Summary Report on Community Toolkits Addressing Socio-Economic and Health Impacts from Natural Resource Development Relevant to Northern BC

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northern health
the northern way of caring

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1.0   Introduction

Natural resource extraction projects are on the rise in British Columbia (BC) and specifically in Northern BC, with the intention of creating positive impacts on the economy and communities. However, as experience has demonstrated, these projects can also bring negative impacts. Northern BC's economy is heavily impacted by resource extraction including (liquefied) natural oil and gas, forestry, mining and manufacturing.

The BC Oil and Gas Commission (OGC) has approved over 30 shale gas[1] projects in the last decade in northeast BC (BC Ministry of Energy and Mines (MEM), 2012). Coalbed methane[2] is also believed to be available in large quantities around the province and given the abundance of unconventional energy resources, it seems certain that natural gas will contribute significantly to the future of the province's economy (Energy BC, 2012).   BC is also Canada's largest exporter of coal, leading producer of copper and only producer of molybdenum (MEM, 2015).   Given all the natural resource potential that BC and specifically Northern BC possesses, the provincial government has concentrated its efforts on making this sector the motor of economic growth in BC.   BC Premier Clark has promised to ensure that this economic growth benefits British Columbians and the natural resource wealth is used to improve health care and education (BC Ministry of Natural Gas Development, 2014).

Natural resource development can have both positive and negative impacts on communities, especially those communities living close to natural resource projects.

YGT Solutions was contracted by Northern Health to conduct a scoping review of community toolkits, guides and summary articles on the socio-economic and health impacts, best management practices and mitigations for natural resource development projects – mining, energy and forestry – that may be relevant for Northern BC.   This scoping review is intended to inform a larger knowledge synthesis project which will be used to develop a community health support tool for Northern communities being affected by resource development projects. The information provided in this scoping review is based on the documents that were selected for more in-depth review and does not encompass a full literature review of toolkits and possible mitigation strategies and best practices.

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[1] "Shale gas is the next unconventional type of gas likely to see widespread commercial production as the technology for it has been proven successful in the United States. The provincial government has approved "several experimental shale gas schemes." Like the province's tight gas reserves, most of B.C.'s shale gas is found in the province's northeastern corner, closely clustered around Fort Nelson, and another smaller deposit around Fort St. John. Commercial development of these resources has not begun as of March 2010" Retrieved from http://www.energybc.ca/profiles/naturalgas.html

[2] "Coalbed methane consists of 90% to 100% methane and therefore requires less refining than any other fossil fuel in use. Coalbed gas can be found in essentially every coalfield throughout the province. The major estimated reserves are, by size, the Peace River (northeast), Klappan and Groundhog (north Nechako basin), Elk Valley and Crowsnest (southeast corner), Hat Creek (central interior), and Comox and Nanaimo (Vancouver Island)" Retrieved from http://www.energybc.ca/profiles/naturalgas.htmlhttp://www.energybc.ca/profiles/naturalgas.html

1.1   Objective and Purpose

The main objective of this scoping review is to create a report that assesses and summarizes existing community tools available to address community impacts due to natural resource development, where relevant to Northern BC communities. More specifically the objectives of this scoping review are as follows:

- Scan readily available examples of community toolkits, guides, and handbooks and selected summary journal articles that discuss socio-economic and community health impacts and/or suggest best management practices for natural resource development in developed and developing countries.

- Select toolkits, guides and information that are most relevant to Northern BC communities

- Describe the positive and negative socio-economic and health impacts from resource development projects identified in the selected toolkits, guides and information.

- Highlight mitigation strategies and best practices that already exist at the local and international level as identified in the selected toolkits, guides and information.

This survey of existing community toolkits, guides and information addressing socio-economic and health impacts of natural resource development has the purpose of highlighting available information that can be tailored to the Northern BC context.

1.2   Context

Northern British Columbia is experiencing a boom in mining and energy production. This occurs against a backdrop of long-standing dominance by the forestry industry. Metals and minerals as well as coal and oil and gas are found all through our province. According to Energy BC the total GDP in oil and gas and mining grew 80% from 1990 to 2008 and the number of people working in those industries rose 37%.   A recent report from the Canadian Association of Petroleum Producers cited BC as Canada's second largest producer of natural gas and noted that the industry contributed over $1 billion in 2012/2013 for resource development to the BC government and over $5 billion on gas exploration and development during 2012 (Badenhorst et al., 2013).

It is well known that natural resource development causes boom and bust cycles characteristic of this sector. Communities large and small in Northern BC are familiar with these boom and bust cycles.   As production of natural resources grows so does the attention to impacts that these activities bring to people and the environment. Socio-economic and environmental conditions are an important determinant of human health (WHO, 1999; IAIA, 2006). Natural resource development activities can impact the socio-economic status and health of people and their environment. In a 2014 report on health impacts of unconventional natural gas development (UNGD) in the USA, interviewees reported top health issues of concern to be: contamination of groundwater; threats to surface water; quantity of water; water for agriculture and wildlife; air quality; cumulative and transboundary impacts; quality of life changes; public health systems; and the limited capacity of government agencies (Smith Korfmacher et al., 2014). These interviewees also reported the need to better engage the public health

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community in decisions about UNDG, as well as adequacy of regulations and capacity of agencies to monitor and enforce regulations.

2.0 Scoping Review Methodology and Approach

The methodology for this scoping review was prepared in consultation with Northern Health. The scoping review methodology included a scan of literature on community toolkits related to the socio-economic and health impacts of mining, oil and gas, and forestry. The present report emphasizes community toolkits, papers and reports related to mining and oil and gas rather than forestry, given the fact that energy and mining projects are currently at the top of the agenda of the BC government to spur on the economy.

2.1 Search Strategy

The following internet search terms were used to find community toolkits: "toolkit", "guide", "handbook", "guidebook", or "manual", in conjunction with one or more of the following:

> *"socio-economic and health impacts of natural resource development", "health impacts of natural resource development", "impacts of natural resource development", "socio-economic and health impacts of mining", "impacts of mining", "socio-economic impacts of oil and gas", "health impacts of oil and gas", "impacts of oil and gas", "socio-economic impacts of forestry", "health impacts of forestry", "impacts of forestry". For more specific research on toolkits pertaining to Northern BC, the terms "British Columbia", "BC", or "Northern BC" were included.*

The terms "mitigation" or "best practices" were not used in this search but the majority of toolkits include mitigation and recommendations for best practices.

The search tool used for this scoping review was exclusive use of Google and Google Scholar web search of electronic documents.   For instance Google search identified about 54 articles when the following search criteria were used: title "toolkit on socio-economic and health impacts of natural resource development in northern BC"; English language; country Canada; excluded terms: environmental, climate change, tourism, agriculture communications; and range from 1990 to present.   These results included toolkits, articles, reports or simply websites advertising forums or events related to this topic.

2.2 Document Scanning

Two main bodies of literature were scanned: peer-reviewed journal articles (PRJAs) which include scrupulous citations and generally strive to appear unbiased, and gray literature comprising non-peer-reviewed reports, papers, guides and toolkits, usually with poor citations and published by groups who may or may not attempt to avoid bias. Resource development toolkits and guides containing socio-economic and health impacts of natural resource development are gray literature and professional judgement was exercised to screen in only those community toolkits that included socio-economic and/or health impacts or best practices of oil and gas, mining and forestry. All selected literature was scanned briefly to categorise it as not promising, promising, or very promising. Very promising literature was selected for more in-depth review (e.g., section 3.1). Some PRJAs about socio-economic impacts and/or health impacts of

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natural resource development were included in the selected literature, especially those articles containing the terms "BC" or "Northern BC", such as the articles by Shandro and Halseth.

This scoping review included toolkits, guides and documents available in English from developing and developed countries. The scoping review also targeted literature on best practices and mitigation strategies in natural resource development. The BC Environmental Assessment Office's Project Information Centre (e-pic) website was also briefly scanned for case studies in Northern BC (https://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_home.html) . The overall document processing methodology is described in the figure below.
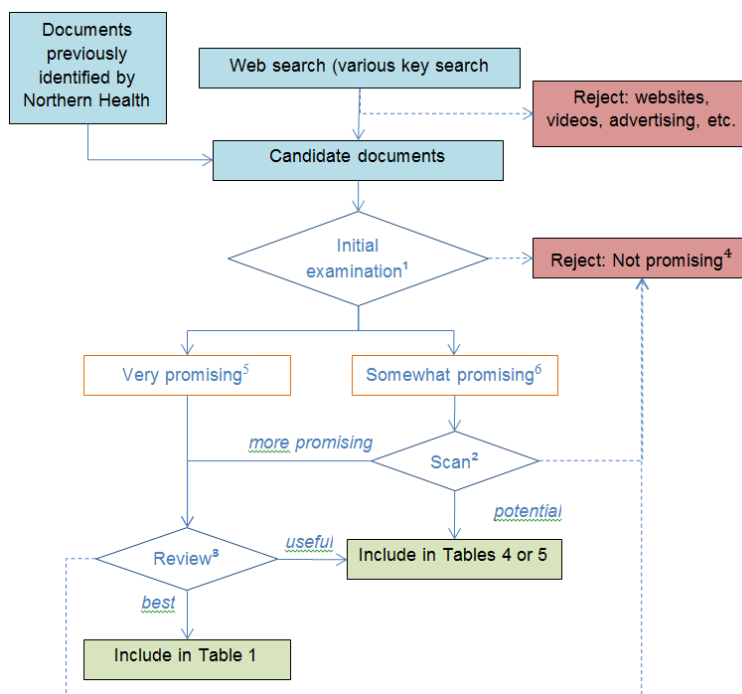
Figure 1. Document identification and screening

[1] *Initial examination:* conducted online, comprising brief scan of Title, Author, Year, Table of Contents, and as necessary, Executive Summary, Conclusions, etc.

[2] *Scan:* conducted online, comprising reading Executive Summary, Conclusions, Introduction, etc. and as necessary, search within document for key terms (best practice, social impact, forestry, etc.) In one case, the document was an annotated bibliography, and the scan comprised reading the entry. The most useful entries were included in Table 5, after verifying their availability.

[3] *Review:* conducted on hardcopy (shorter documents) or online (longer documents), comprising reading sections mentioned in Scan, plus portions of chapters judged most relevant to the development of a Northern BC community toolkit.

[4] *Not promising:* Included documents on natural resource development but which
  - were overly general (theoretical) or overly specific (case studies), or not relevant.
  - did not discuss at least one of social impacts, economic impacts, health impacts, mitigation, or best practices.

[5] *Very promising:* included only documents on natural resource development
  - toolkits containing socio-economic and/or health impacts and/or best practices
  - reports and articles focused on socio-economic and/or health impacts (as opposed to environmental impacts) and/or best practices
  - papers or articles focused on socio-economic and health impacts specific to Northern BC.

[6] *Somewhat promising:* included only documents on natural resource development
  - toolkits and reports mentioning, but not focusing on, socioeconomic, health and/or best practices
  - papers or articles focused on socio-economic and health impacts but not specific to Northern BC.

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The documents scanned and reviewed relied primarily on qualitative, rather than quantitative, methods. Quantitative research on socio-economic, environmental and health impacts tends to relate to assessments of a specific case under consideration, e.g. a particular air shed or a proposed project. These assessment documents proved difficult to generalise into useful guidance suitable to a community toolkit.

