Circumpolar Information Guide on Mining for Indigenous Peoples and Northern Communities

Prepared for

The Sustainable Development Working Group (SDWG) of the Arctic Council
2011

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Introduction

The Circumpolar Information Guide on Mining recognizes that indigenous and northern communities are central stakeholders for a sustainable Arctic. The purpose of the Guide is to increase the ability of Indigenous peoples and residents of northern communities to understand, influence and participate in mining-related processes in order to maximize benefits and minimize negative effects on their lives, culture, land and the environment.

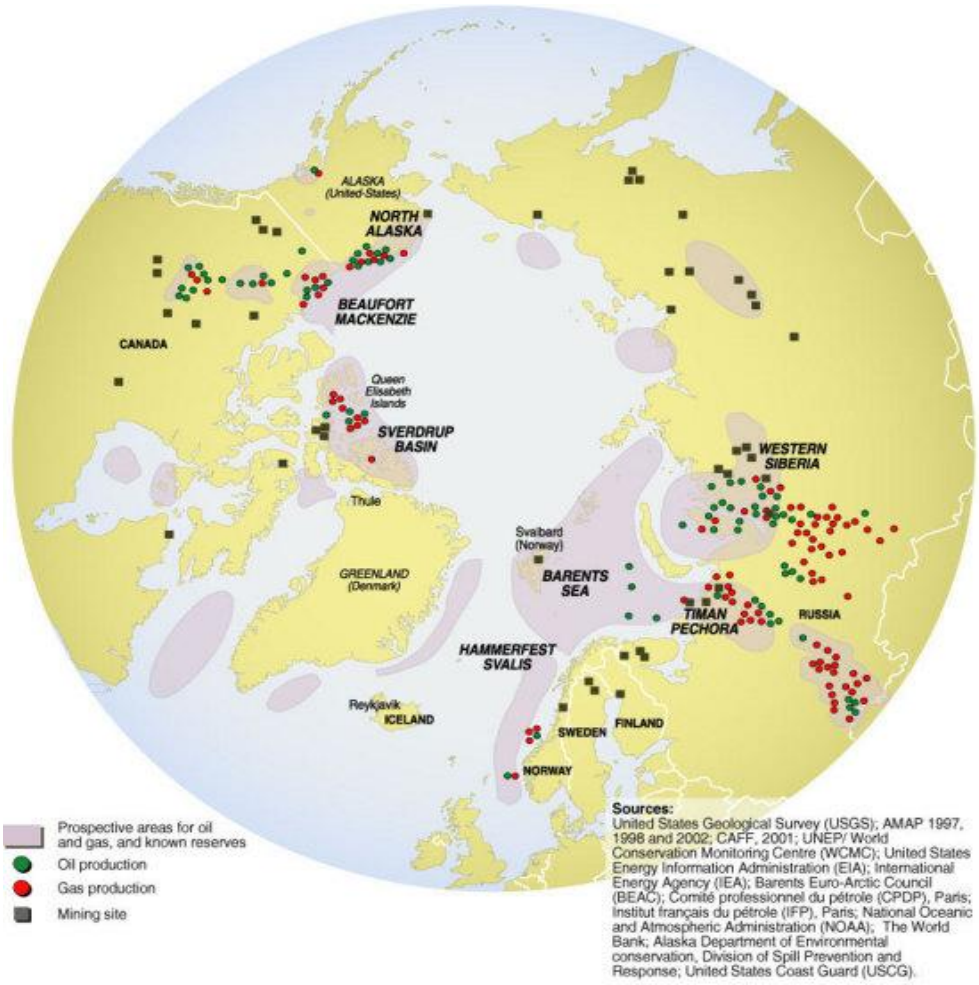
There are an estimated four million people living in the Arctic regions of Canada, Faroe Islands (Denmark), Finland, Greenland (Denmark), Iceland, Norway, Russia, Sweden and the United States. Arctic Indigenous populations range from about 88.1 per cent in Greenland, 50 per cent in Arctic Canada, 20 per cent in Alaska, 5 per cent in Arctic Norway, 5 per cent in Arctic Sweden, 5 per cent in Arctic Finland and as little as 3-4 per cent in Arctic Russia. With such a divergence of countries in the Arctic region – from culture, to language, to infrastructure, governance, and so forth – the information provided in this mining guide should be considered with *national and regional acts and regulations* pertaining to resource extraction. It should also be supplemented with *international declarations and guidelines relevant to Arctic nations and their peoples*. Information on country-specific acts and regulations, as well as international guidelines on the rights of indigenous peoples, are included at the end of this guide.

