closure plans, including during the project assessment phase, is crucial to equitable and effective closure and remediation practice
- particular attention is required to the *legacies of mining and mine remediation for Indigenous communities* in the context of settler colonial relations and more recent practices related to negotiated agreements

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Knowledge Synthesis Report

1. Background

1.1 Mining, sustainability, and remediation

The cyclical and volatile nature of resource economies means that particular extraction sites may be subject to sudden closure and abandonment, often leaving behind considerable social and environmental problems (Worrall et al., 2009). There are an estimated 10,000 or more abandoned mines across Canada, ranging from small workings to large, complex post-industrial sites (MacKasey, 2000). Two federal Auditor General's reports (2002, 2012) highlighted abandoned mines as being among Canada's most toxic sites, representing major public liabilities in the billions of dollars. In addition to these legacy sites, the many current and planned mineral developments across Canada's northern mining belt are forecast to close in the coming two decades. Beyond mining, there are countless oil wells, chemical plants and other types of industrial developments that present similar risks and perpetual care challenges (Hoover, 2017; Joly, 2017; Westman et al., 2019; Wiebe, 2016). These post-industrial sites are almost always located in the traditional or Treaty territories of First Nations, Métis, and Inuit communities, many of which are in rural and remote regions.

While increasing effort is devoted to the environmental and engineering challenges of mine remediation, there has been comparatively little attention paid to public participation and Indigenous community values associated with closing and cleaning up mine sites (Nicholas Bainton and Holcombe, 2018; NOAMI, 2003). Although seemingly positive, remediation (also known as reclamation) can generate controversy around clean-up objectives, residual health risks, and the restoration of the post-mining landscape. Mine closure regulation and assessment practices vary widely across Canada, particularly surrounding socio-economic impacts. Typically, closure and remediation receive scant attention during the impact assessment phase of major mineral development projects, with the focus instead placed on the initial ecological and social impacts of development and operations. Public assessments and reviews of closure and remediation plans for active mines (where they occur) rarely include Indigenous knowledge, values or land uses as part of setting remediation goals and standards (Dance, 2015). For Indigenous communities in particular, which are disproportionately affected by the negative environmental impacts of mining, mine remediation efforts may reawaken or reproduce the negative effects of past industrial developments (Keeling and Sandlos, 2009, 2017). Centering Indigenous governance and participation is key to ensuring remediation activities are equitable and effective, and respect Indigenous self-determination while protecting community and environmental health.

This Knowledge Synthesis Report investigates and illuminates the gaps in environmental and social impact assessment practices for mine closure and remediation. This emphasis on mine closure and reclamation (rather than mineral development proposals more generally) reflects the particular knowledge and policy challenges associated with this final (and frequently longest) phase of the mining cycle, including: addressing long-term environmental and social impacts; financial securities for post-closure liabilities; post-remediation monitoring and relinquishment of

closed sites; and the often complicated regulatory arrangements surrounding operating and/or abandoned mines. In addition, while the majority of impact assessments (IA) occur at the front end of large-scale mining projects and do not include detailed discussions or evaluations of closure and remediation, in recent years some high-profile mine remediation projects have themselves been subject to full IA reviews.

1.2 Mine closure and remediation: key issues and terms

Mine closure refers to the process of decommissioning an active mine after the cessation of ore extraction activities. As minerals are a finite resource, this is an inevitable stage of any mining operation and a normal part of the "mining cycle" (Laurence, 2006). However, closure and decommissioning typically results not from the absolute exhaustion of an orebody, but rather from economic and technical circumstances that render extraction unprofitable (Keeling and Sandlos, 2017). Thus, while the timeline for closure (mine life) may be forecast at the outset of production as part of mineral development planning, it is not perfectly known. After closure, the process of "cleaning up" post-mining sites—securing waste deposits, mitigating toxicity and pollution from extraction activities, and restoring (where possible) pre-mining ecological conditions or function—is referred to as (variously), rehabilitation, reclamation, or **remediation**. The latter term is increasingly widely used within industry and technical fields to designate environmental mitigation activities associated with mine closure, and will be the preferred term in this report (Beckett and Keeling, 2019; Hockley and Hockley, 2015). However, the term reclamation is also widely used and generally refers to an attempt to return some kind of 'value' to the space, be that environmental, social or economic.

The process of mine closure presents a variety of technical and environmental challenges. These include addressing ecological disturbances related to the removal of surface soils and rock (overburden), blasting and excavation activities, waste rock production, water contamination, and liquid, solid, and airborne wastes associated with mineral processing. At large-scale mines, these activities generate massive volumes of wastes, some of which present physical and chemical hazards, and which require long-term management (Cowan et al., 2010; Hudson-Edwards et al., 2011; Lottermoser, 2010). Decommissioning may also entail the removal of extensive surface works, from mine headframes to ore storage and processing facilities to other infrastructure associated with operational activities, as well as networks of roads, rails, and power generation facilities. A number of national and international industry guides for closure and remediation planning have appeared since the early 2000s, and sufficient attention to mine remediation is increasingly recognized as a key aspect of the "sustainability" of individual mines, and the industry as a whole (Cowan et al., 2010; International Council on Mining and Metals, 2019; Kabir et al., 2015; Laurence, 2006; Sánchez et al., 2014; Worrall et al., 2009; Mining Association of Canada, 2008). Nevertheless, because individual mines are characterized by unique operational, environmental, logistical, and regulatory factors, remediation itself is a highly localized and site-specific process.

Mine closure also entails a range of social and economic impacts that, until recently, were not effectively integrated into either project assessment or mine closure planning. Mining has long been known as an intensely cyclical, "boom-bust" industry (Bradbury, 1984; Bowles, 1992; Mawhiney 1999; Freudenburg and Wilson, 2002; Wilson, 2004; Keeling 2010). The impacts on workers and local communities of sudden downturns and mine closures may be intense,

including unemployment, outmigration, capital disinvestment, loss of infrastructure, and the deterioration, even destruction, of the built community. Mine closure not only results in reduced economic activity (including government revenues), but may also impose economic burdens on mining regions in the form of environmental liabilities associated with unremediated sites (Cowan et al., 2010; Worrall et al., 2009). In a settler colonial context, Indigenous communities often bear the brunt of these burdens (Sandlos and Keeling, 2017; Women's Earth Alliance and Native Youth Sexual Health Network, 2018) (Women's Earth Alliance, 2018; Keeling and Sandlos 2017).

During the industry downturn from the late 1980s-2000, governments and industry dedicated some effort to address these problems through planned worker adjustment and "winding down" of communities experiencing mine closure (Bradbury, 1984; Bradbury and St-Martin, 1983; Kendall, 1992; Skeard, 2015). However, research on mine closure planning and remediation was relatively unexplored in academic literature, with discussion limited to conference proceedings and industry publications (Getty and Morrison-Saunders, 2020). Very recently, both industry and academic attention has focused on the social aspects of closure and their mitigation (Bainton and Holcombe, 2018b; Beckett and Keeling, 2019). Research indicates that community objectives for post-mining land use and definitions of what it means to 'clean up' a contaminated site are poorly understood (Baeten, 2018; Rixen and Blangy, 2016). In response to this knowledge gap, scholars have urged attention to the "socio-political indicators" of mine closure and remediation (Nicholas Bainton and Holcombe, 2018a). This research calls for the integration of socio-economic objectives into existing remediation research and planning structures, recognizing the various needs and motivations of different stakeholder groups, especially Indigenous communities (Everingham et al., 2018; Faircheallaigh and Lawrence, 2019; Palmer et al., 2010).

1.3 Closure, remediation, and impact assessment

Before the 1980s, government policy regarding the mining industry was characterized by favourable tax policies, infrastructure investments, direct subsidies and lax environmental standards. Few mines were subject to rigorous environmental assessment, and few if any jurisdictions adopted comprehensive policies and regulations for mine closure (beyond surface remediation requirements). The generation of large-scale mining projects that characterized the industry's postwar expansion thus proceeded with little consideration of post-mining social, economic, or environmental conditions (McAllister and Alexander 1997). When a wave of mine closures hit the industry beginning in the early 1980s, accelerating in the years around 1990, many sites were closed and/or abandoned with little or no active environmental remediation, leaving significant financial and environmental liabilities for governments to bear (Keeling and Sandlos, 2017; Office of the Auditor General of Canada, 2002; Tremblay et al., 2006).

The 1990s saw growing attention to both impact assessment and mine closure and remediation in Canada. Most jurisdictions adopted some form of statutory requirement for closure and remediation plans (typically under Mining or Lands acts), as well as policy guidelines. Although varying between provinces and territories, these regulations typically address various aspects of closure, including decommissioning, site stabilization and maintenance, environmental remediation, tailings waste management, water treatment, financial assurance, and (in some cases) conditions for relinquishment of mine lands (Cowan et al., 2010).

Remediation projects on Indigenous lands, particularly in Northern Canada, are also governed through regional land and water boards, land claims agreements, and impact and benefit agreements (IBAs) (Dance 2015). Important strides have been made in the identification, characterization, and mapping of abandoned mine sites, particularly through the National Orphaned and Abandoned Mines Initiative (NOAMI) (Tremblay et al., 2006). Nevertheless, as Dance (2015: 43) writes, "Efforts to mitigate the impacts of new and legacy mines are complicated by the highly site- and case-specific nature of remediation; the lack of a clear, ambitious technical and regulatory definition or vision of remediation; and the jurisdictional overlap and governance issues associated with cleanup."

Over the same period, Canadian federal and provincial environmental assessment evolved (haltingly) towards greater harmonization and scrutiny of both environmental and social aspects of major mineral development projects (Gibson et. al. 2005; Noble and Bronson 2005; Doelle and Sinclair, 2019). Current approaches to impact assessment and 'sustainability assessment' (Atlin and Gibson, 2017; Pope et. al., 2017; Hunsberger et. al. 2005) have increasingly focused on socio-economic indicators for sustainability and have led to innovations in impact assessment such as socio-economic assessments and independent oversight boards (at the Ekati and Diavik mines in the NWT for example) (Boerchers et al., 2018). International guidelines and best practices literature for mine closure emphasizes the importance of regular and engaged planning for closure (International Council on Mining and Metals, 2019). These best practices are directly reflected in international impact assessment guidelines that outline principles for mitigation and adaptive management. Sanchez et. al. (2014) argues that because impact assessment focuses on identifying and assessing impacts from development, and implementing mitigation, management and monitoring, the two processes of impact assessment and remediation planning should go hand in hand (Morrison-Saunders et al., 2016). However, in practice, impact assessments often overlook or underestimate the tradeoffs between short term benefits and long-term effects and fail to ensure that developments avoid long-term legacies while also securing some form of sustainability (Boerchers et al., 2018; Doelle and Sinclair, 2019).

In spite of the increasing scrutiny of mineral developments through impact assessment, it is unclear whether mine closure, remediation, and monitoring—arguably the longest phase of the mining cycle—receives adequate attention in project reviews. Impact assessments (and public debate) of major mining projects tends to focus on issues related to the construction and operational phases of mining, with less attention devoted to either pre-development exploration or to closure, or the cumulative effects of historic and contemporary developments (Atlin and Gibson, 2017). In part this is due to the timing of these phases in relation to the overall project: exploration is considered an activity more or less separate from actual mining, while the specific requirements for closure and remediation (often decades into the future) may be difficult to determine or subject to change over the life of the mine. As discussed in Section 4 below, project proposals submitted for impact assessment typically include only conceptual closure plans offering relatively scant technical detail around environmental remediation, and almost no discussion of socio-economic impacts of mine closure. Understandably, it may be difficult for proponents, regulators and researchers to provide robust information for remediation plans at the beginning of development. However, after a project is approved through an impact assessment process, there are few opportunities for public input on remediation planning, unless a proponent chooses to support such engagement, either through their own 'best practices' or through requirements of an impact benefit agreement (Fidler, 2010; Morrison-Saunders, 2019). Some

jurisdictions in Canada, such as the Northwest Territories (NWT), have public hearings for updates to water licensing, where updated closure plans can be reviewed before a license renewal is approved. However, this process does not necessarily require community-engaged planning, as it focuses on a technical evaluation of the plan. As can be seen in the recent water license public hearing for the Snap Lake Mine in the NWT, a lack of clarity and strict regulations on closure expectations, has led to disagreements about necessary mitigations, financial security requirements and reneging on measures outlined in impact assessment documents (Blake, 2019). In short, there are no consistent regulatory requirements for public evaluation of remediation plans as a project progresses towards closure and it is unclear how proponents can be held accountable to community-based objectives for remediation and post-industrial land use.

2. Research Objectives

In the context of both historical, ongoing, and anticipated mineral development activities in Canada, a better understanding of the state of knowledge surrounding **the role and practice of impact assessment for mine closure and remediation** is required. In particular, we aim to assess: i) whether and how mine closure and remediation are incorporated into environment and impact assessment processes (in Canada); ii) public participation and oversight of mine closure and remediation (through environment and impact assessment processes); and iii) the various regulations, policies, and practices of mine closure and remediation, as reflected in actual closure plan documents. These objectives are guided by the Knowledge Synthesis priority themes of socio-economic effects, sustainability, Indigenous participation and engagement, and public participation and transparency.

To achieve these goals we undertook a two-pronged strategy. First, we conducted a systematic literature review (Section 3) using major scientific databases to identify and assess studies related to mine remediation, public participation, and impact assessment. This yielded a handful of relevant studies from the Canadian and international literature that identified important insights and gaps in the state of knowledge on these topics. Second, we undertook a review of mine closure plans (Section 4), with a focus on major mining developments in the Canadian North, to analyse how these projects have undergone regulatory review or environmental assessment, and consider how these plans incorporate community engagement, socio-economic impacts, and Indigenous participation in remediation planning. Finally, we summarize and link the results of these analyses and discuss their implications for both environmental assessment and mine closure and remediation.

3. Systematic Literature Review

3.1 Methods

This literature review is organized around the research questions outlined above, focusing on public participation in both impact assessment and closure/remediation. Our conceptualization of impact assessment goes beyond technical, biological and environmental indicators, which are critically important but receive the majority of attention in impact assessment compared to mechanisms for evaluating socio-economic impacts of both the development *and* closure of

extractive industries (Nobel and Hanna, 2015; Eckert et al., 2020). Internationally, there is an emerging literature on the socio-economic impacts of mining closure and remediation (Nicholas Bainton and Holcombe, 2018; Chaloping-March, 2017; Faircheallaigh and Lawrence, 2019; Morrison-Saunders and Sánchez, 2018; Vivoda et al., 2019) and a well-established critical literature on the practice of environmental assessment and public participation (Galbraith et al., 2007; Udofia et. al., 2015; Gibson et al., 2005; Muir, 2018; O'Faircheallaigh, 2017). However, the majority of this literature focuses on policy recommendations and there is limited case-based or community-engaged literature on people's experiences of remediation planning and practice (Beckett, 2017; Cohen and Central, 2017; Joly, 2017; Rixen and Blangy, 2016) and even less literature on the practical interactions between closure, remediation and impact assessment (Boerchers et al., 2018; Getty and Morrison-Saunders, 2020; Morrison-Saunders et al., 2016). This report demonstrates the need for a more robust understanding of current closure and remediation regulation and practice across Canada and the development of new methodologies for addressing these challenges through ongoing impact assessment mechanisms.