The approach taken to evaluate the information available on community toolkits and impacts of natural resource development is a brief scoping review of gray and peer-reviewed community toolkits, guides, handbooks and articles available on socio-economic and health impacts, including cumulative impacts[3]. In Table 5, each publication scanned or reviewed is described by: Title, Developer/Sponsor, Type of Document, Target Audience, and Comments. Current (April 2015) Internet links (URLs) are provided, recognizing that while Internet links are not stable, most publishers of gray literature do not subscribe to the digital object identifier (DOI) system.

2.3 Report Organization

The following sections summarise the literature reviewed, including best practices for mitigation; analyse key findings, controversies, barriers, and information gaps; highlight the relevance to Northern Health; and present conclusions and recommendations for future work.

The following main report section contains the toolkits related to natural resource development projects considered most relevant for the purposes of the present report. If the toolkits contained good information on socio-economic and/or health impacts and/or mitigations and/or best practices, the toolkit was included in this table.

Appendices contain additional publications reviewed, in three tables, described as follows:

- Table 4 summarizes an excellent annotated bibliography prepared by the National Aboriginal Health Organization (NAHO, 2008). The source documents were only consulted where necessary to confirm the report contents. This table was included for its special focus on the health impacts on Northern communities, although most projects are in the territories.

- Table 5 is a complete list of literature including toolkits, studies, papers and reports related to the topic of socio-economic and health impacts, mitigations and best practices of natural resource development on communities. This table contains literature from Table 1 and literature considered worthy of review in the present study. Most of these reports were compiled by Northern Health prior to the start of the present study. Though less relevant to the present work than those in Table 1, they may provide important information on other aspects of community and health impacts.

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[3] BC Environmental Assessment Office (EAO) defines 'cumulative impacts' to include: likely impacts from a project, combined with the impacts from prior development, existing activities and, reasonably foreseeable future development. (EAO, 2011, p26)

Table 6 is a summary of impacts taken from an exemplary toolkit (Government of Canada, 2013), which stands out as the best information found on impacts *by project phase* from exploration to closure. It is a concise tool covering both positive and negative impacts of mining. It could serve as a template for a new toolkit tailored to Northern BC communities.

3.0 Summary of Literature Reviewed

This scoping review considered socio-economic and health impacts themes that have been found in toolkits, papers, reports and journal articles on the mining, oil and gas, and forestry sectors. Most mining toolkits or guides were prepared by either the industry organizations or the government; very few of these toolkits came from civil society. In contrast, in the oil and gas sector there are several toolkits prepared by civil society, government and industry. Although forestry is a key contributor to the BC economy, this scoping review did not identify many community toolkits or guides available. Literature found on forestry in BC concentrates on highlighting lessons learned and good practices rather than socio-economic or health impacts. Only one recent socio-economic impact assessment of forestry (MNP, 2015) was reviewed. Community toolkits and guides related to natural resource development mainly target communities and industry managers, explaining strategies for community involvement and engagement in carrying out resource extraction projects. These community toolkits do not specifically focus on socio-economic or health impacts but rather mention typical impacts and suggest strategies on how to mitigate those impacts and best practices to use in order to promote a positive relationship between industries and their surrounding communities.   They tend to emphasise the *process* of community engagement over its specific outcomes. Beyond toolkits, information on socio-economic and health impacts was also found in papers, reports, journal articles and regulatory environmental impact assessments (EIAs) prepared for specific projects.

Although there are toolkits aimed at Aboriginal communities, this scoping review did not find mining, oil and gas or forestry toolkits targeting Northern BC communities specifically. One toolkit (Halseth et al., 2008) presents community engagement and development strategies in Northern BC communities.

One of the goals of this review was to report on the health impacts of natural resource development in Northern BC. A search for literature on health impact assessment in Northern BC yielded little information.

3.1 Socio-Economic, Environmental and Health Impacts of Natural Resource Development

A variety of toolkits, guides or handbooks, especially in the mining sector from industry organizations such as International Council for Mining and Metals (ICMM), Government of Canada, and lending institutions such as International Finance Corporation (IFC), as well as toolkits from the oil and gas sector and forestry are included in

Table 1 below, which outlines the content in the best toolkits reviewed by their coverage of the following categories:

- target audience
- project phases
- Social Impacts
- Cultural Impacts

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- economic impacts
- environmental impacts
- Health Concerns
- Tools / Best Practices

Note that mining projects are typically divided into four phases: exploration, development and construction, operation, and final reclamation and closure.   Oil and gas projects typically name the phases: entry/exploration, development, operation/production, and exit.

Table 1. Impact and mitigation coverage map for community toolkits.

Sector		Mining						Oil and Gas					Forestry		General		
Toolkit Author[1] ✓ *Discusses topic*		AMEBC	CRI	Grande	GC	ICMM (2010)	ICMM (2015)	ANSI / API	WCEL	IPIECA	SLDF	OGAP	FORREX	HK&M	IFC	MVEIRB	Shandro
Target Audience	Aboriginal communities in developed countries	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓			✓	✓
	Indigenous communities in developing countries					✓	✓								✓		
	Industry/operators	✓			✓	✓	✓	✓	✓	✓					✓	✓	✓
	All communities	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Government							✓		✓				✓	✓	✓	✓
	Civil Society		✓					✓								✓	✓
Sector	Mining	✓	✓	✓	✓	✓	✓								✓	✓	✓
	Oil and gas							✓	✓	✓	✓	✓			✓	✓	✓
	Forestry												✓	✓	✓		✓
Project Phases	**General Phasing**					✓	✓	✓	✓	✓			✓	✓		✓	✓
	Entry Phase (oil and gas)							✓			✓	✓					
	Exploration (feasibility studies)	✓	✓	✓	✓			✓			✓	✓			✓		
	Development (construction)		✓	✓	✓			✓			✓	✓			✓		
	Operation/production		✓	✓	✓			✓				✓			✓		
	Closure (downsizing, exit, reclamation)		✓	✓	✓			✓				✓			✓		
	Post-closure monitoring		✓	✓	✓							✓					
Economic Impacts	**General Economic**							✓	✓					✓			
	Increased employment			✓	✓	✓	✓							✓		✓	
	Influx of money			✓	✓	✓	✓							✓		✓	
	Increased business opportunities				✓	✓	✓										
	Increasing government revenues											✓					
	Increasing community wealth				✓	✓	✓							✓		✓	
	Increase in local purchases				✓	✓								✓		✓	
	Affordability of health services, goods, and services in general					✓											✓
	Increase in house prices, inflation				✓	✓						✓					✓
	Economic displacement and income inequality						✓										

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	Sector	Mining						Oil and Gas					Forestry		General		
	Toolkit Author[1] ✓ Discusses topic	AMEBC	CRI	Grande	GC	ICMM (2010)	ICMM (2015)	ANSI/API	WCEL	IPIECA	SLDF	OGAP	FORREX	HK&M	IFC	MVEIRB	Shandro
Environmental Impacts	General Environmental		✓				✓		✓							✓	
	Land use / soil monitoring	✓		✓	✓	✓		✓	✓	✓	✓	✓					
	Air quality	✓		✓	✓	✓			✓	✓		✓		✓			
	Water quality	✓		✓	✓	✓			✓	✓	✓	✓		✓			
	Wildlife	✓		✓	✓	✓	✓		✓	✓		✓		✓			
	Domestic and livestock										✓	✓					
	Cultural material	✓		✓	✓	✓	✓			✓		✓					
	Noise disturbance			✓					✓		✓	✓					
Social Impacts	General Social						✓	✓	✓							✓	
	Shift/rotational work impact traditional community activities	✓		✓	✓	✓					✓	✓				✓	
	Uncontrolled immigration into Indigenous territories	✓		✓	✓	✓						✓		✓		✓	
	Workers and families separated			✓	✓							✓				✓	
	Community infrastructure, leisure and recreation				✓												
	Opportunities to meet new people			✓	✓												
	Infidelity, divorce and family separation		✓	✓		✓										✓	
	Crime, alcoholism and substance abuse		✓	✓	✓	✓						✓					✓
	Social disturbance / instability among families, friends and neighbours.	✓		✓	✓						✓	✓		✓		✓	✓
	Traffic safety				✓						✓	✓					
	Increase/decrease in population			✓	✓							✓					
	Resettlement				✓	✓						✓					
Cultural Impacts	General Cultural						✓	✓	✓				✓	✓			
	New people challenge traditional ways of life and knowledge	✓		✓	✓	✓	✓										
	Disruption of hunting and fishing time	✓		✓			✓		✓								
	Disturbance in archaeological and historical sites	✓			✓		✓										

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	Toolkit Author[1] (✓ Discusses topic)	Mining						Oil and Gas					Forestry		General		
		AMEBC	CRI	Grande	GC	ICMM (2010)	ICMM (2015)	ANSI/API	WCEL	IPIECA	SLDF	OGAP	FORREX	HK&M	IFC	MVEIRB	Shandro
Health Concerns	General Health		✓				✓	✓			✓			✓			
	Respiratory Infections		✓			✓			✓	✓		✓					
	Vector-related disease		✓			✓				✓							
	Noise (mental and body fatigue, hearing damage, disruption of sleep and anxiety)											✓					
	Sexually transmitted infections					✓				✓						✓	
	Soil and water borne disease		✓			✓			✓	✓							
	Food and nutrition-related issues		✓			✓				✓		✓					
	Accidents and injuries					✓				✓						✓	
	Exposure to potentially hazardous materials		✓			✓		✓		✓	✓	✓					
	Psychosocial - domestic violence, child abuse, stress		✓			✓				✓	✓	✓				✓	✓
	Cultural health practices		✓			✓				✓			✓			✓	
	Health systems infrastructure and capacity		✓			✓				✓	✓	✓				✓	✓
Community Tools / Best Practises	Stakeholder identification		✓			✓	✓	✓	✓					✓	✓		
	Stakeholder analysis / Engagement	✓	✓			✓	✓						✓	✓	✓		✓
	Stakeholder consultation	✓		✓		✓	✓		✓				✓	✓	✓	✓	
	Information Disclosure		✓	✓		✓							✓	✓			✓
	Partnering	✓		✓		✓	✓		✓				✓	✓			✓
	Local Statistics																✓
	Dispute resolution / Grievance Management	✓				✓	✓						✓	✓			
	Participatory project monitoring						✓						✓	✓	✓		✓
	Community development master plan					✓	✓						✓	✓	✓		✓
	Gap analysis					✓	✓										
	Financial valuation					✓	✓						✓	✓	✓	✓	
	Social baseline			✓		✓	✓						✓	✓		✓	
	Social impact assessment	✓				✓	✓						✓			✓	
	Analysis of health impacts					✓											✓
	Cultural heritage assessment	✓					✓						✓				
	Gender impact analysis	✓				✓	✓								✓		
	Institutional competencies assessment					✓	✓						✓	✓			✓
	Community development agreements	✓		✓		✓	✓						✓	✓			
	Community action plans	✓	✓			✓	✓						✓	✓		✓	✓
	Economic diversification					✓							✓			✓	
	Resettlement planning					✓	✓										

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Sector					Mining			Oil and Gas				Forestry		General		
Toolkit Author[1] ✓ Discusses topic	AMEBC	CRI	Grande	GC	ICMM (2010)	ICMM (2015)	ANSI/API	WCEL	IPIECA	SLDF	OGAP	FORREX	HK&M	IFC	MVEIRB	Shandro
Request best available technologies																
Monitoring indicators		✓			✓		✓						✓	✓		✓
Goal attainment evaluation		✓			✓								✓		✓	
Reporting to stakeholders					✓								✓	✓		
Glossary		✓														
Influence diagrams		✓														
Community health assessment		✓										✓			✓	✓

[1] Toolkit author key for Table 1:

Mining:

AMEBC: The Association for Mineral Exploration British Columbia (AME BC) (2014). Aboriginal Engagement Guidebook

CRI: Canary Research Institute (CRI) for Mining, Environment and Health (2009). Mining and Health: A community-centered health assessment toolkit

Grande: Grande (2013).   The Mine Medicine Manual: A community resource

GC: Government of Canada (2013). Exploration and Mining Guide for Aboriginal Communities

ICMM (2010): International Council on Mining and Metals (ICMM) (2010). Good Practice Guidance on Health Impact Assessment

ICMM (2015): International Council on Mining and Metals (ICMM) (2015). Good Practice Guide: Indigenous People and Mining

Oil and Gas:

ANSI/API : American National Standard Institute (ANSI)/American Petroleum Institute (API) (2014). Bulletin 100-3 - Community Engagement Guidelines

IPIECA: International Petroleum Industry Environmental Conservation Association (IPIECA) (2005). A Guide to Health Impact Assessment in the Oil and Gas Industry

OGAP: Oil and Gas Accountability Project (2005). *Oil and Gas at your Door? A Landowner's Guide to Oil and Gas Development*

SLDF: Sierra Legal Defence Fund (SLF) and West Coast Environmental Law (2004). *When the Landsman Comes Knocking – A Toolkit for BC Landowners Living with Oil and Gas*

WCEL: West Coast Environmental Law (2003). *Coalbed Methane: A Citizen's Guide*

Forestry:

Forrex: Forrex (2004). The Community Forestry Guidebook: Tools and Techniques for Communities in British Columbia

HK&M: Halseth G., Killam S., & Manson D. (2008). *Transition Toolkit: Working Framework for a More Resilient Community*

General:

IFC: International Finance Corporation (2007). Stakeholder Engagement: A good practice handbook for companies doing business in emerging markets

MVEIRB : Mackenzie Valley Environmental Impact Review Board (2005). *Issues and Recommendations for Social and Economic Impact Assessment in the Mackenzie Valley*

Shandro: Shandro, J. (2014).   *Summary Report for the Regional Health Forum on Community Health and Extractive Industry Development*

Note: Although the discussion paper of the Mackenzie valley Environmental Review Board (MVEIRB, 2005) and Dr. Shandro's report (Shandro, 2014) are not toolkits per se, they are relevant for Northern BC and considered worthy of inclusion here.

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3.2 Common Themes in Socio-Economic and Health Impacts

Consistent socio-economic and health impacts were identified in the documents reviewed. Potential impacts can be positive or negative, and direct, indirect or cumulative. ICMM (2012) describes "*direct impacts to changes in baseline social conditions that are caused by a specific project-related activity, **indirect impacts** refer to changes in baselines social conditions that are indirectly caused by a specific project-related activity, and **cumulative impacts** are direct and indirect impacts that have the potential to accumulate with those impacts of other existing or proposed projects and activities in the areas of influence*" (p. 137).   For the purpose of this report, we discuss impacts in general. This scoping review is not comprehensive, and additional sources may identify other impacts. The key themes common to several community toolkits, guides, handbooks and papers reviewed in this scan are described below.

3.2.1 Typical Social Impact Themes

The following are themes commonly presented in the toolkits and papers scanned. Notably each of these themes are not stand alone but very much interrelated with one another.

Shift rotational work can create restrictions on family time for workers at natural resource projects, which can lead to family break-up as well as the loss of traditional community activities (GC, 2013).

- Migration patterns. Halseth and Sullivan (2000) present the case of Mackenzie where people tend to move frequently. Given the attraction of high wages during booms of natural resource development projects, people are accustomed to moving and to living in a fluctuating economy (GC, 2013). The influx of workers, mostly men, can strain the existing recreational, health, and social services in communities (Mining Watch Canada, 2001).

- Influx of people in the community.   Although there is an opportunity to meet new people (GC, 2013), learn new cultures, and become more flexible in understanding and accepting people from different backgrounds and cultures, the influx of new people can also create negative impacts on communities (FMC, 2013). Negative impacts include: social dislocation including change to the original community's cultures and lifestyle, increased alcoholism, infidelity and spousal abuse.   NRTEE (2001; MVEIRB, 2005) documented increased alcohol consumption and alcohol-related crime in the community of Fort Liard.

- Social disturbance and instability.   Disputes over job opportunities, implementation of development programs in certain areas but not others, and disagreement about supporting or opposing a given project can cause disruptions, breakdowns, or feelings of alienation between families, neighbours or communities (MVEIRB, 2005).   The trigger for consultation and the influx of people from other areas to local communities can create an environment of disrespect for rights, interests, cultures and beliefs of Aboriginal communities, creating feelings of discrimination and disrespect towards new or existing cultures (AMEBC, 2014).

- **Increase in crime, alcoholism, prostitution, and substance abuse.** These impacts are enabled by the ready availability of money among workers and families.   The Government of Northwest Territories (GNWT) (2014) shows that over the years since the first mine became operational, multiple crime indicators have increased. It is also important to note that these impacts may not be directly attributable to industry.   In fact, improved economic status of individuals, families and communities leads to improved health as described below.

3.2.2 Typical Economic Impacts

- **Increased income level.** While most toolkits highlight the positive impacts of natural resource development in improving nutrition, clothing and the general standard of living, these also recognize negative impacts. Because of well-paying jobs, and investment opportunities from the natural resource development, directly or via the multiplier effect, more money flows into the community, social problems may rise in terms of increase in alcoholism and prostitution, as well as general inflation.

- **Increased community wealth.** Uneven wealth can also create stress among friends and families and neighbours. The sudden increase in income among some families can create distress and mismanagement of income. New income through employment or small business creation may increase inequality.   With the influx of people and money in the community, the demand for housing increases, creating inflated house prices, and low vacancy rates. (Shandro, 2014)

- **Employment.** Opportunities for training and skills development for families and workers are positive.   However, mining jobs can require such highly skilled workers that communities do not have the required skilled workforce. In oil and gas projects, local people seldom gain permanent jobs. WCEL (2003) concluded that CBM had little lasting impact on employment in La Plata County, Colorado.

- **Increase in local purchases.** Local communities can prosper, but personal wealth increases can also create jealousy and favouritism among families, neighbours and businesses (GC, 2013).

3.2.3 Typical Health Impacts

Common themes around health impacts from natural resource extraction projects are listed in Table 1. Health impacts that apply for Northern BC that have been found in this scoping review are study reports from Dr. Shandro (2011, 2014), Fraser Basin Council (2012), and the Mackenzie Valley Environmental Impact Review Board (2005).

- **Respiratory disease.**   A common denominator from extractive industries around the world is dust and smoke. The Canadian Industrial Disease Standards Panel concluded that miners have an increased incidence of lung cancer (Mining Watch Canada, 2001). In Northeast BC in particular, many people are concerned about the health effects of poor air quality. Exposure of workers and residents to diesel combustion can trigger major health risks (Mining Watch Canada, 2001);commonly cited concerns in Northeastern BC (FBC, 2012) included asthma, bronchitis, and cancer.

- **Vector-related disease.** Worldwide, vector-related diseases are still a major cause of mortality and morbidity, led by malaria, schistosomiasis, onchocerciasis, and

others. These existing problems are made worse by habitat creation (e.g., standing water at mines) and increased exposure (e.g., inadequate housing). However, vector-borne diseases are much more prevalent in developing countries, and are not presently a major concern in Northern BC.

- **Soil- and water- borne disease.** As with vector-borne disease, soil- and water-borne diseases are important contributors to the global burden of disease, but have no proven association with industrial development in Northern BC. Concerns about consumption of animals and vegetables from areas impacted by oil and gas were noted in Northeast BC (FBC, 2012).   Concern about groundwater contamination was especially high (ibid.), but this relates to suspected toxic contaminants, not infectious diseases.

- **Sexually transmitted infections (STIs).** Workers in natural resource extractive industries are overwhelmingly male. Families are often reluctant to live in camps or isolated communities lacking cultural infrastructure. This leads to a strong market for prostitution, and the marginalisation of prostitutes can lead to increases in STIs. Binge use of alcohol and drugs can also correlate with unprotected sex and STIs. This theme is worldwide, and applies in Northern BC as much as anywhere.

- **Food and nutrition-related issues.**   Again, food and nutrition issues are very different in developing countries where the malnutrition is common, and Northern BC where over nutrition is more likely. Shandro (2014) identified the need for wellness planning for communities affected by resource extraction, and it seems likely that unhealthy diets correlate significantly with the overabundance of men, the lack of families, the alcohol abuse, and the lack of recreational amenities in camps. Aboriginal groups frequently express concern over the loss and alteration of traditional "country foods".

- **Accidents and injuries.** This health impact is most commonly discussed around workplace accidents, but can also be linked to increased traffic, social problems, drug and alcohol abuse, and family violence. Employers use different approaches to reduce accidents – zero tolerance to three strikes (Shandro, 2014). Because of the nature of the industrial work involving heavy machinery and hazardous materials, injuries are part of their jobs risks. Workers also question the competence level of site first aid staff, and the travel time to hospital in the event of serious jobsite injury (Shandro, 2011).

- **Exposure to potentially hazardous materials.** This is a broad area, and one where community concern greatly exceeds scientific certainty, creating a difficult situation for evidence-based decision making. As with accidents, it is useful to separate workplace exposures from ambient community exposures. The occupational health risks of exposure to hazardous doses of potential toxics at worksites are well-recognised and generally approached through aheirachy of controls. This includes engineering controls, administrative controls, and personal protective equipment to ensure compliance with occupational health exposure regulations. Less easily managed is the chronic, low-level exposure residents and workers experience in the community. This was a major concern raised in Northeast BC (FBC, 2012), including hydrogen sulphide, sulphur dioxide, particulates, fugitive emissions, trace

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contaminants, etc. This concern ties into Shandro's (2014) call for better local statistics.

- **Psychosocial.**   This includes a wide range of health impacts, including stress, family breakdowns, violence, addictions, alcohol and drug abuse, depression, and suicide.   Mental health and addictions issues stand out during boom and bust times (Shandro, 2014). During mine closure, people report increased stress, anxiety, depression and alcoholism (Shandro, 2011). Noise and light pollution were also raised as contributors to psychological distress in Northeast BC (FBC, 2012).

- **Cultural health practices.** This theme relates to the potential loss of Indigenous medicines and techniques due to habitat alteration and changes to traditional ways of life and has been identified as an issue in Northern BC.

- **Health systems infrastructure and capacity.** This theme is related to larger issues around social and community services, municipal and regional infrastructure (FBC, 2012) and adequate housing (Shandro, 2014). Generally, the above health concerns specific to natural resource developments mean that the disease profile in such communities is significantly different than in a typical community. There is greater need for addiction counsellors, mental health expertise, outreach to sex-trade workers, emergency preparedness, and workplace safety (FBC, 2012). Despite these needs, there is often a shortage of medical staff and doctors, exacerbated by underfunding due to budgets set by census rather than actual need (ibid.).

3.2.4 Cumulative Impacts

A theme not emphasised in the highlighted toolkits (Table 1), but very relevant to any discussion of health impacts due to resource development in Northern BC is *cumulative impacts*. Shandro (2014) mentions important issues around transient workers, administrative capacity (both Aboriginal and municipal), emergency response, water, wildlife, flora, crime, and infrastructure. Even in the themes discussed above, it is evident that many health issues are interrelated.