The Arctic, its people and its economy, are undergoing considerable changes. Climate change is having significant impact on the land, infrastructure, livelihood, environment and culture of northern and indigenous communities. It is also expanding opportunities for natural resource extraction; however, it is imperative that these economic opportunities be pursued in such a way that minimizes effects on indigenous and northern communities.

Resource development represents a significant portion of the economic activity currently taking place in the Arctic region. Today, the economic activity of Arctic countries is characterized by the large-scale development of metallic minerals, precious metals, hydrocarbons, and precious and semi-precious stones. Extractive activities vary across all Arctic countries as shown in Figure 1.1.[1]

[1] *UNEP/GRID-ARENDAL*, 2008.

Figure 1.1 Arctic Resource Development Activities, 2007 (UNEP/GRID-ARENDAL)



Although the overall value and benefits of significant levels of activities across the Arctic are national and perhaps global, mineral projects and effects happen largely at the community level in specific areas, frequently bringing with them long-term environmental impacts and risks. The local economy, society, culture and environment go through a transformation as new investment, jobs and activities affect how traditional activities are pursued and passed on from generation to generation.

Preparing for and learning lessons from these changes are among the aims of this Mining Guide. The document is intended to serve to improve community residents' understanding of the industry and possible effects and increased involvement and partnerships. When community residents have the capacity to effectively engage in discussions with mining companies and other stakeholders, it is possible to become active participants in ensuring the resource extraction generates substantial benefits, and that the negative impacts that can be associated with large-

scale resource development are avoided or minimized.

This Mining Guide uses the development cycle of mining activity to organize the report into four main modules (Figure 1.3).

Module 1 - Mineral Exploration: The first phase of mining involves the search for mineral deposits and the initial evaluation of these deposits. Exploration can span a number of years and can include activities such as: acquiring mineral rights, mapping, field surveys, sampling, drilling and mineral resource evaluation. Neither the economic opportunities nor the potential adverse impacts from this initial phase of mineral development are typically as significant as other phases.

Module 2 - Mine Development and Construction: The second phase of mining focuses on the detailed technical and economic evaluation of the mineral deposit, mine plan development, financing, permitting and licensing, production decision and the possible construction of the mine and corresponding infrastructure. In order to proceed through this phase, the potential mine must be evaluated to determine if it is valuable enough to offset the costs of construction and operation of the mine. Environmental impacts and socio-economic risks are normally assessed during this phase and determine the risks versus the rewards of a mining development.

The mine development and construction stage provides many opportunities for community consultation, involvement, employment and contracting, as well as many opportunities for involvement in decisions concerning proposed mining activities.

Module 3 - Mine Operation: The mine operation phase includes the process of extracting and producing a mineral product. The excavation of ore can occur in either an underground or an open pit mine. The operation life of a mine can span a number of years, depending on various factors such as the extent and value of the resource and constitutes a longer-term presence that may have cumulative socio-economic effects, as well as an opportunity for increased local employment and revenues. The cost and benefit to local communities will depend on the relationship and understanding built in the earlier phases of activity between the residents and the companies.

Module 4 - Mine Closure and Reclamation: This is the last phase of the mining cycle. Mine closure is defined as the conversion of an operating mine to a closed state. When done properly, it is done in an orderly, safe and environmentally sound manner. Some jurisdictions require companies to set aside security to cover reclamation costs. The conversion of an operating mine to a closed state usually occurs when it is no longer economically viable to mine. All mines will eventually close. Mine reclamation typically requires removal of all on-site infrastructures, rehabilitation of soils and vegetation, and long-term water monitoring and management systems. The goal is to return the site as close as possible to its original state, or to some other state agreed with regulators in consultation with stakeholders. The preparation for mine closure begins well before the actual shutting down of the mine, usually during the mine development and construction phase, where local inhabitants have the best opportunity for input. One of the impacts of mine closure is the reduced levels of employment in this stage of the mining project, which can have a significant impact on the local community. Some closed mines require

perpetual treatment of waste water and monitoring of tailing impoundments.

Figure 1.3 Mineral Development Cycle

Throughout the Mining Guide 'Facts and Figures' boxes have been included to illustrate how affected stakeholders can participate in the decision-making process. Within each of the four main modules, there are topic areas to provide perspective on the mineral cycle:

Overview: gives a general governance overview and explains the purpose, main activities, key participants during each phase of the mining cycle, and the opportunities for Indigenous peoples and northern community residents to become involved.