We chose the systematic literature review method to explore this topic because of the 'process' nature of our questions and the current state of knowledge regarding environmental assessment and mine closure planning as a social intervention. According to Petticrew & Roberts (2006), systematic review is suitable when: 1) there are unknowns about an intervention; 2) policy is just emerging; 3) there is a wide range of research but people's experiences remain unknown; 4) a general picture is needed to direct future research; or 5) an accurate picture of the past is needed to develop new methodologies. As noted, intersections in the literature between mine remediation, community engagement and impact assessment are rare. In addition, existing research on these topics is spread thin across different fields of inquiry and jurisdictions. These observations point to a need to provide an overview of how remediation, community engagement and impact assessment intersect in order to begin to envision a way forward.

Systematic qualitative reviews of environmental policy issues, while increasing in frequency, are still rare and there are few guiding protocols (Macura et al., 2019). To address this gap, we use the 'preferred reporting items for systematic review or meta-analysis' approach, known as PRISMA (see Appendix A for a visualization of the PRISMA process) (Moher et al., 2009). Following these guidelines, and adapting to our own research questions, we have outlined our string search and exclusion criteria in Tables 1-2 and have documented our review codebook in Appendix B. Given the time, funding, and expertise available for this work, we situate this review in between a qualitative synthesis (Suri and Clarke, 2009) and a 'rapid' systematic review (Petticrew and Roberts, 2006; Grant and Booth, 2009). We use the PRISMA guidelines to ensure rigour, but analyze the results qualitatively not quantitatively, and synthesize findings in a narrative instead of statistical form. Our focus was not on conducting an exhaustive search but a 'rapid' and replicable assessment of accessible literature that may be further developed.

Our search was conducted across four platforms: ProQuest, Ebsco, Scopus, and Google Scholar. Over twenty databases were included from environmental studies, policy studies, anthropology, sociology, dissertation and thesis catalogues, and other grey literature. In addition, a database of 'known' or familiar literature was compiled by the researchers and reviewed using the same screening protocol as our systematic search (see Tables 1-2 for this screening protocol). These studies were not subjected to a full systematic review, but used to increase our

understanding of the research context and speak to any gaps in our findings. This collection of 'known' literature was also used as a benchmark to determine if our search strings were adequately identifying the target literature.

Following PRISMA and other systematic review guidance, we used the PICO method to develop our search strings, as described by Cooke et al. (2012), Moher et al. (2009), and Petticrew and Roberts (2006). We thus include terms to describe a *population* (the 'public' or citizens), an *intervention* (engagement or participation in mine closure or remediation), and a *context* (environmental assessment or other formal assessment used as a regulatory policy tool) (See Table 1). Since our questions are about process and not an evaluation of these interventions, we did not include an *outcome*. General or global terms were used where possible to extend the reference pool. It is important to note that terms such as remediation, reclamation and restoration are used and defined differently across regional contexts. In general, these terms are common in North America, Australia, South America and South Africa, where much of the anglophone research on mining originates. In searching for public engagement and participation, we used terms that were familiar from environmental governance literature. We did not include "Indigenous" or "Aboriginal" in our search terms, but did make note of papers that included specific reference to Indigenous communities. Finally, our research focuses on hard rock mining, so we did not include any terms about general 'extraction' or 'extractive' practices. All searches were conducted in December of 2019.

Table 1. Keyword strings

(participation or engagement or consultation or community or public or stakeholder or citizen or participatory or governance)
AND
(mine or mines or mining or metals or mineral)
AND
(remediation or reclamation or rehabilitation or restoration or closure or "post-closure")
AND
("environmental assessment" or "environmental impact assessment" or "social impact assessment" or "socioeconomic impact assessment" or "impact assessment")

Search results were exported to a Google Sheets database, duplicates identified and removed, then studies were manually screened by title and abstract using five exclusion criteria based on population, intervention and context (Table 2). Studies that comprised part of an environmental assessment application were also excluded, as closure plans are directly reviewed in Section 4 of this report. The five screening criteria were pilot tested for inter-coder reliability between two of the researchers. Criteria that caused discrepancy were discussed and clarified, and the remainder of the studies screened by a single reviewer. Any studies that did not provide sufficient information for preliminary screening (lack of an abstract for example) were included for full review.

Table 2. Exclusion criteria

Screening questions and possible response
Does the article discuss public participation or engagement: yes – no – unclear
Does the article discuss mining or resource extraction: yes – no – unclear

Does the article discuss restoration (or synonyms): yes – no – unclear
Does the article discuss environmental or other regulatory assessment: yes – no – unclear
Does the article discuss a qualitative research design: yes – no – unclear

Once screened, studies were subjected to full review using a codebook reflective of our research objectives and quality assessment questions (Appendix B). All studies were read in full and data manually abstracted to develop a broad understanding of the subject area. As Petticrew & Roberts state, "perhaps the least useful way of dealing with qualitative data in systematic reviews is to turn it into quantitative data" (2006: 191). Thus, we provide only a brief quantitative description of the included studies and a table of descriptive information collected based on our codebook. We then present a narrative analysis of findings within and across the included studies. Finally, respecting the criteria we use in our analysis, this portion of the report did not involve the participation of any community member, Indigenous or settler/non-Indigenous.

3.2 Results

A search of the above portals and databases returned 912 studies. From this total, 148 duplicates were removed and the remaining screened by title and abstract. Of the 764 studies screened, 383 were excluded due to a lack of public engagement content, 46 for a lack of mining content, 81 for a lack of remediation or closure content, 39 for a lack of discussion on impact assessment in the context of environmental management, three for a lack of content related to qualitative research methods, and 180 studies because they were a volume or report in an environmental assessment application or decision. The remaining 32 studies were read in full to determine eligibility for inclusion in our final analysis. Two studies were excluded due to a failure to meet minimum quality standards in their reporting of methods or data collection, ten were excluded due to a lack of meaningful content in one of the five screening criteria categories (mining=1, remediation=7, qualitative research methods=2), and six were excluded due to a lack of electronic access. A total of 14 articles were included for this synthesis, and a summary of findings is presented in Table 3.

Of the 14 studies included in this synthesis, nine are peer-reviewed academic journal articles, three are conference papers, one is a report, and one is a PhD dissertation. All studies were published between 2005 and 2019, and eight are published in 2015 or later, suggesting that mine closure and remediation are a growing field of social science research (Bainton and Holcombe, 2018; Karakaya and Nuur, 2018). We are primarily concerned with impact assessment and remediation of hard rock mines in Canada. However, literature on these topics in Canada appears to be very limited. In order to develop a full picture of remediation best practices, we included studies from a range of countries, discussing mines that extract a variety of minerals (see Table 3 for a breakdown of country and mineral data). Not all countries in the study have an Indigenous population, yet only two papers included substantial discussion of Indigenous Peoples in terms of impact assessment, mine closure impacts, or remediation. Six studies reviewed or evaluated closure policies of a state or region with some links to assessment practices (Baxter, 2015; Everingham et al., 2018; Hoadley and Limpitlaw, 2008; Kabir et al., 2015; Morrison-Saunders, 2019; Morrison-Saunders et al., 2016). Two studies reviewed specific closure policies for a corporate actor with some relation to impact assessment (Stacey et al., 2010; Xavier et al., 2015). Five studies investigated the environmental assessment and

closure/remediation of a specific mine (Devlin and Tubino, 2012; Fidler, 2010; Muldoon and Schramm, 2009; Sandlos and Keeling, 2016; Younger et al., 2005).

The methods utilized in these studies are consistently limited to document reviews, interviews, surveys, case studies and participant observation. With the increasing documentation of the social impacts of mine closure, we were expecting to see more community-based participatory research methods, but such research did not appear in this systematic review. Nine of the fourteen papers rely on documents reviews, while six include at least one set of interviews. Interviews are conducted with various stakeholder groups, including impacted communities located near a mining operation, the mine operator or proponent, and government personnel in bureaucratic or decision-making roles. Most of the document reviews target existing policy and best-practice guidelines. Devlin & Turbino (2012) add archival documents to the mix, while Sandlos & Keeling (2016) use public hearing transcripts.

Based on practices in participatory and decolonial research, we also asked how members of the public were included in the writing and dissemination of these studies. We found none of the studies included a statement on co-authorship or consultation, nor are any of the authors part of the community or 'public' involved in the research. If involved at all, communities of interest to the impact assessment or mine closure at the center of the study were a source of primary research data and no explicit references were made to community validation of research findings. While we are aware of some research that focuses on specific examples of communities' remediation experiences, perspectives and challenges (Claudia et al., 2020; Cohen, 2017; Rixen and Blangy, 2016) community-based research approaches were not prevalent (or made explicit) in the papers found for this systematic review.

Table 3. List of publications included for full review

Author(s)	Title	Date	Journal/Publication Type	Countries included in study	Primary mineral extracted	Reference to Indigenous communities
Baxter, Helen Abigail	Framework for remediation of rivers impacted by legacy metal mine pollution	2015	PQDT - UK & Ireland; PhD dissertation	England	Non-ferrous metal	No
Devlin, John; Tubino, Denise Isabel;	Contention, participation, and mobilization in environmental assessment follow-up: The Itabira experience	2012	*Sustainability: Science, Practice and Policy*; peer reviewed	Brazil	Iron	No
Everingham, Jo-Anne; Rolfe, John; Lechner, Alex Mark; Kinnear, Susan; Akbar, Delwar;	A proposal for engaging a stakeholder panel in planning post-mining land uses in Australia's coal-rich tropical savannahs	2018	*Land use policy*; peer reviewed	Australia, Canada	Coal	No
Fidler, Courtney	Increasing the sustainability of a resource development: Aboriginal engagement and negotiated agreements.	2010	*Environment, Development & Sustainability;* peer reviewed	Canada	Copper-gold	Yes

Hoadley, EM; Limpitlaw, Daniel;	Preparation for Closure—Community Engagement and Readiness Starting with Exploration	2008	*Mine Closure 2008 Conference Proceedings*; conference presentation	South Africa	Uranium, general	No
Kabir, SZ; Rabbi, Fazle; Chowdhury, Mamta B; Akbar, Delwar;	A review of mine closure planning and practice in Canada and Australia	2015	*World Review of Business Research*; peer reviewed	Australia, Canada	Diamonds, phosphate	Yes - minimal
Morrison-Saunders, A; McHenry, MP; Rita Sequeira, A; Gorey, P; Mtegha, H; Doepel, D;	Integrating mine closure planning with environmental impact assessment: challenges and opportunities drawn from African and Australian practice	2016	*Impact Assessment and Project Appraisal*; peer reviewed	Australia, Ghana, Kenya, Nigeria, Mozambique, South Africa, Tanzania and Zambia	General	Yes - minimal
Morrison-Saunders, A;	The action is where the social is! The ecosystem services concept and other ideas for enhancing stakeholder engagement in integrated mine closure planning	2019	*Mine Closure 2019: Australian Centre for Geomechanics*; conference presentation	Australia, Brazil	General	No
Muldoon J., Schramm L.L.	Gunnar uranium mine environmental remediation - Northern Saskatchewan	2009	*Proceedings of the International Conference on Radioactive Waste Management and Environmental Remediation, ICEM*; conference presentation	Canada	Uranium	Yes - minimal
Sandlos J., Keeling A.	Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada	2016	*Extractive Industries and Society*; peer reviewed	Canada	Gold	Yes
Stacey, J; Naude, A; Hermanus, M; Frankel, P;	The socio-economic aspects of mine closure and sustainable development: literature overview and lessons for the socio-economic aspects of closure-Report 1	2010	*Journal of the Southern African Institute of Mining and Metallurgy*; peer reviewed	South Africa	General	Yes - minimal
Vivoda, Vlado; Kemp, Deanna; Owen, John;	Regulating the social aspects of mine closure in three Australian states	2019	*Journal of Energy & Natural Resources Law*; peer reviewed	Australia	General	No

Xavier, Andre; Veiga, Marcello M; van Zyl, Dirk;	Introduction and Assessment of a Socio-Economic Mine Closure Framework	2015	*J. Mgmt. & Sustainability*; peer reviewed	Mongolia	Gold	No
Younger P.L., Coulton R.H., Froggatt E.C.	The contribution of science to risk-based decision-making: Lessons from the development of full-scale treatment measures for acidic mine waters at Wheal Jane, UK	2005	*Science of the Total Environment*; peer reviewed	England	Tin	No

3.3 Synthesis/Discussion

Research designs and motivations

We found little commonality in the theoretical approaches used within the studies selected. Theoretical frameworks range from environmental justice to development studies, economics, and ecosystem services. The links between different methods such as interviews, surveys, participant observation, etc., and theoretical frameworks are loose and inconsistent. In short, the research designs expressed in these papers do not seem to be consistent or 'speaking to each other' in a meaningful way. Research motivations tend to focus on creating policy guidance; evaluating existing standards; and improving integration of social impacts into the impact assessment and closure process. Yet, because there is sparse discussion of community-based research, it is unclear how or if these theories and policy recommendations have been used or evaluated 'in practice'. The inconsistencies in documentation and research approach do not diminish the quality of the research here, but suggest the body of remediation literature, from a qualitative lens, is still developing and could be focused on creating interdisciplinary linkages and research standards to better address socio-economic dimensions.

Given the lack of common research design among the studies reviewed, it is clear the topic and field of study is fragmented. Analysis of the systematic and 'known' literature, demonstrates that much of the relevant research for the questions we are posing does not directly address impact assessment, closure, *and* community engagement, but rather focuses on one of those three topics, with passing or contextual mentions of the others. There are few academic works that directly link these topics (some very recent notable examples would be Boerchers et. al., 2018; O'Faircheallaigh & Lawrence, 2019, Bainton & Holcombe, 2019, Getty & Morrison-Saunders, 2020, and, in the context of the oil sands, Joly, 2017 and Joly & Westman, 2017). However, none of these papers surfaced in our systematic review. Nevertheless, like the fourteen papers reviewed, the majority of these other research projects focus on analysis of policy, regulation, and industry guidelines (Nicholas Bainton and Holcombe, 2018; O'Faircheallaigh and Lawrence, 2019; Getty and Morrison-Saunders, 2020).

Defining remediation

Remediation takes on a wide range of meanings and framings in these studies. Most commonly it is considered a process, rather than an outcome, which at its best has an integrative dimension that addresses social, environmental, economic and technical considerations. However, Baxter (2015), Everingham et al. (2018) and Younger et al. (2005) also note the tendency for engineering aspects to be prioritized in remediation practices. Only Devlin and Turbino (2012) frame remediation in strictly environmental terms as contamination and clean up. Remediation is often a tangential or satellite topic within these studies rather than the focus of the research. Sandlos and Keeling (2016) frame remediation and closure planning as contested, historically contextual, and political. Similarly, Hoadley and Limpitlaw (2008) frame post-mining land use as socially embedded with variable outcomes depending on the context. Kabir et al. (2015) emphasize a 'changeable' approach, contesting the perception of remediation as "orderly and safe" (141). Younger et al. (2005) note 'reclamation' is an unfolding public policy issue given that "the general weakness of polity and regulatory awareness in this field means that further examples will likely occur in the future in many mining districts around the world" (139). Despite differing definitions and themes of analysis, across the board authors from different jurisdictions found that current regulatory and public engagement processes are ineffective and that definitions, objectives and evaluation structures for mine remediation are inconsistent.