3.3   Recommended Best Practices

Natural resource development projects have positive and negative impacts on people and the environment where they operate. But aiming to avoid impacting negatively is an area where Progress has been achieved in mitigating or minimizing negative impacts on communities and the environment. Tools and strategies have been implemented in order to minimize or fully mitigate the negative impacts on the health of people and their environments. Badenhorst et al. (2013) suggest that a socio-economic impact assessment (SEIA) is an essential tool to identify and evaluate the effects of projects and programs on the health and well-being of people in their communities; ideally, an SEIA would be included as a component of a larger Health Impact Assessment. Although there is still work to do in this aspect of managing the negative impacts, most community toolkits, and reports discuss strategies and recommendations for how negative socio-economic and both direct and indirect health impacts can be minimized.

"Best practices" in the context of the present report (Table 2), include recommendations, suggested practices, and "tools" to engage, involve, and satisfy the community throughout the lifecycle of natural resource development projects.   The table was compiled from selected toolkits that identified best practices in mining, oil

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and gas and forestry. Some of the toolkits are not included in this table to avoid repetition of best practices, or because they were not relevant to Northern BC (e.g., WCEL, 2003).

Table 2. Best practices for improving community relations in natural resource development.

Best Practice	Source
Build and maintain a positive and effective relationship with Aboriginal communities starting from the early stages of the project.	AME BC (2014)
Continue updating the community with activities, programs and citizen involvement.	
Identify a list of Aboriginal communities and ask MEM and Forest, Lands and Natural Resource Operations (FLNRO) which communities should be engaged in the process.	
Build community profiles to better understand their political, cultural, social and economic background prior to engagement.	
Recognize the importance of Elders, their traditional and historical knowledge as well as youth in Aboriginal communities.	
Be aware of overlapping claims to traditional territories and be careful in making exclusive arrangements in the engagement process.	
Document all type of engagement with communities.	
Provide information in formats that can be understood and easy to manage.	
Be respectful of rights and interests asserted by communities.	
Understand the diversity of culture and language, and the difference in communication. Be prepared to answer questions with respect to the company and plans.	
Identifying and exploring expectations of both the community and the explorers and understand the protocols, policies and agreements in place.	
Assist with capacity funding to Aboriginal communities so they can attend meetings related to the project.	
Avoid or mitigate impacts of the project on the Aboriginal communities.	
Respect archaeological and cultural sites.	
Include Traditional Use/Traditional Knowledge to understand the project-related impacts.	
Encourage using collaborative approaches with communities.	
Incorporate training programs, employment and business opportunities available for Aboriginal communities. Employ people from within the Aboriginal communities.	
Gender consideration.	ANSI/API (2014)
Constant communication between operators (companies) and communities through all stages of the oil and gas project from entry to exit. Companies should focus on transparency and dialogue. Open dialogue and communication is crucial during the exploration phase as is aligning expectations.	
Be transparent and give information people need to participate in an informed manner.	
Pre-consult with Indigenous populations and identify priority issues for consultation.	
Negotiate in good faith and find strategic partnerships.	
Trusted representation and shared vision.	Forrex (2004)
Respect for Traditional Knowledge.	
Ensure adequate security is included as part of the Socio-Economic Agreement or the Impact Benefit.	Grande (2013)

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Best Practice	Source
Comply with Government regulations for camps, roads.	GC (2013) ICMM (2012)
Minimize use of area (project footprint).	
Re-vegetate disturbed areas promptly.	
Encourage the creation of support groups or programs to minimize the stress experienced by families.	
Encourage small business development, training and support.	
Develop spill plans and establish fuel management programs.	
Control drainage of water, ensure discharge criteria are met, conduct water quality monitoring, and identify alternative water sources.	
Use environmental baseline work to understand wildlife activity in the area, educate employees and contractors to understand their responsibilities towards wildlife. Establish no hunting/fishing zones.	
Provide workshops on money management, saving of wages, banking, etc.	
Explore possible partnerships and capacity-building for small to medium sized enterprises.	
Assist with development of new economic activities.	
Ensure strategies and actions are supported by impacted communities.	
When implementing responses to issues identified at the community level, Ensure support and participation from Indigenous peoples.	
Monitor activities and outcomes and conduct regular evaluations of local communities concerns.	
Minimize road construction into Indigenous lands.	
Increase social services (re prostitution, alcohol/drug abuse) associated with the arrival of workers from other areas.	
Situate workers' camps some distance from Indigenous communities.	
Comply with Government regulations for camps, roads.	
For resettlement of Indigenous peoples from lands that are traditionally owned, or under customary use, consider alternative project designs in consultation with affected communities and independent experts.	
For disrupted access to culturally significant sites, build roads or other means of access, subject to safety requirements.	
Understand the local context of communities for engaging with Indigenous Peoples.	ICMM (2015)
Engage communities and promote participation and dialogue between stakeholders.	
Involve communities in decision-making.	
Manage workforce and contractor behaviour to avoid mistreatment of Indigenous people.	
Compensate and share project benefits through agreements with communities.	
Protect and enhance the tangible and intangible aspects of cultural heritage.	
Prepare and plan for project closure.	
Establish community engagement and grievance resolution mechanisms.	IFC (2007)
Include participatory monitoring from affected individuals and external monitoring.	
Implement an effective Environmental and Social Management System (ESMS) that involves engagement between industry, its workers, local communities directly affected by the project, and where appropriate other stakeholders. Performance Standard 1.	IFC (2012)
Establish preventive and control measures consistent with good international industry practice (GIIP) - The client (industry) will evaluate the risks and impacts to the health and safety of the affected communities. Performance Standard 4.	
Identify all communities of Indigenous Peoples within the project area of influence who may be affected by the project. Establish and maintain an ongoing relationship with communities based on Informed Consultation and Participation (ICP). Performance Standard 7.	
Establish an early surveillance plan (monitoring) that can capture effects and unanticipated consequences.	IPIECA (2005)

northern health
the northern way of caring

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Best Practice	Source
Define responsibilities among the project participants and host government.	
Analyse local, regional and national health infrastructure.	
Use primary and secondary prevention strategies where local capacity is weak.	
Consider including a system to monitor and assess compliance with the implementation plan to ensure achieving the intended results.	
Allow communities and First Nations to decide whether or not they support seismic exploration.	
Use helicopter drills to eliminate the need for vehicle access routes completely.	
Develop a model lease that identifies specific environmental protection measures that landowner can incorporate in their surface leases.	
Include safer methods for treating and disposing drilling wastes. Lengthy special approval processes discourage companies from adopting safer methods.	WCEL (2003)
Charge a provincial royalty for the gas a company flares. This will provide an economic incentive for companies to minimize the amount of gas it flares.	
Use alternatives to fresh water sources for increasing production rates (e.g., frack with saline or waste water).	
Lower emissions by replacing older compressors with available fuel-efficient models.	
Locate batteries[4] away from sensitive areas and improve inspections to minimize emissions, spills, etc.	

3.4   Recommended Questions

Some of the toolkits reviewed suggest questions that the industry or communities should ask.

Table 3: Recommended questions for industries

Questions to ask/expect	Source
What is the Aboriginal community's experience with explorations and development?	
Are there other companies conducting exploration in the area, and if so, do they have positive relationships with the local communities?	
What are the main concerns for the Aboriginal community?	
What has the Aboriginal community's prior experience of engagement with the mineral exploration industry been like?	AME BC (2014)
What kind of existing systems, protocols or capacity does the Aboriginal community have regarding engagement with explorers?	
What agreements or arrangements between government and the Aboriginal community exist that may be relevant to the area (e.g. ECDAs, SEAs)?	
What is the Aboriginal community's general relationship with government?	
How can the Proponent keep its promises, or predict any event in the life of a mine, when everything about the mine is tied to the vulnerability of the market?	
What will the Proponent agree to do – to be responsible for – should the market fall?	
Will it sign an agreement that account for this?	
At closure:	Grande (2013)
How much damage will be irreparable?	
What sorts of toxins will leach into the lands and waters?	
Will wildlife ever return?	
What will the community be like?	

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[4] Battery – is a structure that is built to separate the gas from oil and water to remove unwanted chemical (WCEL,2003)

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4.0 Analysis

4.1   Key Findings

For the purpose of this scoping review the analysis will be divided into analysis of toolkits and of reports and articles. Fourteen toolkits have been selected for this scoping review for their relevance highlighting socio-economic and health impacts, best practices and mitigation. Six toolkits are related to mining development, five to oil and gas, two to forestry and one to natural resource development in general.

4.1.1 Aboriginal and Indigenous community issues

The following toolkits and reports target Aboriginal[5] and non-Aboriginal communities, mainly in Canada and North America.

Oil and Gas:
1. American National Standard Institute (ANSI)/American Petroleum Institute (API) (2014). Bulletin 100-3 - *Community Engagement Guidelines*
2. International Petroleum Industry Environmental Conservation Association (IPIECA) (2005). *A Guide to Health Impact Assessment in the Oil and Gas Industry*
3. Oil and Gas Accountability Project (2005). *Oil and Gas at your Door? A Landowner's Guide to Oil and Gas Development*
4. Sierra Legal Defence Fund (SLDF) and West Coast Environmental Law (2004). *When the Landsman Comes Knocking – A Toolkit for BC Landowners Living with Oil and Gas*
5. West Coast Environmental Law (2003). *Coalbed Methane: A Citizen's Guide*

Mining:
1. Canary Research Institute (CRI) for Mining, Environment and Health (2009). *Mining and Health: A community-centered health assessment toolkit*
2. Government of Canada (2013). *Exploration and Mining Guide for Aboriginal Communities*
3. Grande (2013) - *The Mine Medicine Manual: A community resource*
4. The Association for Mineral Exploration British Columbia (AME BC) (2014). *Aboriginal Engagement Guidebook*

Forestry:
1. Forrex (2004). *The Community Forestry Guidebook: Tools and Techniques for Communities in British Columbia*
2. Halseth, Killam and Manson (2008). *Transition Toolkit: Working Framework for a More Resilient community*

Natural Resource Development in General:
1. Mackenzie Valley Environmental Impact Review Board (2005). *Issues and Recommendations for Social and Economic Impact Assessment in the Mackenzie Valley*

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[5] In this scoping review the term Aboriginal refers to Native North Americans (Canada and USA), including First Nations, Metis, and Innuit.

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The following **toolkits** target Indigenous[6] people around the world:

Mining:
1. International Council on Mining and Metals (ICMM) (2012). *Community Development Toolkit*
2. International Council on Mining and Metals (ICMM) (2015). *Good Practise Guide: Indigenous People and Mining*

Natural Resource development in General:
1. International Finance Corporation (2007). *Stakeholder Engagement: A good practice handbook for companies doing business in emerging markets*

IPIECA's toolkits and guides (e.g., 2005, others available online) target communities in general.

4.1.2 Oil and Gas sector

Coalbed Methane: A Citizen's Guide (WCEL, 2003) considers socio-economic impacts and there has been interest in developing coalbed methane projects in the region. It focuses on environmental and health impacts that communities in the USA have experienced and can be relevant to BC citizens affected by coalbed methane projects. West Coast Environmental Law has published other community toolkits, but they tend to concentrate on environmental issues. The Oil and Gas Accountability Project (OGAP, 2005) – now Earthworks, a non-profit organization – issued an informative guide for land owners stating the impacts of oil and gas development. This guide contains not only environmental impacts, but also socio-economic and health impacts. Other toolkits have been written by petroleum organizations such as IPIECA (2005) and API (2014). These toolkits show similarities, discussing environmental and health impacts as well as strategies on how to negotiate and approach communities during different project stages – entry, exploration, development, operation/production, and exit where oil and gas projects are being developed. Although most toolkits in the oil and gas tend to center their attention on environmental impacts and mention health impacts in general, the IPIECA (2005) guide on health impact assessments (HIA) states the importance of including HIAs in the Environmental Impact Assessment (EIA) and explains in a more extensive way the health impacts of these projects in on communities.