Environmental and Social Effects: identifies the most likely impacts on people and the environment during each phase of the mining cycle. Therefore, the importance of environmental studies and environmental monitoring in the different phases of the life-cycle of a mine is of tremendous importance.

Please note that 'health effects' is considered a topic of significant importance. Due to the complexity and extent of the health topic it will not be covered in this document. The focus of this Information Guide is predominantly related to environmental and social process, costs and benefits. Additional consideration of human health issues can be reviewed through the Arctic Council's *2009 Assessment of Human Health in the Arctic* at www.amap.no. The assessment contains a section on the influence of local activities, such as mining, on contaminant exposure and community well-being.

Employment and Other Economic Opportunities: identifies employment and other economic opportunities for community members, and opportunities to build capacity, for meaningful participation throughout the mining cycle, and the potential for significant economic and business growth.

Effects on Traditional Ways of Life: identifies the effects of the introduction of mining activity and a formalized economy into traditionally-based economies and cultures.

Case Study: to provide examples of communities' experiences in mining activity and to help illustrate how mining developments are affecting the Arctic region.

The modules work together, but can also be used separately. Although there is some duplication from module to module, this is done to allow each module to be used on a stand-alone basis. There is also a glossary of terms at the end of this publication that provides definitions for words that are bolded in the text.

This Mining Guide has used the Canadian resource, "Mining Information Kit for Aboriginal Communities" (http://www.nrcan-rncan.gc.ca/mms-smm/abor-auto/pdf/kit-gui-eng.pdf), as the point of departure and has been designed, through identifying similarities amongst Arctic countries, to develop a regional portrait of the circumpolar Arctic with regards to the mining industry. In future, each Arctic country may wish to provide specific information in the form of an "appendix" that provides further detail regarding: legislation, regulatory bodies, and impacts that will customize the document and make it even more useful for local populations.

1.1 Overview

The first phase of the mining cycle is mineral exploration. It is the search for mineral deposits. Every new mine has its beginnings as an exploration project; however, most exploration projects will not advance to become mines. Each country in the Arctic region has specific laws governing the exploration for minerals.

The purpose of exploration is to locate a new source of metals or minerals. This includes base metals, such as iron, lead, zinc and copper, precious metals and gemstones, such as gold and diamonds, and industrial minerals (such as silica used in the making of glass or clay minerals used in the making of ceramics).

The exploration phase starts with identifying large areas that may have a certain type of ore deposit that could be developed as a resource. For example, the types of rocks (geology) in parts of northern Finland are similar to rocks found in other areas of Finland where gold deposits have been discovered. This early work involves reviewing maps, surveys and reports usually available from a country's regional geological survey division or educational institutions.

There are different strategies in mineral exploration:

- Exploration that looks for a deposit in an area where the mineral or metal has not been found before;
- Exploration that searches for additional deposits near a known mine; and
- Exploration done to expand a mineral resource that has already been found and developed on the property of an existing mine.

Facts and Figures

Exploration may lead to a number of discoveries of mineral showings. However, the number of these discoveries actually being developed into a mine is very low.

(Source: Natural Resources Canada)

Success Rates

The success rate is extremely low for exploration, particularly in areas that have not been mapped. A prospector would be fortunate to find one or two prospects that become a mine in his or her lifetime. Success rates are higher near a known mine or on existing developed property. If exploration leads to the discovery of a mineral prospect or "showing", these mineral showings are examined to discover which one can be taken to the next stage of investigation. Of the prospects that get to the intermediate stage, few are worth being taken to the advanced exploration stage and fewer still go beyond that.

Time Frames

Exploration is a very slow process. For exploration programs where a promising mineral showing is discovered, it will take at least seven to ten years before the start of a new mine. In some cases, it can take longer depending upon a number of factors, such as environmental protection measures, land status, remoteness, and possible use-conflicts. It depends on the willingness of investors to advance the money to explore more fully over the years and the commodity supply and demand cycle. A property can be explored many times, by different companies, without success. Properties can also change ownership many times during this stage.

Mineral Exploration Activities

Prospecting

Prospecting is the search for mineral deposits. It usually takes place in the summer and can be highly competitive and, therefore, a secretive activity until the prospector has secured a mining claim.