As noted in our search strings, reclamation, restoration, remediation, rehabilitation and closure are all terms with different definitions and regularity of use depending upon geographical and political contexts. Closure is by far the most commonly used phrasing across these studies, followed by remediation. In this sense, more research focuses on the immediate impacts of mine closure, rather than on the often drawn out, or perpetual, process of remediation. However, some terms that were used less often suggest the complexity of remediation meanings and definitions, including references to *perpetuity, legacy, care, utility,* and *stakeholders*. For instance, a remediation plan may require care in perpetuity (Sandlos and Keeling, 2016) or be understood as an act of care (Hoadley and Limpitlaw, 2008). The term legacy suggests a long-lasting impact to be reckoned with (Hoadley and Limpitlaw, 2008), the commemoration of a region's mining culture and heritage (Baxter, 2015), or a message to future generations (Sandlos and Keeling, 2016). The term utility (Everingham et al., 2018) speaks to a human-centric and socially defined post-mining land use as a driver for remediation. Often, the complexities of these terms are lost in technical or regulatory definitions of remediation.

Public engagement in remediation and research

Post-mining land use is most often conceptualized in techno-scientific terms that exclude the users themselves. Yet, without engagement and agreement between stakeholders, the care of a contaminated site is more likely to fail and impacted communities are unlikely to reclaim any kind of 'utility' (Everingham et al., 2018; Hoadley and Limpitlaw, 2008). Throughout the papers reviewed, there is a continuum of public participation frameworks presented, ranging from public approval of remediation certificates and success criteria (Fidler, 2010; Morrison-Saunders, 2019) to low transparency and limited public involvement (Xavier et al., 2015). Other framings of participation include: co-selecting land-use outcomes; challenging the geographic, temporal and political scope of remediation definitions; creating a 'co-owned' closure plan; or defining

community-based ecosystem services. Surprisingly, engaging the public through benefit creation was only explicitly mentioned by Baxter (2015) in terms of increased environmental resilience, and Muldoon & Schramm (2009) in terms of jobs and economic opportunities. Critically, public participation during closure planning should be recognized as a chance for the company and regulator to manage expectations and legitimize plans (Hoadley & Limpitlaw, 2008). However, closure planning and engagement, when it happens, typically occurs long *after* overall project assessment and approval, which accounts for the limited and variable public participation opportunities available.

Accommodating multiple publics and working within the complexities of social context is a particular challenge in remediation planning (Morrison-Saunders, 2019; Stacey et al., 2010). There are several factors that motivate the public to become 'engaged' in regard to remediation. Direct impacts such as physical nuisances during and after operations and environmental harm are common. Authors also noted more personal concerns including feeling a loss of control (Everingham et al., 2018) and worry about long-term threats to jobs, livelihoods and land-based relationships (Devlin and Tubino, 2012; Sandlos and Keeling, 2016). On a community level, authors acknowledged concerns about contaminant remobilization and continued environmental injustices, a desire for compensation, and a desire to effect closure outcomes like public infrastructure and future land use (Sandlos and Keeling, 2016; Stacey et al., 2010). Stacey et. al. (2010) recommend considering an 'impact zone' of socio-economic effects beyond the mine footprint; treating the stakeholder relationship as a long trust building process; verifying the *outcomes* of socio-economic plans; and having a plan to adapt engagement structures between stakeholders and the mining company as operations, closure and remediation progress. The multiple and sometimes competing closure and remediation preferences of the public, regulator, and proponent require constant attention in order to successfully elicit a comprehensible planning format such as a map (Everingham et al., 2018) or "singular number or range" (Baxter, 2015: 141).

Many of the authors of these papers also referenced and analyzed existing industry guidelines such as the International Council on Mining and Metals' *Integrated Mine Closure: Good Practice Guide*, 2019 (see also, the Mining Association of Canada's, Toward Sustainable Mining: Mine Closure Framework), which emphasis early and consistent community engagement on mine closure. As noted, these industry guidelines are useful for promoting the benefits of public engagement to industry and pushing companies to consider 'best practices' for closure and remediation (Everingham et al., 2018; Hoadley and Limpitlaw, 2008; Stacey et al., 2010). However, as Morrison-Saunders (2019) argues, "in the current context of regulation/legislation on remediation in Australia, mining companies have to operate beyond legal compliance in order to actually do a good job of engagement and closure planning outcomes" (11). Engagement at closure is often left to the discretion (and financial capacity) of the company, rather than compelled by regulators or local governments.

Of the fourteen studies, four could be said to describe successful public engagement, five describe 'what not to do', or avenues for improvement, two describe policy frameworks for engagement, one proposes an untested method, and one describes context as the critical factor in multiple cases. All authors mention the importance of public engagement in remediation planning and most argue for better inclusion/integration of public engagement tools in remediation policy and guidelines. However, the research reviewed, and the broader literature

that it draws on, provides few concrete examples of engagement models, reclamation successes or evaluation criteria.

Integrating remediation processes into impact assessment

Impact assessment provides a potential venue to address mine closure and remediation issues early in the life of a mining development. However, frameworks for including remediation planning in impact assessment are unevenly applied across jurisdictions and it is unclear how updates to remediation plans are connected to the mitigations and objectives outlined in impact assessments. Since the 1990s, impact benefit agreement (IBA) negotiations have increasingly been used to fill some of the socio-economic gaps in impact assessment, including stipulations for closure and remediation practices (Fidler, 2010). However, these agreements are negotiated privately and may disintegrate or become less meaningful if company-community relationships falter. Devlin and Turbino (2012) suggest government and community organizations should work together to ensure corporate compliance through participatory monitoring units created before mining approvals are issued, while the doubt of approval creates leverage for public values. While keeping in place short term benefits such as jobs and infrastructure, the majority of the authors in this review stress the importance of balance with long-term costs and benefits that may be slower to materialize (such as investments in and impacts to water and electric infrastructure, social cohesion and environmental monitoring opportunities). Few jurisdictions have actual mine closure laws, and impact assessment is one of the key regulatory processes that address closure, so it must be effective (Vivoda et al., 2019). In Canada, the context of IBAs also plays an important role in how remediation can be planned for (Fidler, 2010).

Several of the articles reviewed in this report focus on policy analysis and recommend best practices for integrating closure planning into environmental regulation. Kabir et al. (2015) develop standard closure practice principles and test Canadian and Australian closure plans against these. Stacey et al. (2010) are commissioned to develop a set of best-practice guidelines for incorporating social issues into closure and remediation planning in South Africa. Vivoda et al. (2019) analyze regulatory regimes in three mining regions of Australia. Morrison-Saunders et al. (2016) explore how existing impact assessment processes compare between Western Australia and several African countries, and how these could be improved and adapted across contexts. These authors point to South Africa as a jurisdiction with the "most developed and sophisticated arrangements for mine closure planning and regulation" (Morrison-Saunders et al., 2016: 123), albeit with capacity for implementation remaining an issue. In South Africa, as the time for closure approaches, the mine closure plan itself is subject to an environmental impact assessment. While other jurisdictions reviewed in these papers, such as Canada, Australia, Mozambique and Zambia, merge impact assessment legislation, mining regulation, and various environmental departmental guidelines in order to broadly cover mine closure, without *specific* regulations and evaluation for closure and remediation, closure plans often lack meaningful timelines, clear overviews of context-based standards, and robust structures for community-based planning. Impact assessment, playing such an important role in the public evaluation of a project, is pivotal in defining the life of a project and needs to include specific evaluations and regulations for closure.

This research also highlighted the challenges of ensuring financial securities to avoid closure 'limbo', and the lack of public evaluation of these securities during impact assessment or

any other regulatory point (Morrison-Saunders, 2019; Morrison-Saunders et al., 2016; Muldoon and Schramm, 2009; Stacey et al., 2010). Often, the financial bonds provided by companies fall short of what is needed for long-term remediation and monitoring projects. In addition, the point at which companies can 'forfeit' the liability of the site and return it to government or private ownership (relinquishment) may be unclear. Illustrating how mine closure planning and impact assessment could be merged, Morrison-Saunders et. al. (2016) state that: "While there is a particular emphasis in the extractive sector on financial securities to be put in place for unexpectedly abandoned mine sites and for financial transactions within the mining sector to be fully disclosed, similar sentiment can be found in EIA practice in relation to the capacity of proponents to implement proposed mitigation measures" (126). In policy and guidelines, direct links need to be made between the public assessment of financial securities and the assessment of a company's ability to implement remediation plans. For example, in the passing of the *Mining Rehabilitation Fund Act*, Western Australia has moved away from negotiating individual bonds, to a centralized Mining Rehabilitation Fund managed through environmental regulatory bodies (Getty and Morrison-Saunders, 2020).

Impact assessment policies need to take better account of closure and remediation, including: incorporating detailed closure objectives and standards, public discussion of financial securities and an evaluation of potential post-mining land uses. However, the most important dimension of these calls for policy change focused on community engagement in remediation planning. Impact assessment can provide a platform to establish ongoing community oversight structures and to define a community's role in closure planning beyond assessment approvals. However, Vivoda et al. (2019) finds that contemporary impact assessment processes often lack regulatory levers to embed public engagement in remediation planning. In impact assessment, there is a need for a better balance between the "enabling incentives" for mining industry (namely tax incentives, subsidizing of infrastructure, job creation etc.) with the "restrictive elements" imposed by government (such as financial securities, environmental and socio-economic protections, closure requirements etc.). Achieving this balance in impact assessment would require more resources for measuring, monitoring and researching socio-economic impacts of closure and remediation, and for ensuring that this research is included in decision making (Vivoda et al., 2019). Without a better balancing between short term gain and long term costs, governments and communities will have limited resources to hold companies accountable and to ensure robust remediation.

Several of the authors present recommendations for working towards a 'better balance' in impact assessment through community engagement. Baxter (2015), for example, shows that alternative frameworks such as ecosystem services (commonly used for environmental assessment) provide alternative methods for exploring community costs and benefits of remediation (see also, Morrison-Saunders, 2019). Kabir et al. (2015), Muldoon & Schramm (2009), Younger et al. (2005), and Everingham et al. (2018) find that public engagement can be integrated into closure and remediation planning when impact assessments *trigger and require* it in some form. Critically, this early engagement needs to include an ongoing co-governance structure for continued partnership in remediation planning: "public and government bodies should work collaboratively to ensure ongoing compliance for the life of a mine project" (Devlin and Tubino, 2012: 112). Both Xavier et. al. (2015) and Everingham et al. (2018) recommend the creation of an independent oversight board or stakeholder working group (through impact assessment processes) specifically for mine closure and remediation planning. Without ongoing

oversight from both the regulator and the public, indicators and expectations established through impact assessment may be long forgotten by the time remediation is being enacted (Devlin and Tubino, 2012).

Independent oversight, in a self-determined form, is particularly important for Indigenous communities, who are often the most exposed to environmental injustices related to mining and remediation. Fidler (2010) and Sandlos and Keeling (2016), both recommend that particular attention needs to be paid to Indigenous governance and traditional knowledge in the design of mine closure plans and in long-term planning for monitoring and maintenance. Fidler (2010) highlights that negotiated agreements such as impact benefit agreements should not be considered a "substitute or stand-in for EIA matters when it comes to decision making for remediation. While IBAs make good business sense, they cannot be taken in isolation to the broader judicial system" (242). Sandlos and Keeling (2016) recommend that impact assessment processes, in the context of remediation and beyond, need to avoid simply subsuming Indigenous Knowledge into highly technical processes. Instead, impact assessment practitioners need to enlarge the scope of knowledge that is considered relevant. Hoadley and Limpitlaw (2008) reflect these recommendations, stating that: "It is also of the utmost importance that project proponents recognize and accommodate the close ties, spiritual, cultural and traditional that many societies have with the land. Failure to do so can destroy the fabric of the community as well as its livelihood opportunities" (850).

3.4 Conclusions: Critical elements for Remediation/Closure Planning and Impact Assessment

There are broad and generally-agreed practices that are critical to closure planning and remediation (International Council on Mining and Metals, 2019), but specific indicators and outcomes are context-dependent on the mine, local history, environment, and relationship between stakeholders. That said, nearly all of the critical elements outlined in the reviewed articles rely on public engagement. The most common elements considered best practices for mine closure planning fall into four themes:

- Planning for closure and remediation are integrated into the entire mine life-cycle, starting with or before exploration;
- Public engagement starts just as early and is ongoing through the life of the mine and decommissioning;
- Community preferences and social outcomes are explicitly considered and included in the closure and remediation plan;
- Progressive closure planning and the final remediation project undergo evaluation, oversight, and monitoring.

Other critical elements for remediation included: the use of scientific research to provide a context for public understanding (Baxter, 2015; Younger et al., 2005); adequate financial resources for remediation work and public engagement (Devlin and Tubino, 2012; Stacey et al., 2010); and planning for surprises and contingency during the mine life-cycle (Stacey et al., 2010).

'Social goals' were often referenced, sometimes explicit and other times vague, such as centering the cultural and historical context of a mine and remediation project or including

economic or other benefits for communities in closure planning and during remediation practice (i.e. jobs). Stacey et al. (2010) propose highlighting 'milestones', which might suggest mine closure planning build in success or evaluation points. In settler colonial contexts such as Canada and Australia, such milestones should also include reckoning with historical harms and colonial violence, through various tools such as apologies, compensation, assertion of self-governance and other decolonial processes. Sandlos & Keeling (2016) are explicit that "traditional knowledge of the land and the historical experience of mine development (along with its attendant social, economic and environmental injustices) cannot be neatly separated from one another" (283). Given the intergenerational socio-economic and environmental dimensions of mine remediation, restorative justice may be a reasonable expectation for communities, but impact assessment is not found to be a tool capable of integrating this scope (Sandlos and Keeling, 2016). No matter the social goals identified in each case, the importance of regularly updating closure plans in the context of ongoing public engagement is critical to ensure expectations are appropriate and obligations are met.

The insights from this literature have implications for the enhanced integration of mine closure and remediation into project assessment and approval. Scholars in Australia argue that, to date, it has been very difficult to evaluate the effectiveness of impact assessments to set up governance structures that plan for, regulate, and monitor closure and remediation activities (O'Faircheallaigh and Lawrence, 2019; Getty and Morrison-Saunders, 2020). Extractive developments change drastically over time, sometimes making initial impact assessment measures irrelevant. Water licensing renewals, which often include updates of closure plans, are not directly relevant when assessing the socio-economic and cultural impacts/mitigations resulting from ongoing extraction, closure or remediation. After impact assessment certificates have been granted, legislative requirements for monitoring and follow up often do not specifically outline community-based targets for closure planning. Impact assessments need to specify the resources needed to mitigate the impacts of closure and remediation, not just the technical requirements, but also the resources needed to conduct effective socio-economic evaluations through the life of the project, including engaged planning for closure (Stacey et al., 2010).