Some Alberta ranchers report that "flaring is responsible for their asthma, coughs, headaches, aching muscles, shortness of breath and memory loss" (WCEL 2003, p30). People living in counties that are located in proximity to oil and gas activities in the US have also reported health effects including stress related to living in industrial zone may result from contamination of the surface and groundwater, dust and air pollution, soil contamination, noise pollution, light pollution (OGAP, 2005).

In terms of socio-economic impacts, major impacts reported in communities living around oil and gas projects include housing, crime, roads, and dust emissions. While the purchase price and rental of sale and housing increases during the initial stages of these projects, the property value of houses that are located close to oil and gas projects decreases (e.g., 22% in a Colorado, USA study (OGAP, 2005 p. I-44)).

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[6] In this scoping review the term Indigenous refers to Native people in other parts of the world other than the Canada and the USA.

4.1.3 Mining sector

In the mining sector, community toolkits were mostly developed by government and industry organizations. They tend to focus more on the socio-economic impacts and health impacts are mentioned only rarely, except for the ICCM toolkit (2015) which explains the health and wellbeing impacts of mining, such as infectious and chronic diseases, nutritional disorders, physical injuries, and mental health and wellbeing. This ICMM toolkit also discusses the determinants of health as well as recommendations on how to mitigate negative impacts. From an industry perspective, AMEBC (2014) aims to help managers from the industry and Aboriginal communities with strategies and best practices on how to approach and have a positive relationship with communities. Their toolkits tend to dismiss or evade socio-economic and environmental impacts of mining.

The Government of Canada (2013) describes in an instructive and informative way the socio-economic and environmental impacts of mining in all its stages from exploration, construction and development to closure. It also describes how communities can get involved in mining and includes examples of communities' strategies to benefit from the development of mining, such as impact benefit agreements.   Not many mining community toolkits written by civil society were found. The Canary Research Institute (2009) explains health impacts of mining and how communities should prepare to face these impacts. The Fair Mining Collaborative (Grande, 2013) explains the different types of mining, processes and stages of mining, the legal regulations and procedures, and briefly explains the impacts and benefits of mining.

4.1.4 Sector issues

The oil and gas toolkits that were identified during this scoping review tend to put a strong emphasis on environmental and direct health impacts and less on socio-economic impacts.   Hilson (2012) states "the pressure to embrace CSR is far greater in the mining industry than the oil and gas sector" (p 131) . He suggests location (onshore versus offshore), visibility, contact with subsistence groups, and break-even time as key factors encouraging a commitment to CSR. Other reasons why oil and gas companies tend to focus less on socio-economic impacts than the mining industry may include issues related to remote geography, and distribution of benefits and risks.

The few toolkits reviewed from the forestry sector do not devote major attention to socio-economic impacts and less attention to environment than oil and gas and mining. More publications about human rights were found for oil and gas projects than mining.

Socio-economic impacts are discussed more extensively in mining than in oil and gas publications. The reason may be differences in the nature of production between mining and oil and gas industries. Oil and gas wells are dispersed throughout an area, and are small enough to co-exist alongside other land uses such as farming and ranching. In contrast, open pit mining appropriates the entire footprint of the land, making any other land use impossible. In oil and gas, the social impact and economic compensation for allowing the company to drill a well on private property is perceived to affect only that family, not the community at large. Community toolkits targeting oil and gas projects tend to discuss environmental and health impacts more than socio-economic impacts, perhaps because the number of workers employed in oil and gas production is low compared to operation of a mine. In the case of building a pipeline that will transport gas or oil, the impacts will cover a number of communities. Pipelines may be an extreme version of oil and gas, in that socio-economic impacts focus on short-term

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construction, while environmental liabilities occur over decades.   These explanations are speculative. However and there are patterns among community toolkits targeting different natural resource development industries. These differences are striking, and point to the significant challenges in attempting to craft a community toolkit that would encompass a wide breadth of varying industries.

4.1.5 Author bias

Community toolkits designed by industry organizations and governments inevitably tend to highlight positive impacts and smooth over the negative impacts of natural resource development projects. Toolkits by industry organizations or government appear biased in favour of industry.   Conversely, toolkits developed by civil society are more apt to mention and discuss negative socio-economic, environmental and health impacts of natural resource development. An anti-industry bias, ignoring positive benefits, tends to be present in these publications.

The majority of existing community toolkits addressing impacts of natural resource development have been prepared by the industry, mining and oil and gas associations, government or international lending institutions – groups who promote natural resource development – but few toolkits have been published by organizations that have no interest in promoting natural resource development and of those, these are generally biased against industry.

4.1.6 Northern issues

There is one transition toolkit aiming specifically at Northern BC communities by representatives of the Community Development Institute (CDI) from the University of Northern British Columbia (UNBC).   There is also valuable research done by Greg Halseth from CDI at UNBC on resource town sustainability. The annotated bibliography (NAHO, 2005) contains useful information on the health impacts of natural resource development on Northern communities in Canada. This annotated bibliography is summarized in **Table 4**.

4.1.7 Other Reports and Articles

While this scoping review focussed on toolkits, a few articles were also briefly reviewed, especially those related to oil and gas development in BC. Two best practices are highlighted:

- Community engagement and participation - should start at the beginning if not prior to the beginning of the natural resource development project.

- Communication between industry, government and communities is crucial in the success of any project. Lack of communication tends to create or promote speculation around communities.

Three quantitative studies not yet mentioned are Habitat Health Impact Consulting (2012) - a Health Impact Assessment (HIA) of mining activities near Keno City, Yukon; Paredes et al. (2014) on economic effects of shale gas from the Marcellus region in New York; and Brown (2014) also looking at the economic effects of shale gas but over 9 states.   These studies are included in **Table 5**.

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4.2   Highest recommended toolkits

Overall, the five most recommended toolkits for the purposes of informing the development of a toolkit for Northern BC communities planning or undergoing natural resource development projects are:

- **Government of Canada (2013). Exploration and Mining Guide for Aboriginal Communities** This toolkit clearly outlines the different stages of mining, briefly mentions some government regulations, discusses socio-economic and environmental impacts, included suggestions on how communities can get involved and benefit from the wealth of mining, and draws on evidence that mining communities have actually experienced. It is a comprehensive and useful guide.

- **ICMM. (2015). Good Practice Guide: Indigenous Peoples and Mining**. Although this toolkits aims at Indigenous people all over the world that are impacted by mining, it shares similarities with the toolkit by the Government of Canada (2013). It is a complete guide, including the impacts of mining, mitigations and best practices of mining.

- **Campbell, K., Howard, T. (2004). *When the Landman Comes Knocking – A Toolkit for BC Landowners Living with Oil and Gas.*** This toolkit clearly explains the landowner's rights in terms of who is the owner of the surface and subsurface. Although it briefly explains the socio-economic and health impacts of oil and gas projects, it focuses on preparing landowners dealing with oil and gas projects on the process of negotiation.

- **OGAP (2005). *Oil and Gas at your Door? A Landowner's Guide to Oil and Gas Development*.** This toolkit describes and explains all stages of oil and gas development, its socio-economic and health impacts as well as suggestions for mitigations and best practices.

- **Forrex (2004). *The Community Forestry Guidebook: Tools and Techniques for Communities in British Columbia*.** This toolkit focuses on recommendations on how communities can mitigate negative impacts of forestry and how companies should approach communities and form partnerships to work together. It also discusses the importance of developing sound policies.

There is also a variety of peer-reviewed articles with respect to the socio-economic and environmental impacts, boom and bust of natural resource extraction. There seems to be more case studies from oil and gas projects from the USA and Canada than from other developing countries around the world. However, an academic literature review focussing on peer-reviewed journals is outside the scope of the present scoping review.

4.3   Information Gaps

Monitoring is essential to evidence-based decision-making. Data collected on health statistics in Northern BC rural communities, which would be valuable when quantitative research is needed to assess the changes that communities go through when experiencing natural resource development, is unfortunately sparse.   More research needs to be done to find baseline community health data, and existing vital statistics reporting may not be adequate for assessing community health impacts of natural resource developments. Shandro (2014) identifies the need for local health statistics collected in a holistic, community determined and culturally appropriate way. Health Authorities, community partners and industry can play an important role in how the human health data can be collected and monitored. Information captured during

assessments by industry should be shared with communities and authorities. This will strengthen the call for detailed monitoring and reporting of community health statistics for affected communities, far beyond the current reportable illness requirements.

Many environmental assessments (EA) have been conducted by industry through consultants for mining and energy projects in Northern BC. However there is less research on the socio-economic and health impacts of natural resource development in Northern BC by academics, government or civil society. Exceptions include a human health risk assessment (HHRA) for Northeast BC (FBC, 2012) and airshed assessments for Kitimat and Prince Rupert (ESSA et al., 2014) which tried to quantitatively assess impacts to health. However, these studies adopted a narrow toxicological approach to health assessment, as opposed to the broader "social determinants of health" approach more in line with Northern Health's population health approach.

Most research on socio-economic and environmental impacts of natural resource development in Northern BC has been carried out by UNBC. Useful qualitative research on health impacts in Northern BC has been performed by Janis Shandro of the University of British Columbia (Shandro, 2009, 2011, 2014a, 2014b). An instructive quantitative study on health impacts of natural resource development was carried out for Keno City, Yukon, which is a very small community (<30 residents) (Habitat Health Impact Consulting, 2012). Different information and issues could emerge when research is community-driven rather than industry-driven.

Other techniques currently used include traditional use studies, such as socio-economic studies developed by First Nations, as well as consultation activities and interviews with select community representatives.

5.0   Conclusions

A variety of community toolkits and guides of socio-economic impacts of natural resource development have been found and reviewed. Although only one community toolkit aimed specifically at Northern BC communities was found during this review, there are toolkits aiming at communities in developing and developed countries sharing similarities of socio-economic and health impacts. The health impacts of natural resource development are still being explored and information is still ambiguous and limited. Concerns about negative health impacts of natural resource development in Northern BC have recently been studied (Intrinsik, 2014) and there is also information available on health impacts from anecdotal experiences or concerns from communities (FBC, 2012).   HIAs are a tool that that is increasingly gaining importance and recognition. With increasing investment in natural resource development from industry and the interest from the BC government to promote an economy based on resource extraction, stakeholders such as industry, government, communities and civil society are becoming more aware of the socio-economic, environmental and health impacts. New technology currently being used in the development of oil and gas projects – unconventional natural gas development and coalbed methane – have increased community interest and concern about the effects of the extraction of natural resources. Attention is now also being paid to recognize the importance of cumulative impacts of multiple resource development projects in an area.

Toolkits or guides written by the natural resource industry or related organizations concentrate on strategies to approach communities and stakeholders to minimize

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conflict, and highlight the importance and benefits of the development of natural resource extraction projects. These toolkits approach the socio-economic, health and environmental impacts 'softly', avoiding direct discussion of negative impacts. Community toolkits found in the mining industry tend to minimize or ignore health impacts.

The majority of community toolkits aimed at mining communities found in this scoping review on socio-economic, and health impacts have originated from industry or government. In the oil and gas industry, more toolkits are designed by civil society, especially in terms of environmental and health impacts.

The majority of toolkits have a section on best practices and mitigation of negative impacts, given the concerns of communities with respect to socio-economic and health impacts.   Community engagement and communication of information are two themes highlighted as best practices.   Miscommunication or lack of communication between the industry and all people from communities is a factor that has been reported in developing countries (Tamblyn, 2014) as well as developed countries (Halseth, et al., 2014).