Prospecting is a low-intensity activity and the least environmentally and socially disruptive activity of the mining cycle. It is also the first contact between the industry and local population, and, therefore, will have a disproportionate influence on the local inhabitants' perception of the mining company. Exploration can take many forms, from a prospector walking through the bush with a rock hammer and gold pan, to a prospector identifying exact positions using satellites (global positioning system [GPS]). Most prospecting is done by individual prospectors walking the ground, examining and mapping rock types, and collecting rock and soil samples by hand for either mineral or chemical analysis. If there are signs of minerals, prospecting activities progress to more detailed work programs (more sampling, small portable drilling).

Basic geosciences surveys, such as geological mapping and even satellite coverage, help guide the search for a showing. Many mineral deposits are structurally controlled, so understanding the basic structural geology of an area (i.e. how the rocks have been folded and faulted) is very important.

After the rocks have been examined on the ground, geological maps are created to show the location of different types of rocks or structures of the earth. Regional surveys and mapping, often done by regional governments, are often used to provide more information on mineral potential. Prospectors use geological maps to understand the geological context and locate the best areas to explore for minerals that could lead to a mine. The use of geological maps can greatly reduce the search time.

During prospecting, community members may notice prospectors investigating rock structures. In the Arctic, where communities are few and widely separated, small exploration camps are set up for several seasons. The size and type of camp will depend on the length of the job and the number of people staying at the camp. Involving local inhabitants before this activity takes place, perhaps through a meeting/discussion, would be a positive first step in building a relationship. Camp support of supplies and transportation of prospectors and samples are usually provided by small aircraft.

Prospecting activity does not mean that a mine is going to be developed but, rather, that there are people searching for signs of minerals. It will lead to increased information of the mineral resource in the region.

Acquiring Mineral Rights

A prospector can acquire mineral property rights before doing prospecting if, based on initial exploration results, he believes that further work is justified. The method and location for acquiring mineral property rights will be unique to each country. The mineral property right indicates to government and other prospectors that a request has been made for future exploration. Once the mineral property right is approved by the appropriate government agency it gives the prospector/company the exclusive right to explore for minerals for a certain period of time. Usually, the prospector/company has secured the rights to explore for minerals only and does not have exclusive rights to the surface of the land.

Detailed Exploration

Once prospecting has revealed interesting findings, mineral property rights are acquired, and financing has been secured, the exploration program will move forward.

Many mineral deposits are not exposed at the surface of the earth, but are buried beneath snow, ice, soil, glacial sediment or other rock formations. To test if minerals are present, it is often necessary to look beneath the surface materials. This is done using advanced techniques such as geophysical and geochemical surveys, rock sampling and diamond drilling programs. To prepare for this advanced work, various surveys must be planned.

For surveys to be accurate, a map grid is created on the land marked by narrow cut-lines in forest or by a long line of pickets on open land. Once this grid has been made, geophysical instruments

can be carried along the grid and more precise work can be performed, including trenching. Cut-lines could be of concern to subsistence hunters and ecologists.

At this stage, members of the community may notice not only increased work on the ground, but also a helicopter or an airplane carrying special antennas or instruments pulled through the air. Depending on the scale of these activities, some impact could be felt on the ecology and local subsistence activities. These could include impacts on fishing, hunting for game, animal grazing and migration paths.

Sampling and Drilling

Initial prospecting takes small samples, whereas trenching, in soil or rock, can provide a larger and more representative sampling of a mineral occurrence. If earlier work indicates that there is a possibility of a mineral deposit underground, the exploration company must now be able to sample that rock to estimate the extent and shape of that mineral deposit. A diamond drill is used to cut through rock, going down hundreds of meters and bringing up lengths of cored rock samples. An average drill program is by far the most expensive phase of detailed exploration. The samples are then sent to laboratories for assay[2], where results will be analyzed.

Environmental Baseline Work

Although environmental baseline studies are normally done at the advanced exploration phase, regulators and companies are encouraged to do environmental baseline work during the detailed exploration activity period. These are studies of soil and vegetation types, wildlife, and water analysis. These studies could include collecting water samples for testing or having a community member, possibly an elder, identify cultural areas that are to be respected. This background data provides information for the environmental assessment, and if the project proceeds will provide a reference point that can be used to measure the impacts and benefits of a project over time.

Preliminary Deposit Evaluation

The evaluation phase is the period during and after the field program where rock samples and survey information are carefully reviewed to check the results and to determine whether there is enough mineral potential to invest in more detailed and expensive activities, such as detailed drilling and bulk sampling, before advancing to mine development.

Facts and Figures

During detailed exploration, the community may notice not only increased work on the ground, but also a helicopter or an airplane carrying special antennas or instruments pulled through the air.