4. Closure and Remediation Plan Review

4.1 Methods

Closure plans from currently operational mines in the territorial and provincial North were analysed to understand how the socio-economic impacts of mine closure discussed in academic literature are translated into the official documents being used to guide actual mine closure. This analysis involved a qualitative comparison of closure plans from mines operating in Yukon (1), the Northwest Territories (3), Nunavut (3), Nunavik (2), and Labrador (1) (see Table 4). Instead of examining closure plans from all provinces and territories, these five Northern regions were chosen due to the inconsistent availability of closure plans across Canada. As will be discussed in a subsequent section about accessibility, the existence of territorial public registries that contain a wide range of industry documents as well as the authors' own research experience in Northern

regions are both factors that defined the geographical scope of this analysis. All of the closure plans are written for mines that have an expected active operational lifespan of between 8 and 41 years, are currently 20 years or less from their expected closure date, and have an Impact and Benefit Agreement (IBA; or similar formal agreement) and a duty to consult with the Indigenous peoples whose lands they are operating on or expected to impact (see Table 4). The closure plans used represent the most recent versions that have been accepted by the corresponding provincial or territorial government as of December 2019.

Closure plans explain the methods that will be used for both progressive and final closure of a project. In theory, they should explain exactly how the mine will be decommissioned, the land remediated, and communities protected from negative impacts during and after closure activities. The details of the closure planning process vary across jurisdictions, but typically it involves the development of a conceptual closure plan before the mine is operational, which is then refined, updated, and resubmitted to the relevant authorities every 5 years for approval. Thus, most of these more detailed closure plans have not been subject to formal impact assessment or public engagement processes.

The purpose of this comparison is to understand how mine closure plans engage community expertise and address the socio-economic and cultural aspects of closure, as well as to assess the accessibility of these documents for public scrutiny. For this analysis, text from the closure plans was extracted and sorted into three categories: (1) information about the methods used for community engagement; (2) explicit use of Indigenous Knowledge (IK)/Inuit Qaujimajatuqangit (IQ) and community feedback; and (3) acknowledgements of and mitigation strategies for the negative socio-economic and cultural impacts of mine closure.

Table 4: Mine sites included in the closure plan comparison

Mine Site	Accessed through	Location of site	Primary mineral extracted	Consulted Indigenous group(s) and organization(s)
Keno Hill Mine Operations (2018)	Yukon Government website	Yukon	Silver	First Nation of Nacho Nyak Dun (FNNND)
Diavik Diamond Mine (2017)	MVLWB public registry	NWT	Diamond	Kitikmeot Inuit Association; Lutsel K'e Dene First Nation; North Slave Métis Alliance; Tłı̨chǫ Government; Yellowknives Dene First Nation
Ekati Diamond Mine (2018)	MVLWB public registry	NWT	Diamond	Tłı̨chǫ Government; The hamlet of Kugluktuk and Kitikmeot Inuit Association; Yellowknives Dene First Nation; Lutsel K'e Dene First Nation; North Slave Métis Alliance; Deninu Kue First Nation; Fort Resolution Métis Council

Snap Lake Mine (2019)	MVLWB public registry	NWT	Diamond	Tłı̨chǫ Government; Yellowknives Dene First Nation; Lutsel K'e Dene First Nation; North Slave Métis Alliance;
Meadowbank Gold Project (2014)	NWB public registry	Nunavut	Gold	Kivalliq Inuit Association
Meliadine Gold Project (2015)	NWB public registry	Nunavut	Gold	Kivalliq Inuit Association
Mary River Project (2018)	NWB public registry; company website	Nunavut	Iron	Qikiqtani Inuit Association
Raglan Mine (2019)	Provided by company	Nunavik	Nickel	Salluit Land Holdings; Kangiqsujuaq Land Holdings; Makivik Corporation
Nunavik Nickel (2019b, 2019a, 2016)	Provided by company	Nunavik	Nickel	Salluit Land Holdings; Kangiqsujuaq Land Holdings; Municipality of Puvirnituq; Makivik Corporation
Voisey's Bay (2016)	ATIPP	Labrador	Nickel; copper	Innu Nation; Nunatsiavut Government

This comparison focuses on interpreting the meanings of words, sentences, and paragraphs, as opposed to producing quantitative data about the individual words and statements between documents. The information sorted into the three categories was used to piece together the narratives that companies have created about the closure of their mine, with respect to community engagement and socio-economic impacts. Policies, regulations, and government guidelines (Appendix C) were then used to supplement this information, giving insight into what the federal, provincial, and territorial governments minimally require and what kind of relationships exist between remediation policies, impact assessments procedures, and closure plans. Specifically, we wanted to know what is required for impact assessments and mine closure plans, what the difference between those requirements are, and how they translate into the actual closure plans that are produced.

4.1.2 Accessibility

Of the 10 closure plans reviewed, seven were accessed through public registries, with the Voisey's Bay, Raglan Mine, and Nunavik Nickel closure plans being retrieved through other means. Most provinces and territories have public registries, but they vary in how easy they are to access and use, as well as the kinds of documents made available on them. Registries for impact assessments sometimes include conceptual closure plans or project descriptions that briefly discuss closure. However, it excludes more up-to-date documents that are produced after the environmental assessment is complete - notably, later versions of closure plans that are more detailed, based on more current and accurate data, and more reflective of what will actually occur at closure. This also means that it can be difficult to find documents from older environmental assessments that have been completed. This is also true for the federal Canadian Impact

Assessment Registry, where one can find project descriptions, impact statements, and, occasionally, conceptual closure plans, but nothing produced *after* an assessment is complete.

These registries and websites can be difficult to find and navigate. In searching for closure plans across both provincial and territorial websites, it was clear that the territorial governments are much more effective in making information about projects available to the public and therefore open to greater assessment and scrutiny. Yukon, the NWT, and Nunavut all have public registries where up to date documents related to mine projects, not just those related to environmental assessments, can be found. This includes conceptual, interim, and final closure plans, as well as a plethora of other documents and communication materials. This accessibility and completeness is one of the reasons for this report's focus on Northern closure plans.

The three closure plans that were not accessed from public registries were already in our possession, obtained by a team member for a separate research project. Voisey's Bay Mine is located in Labrador, where the provincial government does not have a public registry for mine closure plans. In fact, mine closure plans are considered confidential under section 15 of the province's Mining Act, and as a result this document was accessed through an Access to Information and Protection of Privacy (ATIPP) request. The Nunavik Nickel Mine and Raglan Mine closure plans were provided by the companies upon request. While the Québec Government does technically have a public registry where one can find documents related to mining activity in the province, only the French versions are submitted to the government and made available online. It is also much less user-friendly than any of the territorial registries – the website is difficult to find, there is no keyword search function, and files are poorly labeled.

Across all the closure plans reviewed there are countless references to technical reports, past research, environmental impact statements, approval conditions, and a variety of other documents to support different aspects of closure. This creates challenges for assessing the quality and effectiveness of the closure plan because a reader does not necessarily have access to all of this supplementary data, or the technical knowledge to understand it. If a closure plan were to be sent out for public review, the public would be limited in their ability to assess it without the many additional documents being used to justify it. This issue is exacerbated by difficult to use or non-existent registries. For example, the Snap Lake Mine (NWT) closure plan states that "records of past engagement are available in other documentation, including the Environmental Assessment Report … water license applications and renewals … and annual closure and remediation plan progress reports (including annual reports from 2012 to 2017, each of which contains a description of engagement and consultation related to closure plans, objectives, criteria, progressive remediation, and related topics)" (De Beers, 2019: 1–2). Finding these additional documents to be able to fully understand the closure plan is possible because of the MVLWB public registry, but their review would take a considerable amount of resources (to locate, download, and read). In other jurisdictions these additional documents may not be accessible at all.

4.2 Results

Policy Review

Appendix C contains a summary of the policies, acts, and guidelines that were reviewed for this report. Priority was given to those policies that refer to the requirements of impact assessment processes and guidance materials for mine closure across the regions represented by the closure plans consulted. The documents were read for information relating to the assessment of socio-economic impacts and use of community knowledge. Overall, across the North there is a lack of clear policies that explain when and how community engagement should occur during a mine's operational life, and how community knowledge can and should be integrated into closure planning. Furthermore, there are few explicit policies dictating how companies should address the socio-economic impacts of mine closure.

Impact assessment guidelines, including those at the federal level through the Impact Assessment Act (2019), require community engagement before a mine is developed, particularly with affected Indigenous communities. The IAA requires impact statements to include "where and how Indigenous groups' perspectives and input were integrated into or contributed to decisions regarding the designated project" including plans for decommissioning, abandonment, follow-up and post-closure monitoring (Impact Assessment Act c. 28, s. 1, 2019). The 2019 IAA improved upon the 2012 Environmental Assessment Act by requiring proponents to take community knowledge into account in demonstrable ways (Alderson et al., 2019), but the closure policies and guidelines that govern mine closure plans produced *after* the impact assessment do not have these same requirements. The NWT and Nunavut are the only regions whose guidelines clearly state that communities must be directly involved in ongoing closure planning and decision making. Other regions routinely use language that is too vague to be consistently interpreted and enforced across all projects, and few specific guidelines exist for how Indigenous Knowledge should or could be applied to closure planning at the territorial and provincial level. In Quebec, for example, there are independent regional authorities that facilitate public engagement and review documents submitted by proponents for licensing. However, it is unclear if these bodies only conduct public engagement during impact assessments, or if subsequent engagement for closure planning is also required. It remains to be seen if closure plans produced for new mine projects after the 2019 IAA changes will more consistently utilize community knowledge, but existing mines and their closure plans are outside of the reach of the IAA. As a result of the lack of clear guidance for applying community knowledge and review processes that do not extend beyond the impact assessment, closure plans inadequately include community knowledge and priorities (which will be discussed in greater detail).

To address the various layers of effects on communities, impact statements must consider the positive and negative environmental, health, social, and economic impacts of the project at all stages of development and on multiple scales. For the development and operational stages, the IAA guidelines give specific examples of a myriad of possible impacts including the effects of increased wages, greater pressure on local infrastructure, and changes to community in/out migration (Impact Assessment Act c. 28, s. 1, 2019). However, the long list of possible impacts provided in federal impact assessment guidelines almost never make any connections to closure, reclamation, or post-closure monitoring. The only direct reference to closure is to identify "an estimate of direct, indirect, and induced income and/or wages, and the distribution of that income

and/or wages, resulting from project expenditures during construction operation, and decommissioning" (Impact Assessment Agency of Canada 2019, sec. 17). Other possible impacts listed in these guidelines that could be extrapolated to apply to mine closure include changes to viewscapes, in- and out-migration, and loss of traditional jobs, but their connection to closure is not explicit (Impact Assessment Agency of Canada 2019). Instead of making clear links to closure and reclamation, they speak generally to the full life of the project, which creates an environment where the complex and long-term impacts of mine closure can be neglected in favour of addressing the impacts of construction and operations with which the industry (and communities) are more familiar.

As closure plans for existing projects are not subject to these IAA requirements, current and future closure plans for these projects are evaluated using policies, regulations, and guidelines that are specific to mine closure and outside the IA system. These documents (and guidelines) have many of their own shortcomings with regard to the socio-economic aspects of closure. Documents from the governments of Newfoundland and Labrador, Nunavik/Quebec, and Yukon lack clear acknowledgements or definitions of possible socio-economic impacts of closure, and there is no guidance for how proponents should address these impacts in closure plans. Documents from Nunavut more frequently cite socio-economic impacts than those from other regions, and they include employment, community wellness, community infrastructure, and human health considerations in the requirements for Nunavut Impact Review Board (NIRB) reviews and Nunavut Water Board (NWB) licensing (Nunavut Impact Review Board and Nunavut Water Board, 2012). Like the IAA, though, connections are not made between these considerations and mine closure specifically. In Newfoundland and Labrador, projects are "evaluated for [their] bio-physical and socio-economic impacts" (Newfoundland and Labrador, 2010), but no details are provided on how these are evaluated, what socio-economic impacts are being considered, or how they apply to mine closure. In Quebec, mine remediation "must attain technical, environmental and social objectives," (MERN, 2017: 27) but no definition or criteria is given to 'social objectives.' The Nunavik Inuit Mining Policy requires environmental and social impact studies to be carried out for mineral exploration and operations, but not closure (Makivik Corporation, 2014). The Government of Yukon's Mine Site Reclamation and Closure Policy (2006) emphasizes only the desire for having a competitive mining industry that "upholds the essential socio-economic and environmental values of the Yukon" (3), and promotes remediation activities that "will provide economic benefits to local communities and First Nations" (9), but this document does not provide any guidance on the assessment and mitigation of negative socio-economic impacts. Thus, what criteria do exist in the federal IAA for the socio-economic aspects of mine closure are not reflected in provincial and territorial closure guidelines. In fact, most of these guidelines do even less to articulate how socio-economic aspects of closure should be identified, measured, and mitigated by proponents and therefore do not fill the gap left by the IAA's limited scope and guidance.

The exception to this lack of clear guidance is in the NWT. Between guidelines for impact assessments, community engagement, and mine closure planning published by the Mackenzie Valley Land and Water Board (MVLWB) and the Mackenzie Valley Environmental Impact Review Board (MVIRB), there is ample detail provided to proponents about how they should address the socio-economic aspects of closure. These documents provide definitions of the socio-economic aspects of mining that are broader and more nuanced than in any other policy or guidelines included in this review. While some of these guidance documents are specific to

impact assessments, they include clear examples of how mine closure can negatively impact communities and offer possible mitigation strategies to be included in the company's impact statement and overall project planning. Other impact assessment policy and guidance documents from other jurisdictions do not provide this kind of detail. The MVLWB closure and remediation guidelines require a proponent's assessment of risk to "consider factors such as risk acceptability, public perception of risk, socio-economic impacts, benefits, and technical feasibility" (2013: 9). The MVLWB process for renewing water licenses also includes a public hearing where closure plans can be examined. The guidelines stress the importance of conducting research throughout the full life of the mine, learning from other mine sites, engaging with communities consistently, and identifying strategies for helping communities adapt to a post-closure economy. Proponents are required to consider a range of possible impacts that go beyond the baseline requirements for obtaining the necessary licensing for the project. The NWT closure guidelines also specify that communities must be involved in closure specifically, and suggest that companies create stakeholder working groups for closure planning.

Closure Plan Comparison

The level of detail contained in closure plans varies considerably between regions, with closure plans from the NWT having the most detail and the provincial closure plans being the shortest and least detailed. In general, across the plans we reviewed, both community knowledge and socio-economic impacts are underrepresented in closure plans, reaffirming what has been observed elsewhere: mine closure focuses heavily on addressing technical issues, while more complex social, cultural, and historical challenges are not well understood or left out the scope of the planning process (Bainton and Holcombe, 2018; Beckett and Keeling, 2019). Table 5 summarizes the differences between territorial and provincial closure plans and the lack of focus on community knowledge and socio-economic impacts. It also illustrates that even though the better examples of closure planning come from the NWT, there are still significant gaps in whether and how socio-economic impacts are being addressed.

Table 5: Results from closure plan analysis

Mine site	***Explains engagement methods?***	***Explicit use of community knowledge?***	***Community knowledge distributed throughout?***	***Acknowledges negative socio-economic impacts?***	***Presents plans to mitigate impacts?***
Keno Hill (YK)	No	No	No	No	No
Diavik (NWT)	Yes	Yes	Somewhat	No	No
Ekati (NWT)	Yes	Yes	Somewhat	No	No
Snap Lake (NWT)	Somewhat	Yes*	No	No	No
Meadowbank (NU)	No	Yes	No	No	No

Meliadine (NU)	No	No	No	No	No
Mary River (NU)	Somewhat	Yes	No	Yes	Somewhat
Raglan (QC)	No	No	No	No	No
Nunavik Nickel (QC)	No	No	No	No	No
Voisey's Bay (NL)	No	No	No	No	No

*The body of the Snap Lake closure plan does not explicitly use any community knowledge or address community concerns anywhere. However, Appendix C in the plan contains a 321-page community engagement report that lists all engagement activities, including a "traditional knowledge summary table" section which lists TK contributions to the closure plan.