Importantly, some identified limitations of this review include maintaining the currency of web-links which is a challenge for any enduring document in an age of rapid internet evolution.   The scope of this review as defined previously in the document is not entirely inclusive, but attempted to capture the topic area in a comprehensive, but rapid manner.   Additionally, it is also worth noting that occupational health of workers in industry is not entirely reflected in this document, and is an important topic that has not been adequately reflected here.

6.0   Recommendations and Next Steps

Communities should be prepared and have the capacity to receive and discuss natural resource development projects and have knowledge about potential direct and indirect health impacts of these projects for their communities. A community toolkit developed and tailored for Northern BC communities would help communities understand the issues, make informed decisions, and advocate on their own behalf.

Health authorities create public health strategies and community partnerships that can contribute to the sustainable socio-economic development of communities and may be in a good position to develop such a toolkit.   This community toolkit should be based on the information contained herein and further assessment of academic and other available literature on the socio-economic and health impacts of natural resource development in Northern BC communities.

More primary research on the cumulative socio-economic, environmental and health impacts of natural resource development on communities in Northern BC, is strongly recommended. The uncertainty about the effects and impacts of natural resource development on the health of people has contributed to social instability[7] in communities affected by mining and energy projects.   It is vital that there is an open and transparent communication and distribution of information between communities,

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[7] As this report is being finalized, we are learning of the death of a protester at a public information session in Dawson Creek regarding a nearby hydroelectric dam (Site C). http://globalnews.ca/news/2116347/rcmp-fatally-shoot-man-in-site-c-open-house-in-dawson-creek/

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government and industry to transform resource wealth into socio-economic and sustainable development in healthy communities.   Clearly documenting empirical changes in population health indicators (overweight, smoking, stress) and outcomes (respiratory diseases, anxiety, heart diseases, STIs, cancer, etc.) before, during and after the development of a natural resource extraction project enables us to design policies and strategies that contribute to a healthy population.

Also, defining evidence based best practices remains important work yet to be done. It would be useful to have consensus on what these best practices entail at a more granular level (e.g. what does "assist with development of new economic activities" or "Recognize the importance of elders" actually mean?), and at what point should industry be mandated to simply exercise best practices up front when we know they help mitigate negative consequences, rather than basing mitigation strategies only when exceedance occur or problems arise.

6.1 Relevance to Northern Health

Oil and gas, mining and forestry companies need to understand the importance of the potential public health impacts of their activities to communities living around their operations. Given the increasing volume of oil and gas and mining projects in Northern BC communities, it is relevant for Northern Health to work in a collaborative way with companies, local government and Aboriginal communities to mitigate the socio-economic and environmental determinants of health and enhance health opportunities in surrounding communities (IPIECA, 2005).   It is in the interest of Northern Health to implement strategies that can minimize the negative socio-economic impacts of natural resource extraction in communities given the consequences that these impacts can have on population health outcomes.   Ensuring that municipalities and Aboriginal communities have adequate knowledge of the impacts of natural resource development and the appropriate tools to advocate on their own behalf can minimize or mitigate the negative impacts on the overall health of the community and maximize the benefits of the resource wealth.   It is also important to encourage industry to use best practises within their natural resource projects.

7.0 Acronyms

AANDC	Aboriginal Affairs and Northern Development Canada	GC	Government of Canada
AME BC	Association for Mineral Exploration British Columbia	GIIP	Good International Industry Practice
		GNWT	Government of Northwest Territories
ANSI	American National Standards Institute	HHRA	Human Health Risk Assessment
API	American Petroleum Institute	HIA	Health Impact Assessment
CBM	Coalbed Methane	IAIA	International Association for Impact Assessments
CDI	Community Development Institute		
CRI	Canadian Research Institute	ICMM	International Council on Mining and Metals
CSR	Corporate Social Responsibility	ICP	Informed Consultation and Participation
EA	Environmental Assessment		
EIA	Environmental Impact Assessment	IFC	International Finance Corporation
ESMS	Environmental and Social Management System	IPIECA	International Petroleum Industry Environmental Conservation Association
FLNRO	(Ministry of) Forest, Lands, and Natural Resource Operations	LNG	Liquefied Natural Gas
		MEM	Ministry of Energy and Mines
FBC	Fraser Basin Council	MVEIRB	Mackenzie Valley Environmental Review Board
FMC	Fair Mining Collaborative	NAHO	National Aboriginal Health Organization

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NRTEE	National Round Table on the Environment and the Economy	SEIA	Socio-Economic Impact Assessment
OGAP	Oil and Gas Accountability Project	STI	Sexually Transmitted Infections
OGC	Oil and Gas Commission	UNBC	University of Northern British Columbia
PRJA	peer-reviewed journal article	UNGDP	Unconventional Natural Gas Development and Production
SLDF	Sierra Legal Defence Fund	WCEL	West Coast Environmental Law

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Appendices

Table 4. Summary of annotated bibliography from Northern Aboriginal Health Organization (NAHO) (2005) focussing on health impacts in the North

Author	Year	Type[1]	Length	Case(s)	Place	Industry[2]				Impacts[3]										BPs*	Link
						Gen	Min	O&G	For	Soc	Cult	Her	Spir	Econ	Gend	Pol	Hlth	Env	Cum		
NAHO	2005	AB	28p	69 publications	Can		●	○													web
Dembosky	2006	Mag	1625w	Pebble	AK		●				●			○							web
NWT	2005	WS	56p	Mackenzie V.	NWT			●		●	●			●			○				web
NWT	2005	WS	42p	Mackenzie V.	NWT			●		●	●			●			○				web
NWT	2005	WS	46p	Mackenzie V.	NWT			●		●	●			●			○				web
Hurst	2007	Mag	1552w	Screech L.	NWT		●				●							○			web
MVEIRB	2007	D	70p	Screech L.	NWT		●				●		●					●			web
Tlingit First Nations	1998	Rep	65p	Tulsequah Chief	BC		●			○	●	○		●			○	●			web
Alternatives North	2007	Rep	49p	Mackenzie V.	NWT			●						●							web
Archibald & Ritter	2001	BkCh	40p	Voisey's Bay, Diavik	Can		●			●				●				●		●	web
Cleghorn	1999	Rep	8827w	six cases	Can		●			○	○		○	○		○	○	○	○	●	web
EMCBC	2001	Rep	36p	several	Can		●			●	●			●			●	●			web
Winfield et al	2002	Rep	140p	BC,ON,QC,YK, NWT	Can		●			●	○			●				○			web
Archibald & Crnkovich	1999	Rep	52p	Voisey's Bay	NL		●							●	●					●	web
Brockman & Argue	1995	Rep	41p	BHP/Diamet	NWT		●			○	○			○	●		○	○	○		web
CCSG Associates	2004	LR	76p	n/a	n/a		●							●			●				web
TIA Ad Hoc Committee	1997	Rep	1899w	Voisey's Bay	NL		●			○	○		○	○	●		○	○	○	●	web
Nunavut	2006	Rep	68p	n/a	NU		●			○	○			○		●	○	○		●	web
Hipwell et al	2002	Rep	57p	n/a	Can		●			○	○	○	○	○	○	●	○	○	○	●	web
Buell	2006	Rep	51p	n/a	Can		●	●		●	○			○			●			●	web
Dale	2005	Rep	170p	n/a	BC			●		●	○			●				○	○	●	web
Gibson & Klinck	2005	PRJ	26p	n/a	NWT		●	○		●	●			●	●	●	●	●			web
Hobart	1984	PRJ	22p	Ft Mc, Coppermine	NWT		●	●		●				○	○		●				web
Hodge	2007	WS	44p	n/a	North		●	●		●				●						●	web
IIED	2002	Rep	34p	n/a	n/a		●			●	○		○	●	○	○	○	●		●	web

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Author	Year	Type¹	Length	Case(s)	Place	Industry²				Impacts³										BPs*	Link
						Gen	Min	O&G	For	Soc	Cult	Her	Spir	Econ	Gend	Pol	Hlth	Env	Cum		
Lapalme	2003	Rep	38p	n/a	n/a		●			●	●		●	●	●		●	●		●	[web]
Paci & Villebrun	2005	PRJ	16p	Denendeh	NWT		●			●	●			●			●	●	●	●	[web]
Pika & Bogoyavlensky	1995	PRJ	14p		Russia			●		●				○	●		●	○			[web]
Remy & MacMahon	2002	Rep	32p	five	Can		●			●	●			●			●	●		●	[web]
Stevenson et al	1999	Rep	317p	Diavik	NWT		●			●	●		●	●	●		●	●	●	●	[web]
Yu	2005	Rep	19p	Mackenzie GP	NWT			●		●				●	●		●			●	[web]

¹ Publication types: AB = annotated bibliography; Mag = non-peer-reviewed magazine; WS = workshop proceedings; D = decision of administrative tribunal; Rep = report; BkCh = book chapter; LR = literature review; PRJ = peer-reviewed journal

² Industries: Gen = general natural resource extractive industry; Min = mining; O&G = oil and gas (hydrocarbon); For = forestry

³ Impacts: Soc = social; Cult = cultural; Her = heritage; Spir = spiritual; Econ = economic; Gend = gender (focus on women); Pol = political; Hlth = health; Env = physical environment; Cum = cumulative

BPs* = recommendations, including best practices; basically, if the author suggested a solution to the impact, it is included under BP. Many reports simply cited Impacts without suggesting solutions

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Table 5. Screened literature

Title	Developer/Sponsor	Type	Target Audience	Location	Comments
A framework for combining social impact assessment and risk assessment	Environmental Impact Assessment Review 43 (2013) 1-8. Mahmoudi H., et al, 2013.	PRJA	Professional	Link	A model combining Social Impact Assessment and Social Risk Assessment forming a new approach called Risk and Social Impact Assessment (RSIA). RSIA expands the capacity of SIA to evaluate and manage the social impacts of risky projects.
A Guide to Social Impact assessment in the oil and gas industry	International Petroleum Industry Environmental Conservation Association (IPIECA)	Guide	Oil and gas industry	Link	
A Healthy, Productive Canada: A Determinant of Health Approach	Senate Subcommittee on Population Health	Guide	Health professionals	Link	-Really good information - Look at Chart 1
Analyzing the Economic Implications of Mining for Nonmetropolitan Regions	Sociological Inquiry, Vol. 72, No. 4, Fall 2002, 549-75	PRJA	Professional	Link	Freudenburg and Wilson 2002
BC Forestry Industry – Economic Impact Study	MNP - LLP Consulting Firm	Report	Industry	Link	- Economics of BC forestry
Boomtowns, Resource Dependence and Socio-economic Well-being	Australian Geographer, Vol. 42, No. 2, pp. 139164, June 2011	PRJA	Professional	Link	Laurie 2011 (attached)
Coalbed Methane: A Citizen Guide	West Coast Environmental Law	Guide	Communities	Link	A practical guide for citizens. Describes a set of recommendations on how to handle coal bed methane projects as well as the impacts of these type of projects in BC.
Community Development Toolkit	International Council on Mining and Metal	Toolkit	Industry, communities, policy makers	Link	A toolkit with tools on community development, relationships, planning, assessments, management and monitoring
Community Engagement Guidelines	ANSI/API	Guide	Stakeholders and operators	Link	Focuses on considerations for stakeholders and industry to best align communities' values and priorities and oil and gas operations. Includes community engagement in the five phases of oil and gas operations
Community Vitality Monitoring Partnership Process – Review 2013	Community Vitality Steering Committee (from Dr. James Irvine)	Report	Stakeholders and operators	Link	- From Dr. James Irvine out of northern Saskatchewan (refer to Sheila's email July 24, 2014)
Comparative Case Study as Social Impact Assessment Possibilities and Limitations for Anticipating Social Change in the North	Social Indicators Research, Vol. 94, No. 3 (Dec., 2009), pp. 483-497	PRJA	Professional	Link	Asselin and Parkins 2009 (attached)
Considerations in Developing Oil and Gas - Industry Best Practises in the North	Environmental Studies Research Fund	Report	Industry	Link	A literature review of best practices of oil and gas products in Northern Canada.