Use of Community Knowledge

Knowledge and input from Indigenous communities is used inconsistently between projects and methods for community engagement are not clearly explained in these closure plans. Specific details about the outcomes of engagement activities are absent, and it is often unclear if what is being described is specific to mine *closure* and not overall project operations. Similarly, the sources of information being used in closure planning is often not specified, and most of these closure plans do not explicitly reference community knowledge, concerns, or questions anywhere in the document. The two best examples of a mine closure plan using community knowledge clearly and effectively are from the Diavik and Ekati diamond mines, both located in the NWT. Closure plans for mines in Nunavut are sometimes effective in this area, particularly the Mary River mine, while those in Quebec, Labrador, and Yukon have few or no clear examples of community knowledge being applied to closure planning. Yukon does have several ongoing cases of community-directed remediation planning. However, they are for sites that have been abandoned and are now federally or territorially managed, not sites that are currently planning for closure and still under the ownership of a private company. A recurring observation in this comparison, and one that can be seen in Table 5, is that mine closure plans produced in the provincial North (Nunavik and Labrador) engage much less with the non-technical aspects of mine closure compared to those produced in the territories. The exception is the Keno Hill mine closure plan in Yukon, which more closely resembled those produced in Nunavik and Labrador.

A frequent problem is the use of vague language to describe community engagement and input. The Keno Hill (Yukon) closure plan states that the company recognizes the importance of producing a closure plan that is developed in partnership with the Yukon Government and First Nation of Nacho Nyak Dun (FNNND), and that their relationship with FNNND "provides for significant consultation and collaboration on closure objectives and final options" (Alexco, 2018: 8). As a general direction or vision for closure planning this statement is fine, but only if it is followed up by clear definitions and documentation of what 'significant consultation and collaboration' means, how that will be achieved, and how success will be measured. Keno Hill is not the only closure plan that has this problem – all 10 documents reviewed for this report use

vague language, some more so than others. The closure plans from Nunavik and Labrador have no clear examples of community knowledge being used in any aspect of closure planning. The Meliadine (Nunavut) closure plan , states that the company will "consider community land use expectation and traditional knowledge in the closure planning," with the process for that objective being that "community engagement will continue to be implemented" (Agnico, 2015: 7). The Meadowbank (Nunavut) closure plan frequently states that TK was 'documented' or 'used' without more clearly describing how. Many of these documents do not make it clear where they are getting information for the socio-economic aspects of mine closure (via academic studies, consultants, the company, or directly from communities), so it is not clear how and where community knowledge is being accessed and used (Agnico, 2014). Without clear documentation of community engagement and input, these statements fall short of demonstrating useful and effective engagement strategies.

There are a few notable exceptions that show promise for better engagement in closure planning. The Mary River (Nunavut) closure plan references IQ in describing the natural environment and includes research plans to address uncertainties that the communities find unacceptable. Closure plans from the NWT, particularly for the Ekati and Diavik mines, are more likely to clearly articulate how they are collecting and utilizing community knowledge. The Ekati closure plan includes descriptions of issues raised by community members and the Traditional Knowledge Elders Group.[1] The plan also cites Ekati's Traditional Knowledge Management Framework, which "describes protocols for collecting, storing, and managing TK" and "outlines how Dominion will use TK in environmental decisions for the Ekati Mine" (Dominion Diamond Mines, 2018: 39). A Traditional Knowledge Panel also exists for the Diavik mine, which is meant to facilitate the inclusion of TK in closure planning, and the results of panel meetings are shared with respective community organizations. The Diavik closure plan also clearly explains their engagement methods, which are developed with input from community members to ensure that it is socially and culturally appropriate as well as practical (Diavik Diamond Mines, 2017). Both the Ekati and Diavik closure plans have a record of engagement that is concise enough to be easily used, is specific to mine closure and remediation, and includes specific issues raised by community members and the company's response.

Where companies do refer to specific ways that community knowledge is being used, the examples are sometimes not clearly related to closure and remediation, but instead might relate more to the development or operations phases of the project. For example, the Ekati mine closure plan explains how IK is being used in wildlife monitoring and other similar programs, but this kind of monitoring is not necessarily specific to mine closure and it is unclear if these programs will continue once the mine is no longer operational. In other cases, community engagement activities are summarized or listed in tables, but they do not include the outcomes of these activities or how they contributed to the mine closure plan.

Lastly, clear statements about how IK/IQ is used in closure planning are routinely limited to descriptions of wildlife baselines and the social and cultural characteristics of communities. This is not to undervalue the importance of using knowledge from communities to understand the ecological and social context that the mine is operating within, and the mining industry has come

[1] This is a group of Elders and TK holders that contributes to the mine's operations and planning to ensure that caribous, water, land, air, and fish are protected.

a long way in terms of creating space for IK/IQ in project planning. However, based on the location of community knowledge within these documents it appears that companies (or the consultants they hire to put closure plans together) are operating with the assumption that communities only have valuable information to provide about the physical environment. Even in the best examples of community-engaged closure plans, it is less clear how IK/IQ is incorporated into the remediation governance, management of tailings and waste rock, mitigation of contaminants, and post-closure wildlife and socio-economic monitoring.

Addressing Socio-economic Impacts

Like the industry's use of community knowledge, the socio-economic aspects of mine closure are often neglected in closure planning. Negative impacts either go unacknowledged or have no clear plans for mitigation. Vague language is, again, a consistent problem across the closure plans, which mirrors the lack of clear statements, definitions, and requirements for addressing socio-economic impacts in policy documents. The difference between territorial closure requirements (which tend to be more detailed and more likely to account for complex human impacts) and provincial requirements (which at best lack detail and at worst ignore socio-economic impacts entirely) is also reflected in the differences between provincial and territorial closure plans. In particular, the closure plans for mines operating in NWT and Nunavut are more likely to account for a wider scope of social, economic, and cultural impacts of mine closure, while the closure plans from Nunavik and Labrador are essentially devoid of these considerations.

It appears that the closure plan for Raglan Mine (Nunavik) attempts to acknowledge the socio-economic aspects of closure in some of their justifications for different closure methods, but does so unsuccessfully. It states multiple times that a particular method was chosen based on "environmental, societal and economic performance" (Raglan Mine, 2019: 68), but at no point are these criteria defined. In the Meliadine closure plan (Nunavut), one of the goals listed for closure is to "help protect traditional values" and "mitigate socio-economic impacts in the area where the mine is located following decommissioning and closure as practically possible" (Agnico, 2015: 37–38). Again, these goals and impacts remain undefined in the document. The explanation put forth by some closure plans, including those for Meadowbank, Ekati, Diavik, and Mary River, is that socio-economic impacts will be assessed closer to, during, or after actual closure. This directly contradicts the guidelines published by the International Council on Mining and Metals, which state that closure planning must integrate social, economic, and cultural considerations early in the mine's life in order to have the time necessary to develop knowledge about and prepare for the complexities of mine closure (International Council on Mining and Metals, 2019).

When negative impacts are listed, they are often too limited in scope or simply not related to closure. The Diavik closure plan claims that information about socio-economic impacts is included in an appendix titled "Site-Specific Risk-Based Closure Criteria Phase I Report," but upon review it is clear that their understanding of 'risk' is limited to the potential for contaminants to be found in country foods. Beyond this criterion, the plan does not assess any other social, economic, or cultural impacts. In other cases, impacts are limited to job loss and the potential loss of archaeological sites. As the sole example of a possible negative socio-economic impact, the Nunavik Nickel closure plan mentions their plans for avoiding damaging

archaeological sites, and refers readers to the information in their original environmental impact assessment.

Even when negative impacts are acknowledged, they are typically deemed not significant or outweighed by the apparently more significant positive impacts that communities experience during operations. The Mary River closure plan does this frequently. In explaining their methods for assessing mine closure impacts, the plan notes that if an individual is likely to experience both a negative and a positive impact, then the negative impact is deemed not significant. For instance, the plan concludes that the educational and training opportunities that exist for employees and community members during operations will offset the negative effects of job-loss at closure. The plan also states that, overall, "the potential for beneficial outcomes is equally or more highly anticipated than the potential for negative effects" (Baffinland Iron Mines, 2018: 311). This of course ignores academic literature that argues the opposite – that the employment benefits of mining are often short-lived, unevenly distributed, and outweighed by the longer-term negative impacts of closure (Bowes-Lyon et al., 2009; Buell, 2006; Rodon and Lévesque, 2015; Sandlos and Keeling, 2012).

Finally, there are no clear plans for mitigating any negative socio-economic impacts of closure. There are some discussions about employment insurance mitigating the impacts of job loss, but otherwise these plans lack any clear socio-economic transition strategies. One of the objectives in the Keno Hill closure plan is to "maximize First Nation, local, and Yukon socio-economic benefits" (Alexco, 2018: 14). They do not mention this objective again anywhere in the closure plan and provide no plan for how this will happen or how success will be measured. This language is similar to the Yukon Mine Site Reclamation and Closure Policy that states that "where feasible and practical, mine reclamation and closure activities will provide economic benefits to local communities and First Nations" (Government of Yukon, 2006: 9), without any additional explanation or recommendations.

4.3 Discussion

The socio-economic impacts of mine closure appear to be misunderstood and neglected by mine companies operating in the North, and the methods used for engaging with communities and utilizing their expertise is inconsistent. Vague language and a lack of clear planning is the most common issue across both the closure plans and policy documents. Statements about how mine companies are incorporating IK/IQ and addressing socio-economic impacts are highly general and describe goals that are indistinct and impossible to measure. They feel more like pandering or box-checking than practical information that demonstrates that the company has put considerable thought and resources into how to engage with the peoples whose land they are occupying. Closure plans also poorly explain how communities are being involved in the closure planning process. Companies seem to be able and willing (or required) to explain how communities are involved in directing the development of a site, but less forthcoming (perhaps because the data does not exist) about how communities are specifically involved in planning for closure. The lack of outcomes included in any descriptions or lists of engagement activities makes it difficult to know what community members are concerned about and what kinds of information they have shared with the company.

A seemingly small and insignificant reference made in the Mary River mine closure plan provides an example of this tendency for companies to not fully understand and plan for the socio-economic impacts of closure, as well as the problems that can arise when closure plans reference external documents and reports to justify their methods. Under a section titled 'Post-Closure Site Assessment,' the Mary River closure plan refers to a Closure Scenario Report published by the company in 2014 and submitted to the NIRB (Baffinland Iron Mines, 2018). The report is meant to examine the possible social, cultural, and economic impacts of closure and provides mitigation strategies. The inclusion of this reference may lead one to believe that the company has conducted a thorough analysis of the possible negative impacts of mine closure. However, the document is only 6 pages of text that exclusively discusses job loss under both the 'social and cultural impacts' and 'economic impacts' subsections. It proposes some brief plans for mitigating the impacts of job loss, argues that the mine will create spin-off jobs, and concludes that closure will not happen for "many, many years" and is therefore not a pressing issue (Wilkinson, 2014: 8). Here, Baffinland, the mines's owner, appears to offer mitigation strategies for the negative impacts of mine closure, but defines these impacts as limited in scope.

The territory or region where a mine is located, and therefore the regulatory framework governing it, has a substantial impact on whether a company is effectively planning for mine closure and remediation. The policies and guidelines that govern mine closure vary considerably among the five Northern regions surveyed. Closure plans are more likely to address the unique concerns of Indigenous peoples in the territories where they remain the demographic majority and where Indigenous organizations and governments have greater power in planning and decision making. The NWT and, to a lesser extent, Nunavut have more thorough guidelines for mine closure planning and place a heavy emphasis on collecting and incorporating IK/IQ in closure plans. The result are closure plans that more clearly address community concerns and acknowledge a wider (though by no means complete) range of negative impacts. The provincial Northern regions have the weakest guidelines for mine closure planning, and therefore the least detailed closure plans are produced there. This is not a rule, however. The closure plan for the Snap Lake Mine in the NWT poorly addresses socio-economic impacts and is vague in how they explain their community engagement strategies and the application of IK.

There does not appear to be a clear relationship between impact assessment processes and closure plans, and there are gaps in the policies governing both. The IAA does require proponents to consider socio-economic and cultural impacts from all stages of mine development, but there are not always clear expectations for what kinds of unique socio-economic and cultural impacts can occur specifically at the closure and post-closure stages. As the template that provinces and territories use in developing their own impact assessment processes, the IAA needs to be clear about the scope of impacts that must be included in closure considerations, and proponents need more guidance on the wide range of impacts that mine closure can have. Furthermore, there is a disconnect between the requirements for impact assessments (which include fairly broad socio-economic considerations) and those for closure plans (which routinely neglect them). With some exceptions, mine closure guidelines and regulations lack clear requirements for acknowledging and mitigating the socio-economic aspects of closure, which underscores the importance of IA process in addressing these issues. Conceptual closure plans may be included in the original assessment, but these documents lack detail and are unlikely to reflect actual mine closure and remediation processes at the end of the mine's lifecycle (long after the end of an IA). Subsequent versions of the closure plan then do not

receive the same level of scrutiny and public feedback because they are produced after the impact assessment has ended.

The lack of requirements for proponents to address closure-specific issues, combined with the absence of any post-assessment follow-up, results in closure plans that do not acknowledge the socio-economic and cultural aspects of closure. This is despite the fact that the original impact statement is required to account for these issues at all stages of development. A systematic comparison of impact assessment decisions and closure plans could provide greater insight into this apparent gap, to determine whether or not information and recommendations is being lost between the two documents. It is possible that information about possible negative socio-economic impacts and mitigation strategies that might be included in an impact statement are not integrated into the final closure plan, given this lack of follow-up between impact assessments and subsequent closure planning processes.

Overall, stronger requirements for how communities should be involved, how IK/IQ is applied, and how socio-economic impacts are mitigated in closure planning is needed. The most common possible negative impacts (outside of physical changes to the environment) cited in these closure plans are the loss of jobs and the risk of disturbing archaeological sites. The focus on archaeological sites makes sense given the clearly defined rules and regulations controlling this aspect of mining; proponents are required by impact assessment processes at multiple scales to explain how they will document and avoid compromising archaeological sites. The same clear, enforceable regulations do not exist for protecting the long-term socio-economic well-being of communities.

5. Implications for policy, practice and research

Mine closure and mitigation of legacy effects remains one of the fundamental sustainability challenges for the industry. Boerchers et. al. (2018) argue that there are five key legacy issues that need to be explicitly included in impact assessment: 1) Residual biophysical effects; 2) Residual effects on communities; 3) Boom and bust cycles; 4) Remaining infrastructure; and 5) Resource depletion. To this list, we would add *settler colonial legacies* as a critical consideration for how closure and remediation is confronted in impact assessment (O'Faircheallaigh and Lawrence, 2019). Across Canada, Indigenous-led assessment processes have recently been framed as a way to move away from colonial legacies and settler environmental governance structures (Eckert et. al., 2020). In identifying and addressing the key issues of remediation throughout impact assessment, it is critical to recognize and resist the perpetuation of colonial injustices. If left unaddressed, these residual effects, or 'key legacy issues' can continue to impact the environment and nearby communities (often in compounding ways), for generations to come.