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Title	Developer/Sponsor	Type	Target Audience	Location	Comments
CPP Handbook	Indian and Northern Affairs Canada	Handbook	Aboriginal Communities	Link	Comprehensive community planning and step by step of the entire comprehensive community planning process.
Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets	International Finance Corporation	Handbook	Industry	Link	Information on Cumulative Impact Assessments and the valued environmental and social components (VECs). The major environmental and social challenges people face today are the result of cumulative impacts from activities that are for the most part individually insignificant but have a major impact at the regional or global level.
Energy Boomtowns & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities	NERCRD Rural Development Paper No. 43 January 2009, 63 pp. Prepared by Jeffrey Jacquet	Paper	Professional	Link	
Environmental & Social Review Summary - Banda Gas & Exmar LNG	International Finance Corporation	Report	Industry	Link	Search criteria: Sector: B-Ab-Oil and Gas Production - Provides good examples
Environmental and Health Impacts of Canada's Oil Sands Industry 2010	The Royal Society of Canada	Report	Stakeholders and operators	Link	-Social impacts start around page 197
Environmental and Social Performance Standards	International Finance Corporation	Guide	Industry	Link	- Guidance notes and interpretation note on Small and Medium Enterprises and Environmental and Social Risk Management available on website
Environmental, Health, and Safety General Guidelines	World Bank	Guide	Industry	Link	- Section 3 - Community Health and Safety
Environmental, Health, and Safety Guidelines for Liquid Natural Gas (LNG) Facilities	World Bank	Guide	Industry	Link	
Exploration and Mining Guide for Aboriginal Communities	Government of Canada	Guide	Aboriginal Communities	Link	Studies socio-economic impacts in the four stages of mining
First Nations Communications Toolkit	Indian and Northern Affairs Canada	Toolkit	First Nations Communicators	Link	Includes topics such as communications planning, publications, events and media relations from a First Nations perspective.
Fort McMurray, Wood Buffalo, and the Oil/Tar Sands: Revisiting the Sociology of "Community"	Canadian Journal of Sociology 38(2) 2013	PRJA	Professional	Link	Introduction to special edition; Dorow 2013 (attached)
General Social Risks for Large-Scale Development Projects	J. Shandro	List	Stakeholders and operators	n/a	- List of typical impacts.

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Title	Developer/Sponsor	Type	Target Audience	Location	Comments
Good Practice Guide: Indigenous Peoples and Mining	International Council on Mining and Metals	Guide	Industry	Link	- This guide discusses good practice where mining projects occur. It has two parts. The first part covers themes that companies should be familiar with, community engagement, managing impacts and implementing mitigations strategies, agreements. Part two includes a toolkit for mining companies for practical good practices. Focuses on particular rights, legal requirements and interests of Aboriginal communities
Growth, decline, stability, and disruption: A longitudinal analysis of social well-being in four western rural communities	Rural Sociology 66(3), 2001, pp. 425-450	PRJA	Professional	Link	Smith 2001
Income inequality and population health Correlation and causality	Social Science & Medicine 66 (2008) 1614e1626	PRJA	Professional	Link	- Unable to show causality, because income inequality very stable over time; Babones 2008 (attached)
Income inequality and population health: A review and explanation of the evidence	Social Science & Medicine 62 (2006) 1768-1784	PRJA	Professional	Link	- Classic paper; Wilkinson and Pickett 2006
Investigating Socio-Cultural & Structural Forces Affecting Youth's STI Testing Experiences in Northeastern BC -	BC Medical Services Foundation, (Shoveller, Goldenberg, Koehoorn, Ostry)	Report	Health professionals and communities	Link	Shoveller 2007
Lessons From The Social And Economic Impacts Of The Mining Boom In The Bowen Basin 2004 - 2006	Australasian Journal of Regional Studies, Vol. 13, No. 2, 2007	PRJA	Professional	Link	Rolfe 2007
Lessons on Experience. Peru LNG: A Focus on Continuous Improvement (No. 3, March 2013)	International Finance Corporation	Report	Stakeholders and operators	Link	- Discusses Adaptable Environmental and Social Management Systems; continuous improvement
Long-term Effects of Income Specialization in Oil and Gas Extraction: In the US West 1980-2011	Energy Economics Volume 45, September 2014, Pages 186-195 Haggerty, Gude, Delorey, Rasker	PRJA	Professional	Link	Haggerty 2014
Mining and Community Health (Summary Report – A British Columbia Based Research Project)	J. Shandro, M. Koehoorn, M. Scoble, C. Hurrell	Report	Stakeholders and operators	n/a	Shandro 2009
Mining and Health	Canary Research Institute for Mining, Environment, and Health	Toolkit	Aboriginal and non-Aboriginal communities living around mining projects	Link	Assess community health and guide them in taking steps to improve community health

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Title	Developer/Sponsor	Type	Target Audience	Location	Comments
Mining Community Development Agreements - Practical Experiences and Field Studies	World Bank	Report	Industry, communities, policy makers	Link	It provides description options, context, and conditions for the preparation and implementation of Community Development Agreements. Presents lessons learned from three different countries such as Ghana, Papua New Guinea and Argentina.
Natural Resource Booms and Inequality: Theory and Evidence	Scand. J. of Economics 113(2), 388-417, 2011	PRJA	Professional	Link	Goderis and Malone
Open for Business but at What Cost? Housing issues in 'boomtown' Darwin	Australian Geographer, 2014 Vol. 45, No. 4, 447-464	PRJA	Professional	Link	Ennis 2014
Opportunities to Meet the Health Needs of the Stuart Lake/Na'kalBunArea: A Baseline Study of Community Health, Community Health and Social Services and Reported Impacts from Local Mining Developments	J. Shandro, A. Ostry, M. Scoble	Report	Aboriginal and non-Aboriginal communities living around mining projects; health professionals	Link	A good example of health impacts of natural resource development.
Overview of Performance Standards on Environmental and Social Sustainability (Jan 2012)	International Finance Corporation	Guide	Industry, communities, policy makers	Link	Performance Standard 4: Community Health, Safety, and Security ß talks about Community Exposure to Disease - References World Bank Group Environmental Health and Safety Guidelines as technical reference.
Perspectives on Community Health Issues and the Mining Boom-Bust Cycle	*Resources Policy*, *36*(2), 178-186.	PRJA	Professional	Link	Excellent paper; Shandro 2011
Potential Public Health Impacts of Natural Gas Development and Production in the Marcellus Shale in Western Maryland	Maryland Institute for Applied Environmental Health – School of Public Health (University of Maryland, College Park)	Report	Industry, communities, policy makers	Link	Talks about Healthcare Infrastructure recommendations (R40-45)
Production of Natural Gas From Shale in Local Economies: A Resource Blessing or Curse?	Federal Reserve Bank of Kansas City, Economic Review, First Quarter 2014, J.P.Brown	Paper	policy makers	Link	Good discussion of effects of shale gas boom at local scale; Brown 2014
Reframing the Conversation: *Understanding Socio-Economic Impact Assessments within the Cycles of Boom and Bust*	Badenhorst CJ,, Mulroy P, Thibault G, Healy T	PRJA	Professional	Link	Ten Strategies for a Community Based Approach to Address Socio-economic Impacts within the Cycles of 'Boom and Bust'
Review of Risks to Communities from Shale Energy Development	Environ. Sci. Technol., 2014, 48 (15), pp 8321–8333 Jeffrey B. Jacquet	PRJA	Professional	Link	Jacquet 2014

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Title	Developer/Sponsor	Type	Target Audience	Location	Comments
Riding the Resource Roller Coaster: Understanding Socioeconomic Differences between Mining Communities	Rural Sociology 69(2), 2004, pp. 261-281	PRJA	Professional	Link	Wilson 2004
Rural North Dakota's Oil Boom and Its Impact on Social Services	Social Work Volume 59, Number 1 January 2014, Bret A. Weber, Julia Geigle, and Carenlee Barkdull	PRJA	Professional	Link	Weber 2014
Scaling up: Assessing social impacts at the macro-scale	Environmental Impact Assessment Review 31 (2011) 382-391	PRJA	Professional	Link	Schirmer 2011
Scoping the Impact and Benefits of Work Camps in the Peace Region	Prepared for: Peace River Regional District By: W. Beamish Consulting Ltd & Heartwood Solutions Consulting	Report	policy makers	Link	
Social dimensions of mining: Research, policy and practice challenges for the minerals industry in Australia	Resources Policy 33 (2008) 142-149	PRJA	Professional	Link	Solomon 2008
Social Impact Assessment	Annual Review of Sociology, Vol. 12 (1986), pp. 451-478	PRJA	Professional	Link	Freudenburg 1986
Social Impact Management Plans: Innovation in corporate and public policy	Environmental Impact Assessment Review 43 (2013) 40-48	PRJA	Professional	Link	Franks and Vanclay 2013
Socioeconomic Assessment of Minera Loma De Níquel, C.A. through the Socioeconomic Assessment Toolbox /SEAT	Zaira Berti Ávila, Clemy Machado de Acedo, Yonaide Sánchez Ferrer	Toolkit	Mainly industry	Link	A case study of cumulative impacts on the Minera Loma de Niquel in Venezuela.
Socio-economic wellbeing in Australian mining towns: A comparative analysis	Journal of Rural Studies 28 (2012) 288e301	PRJA	Professional	Link	Tonts 2012
Stakeholder Engagement: A Good Practise Handbook for Companies Doing Business in Emerging Markets	International Finance Corporation	Handbook	Mainly industry	Link	Mainly focused in stakeholder engagements
Summary Report for the Regional Health Forum on Community Health and Extractive Industry Development	J. Shandro	Report	Health professionals and communities	Link	Shandro 2014b

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Title	Developer/Sponsor	Type	Target Audience	Location	Comments
Synthesis of four Country Case Studies-The Challenge of Mineral Wealth- using resource endowments to foster sustainable development	The International Council on Mining and Metals (ICMM) 2006	Report	Industry	Link	Separate case studies published on 4 countries
Ten Steps Ahead: Nak'al Bun Construction Phase Report	Shandro et al.	Report	Aboriginal and non-Aboriginal communities living around mining projects	Link	Shandro 2014a
The Boom-Bust-Recovery Cycle: Dynamics of Change in Community Satisfaction and Social Integration in Delta, Utah	Rural Sociology 70(1), 2005, pp. 28-49, Brown et al.	PRJA	Professional	Link	Brown 2005
The Community Forestry Guidebook: Tools and Techniques for Communities in British Columbia	Forrex-Forest Research Extension Partnership and British Columbia Community Forest Association	Toolkit	Communities	Link	Tools to encourage communities on strategies to maximize the benefits from the forestry industry.
The curse of natural resources: An empirical investigation of U.S. counties	Resource and Energy Economics Volume 33, Issue 2, May 2011, Pages 440-453	PRJA	Professional	Link	James 2011
The Joint Canada	Alberta Implementation Plan for Oil Sands Monitoring - First Annual Report: 2012-2013	Environment Canada and Alberta Environment and Sustainable Resource Development	Report	Industry, communities, policy makers	Link	
The relationship between mining and socio-economic wellbeing in Australia's regions	Resources Policy 36 (2011) 30-38	PRJA	Professional	Link	Hajkowicz 2011
The resource boom's underbelly: Criminological impacts of mining development	Australian & New Zealand Journal of Criminology 2011 44: 335	PRJA	Professional	Link	Carrington 2011
The risk of social-psychological disruption as an impact of energy development and environmental change	Journal of Environmental Planning and Management, 2013 Vol. 57, No. 9, 1285-1304	PRJA	Professional	Link	Jacquet and Stedman 2013
The social development effects of primary commodity export dependence	Ecological Economics 70 (2010) 317-330	PRJA	Professional	Link	Carmignani and Avom 2010