The complex, long-term environmental and socio-economic impacts from mining are not novel observations. Yet it remains unclear whether impact assessments can effectively evaluate these residual impacts and how such impacts can be 'balanced' against shorter-term benefits through mitigation, management, and monitoring. In line with Boerchers et. al's (2018) 'key legacy issues', we merge the findings of the systematic literature review and closure plan/policy review to highlight key challenges to incorporating remediation into impact assessment and effectively engaging community in closure and remediation planning:

1) Impact assessment and remediation planning tend to prioritize technical, engineering, and environmental or biophysical dimensions. In a study of ten closure plans from Canada and Australia, Kabir et al. (2015) find "closure plans are still more concerned with revegetation and geophysical aspects rather than social and community needs relating to income, displacement, social cohesion, and the re-establishment of cultural connections and heritage" (154), with little social impact analysis during assessment or monitoring built into closure plans. At the same time, restoring ecosystem services through environmental remediation may deviate from community restoration goals (Morrison-Saunders, 2019) and, in turn, achieving socio-economic goals may not always require meeting the highest of environmental standards (Younger et al., 2005). These authors do not suggest the environmental side of impact assessment and remediation planning be ignored, but emphasize that it is the public who will carry any long-term risk, thus socio-economic factors play a critical role in environmental quality. Remediation plans need to include *inter-generational* environmental and socio-economic dimensions.

2) Better guidance for the incorporation of socio-economic impacts of mine closure should be included in impact assessment legislation and guidelines. This would prompt greater focus on these issues at the 'front-end' of development, where best practice suggests they should be. It would also result in more robust data collection, mitigation planning, and public evaluations of remediation plans *throughout* the life of a project. Everingham et. al. (2018) emphasize that a regulatory focus on environmental indicators and monitoring at the impact assessment stage greatly affects post-mining land uses, as the measures/mitigation outlined in impact assessment are used to characterize and evaluate closure plans and outcomes. Thus, the environmental goals of rehabilitation often receive greater attention, funding, and scrutiny than social and economic dimensions.

3) Federal and provincial impact assessment guidelines provide little guidance regarding when, how, and if communities should be engaged in remediation planning. While the IAA 2019 does emphasize that communities should be engaged as early as possible in the IA process (Hunsberger et. al., 2020), there are no details on how this pertains specifically to closure/remediation planning. Our findings imply that generalized guidance to engage throughout the mining life-cycle may be evident at the initial impact assessment stage, but diminishes as closure approaches, with little or no post-closure outcome assessment. Following the research reviewed for the systematic literature review, we recommend that mandating specific engagement requirements for closure and remediation planning from project outset is fundamental. Examples of this can be seen in the independent oversight boards for Diavik and Ekati, with specific reference to closure planning working groups. Researchers in the Australian context also outline possible structures for closure planning governance (Everingham et al., 2018; Getty, 2019; Getty and Morrison-Saunders, 2020; Rosa et al., 2020; Unger and Everingham, 2019). Not only does such an approach support meaningful engagement throughout the lifetime of the mine, it emphasizes the dynamic, long-term, and evolving nature of remediation work (Hunsberger et al., 2020).

4) ‘Social, economic, and environmental’ dimensions are repeatedly referenced throughout mining policy documents and research in terms of sustainable development, but specific criteria for sustainability are typically absent. In particular, this report has found the language and criteria around social impacts and benefits is at best vague. The cumulative and legacy impacts of mining on sustainability are even more rarely incorporated in the current policy landscape (Boerchers et al. 2018, Atlin and Gibson 2017). We recommend that indicators, measures, and concepts for the social dimensions of mining and remediation be clearly articulated during impact assessment, consistently used across the life of each unique project, and considered cumulatively within the broader mining region and legacy of each project. It is essential to begin this process of defining context-specific socio-economic dimensions of closure and remediation at the impact assessment stage so they may be appropriately considered in any discussion of project ‘sustainability’.

5) Methods and metrics to assess the quality of data gathered during public engagement activities, and the conclusions drawn from these, are not clearly articulated in closure plans or research for remediation, nor are there clear directions regarding how the quality of engagement is evaluated for closure planning. To date, independent oversight boards are the best practice to ensure adequate engagement and appropriate synthesis of public findings. Such boards can also play an important role in providing an archive of information and record of engagement on individual projects via accessible public registries.

6) There is a tension between ‘process’ and ‘outcome’ in the policy and practice of impact assessment and remediation planning, where processes (e.g. consultation and collaboration) are emphasized but may amount to little more than ‘box-ticking’, while outcomes (e.g. effectiveness of mitigation measures to prevent negative long and short-term socio-economic impacts) receive scant inclusion or evaluation. We recommend public participation and engagement processes be more critically assessed for quality during impact assessment, and closure and remediation outcomes be included in ongoing post-impact assessment monitoring.

6. Conclusions

Critical literature on impact assessment covers a broad field of disciplines and topics. There is also a growing critical literature on the social impacts of closure of mines and other extractive developments. An integrated approach to impact assessment has long been considered best practice in the field, but in practice, ‘integrating’ closure and remediation planning into impact assessment priorities has been lacking (Getty and Morrison-Saunders, 2020). Case studies and qualitative research on remediation *planning and practice* are sparse, as is the evaluation of the expectations, objectives and monitoring for such remediation projects. Similarly, how remediation is framed, questioned, evaluated, planned for and monitored through impact assessments and the mitigations/requirements created through assessment and licensing processes, are not clearly identified. This lack of clarity makes it almost impossible for communities to hold companies and governments accountable to meaningful closure and remediation planning. This reinforces the tendency to continually ‘put-off’ these decisions until

the mine is nearing closure, and financial and environmental risks begin to pile up. The majority of the critical work needed to connect impact assessment with meaningful and efficient closure and remediation is being led independently by impacted communities, with little support from research institutions or regulators. The lack of community-based academic research and policy reflects the disconnection of closure/remediation/reclamation policy, standards, and practices across Canada (Dance, 2015). With no common ground, expectations or responsibilities for closure clearly set out in impact assessment legislation, or mining policy, communities are left to deal with closure (and its often wrenching impacts) on an ad hoc basis.

Almost all of the literature reviewed for this report emphasizes the importance of clear regulations, guidelines and community-based decision making on closure and remediation being used to direct project planning *from day one*. This applies also to projects that never proceed to full development or complete an impact assessment, as impacts from exploration can also be extensive (Fidler, 2010). Getty and Morrison-Saunders (2020) find that, in Australia, the early integration of IA and mine closure planning aligns with international best practices, reduces costs, improves environmental outcomes, and encourages more robust data collection and cumulative impact assessment. Currently in Canada, public engagement in these processes after impact assessment depends largely on the resources and motivations of the company, case-specific IBAs, or special requirements for community oversight established through regional governance arrangements. While such tools can provide meaningful ways for communities, specifically Indigenous communities, to direct projects and ensure local benefits, these negotiated agreements are often not public knowledge and are not legislatively required. In this context, ensuring community participation in closure and remediation planning is left to the whims of individual companies, rather than required through public policy and guidelines.

Remediation work has the potential to create or secure benefits as different types of work and monitoring are needed on site (Muldoon and Schramm, 2009). Remediation projects also have the potential to extend local employment and procurement benefits, in addition to memorializing the history of the region, and providing important moments of healing for marginalized communities (Baxter, 2015; Sandlos and Keeling, 2016). Without clear regulatory requirements for post-mining land use planning and remediation and a recognition of responsibility for post-mining liabilities (both social and environmental), companies are not motivated to invest resources in these areas. Impact assessments should include an evaluation of the "net contribution to sustainability of proposed mines to ensure that the lure of temporary positive economic gains does not lead to neglect of the long term negative socioeconomic and biophysical effects (Boerchers et al., 2018: 91; Atlin & Gibson, 2017) . Essentially, these researchers argue for an impact assessment system that evaluates projects based on their ability to provide *net gains* to long term sustainability and community-based goals, rather than focusing only on the significance of negative impacts. A balance between short and long-term benefits must be included in the determination of socio-economic benefits and impacts of closure and remediation during impact assessment. A mine closure and remediation project provides the ultimate test of mitigations mandated during impact assessments and license renewals. If done well, remediation can provide a mechanism to evaluate predictions made, act on lessons learned, contribute to regional understandings of cumulative effects, and secure or reclaim long-term community objectives.

Future research areas

Due to limited time, resources, and experience, we did not complete a full systematic review with extensive inter-coder testing or bibliographic hand searching and cross-referencing. To mitigate some of these constraints, we tightly scoped our search strings and research topic. As we discovered, there is little literature that directly connects impact assessment with remediation. In addition, much of the 'known' literature we collected from previous research work was not reflected in the systematic literature search. This may suggest that search terms and keywords change across time, disciplines and regions, making it difficult to compile all related work. It may also suggest that much of the work that combines discussion on impact assessment, remediation, and community engagement is happening outside of an academic or research-affiliated purview. To extend this review, we would suggest a full review of the bibliographies of the selected papers and inclusion of a grey literature search. While a research protocol was developed for the systematic review (see Appendix B), the guiding questions were open-ended and qualitative themselves, to explore the range of practice in the literature. This exploratory method provided many insights, but future iterations could ask more mechanistic questions, such as those used in the closure policy/plan review.

In line with this more in-depth systematic literature review, we also recommend an in-depth analysis of how individual impact assessment statements connect to the eventual final remediation plans for mines across Canadian jurisdictions. While we focused on mines in Northern Canada since the information for those sites was the most accessible, it would be valuable to dig into similar questions for the provinces.

Our research focused on impact assessment, remediation and community engagement within a *mining* context. Another useful avenue for future research would be to contrast, compare and pull from parallel research on oil developments, urban industrial sites, the closure or remediation of chemical sites and critical literature on community engagement and governance in remediation, reclamation and restoration (Hoover, 2017; Joly, 2017; Voyles, 2015; Westman et al., 2019; Wiebe, 2016). Within the literature reviewed, the use of terms such as perpetuity, legacy, care, utility, stakeholder governance, and ecosystem services points towards a wider range of related issues important for post-closure mining landscapes and communities. Similar ideas are reflected in work on post-industrial landscapes that integrates storytelling, history and heritage, community-based volunteer and monitoring programs (Baeten, 2018; Langhorst and Bolton, 2017; Avango, 2017; Kivinen, 2017; Cater and Keeling 2013). These perspectives have the potential to offer creative solutions to remediation planning.

7. Knowledge mobilization activities

The preparation of this report did not directly engage community members, stakeholder groups, or policy users. However, during the initial planning and application stages, we reached out to three independent monitoring agencies/oversight boards in the Northwest Territories to gauge interest and feedback on the proposed topic. Ben Nind, executive director of the Giant Mine Oversight Board in Yellowknife, joined the project as the designated "policy user" for the Knowledge Synthesis project, although he was unable to attend the cancelled IAAC forum. We also drew on our long experience and numerous contacts through research activities related to

mining and remediation. These connections also guided the emphasis in parts of this report (particularly Section 4) on issues related to closure, remediation, and impact assessment in Northern Canada.

Due to the upheaval associated with the global coronavirus pandemic, the timing of specific knowledge mobilization activities remain somewhat uncertain. However, in the coming year we intend to follow through with the research communication strategy outlined in the Knowledge Synthesis knowledge mobilization plan, including:

1. Distribution of the report through research partners and collaborators, particularly in the North. Our team has extensive, long-term research collaborations in Northern communities across Canada, in particular, ongoing research projects in Yukon, the Northwest Territories, and Nunavik as part of the NSERC-Towards Environmentally Responsible Resource Extraction Network (TERRE-NET). Through this project, team members work directly with Northern Indigenous communities and organizations, federal and territorial bodies, and in some cases mining and consulting companies, with whom we will share the report and solicit feedback.
2. Through our TERRE-NET partners, our report will reach a large network of leading scientific experts in mine remediation and waste management, as well as partner organizations including Crown-Indigenous Relations and Northern Affairs Canada and various industry actors. When feasible, we will present results at the TERRE-NET Annual General Meeting and make a summary version of the Knowledge Synthesis report available via the network website (terre-net.ca).
3. We will distribute the report to intergovernmental and civil society groups concerned with various aspects of mining and the environment, including: the National Orphaned and Abandoned Mines Initiative (NOAMI); MiningWatch Canada; the BC MEND-ML/ARD Workshop; and others as they are identified. We will also present findings at the next Northern Latitudes Mining Reclamation Workshop (date tbd). This will allow our report to reach civil society and regulators, particularly in jurisdictions outside the North.
4. The findings of this report will inform the creation of a Community Mine Remediation Handbook or toolkit under development by our TERRE-NET team, to be released in early 2022. These resources will be designed to help communities around Canada and beyond navigate the complex legal, technical, and socio-economic issues related to mine remediation. This handbook will be based on similar publications including the Gordon Foundation's IBA Community Toolkit and the ReSDA Mobile Workers' Guide.
5. Finally, this research will receive scholarly review and dissemination in theses produced by student members of this project, and projected scholarly articles reporting the results of both the systematic literature review and the closure plan review.

8. Bibliography

Agnico (2014) *Meadowbank closure plan*.

Agnico (2015) *Meliadine Preliminary Closure and Reclamation Plan*.

Alderson K, Gilbride B, Bundock E, et al. (2019) The New Federal Impact Assessment Act. *Fasken*, 28 August. Vancouver, BC. Available at: https://www.fasken.com/en/knowledge/2019/08/the-new-federal-impact-assessment-act/.

Alexco (2018) *Reclamation and Closure Plan: Keno District Mine Operations*.

Atlin C and Gibson R (2017) Lasting regional gains from non-renewable resource extraction: The role of sustainability-based cumulative effects assessment and regional planning for mining development in Canada. *Extractive Industries and Society* 4(1). Elsevier Ltd.: 36–52. DOI: 10.1016/j.exis.2017.01.005.

Baeten J (2018) Contested Landscapes Of Displacement : Oliver Iron and Minnesota ' s Hibbing District. 7(1): 52–73.

Baffinland Iron Mines (2018) *Mary River Interim Closure and Reclamation Plan*.

Bainton Nicholas and Holcombe S (2018) A critical review of the social aspects of mine closure. *Resources Policy* 59(September). Elsevier Ltd: 468–478. DOI: 10.1016/j.resourpol.2018.08.020.

Bainton Nick and Holcombe S (2018) *The Social Aspects of Mine Closure: A Global Literature Review*. Brisbane, Australia.

Baxter H (2015) *Framework for Remediation of Rivers Impacted by Legacy Metal Mine Pollution*. University of Hull.

Beckett C (2017) *Rethinking Remediation: Mine Closure and Community Engagement at the Giant Mine, Yellowknife, Northwest Territories, Canada*. Memorial University of Newfoundland.

Beckett C and Keeling A (2019) Rethinking remediation: mine reclamation, environmental justice, and relations of care. *Local Environment* 24(3). Taylor & Francis: 216–230. DOI: 10.1080/13549839.2018.1557127.

Blake (2019) De Beers defends Snap Lake mine closure and reclamation plan. *CBC News North*. November 27.

Boerchers M, Sinclair AJ, Gibson RB, et al. (2018) "Sustainability is finding the next mine": The complicated relationships among legacies, sustainability, and EA. *Environmental Impact Assessment Review* 71(June 2017). Elsevier: 84–93. DOI: 10.1016/j.eiar.2018.01.002.

Bowes-Lyon L-M, Richards JP and McGee TM (2009) Socio-Economic Impacts of the Nanisivik and Polaris Mines, Nunavut, Canada. In: Richards JP (ed.) *Mining, Society, and a Sustainable World*. Berlin: Springer, pp. 371–396. DOI: 10.1007/978-3-642-01103-0.

Bowles (1992) Single-Industry Resource Communities in Canada's North. In: Hay, David A

Basran, Gurchan S (eds) *Rural Sociology in Canada*. Toronto: Oxford University Press, pp. 63-83

Bradbury J (1984) The impact of industrial cycles in the mining sector: the case of the Québec-Labrador region in Canada. *International Journal of Urban and Regional Research* 8(3): 311–331. DOI: 10.1111/j.1468-2427.1984.tb00613.x.

Bradbury JH and St-Martin I (1983) Winding Down in a Quebec Mining Town: a Case Study of Schefferville. *Canadian Geographer / Le Géographe canadien* 27(2): 128–144. DOI: 10.1111/j.1541-0064.1983.tb01468.x.

Buell M (2006) *Resource Extraction Development and Well-Being in the North: A Scan of the Unique Challenges of Development in Inuit Communities*. Ajummginiq Centre, National Aboriginal Health Organization.

Canadian Royalties (2016) *Project Nunavik Nickel: Plan de Restauration Pour Le Site de La Fosse Puimajuq Du Projet Minier Nunavik Nickel*.

Canadian Royalties (2019a) *Project Nunavik Nickel: Plan de Restauration Pour Le Site de La Fosse Expo Du Projet Minier Nunavik Nickel*.

Canadian Royalties (2019b) *Project Nunavik Nickel: Plan de Restauration Pour Le Site Minier Allammaq Du Projet Minier Nunavik Nickel*.

Chaloping-March M (2017) *Social Terrains of Mine Closure in the Philippines*. Taylor & Francis.

Claudia J, Rosa S, Morrison-saunders A, et al. (2020) Planning mine restoration through ecosystem services to enhance community engagement and deliver social benefits. DOI: 10.1111/rec.13162.

Cohen T and Central E (2017) Bringing Country Back? Indigenous Aspirations and Ecological Values in Australian Mine-Site Rehabilitation. In: Jalbert K, Willow A, Casagrande D, et al. (eds) *ExtrACTION: Impacts, Engagements and Alternative Futures*. New York: Routledge, pp. 137–150.

Cooke A, Smith D and Booth A (2012) Beyond PICO: The SPIDER tool for qualitative evidence synthesis. *Qualitative Health Research* 22(10): 1435–1443. DOI: 10.1177/1049732312452938.

Cowan WR, Mackasey WO and Robertson JG a. (2010) *The policy framework in Canada for mine closure and*

management of long-term liabilities: a guidance document.
Dance A (2015) Northern reclamation in Canada: Contemporary policy and practice for new and legacy mines. *41 The Northern Review* 41(2015): 41–80.
De Beers (2019) *Snap Lake Mine: Final Closure and Reclamation Plan*.
Devlin J and Tubino DI (2012) Contention, participation, and mobilization in environmental assessment follow-up: The itabira experience. *Sustainability: Science, Practice, and Policy* 8(1). ProQuest: 106–115. DOI: 10.1080/15487733.2012.11908089.
Diavik Diamond Mines (2017) *Diavik Closure and Reclamation Plan – Version 4.0*.
Doelle M and Sinclair AJ (2019) The new IAA in Canada: From revolutionary thoughts to reality. *Environmental Impact Assessment Review* 79(July). DOI: 10.1016/j.eiar.2019.106292.
Dominion Diamond Mines (2018) *Ekati Mine Interim Closure and Reclamation Plan*.
Eckert LE, Claxton NX, Owens C, et al. (2020) Indigenous knowledge and federal environmental assessments in Canada : applying past lessons to the 2019 impact assessment act. *FACETS* 5: 67–90. DOI: 10.1139/facets-2019-0039.
Everingham J-A, Rolfe J, Lechner AM, et al. (2018) A proposal for engaging a stakeholder panel in planning post-mining land uses in Australia's coal-rich tropical savannahs. *Land Use Policy* 79(December 2017). Elsevier: 397–406. DOI: 10.1016/j.landusepol.2018.08.038.
Faircheallaigh CO and Lawrence R (2019) Mine closure and the Aboriginal estate. *Australian Aboriginal Studies* 1: 65–82.
Fidler C (2010) Increasing the sustainability of a resource development: Aboriginal engagement and negotiated agreements. *Environment, Development and Sustainability* 12(2): 233–244. DOI: 10.1007/s10668-009-9191-6.
Freudenburg WR and Wilson LJ (2002) Mining the data: Analyzing the economic implications of mining for nonmetropolitan regions. *Sociological Inquiry* 72(4): 549–575. DOI: 10.1111/1475-682X.00034.
Galbraith L, Bradshaw B and Rutherford MB (2007) Towards a new supraregulatory approach to environmental assessment in Northern Canada. *Impact Assessment and Project Appraisal* 25(1): 27–41. DOI: 10.3152/146155107X190596.
Getty R (2019) Does the integration of environmental impact assessment and mine closure planning deliver effective mine closure plans in Western Australia ? *Mine Closure Conference 2019*: 817–832.
Getty R and Morrison-Saunders A (2020) Evaluating the effectiveness of integrating the environmental impact assessment and mine closure planning processes. *Environmental Impact Assessment Review* 82. DOI: 10.1016/j.eiar.2020.106366.
Gibson RB, Hassan S, Holtz S, Tansey J and Whitelaw, G (2005) *Sustainability Assessment: Criteria, Process and Applications*. London: Earthscan.
Gibson G, Hoogeveen D, MacDonald A, et al. (2018) *Impact Assessment in the Arctic Emerging Practices of Indigenous-Led Review Impact Assessment in the Arctic.*
Government of the NWT (1998) *Mackenzie Valley Resource Management Act*.
Government of Yukon (2003) *Yukon Environmental and Socio-Economic Assessment Act*. c. 7.
Government of Yukon (2006) *Yukon Mine Site Reclamation and Closure Policy*. Whitehorse, YK.
Grant and Booth (2009) A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal* 26(2): 91-108.
Hoadley EM and Limpitlaw D (2008) Preparation for Closure — Community Engagement and Readiness Starting with Exploration. In: (ed. PJD A.B. Fourie, M. Tibbett, I.M. Weiersbye), 2008, Mine Closure Conference, pp. 845–851. Australian Centre for Geomechanics.
Hockley DE and Hockley LC (2015) Some Histories of Mine Closure, the Idea. In: A. B. Fourie, M. Tibbett, L. Sawatsky, and D. van Zyl (eds) *Mine Closure Conference, 1-3 June, 2015, Vancouver Canada*. Perth: Australian Centre for Geomechanics, pp. 797–804.
Hoover E (2017) Introduction: Environmental Justice, Political Ecology and the Three Bodies of a Mohawk Community. Minneapolis: University of Minnesota Press, pp. 1–28.
Hudson-Edwards KA, Jamieson HE and Lottermoser BG (2011) Mine wastes: Past, present, future. *Elements* 7(6): 375–380. DOI: 10.2113/gselements.7.6.375.
Hunsberger CA, Gibson RB and Wismer SK (2005) Citizen involvement in sustainability-centred environmental assessment follow-up. *Environmental Impact Assessment Review* 25(6): 609-627.
Hunsberger CA, Froese S, Hoberg,G (2020) Toward 'good process' in regulatory reviews: Is Canada's new system any better than the old? *Environmental Impact Assessment Review* 82.
Impact Assessment Act c. 28, s. 1 (2019) Canada.
Impact Assessment Agency of Canada (2019) *Tailored Impact Statement Guidelines Template for Designated*

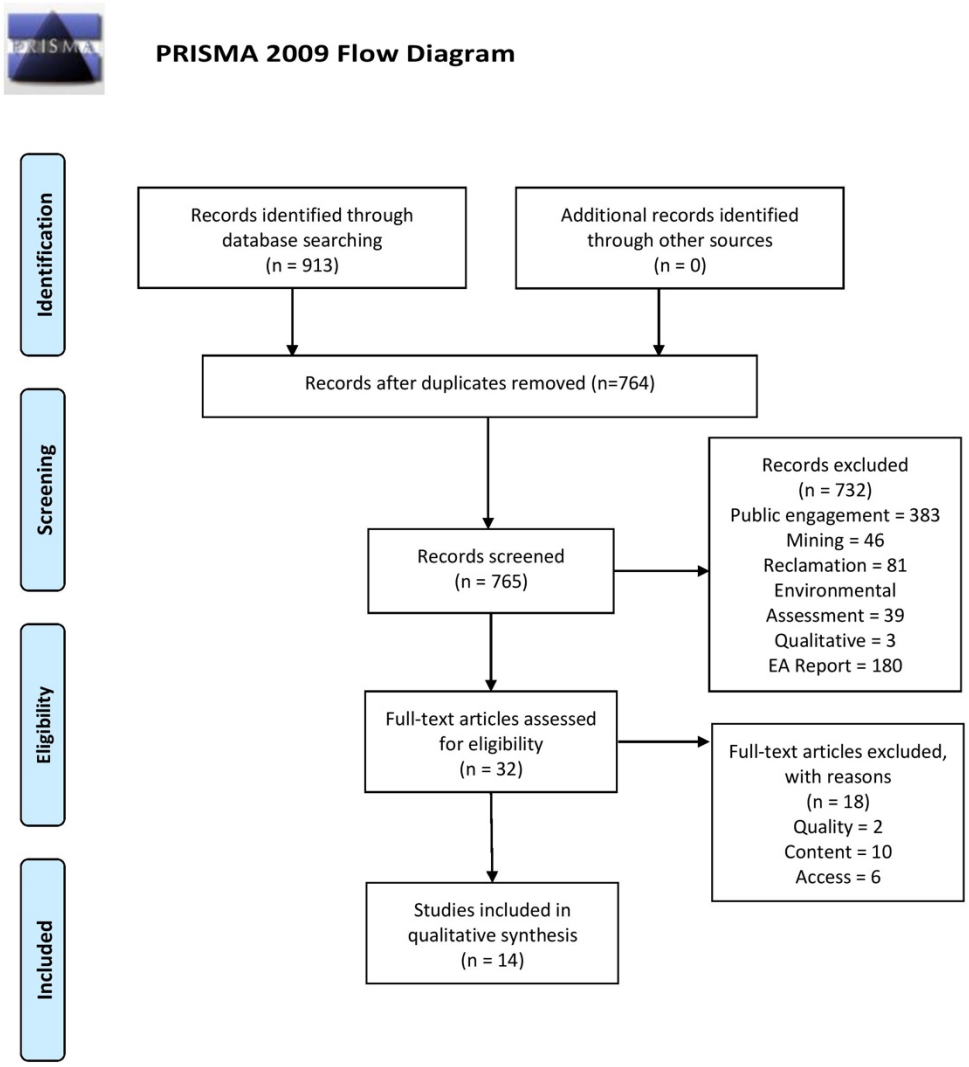
Projects Subject to the Impact Assessment Act.
INAC (2002a) *Mine Site Reclamation Policy for Nunavut*.
INAC (2002b) *Mine Site Reclamation Policy for the Northwest Territories*.
International Council on Mining and Metals (2019) *Integrated Mine Closure: Good Practice Guide*. Available at: http://www.icmm.com/website/publications/pdfs/closure/190107_good_practice_guide_web.pdf#page=37.
Joly T (2017) *Making Productive Land : Utility , encounter , and oil sands reclamation in northeastern Alberta , Canada*. University of Aberdeen.
Kabir SMZ, Rabbi F and Chowdhury MB (2015) Mine Closure Planning and Practice in Canada and Australia: A Comparative Review. *World Review of Business Research* 5(3): 1–22.
Karakaya E and Nuur C (2018) Social sciences and the mining sector: Some insights into recent research trends. *Resources Policy* 58(May). Elsevier Ltd: 257–267. DOI: 10.1016/j.resourpol.2018.05.014.
Keeling A and Sandlos J (2009) Environmental Justice Goes Underground? Historical Notes from Canada's Northern Mining Frontier. *Environmental Justice* 2(3): 117–125. DOI: 10.1089/env.2009.0009.
Keeling A (2010) 'Born in an atomic test tube': landscapes of cyclonic development at Uranium City, Saskatchewan. *Canadian Geographer* 54(2): 228-252.
Keeling A and Sandlos J (2017) Ghost Towns and Zombie Mines: The historical dimensions of mine abandonment, reclamation, and redevelopment in the Canadian North. In: Bocking S and Martin B (eds) *Ice Blink: Navigating Northern Environmental History*. Calgary: University of Calgary Press, pp. 377–420.
Kendall G (1992) Mine Closures and Worker Adjustment: The Case of Pine Point. In Neil, C, Tykkalainen, M Bradbury, J (eds) *Coping with Closure: An international comparison of mine town experiences*. London: Routledge:131-150.
KEQC (1998) *Information and Public Consultation Procedure*. Kuujjuaq, QC.
KEQC (2020) *Kativik Environmental Quality Commission*. https://www.keqc-cqek.ca/en/.
Laurence D (2006) Optimisation of the mine closure process. *Journal of Cleaner Production* 14(3–4): 285–298. DOI: 10.1016/j.jclepro.2004.04.011.
Lottermoser BG (2010) *Mine Wastes: Characterization, Treatment and Environmental Impacts*. *Mine Wastes (Third Edition): Characterization, Treatment and Environmental Impacts*. DOI: 10.1007/978-3-642-12419-8.
MacKasey WO (2000) Abandoned mines in Canada. *MiningWatch Canada.*
Mackenzie Valley Environmental Impact Review Board (2004) *Environmental Impact Assessment Guidelines*. Yellowknife, NWT.
Mackenzie Valley Environmental Impact Review Board (2005) *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment*. Yellowknife, NWT.
Mackenzie Valley Environmental Impact Review Board (2007) *Socio-Economic Impact Assessment Guidelines*. Yellowknife, NWT.
Mackenzie Valley Land and Water Board (2013) *Guidelines for the closure and reclamation of advanced mineral exploration and mine sites inthe Northwest Territories*.
Macura B, Haddaway N, Lesser P, et al. (2019) *Mapping the predicted and potential impacts of metal regions using environmental and social impact assessments : a systematic map protocol 2 mining and its mitigation measures in Arctic and boreal 19 Abstract*.
Makivik Corporation (2014) *Nunavik Inuit Mining Policy*.
Mawhiney A (1999) *Boom Town Blues: Elliot Lake: Collapse and Revival in a Single-Industry Community*. Toronto: Dundurn Press.
McAllister M and Alexander C (1997) *A Stake in the Future: Redefining the Canadian Mineral Industry*. Vancouver: UBC Press.
MERN (2017) *Guidelines for Preparing Mine Closure Plans in Québec*. Québec, QC.
MERN (2017b) *Guidelines of the Ministère de l'Énergie et Des Ressources Naturelles in the Area of Social Acceptability*. Québec, QC.
MERN (2019) *Aboriginal Community Consultation Policy Specific to the Mining Sector*.
Mining Act M-13.1 (2019) Québec, QC.
Mining Association of Canada (2008) *Towards Sustainable Mining Mine Closure Framework*.
Moher D, Liberati A, Tetzlaff J, et al. (2009) Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine* 6(7). DOI: 10.1371/journal.pmed.1000097.
Morrison-Saunders A (2019) The action is where the social is! The ecosystem services concept and other ideas for enhancing stakeholder engagement in integrated mine closure planning. *Proceedings of the 13th International Conference on Mine Closure* (Icmm): 5–18. DOI: 10.36487/acg_rep/1915_02_morrison-saunders.
Morrison-Saunders A and Sánchez LE (2018) Improving Stakeholder Engagement in Closure Planning through an