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Title	Developer/Sponsor	Type	Target Audience	Location	Comments
Transition Toolkit: Working Framework for a more Resilient Community	Published in Municipal World (2008) by Greg Halseth, Stephanie Killam, and Don Manson	Paper	Industry, communities, policy makers	Link	Case study of Mackenzie, BC; Halseth 2008
Understanding IFC's Environmental and Social Due Diligence Process	International Finance Corporation	Report	Mainly industry	Link	2 pager; Useful language for EAs
When the Landman Comes Knocking - A Toolkit for Landowners Living with Oil and Gas	Sierra Legal Defence Fund, West Coast Environmental Law?	Toolkit	Landowners	Link	A very useful toolkit for landowners who deal with oil and gas projects in their property. Good checklist. - Articles have wording to use in EA - Lesson 5: ensure safety policies are also followed by third-party contractors – use in EA - Lesson 16: Business case/buy-in for monitoring - Early Detection of E&S Risks, Conflict Prevention, Communication
Income and employment effects of shale gas extractions windfalls: evidence from the Marcellus region	Energy Economics 47 (2015): 112-120	Paper	Professional	Link	*Excellent* This article analyses the economic, social and environmental impacts of oil and gas extraction activities and the generation of windfall income for some residents in this region.
Health Impact Assessment (HIA) of Mining Activities near Keno City, Yukon	Yukon Department of Health and Social Services	Report	Professional	Link	*Excellent* This report presents the health impact of mining in the small community of Keno City in Yukon.
2014 Annual Report of the Government of the Northwest Territories under the Ekati, Diavik, and Snap Lake Socio-Economic Agreements: Communities and Diamonds	Government of Northwest Territories (2015)	Report	Professional	Link	This report presents quantitative data on how mine activity is affecting residents of Yellowknife and seven small local communities in the Northwest Territories.
Pump it Out: The Environmental Cost of BC's Upstream Oil and Gas Industry	West Coast Environmental Law (2003)	Guide	Citizens	Link	This guide offers a practical explanation of the environmental consequences of typical oil and gas projects in BC.
Identifying Health Concerns Relating to Oil and Gas Development in Northeastern BC – Human Health Risk Assessment: Phase 1 Report	Fraser Basin Council (2012)	Report	Citizens	Link	This report draws on a public engagement process in northeastern communities in BC to identify health concerns by the public.
Detailed Human Health Risk Assessment of Oil and Gas Activities in Northeastern British Columbia – Phase 2	Intrinsik (2014)	Report	Citizens	Link	It presents an assessment of potential health risks that may exist for people living in proximity to oil and gas activities in NE BC.

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Table 6. Social and environmental impacts and mitigation by project phase (GC, 2013)

Exploration Stage

Environmental Impacts		
Type	**Activities and Potential Impacts**	**Mitigation**
Land Use	• Camp construction • Line cutting • Drilling programs (intermediate and advanced exploration) • Fuel storage • Road construction for advanced exploration • Vegetation	• Comply with Government regulations for camps, roads • Minimize area • Re-vegetate (depending on the area and circumstances • Establish drill waste disposal plan • Follow fuel storage standards • Develop spill recovery plans
Water Quality	• Waste from drilling programs (mud) • Drill holes	• Carefully plan drill program to prevent water contamination
Wildlife	• Animal attracted to garbage and food waste • Migratory patterns affected by noise from helicopters, planes and drill rigs	• Dispose of garbage and waste in compliance with local regulations • Teach wildlife awareness to crews in camp • Keep aircraft away from migrating animals • Time program to avoid critical periods for wildlife (i.e., caribou calving)

Social Impacts			
Type	**Activities and Potential Impacts**		**Solution**
Social	Working away from home for extended periods	• Less time to spend on traditional activities • Workers and their families may be separated for several days or weeks • Marital stress • Opportunity to meet new people	• Plan activities around work schedule • Encourage the creation of support groups or programs to minimize the stress experienced by families
Economic	Increased employment levels	• Training and skills development opportunities • Widens gap between employed and unemployed	• Emphasize the positive working role models within the community
	Increased income levels	• Out-migration of community members with well-paying jobs • More money flowing into the community may result in an increase in social problems	• Establish or encourage the development of community addiction response programs and support groups
	Local Purchases	• Increased exploration activities may lead to more purchases from local businesses and suppliers, benefiting the local economy • Increased buying power	• Identify and communicate the type, quality, and quantities of goods and services required so there are no misunderstandings and encourage the local purchasing of these goods • Encourage small business development, training, and support

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| Cultural | Arrival of new people in the community | • New workers may arrive with different culture
• New ideas and technologies can create new opportunities, but also challenge traditional ways of life | • Offer cultural awareness training, delivered by member of the community, to ensure new people in the community are informed of its values and traditions |
| | Hunting and fishing | • Potential for the disruption of hunting and fishing times due to mineral activity | • Company minimizes airborne and on-ground activity that could potentially have an impact on bird or animal migration |

Development and Construction Stage

	Environmental Impacts	
Type	**Activities and Potential Impacts**	**Mitigation**
Land use	• Construction of access roads and power lines, uncontrolled access to mine site • Construction of buildings, workshops, processing plant, and permanent camp • Bulk sampling and extensive drilling programs • Fuel and chemical storage	• Plan to minimize land disturbance due to roads • Install security gates • Use community feedback in design and layout of buildings • Minimize land use • Follow fuel storage standards • Develop spill plans • Establish fuel management programs
Air quality	• Dust from roads and site development activities	• Water roads to minimize dust emissions
Water quality	• Impacts on surface and sub-surface water quality	• Control drainage • Ensure discharge criteria are met • Conduct water quality monitoring • Identify alternative water sources
Wildlife	• Animals attracted to garbage and food waste • Migratory patterns affected by the presence of humans, noise from aircraft, and blasting • Impacts on fish and fisheries	• Develop waste management programs • Use environmental baseline work to understand wildlife activity in the area • Educate employees and contractors to understand their responsibilities towards wildlife • Protect fish spawning and rearing areas, and fish farming • Establish no hunting /fishing zones
Cultural material	• Disturbance of archaeological and heritage sites	• Identify and protect archaeological and heritage sites

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Social Impacts			
Type	**Activities and Potential Impacts**		**Solution**
Social	Shift/rotational work	• Less time to spend on traditional activities • Workers and their families may be separated for several days or weeks • Opportunity to meet new people	• Plan activities around work schedule • Encourage the creation of support groups or programs to minimize the stress felt by families
	Social Investment	• Voluntary social investment by companies may increase local benefits; it is important for these to be collective benefits that do not foster dependency or favour certain groups	• Ensure that social investment is done with the full and transparent participation of those involved • Conduct assessment of priorities, anticipated results, and sustainability • Work with the changing dynamics of the community
Economic	Community partnerships and alliances developed	• Increased business opportunities • Adds wealth to a community	• Improve and enhance community infrastructure where possible
	Increased employment	• Increased training and skills development opportunities	• Emphasize the use of positive working role models within the community
	Increased income levels	• Creates positive role models • Widens gap between employed and unemployed • More money flowing into the community may result in an increase in social problems	• Provide workshops on money management, saving of wages, banking, etc. • Establish or encourage the development of community addiction programs and support groups
	Local purchases	• Communities may benefit from the sale of goods and services	• Determine any required goods and services by the company • Explore possible partnerships and capacity-building for small-to-medium-sized enterprises
Cultural	New people in the community	• New workers may arrive with different culture • Challenges to traditional ways of life	• Offer cultural awareness training for the company, delivered by members of the community, to ensure new people in the community understand its values and traditions
	Population increase through in-migration	• Any increase in population may strain existing services	• Develop partnerships and promote sustainable development and cultural conservation of traditional knowledge
	Rapid cultural change	• Change can happen quickly with increased development of infrastructure, roads, and as goods and services are introduced to local communities	

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Operation Stage

Environmental Impacts

Type	Activities and Potential Impacts	Mitigation
Land use	• Land disturbance from mining activities, i.e., excavations in the mine, storage of waste rock • Tailings waste and tailings dams	• Comply with government regulators • There are strict rules for locating, constructing, and operating
Air quality	• Dust from roads and mining activities • Emissions from trucks and on-site power generation	• Apply water to roads to control dust • Monitor emissions to determine effects on vegetation and air quality
Water quality	• Dirt rocks, or contaminated or unclean water enters streams or lakes • Impacts on water flows	• Establish a water management plan (must be approved by the government) • Train employees and contractors on the water management plan • Monitor water quality and adjust flow supplementation
Wildlife	• Animals attracted to garbage and food waste • Migratory patterns affected by the presence of humans, noise from aircraft, and blasting • Impacts on fish and fisheries	• Use best practices for incineration of food waste and garbage • Remove waste that cannot be incinerated • Establish a waste management plan and employee training to help minimize wildlife impacts • Observe animal behaviour and modify operations as required • Avoid certain activities during migration • Protect spawning and rearing areas and fish farming
Cultural	• Disturbance of archaeological and heritage sites	• Protect land, and identify and protect archaeological and heritage sites

Social Impacts

Type	Activities and Potential Impacts		Solution
Social	Shift/rotational work	• Less time to spend on traditional activities • Workers and their families may be separated for several days or weeks	• Plan activities around work schedule • Create support groups or programs to minimize the separation stress experienced by families • Work with the changing dynamics for the community
Economic	Community partnerships and alliances developed	• Increased business opportunities • Wealth generation	• Improve community infrastructure where possible
	Increased employment	• Training and skills development opportunities • Creates positive role models	• Use the positive working role models within the community as examples
	Increased income	• Widens gap between employed and unemployed • A sudden influx of money may lead to increased substance abuse • More money in the community	• Establish or encourage the development of community addiction programs and support groups • Create and information campaign

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	Wage economy	• Local community businesses can prosper • Personal wealth increases	• Ensure that the work is distributed in all communities
Cultural	Strangers in the community	• Increased population • Increased funding for traditional activities • Strains existing services • Aggravates existing social problems	• Offer cultural awareness training, delivered by community members, to make new people aware of the values and traditions of the community • Support and maintain traditional activities

Closure and Reclamation Stage

Environmental Impacts

Type	Activities and Potential Impacts	Mitigation
Land use	• Long term stability of waste rock piles and mining slopes • Tailings containment structures	• Annual inspections until permanent stability is demonstrated • Periodic monitoring and maintenance
Water quality	• Acid rock drainage or metal leaching	• Water treatment

Social Impacts

Type	Activities and Potential Impacts		Solutions
Social	• Decrease in community capacity	• Loss of social services	• Acquire new resources and capacity
Economic	• Loss of employment	• Reduction in income • Unused skills	• Assist with development of new economic opportunities
Cultural	• End of employment phase	• Return to traditional skills	• Teach skills, mainly through Elders

Source: Government of Canada (2013)

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