Ecosystem Improving Stakeholder Engagement in Closure Planning through an Ecosystem Services Approach. In: *Planning for Closure 2018: 2nd International Congress on Planning for Closure of Mining Operations*, 2018.
Morrison-Saunders A, McHenry MP, Rita Sequeira A, et al. (2016) Integrating mine closure planning with environmental impact assessment: challenges and opportunities drawn from African and Australian practice. *Impact Assessment and Project Appraisal* 34(2): 117–128. DOI: 10.1080/14615517.2016.1176407.
Muir BR (2018) Closing the regulatory gap: revisions to the conventional practice of ex-post plans for EIAs to protect the valued components of Aboriginal peoples in Canada. *Impact Assessment and Project Appraisal* 36(2). Taylor & Francis: 186–203. DOI: 10.1080/14615517.2017.1390873.
Muldoon J and Schramm LL (2009) Gunnar uranium mine environmental remediation - Northern saskatchewan. In: *Proceedings of the International Conference on Radioactive Waste Management and Environmental Remediation, ICEM*, 2009, pp. 621–632. American Society of Mechanical Engineers (ASME). DOI: 10.1115/ICEM2009-16102.
Newfoundland and Labrador (2003) *Environmental Assessment Regulations*. Environmental Protection Act O.C. 2003-220.
Newfoundland and Labrador (2010) *Guidebook to Exploration, Development and Mining in Newfoundland and Labrador*.
Newfoundland and Labrador (2018a) *Environmental Protection Act*. Chapter E-14.2.
Newfoundland and Labrador (2018b) *Mineral Act*. Chapter M-12.
NOAMI (2003) Lessons Learned: On Community Involvement in the Remediation of Orphaned and Abandoned Mines, Case Studies and Analysis. (February): 98.
Noble B and Bronson J (2005) Integrating human health into environmental impact assessment: Case studies of Canada's northern mining resource sector. *Arctic* 58(4): 395-405
Noble B and Hanna K (2015) Environmental assessment in the Arctic: A gap analysis and research agenda. *Arctic* 68(3): 341-355.
Nunavut (2013) *Nunavut Planning and Project Assessment Act*. c. 14, s. 2.
Nunavut Impact Review Board (2020a) *NIRB Technical Guide Series: Proponent's Guide*. Cambridge Bay, NU.
Nunavut Impact Review Board (2020b) *Nunavut Impact Review Board*. https://www.nirb.ca/.
Nunavut Impact Review Board and Nunavut Water Board (2012) *Detailed Coordinated Process Framework for NIRD Reviews and NWB Licensing*.
O'Faircheallaigh C (2017) Shaping projects, shaping impacts: community-controlled impact assessments and negotiated agreements. *Third World Quarterly* 38(5). Routledge: 1181–1197. DOI: 10.1080/01436597.2017.1279539.
Office of the Auditor General of Canada (2002) *Abandoned Mines in the North: Report of the Commissioner of the Environment and Sustainable Development to the House of Commons (Chapter 3)*. *Report of the Commissioner of the Environment and Sustainable Development*.
Palmer L, Gray T and Bell D (2010) Lessons for community-based management approaches to mine water pollution problems: a comparative study of four cases in northeast England. *Local Environment* 15(4): 341–356. DOI: 10.1080/13549831003677696.
Petticrew M and Roberts H (2006) *Systematic Reviews in the Social Sciences: A Practical Guide.* Oxford: Blackwell Publishing Ltd.
Pope, J, Bond, A, Hugé, J, Morrison-Saunders, A (2017) Reconceptualising sustainability assessment. *Environmental Impact Assessment Review* 62: 205-215.
Québec Government (1985) *James Bay and Northern Québec Agreement Section 23, Schedule 3*. CQLR c C-67.
Québec Government (2019) *Regulation Respecting the Environmental and Social Impact Assessment and Review Procedure Applicable to the Territory of James Bay and Northern Québec*. Environmental Quality Act chapter Q-2, s. 205.
Raglan Mine (2019) *Raglan Mine Closure Plan*.
Rixen A and Blangy S (2016) Life after Meadowbank: Exploring gold mine closure scenarios with the residents of Qamini'tuaq (Baker Lake), Nunavut. *Extractive Industries and Society* 3(2). Elsevier Ltd.: 297–312. DOI: 10.1016/j.exis.2015.09.003.
Rodon T and Lévesque F (2015) Understanding the Social and Economic Impacts of Mining Development in Inuit Communities: Experiences with Past and Present Mines in Inuit Nunangat - ProQuest. *Northern Review* 41(2015): 13–39.
Rosa JCS, Geneletti D, Morrison-Saunders A, et al. (2020) To what extent can mine rehabilitation restore recreational use of forest land? Learning from 50 years of practice in southwest Australia. *Land Use Policy*

90(March 2019). Elsevier: 104290. DOI: 10.1016/j.landusepol.2019.104290.
Sánchez LE, Silva-Sánchez SS and Neri AC (2014) *Guide for mine closure planning*. *Brazilian Mining Association*.
Sandlos J and Keeling A (2012) Claiming the new north: Development and colonialism at the Pine Point mine, Northwest Territories, Canada. *Environment and History* 18(1): 5–34. DOI: 10.3197/096734012X13225062753543.
Sandlos J and Keeling A (2016) Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada. *Extractive Industries and Society* 3(2). Elsevier Ltd.: 278–287. DOI: 10.1016/j.exis.2015.06.005.
Sandlos J and Keeling A (2017) The Giant Mine's Long Shadow: Arsenic Pollution and Native People in Yellowknife, Northwest Territories. In: Mcneill JR and Vrtis G (eds) *Mining North America: An Environmental History since 1522*. Berkeley, California: University of California Press, pp. 280–310.
Séguin, JM and MM Larivière (2011) *Nunavik Guidebook: Mineral Exploration, Mining Development and the Nunavik Region*. Kuujjuaq, QC.
Skeard J (2015) Come Hell or High Water: Identity and Resilience in a Mining Town. *London Journal of Canadian Studies* 30: 90–109. DOI: 10.14324/111.444.ljcs.2015v30.006.
Spencer L, Ritchie J, Lewis J, et al. (2003) *Quality in Qualitative Evaluation: A framework for assessing research evidence*. London.
Stacey J, Naude A, Hermanus M, et al. (2010) The socio-economic aspects of mine closure and sustainable development-guideline for the socio-economic aspects of closure: Report 2. *Journal of the Southern African Institute of Mining and Metallurgy* 110(7): 395–413.
Suri H and Clarke D (2009) Advancements in research synthesis methods: From a methodologically inclusive perspective. *Review of Educational Research* 79(1): 395–430. DOI: 10.3102/0034654308326349.
Tremblay GA, Hogan CM and Cowan WR (2006) Policy framework in Canada for mine closure and management of long - term liabilities. In: *EnviroMine2011*, 2006, pp. 1–8.
Udofia A, Noble B and Poelzer G (2015) Community engagement in environmental assessment for resource development: benefits, enduring concerns, opportunities for improvement. *The Northern Review* 39: 98-110.
Unger CJ and Everingham J-A (2019) Reliable mine rehabilitation and closure to minimise residual risk. In: *International Association of Impact Assessment*, Brisbane, Australia, 2019, pp. 1–9.
Vale (2016) *Rehabilitation and Closure Plan: Voisey's Bay*.
Vivoda V, Kemp D and Owen J (2019) Regulating the social aspects of mine closure in three Australian states. *Journal of Energy & Natural Resources Law* 00(0). Taylor & Francis: 1–20. DOI: 10.1080/02646811.2019.1608030.
Voyles TB (2015) *Wastelanding : Legacies of Uranium Mining in Navajo Country*. Minneapolis: University of Minnesota Press.
Westman CN, Joly TL and Gross L (2019) *Extracting Home in the Oil Sands*.
Wiebe SM (2016) *Everyday Exposure: Indigenous Mobilization and Environmental Justice in Canada's Chemical Valley*. Vancouver, BC: UBC Press.
Wilkinson J (2014) Potential Effects of Mine Closure. FHW Consulting; Baffinland Iron Mines.
Wilson L (2004) Riding the Resource Roller Coaster: Understanding socioeconomic differences between mining communities. *Rural Sociology* 69(2): 261-281.
Women's Earth Alliance and Native Youth Sexual Health Network (2018) Violence on the Land, Violence on Our Bodies. In: Greenwood M, de Leeuw S, and Lindsay NM (eds) *Determinants of Indigenous Peoples' Health: Beyond the Social*. 2nd ed. Toronto, ON: Canadian Scholars.
Worrall R, Neil D, Brereton D, et al. (2009) Towards a sustainability criteria and indicators framework for legacy mine land. *Journal of Cleaner Production* 17(16). Elsevier Ltd: 1426–1434. DOI: 10.1016/j.jclepro.2009.04.013.
Xavier AM, Veiga MM and Zyl D Van (2015) Introduction and Assessment of a Socio-Economic Mine Closure Framework. *Journal of Management and Sustainability* 5(1): 38–49. DOI: 10.5539/jms.v5n1p38.
Younger PL, Coulton RH and Froggatt EC (2005) The contribution of science to risk-based decision-making: Lessons from the development of full-scale treatment measures for acidic mine waters at Wheal Jane, UK. *Science of the Total Environment* 338(1-2 SPEC. ISS.). Elsevier: 137–154. DOI: 10.1016/j.scitotenv.2004.09.014.

9. Additional Information/Appendices

Appendix A: PRIMSA Flow Chart



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix B: Codebook for full text review

Table 3. Codebook for full-text review.

Codebook category	Questions within category
Descriptive data	
	(1) Author(s)' name(s) (2) Article title (3) Journal or publication (4) Article type: peer-reviewed or grey; journal article, conference paper, thesis/dissertation, report (5) Year of publication (6) Countries discussed in study (7) Type of mine: (8) What is the context of the research project, the assessment, and the key groups involved? (9) Are Indigenous Peoples or communities discussed?
Research design	
	(1) What is the research purpose? (2) What are the details of public involvement in the research project? (3) What are the limitations of this study? (4) What methods were used to gather information for this research? How adequately has the research process been documented? (5) How is the research disseminated? Was the research made available to communities or stakeholders that participated in the study or are referenced in the study?
Research outcomes	
	(1) How is remediation framed in this research/assessment project? (2) What terms/concepts are used and by who? Is remediation a central theme or satellite issue in this assessment project? (3) How is public engagement/participation connected to remediation? Does this research describe an example of successful engagement? (4) What indicators or elements are considered critical for remediation/mine closure planning? How are these mobilized through impact assessment and public engagement/participation processes? How is successful remediation/assessment/engagement defined? (5) What are the key findings from this research? What 'best-practices' for including socioeconomic assessment during mine remediation are suggested? (6) What are the author recommendations from this research? (7) How clear are the links between data, interpretation and conclusions? Are the assumptions, theoretical perspectives, or values that have shaped the form and output of the evaluation clearly stated?

Appendix C: Policies and guidelines used for the closure plan review (Section 4)

Policies and guidelines	Citation	Jurisdiction
Impact Assessment Act (IAA)	(*Impact Assessment Act c. 28, s. 1* 2019)	All provinces
Tailored Impact Statement Guidelines Template for Designated Projects Subject to the *Impact Assessment Act*	(Impact Assessment Agency of Canada 2019)	All provinces
Guidelines for Preparing Mine Closure Plans in Quebec	(MERN 2017a)	Quebec
Guidelines of the Ministere de l'Energie et des Ressources Naturelles in the Area of Social Acceptability	(MERN 2017b)	Quebec
Quebec Mining Act	(*Mining Act M-13.1* 2019)	Quebec
Aboriginal Community Consultation Policy Specific to the Mining Sector	(MERN 2019)	Quebec
Comité d'examen des répercussions sur l'environnement et le milieu social website	(COMEX 2020)	Quebec JBNQA region south of the 55th latitude
Chapter Q-2, r. 25 of the Environmental Quality Act	(Québec 2019)	Quebec JBNQA region
Nunavik Inuit Mining Policy	(Makivik Corporation 2014)	Nunavik
Kativik Environmental Quality Commission website	(KEQC 2020)	Nunavik
Information and Public Consultation Procedure	(KEQC 1998)	Nunavik
Nunavik Guidebook: Mineral Exploration, Mining Development and the Nunavik Region	(Séguin and Larivière 2011)	Nunavik
Section 23 Schedule 3 of the James Bay Northern Quebec Agreement	(Québec 1985)	Nunavik
Newfoundland and Labrador Mineral Act	(Newfoundland and Labrador 2018b)	Newfoundland and Labrador
Newfoundland and Labrador Environmental Protection Act	(Newfoundland and Labrador 2018a)	Newfoundland and Labrador

Guidebook to Exploration, Developing and Mining in Newfoundland and Labrador	(Newfoundland and Labrador 2010)	Newfoundland and Labrador
Newfoundland and Labrador Environmental Assessment Regulations	(Newfoundland and Labrador 2003)	Newfoundland and Labrador
Yukon Mine Site Reclamation and Closure Policy	(Government of Yukon 2006)	Yukon
Yukon Environmental and Socio-economic Assessment Act	(Government of Yukon 2003)	Yukon
Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories	(Mackenzie Valley Land and Water Board 2013)	NWT
Mine Site Reclamation Policy for the Northwest Territories	(INAC 2002b)	NWT
Environmental Impact Assessment Guidelines	(Mackenzie Valley Environmental Impact Review Board 2004)	NWT
Socio-Economic Impact Assessment Guidelines	(Mackenzie Valley Environmental Impact Review Board 2007)	NWT
Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment	(Mackenzie Valley Environmental Impact Review Board 2005)	NWT
Mackenzie Valley Resource Management Act	(Government of the Northwest Territories 1998)	NWT
Mine Site Reclamation Policy for Nunavut	(INAC 2002a)	Nunavut
Nunavut Impact Review Board website	(Nunavut Impact Review Board 2020b)	Nunavut
NIRB Technical Guide Series: Proponent's Guide	(Nunavut Impact Review Board 2020a)	Nunavut
Detailed Coordinated Process Framework for NIRB Review and NWB Licensing	(Nunavut Impact Review Board and Nunavut Water Board 2012)	Nunavut
Nunavut Planning and Project Assessment Act	(Nunavut 2013)	Nunavut