(Source: Natural Resources Canada)

[2] In metallurgy, to 'assay' refers to the analysis of an ore, alloy, etc. in order to determine the quantity of gold, silver, or other metal in it.

Main Stakeholders in Mineral Exploration Activities

Governments

Holders of mineral rights – these entities can include national and regional governments, native or indigenous tribal governments or corporations - typically support mineral exploration by developing maps and reports that guide prospectors and exploration companies to areas with mineral potential. The government also has a regulatory role in managing and licensing exploration activities of the mining industry through dictating procedures and mechanisms to acquire mineral property rights, environmental requirements, labour codes and other aspects related to development of a region.

Local Communities

Approximately four million people living in the Arctic regions of Canada, Faroe Islands (Denmark), Finland, Greenland (Denmark), Iceland, Norway, Russia, Sweden and the USA. Most of these people live in small towns and villages, often remote. Arctic Indigenous populations range from about 88.1 per cent in Greenland, 50 per cent in Arctic Canada, 20 per cent in Alaska, 5 per cent in the Arctic regions of Norway, Sweden and Finland, respectively, and, as little as 3-4 per cent in Russia. The culture and livelihood of Indigenous and local residents of the Arctic are intimately connected to the land and environment which they depend upon for traditional and subsistence economies.

In areas where there are communities, prospectors and exploration companies are encouraged to communicate with community leaders and to talk with community members before exploring the land.

In order to achieve the optimum results in the exploration process, prospectors and exploration companies are encouraged to consult with community leaders and to work with them to communicate with the local population early in the planning stages of the project and before going onto land. Community leaders may be elected officials or accepted social leaders and are a valuable resource for accessing the views of the community, problem-solving, and for identifying opportunities for the community to collaborate on and jointly benefit from the proposed project. Depending on the size and location of the exploration project, a community may be consulted by government bodies looking for input before issuing permits for companies.

Prospectors

A prospector is usually the first person to look for minerals in a new area. Prospectors work for themselves or for exploration and mining companies, and usually work alone or in small groups. It is important for prospectors to obtain the proper licensing and permits before they start looking for areas that have shown evidence of certain minerals or favorable geology. Regional geological maps and reports are typically found at government or educational institutions.

A prospector may get funding from a company to cover some of his or her expenses in exchange for an interest in a discovery.

Junior Exploration Companies

Junior mining companies are small companies formed to explore for mineral deposits. It relies on its financing from capital markets, and some from private financing sources. Most often junior companies tend to focus on exploring for mineral deposits that could be developed into mines. These entities depend on funds from investors to conduct exploration programs. If they find a mineral deposit worth producing, junior exploration companies may sell or share an interest in the mineral deposit to a larger company that has the capacity to build and operate a mine. However, junior companies are increasingly keeping a stake in the resources they find and becoming mid-tier companies.[3]

Mid-tier and Senior Mining Companies

Mid-tier and senior mining companies are those which operate several mines at a time and extract, refine and produce and sell minerals. They have many employees with experience in a wide range of mining-related activities. Senior mining companies often take over exploration activities once costs escalate. They also conduct exploration programs on existing mine properties in hopes of increasing a mine's life.

Contractors/Service Providers

Many contractors are needed for the expertise they provide or the services they offer during mineral exploration. These individuals/companies are contracted for different activities during exploration, development/construction, operations and mine closure. The mechanisms of coordination between companies and third party contractors/service providers is important for a number of reasons, some of which include: the management of quality control, fulfillment of legal obligations, the compliance of code of conduct and the understanding of corporate social responsibility policies.

Some of the principal contractors and service providers are:

- *Drilling Companies*

Drilling companies generally act as contractors to mineral exploration companies and provide drilling services. The rock cores from drilling operations help define the ore concentrations, and the size and extent of the deposit.

- *Geological Services*

[3] Mid-tier companies are mining companies that operate one or two mines and that may also conduct exploration.

Geological services include mapping of the rocks or soils and collection of surface or rock samples. The samples and maps provide useful clues on the location of deposits.

- *Transport Services*

Exploration companies need to transport people, provisions and equipment. To do so, they contract helicopter services to enter into remote areas where land access is difficult.

- *Geophysical Survey Companies*

Junior companies and mining operators contract geophysical survey companies to search for ore deposits. Through specialized techniques and the measurement of minerals' physical (e.g. magnetic) geophysical survey companies can help locate mineral deposits.

- *Local Businesses*

Local businesses may be able to provide companies with the goods and services needed for exploration. Furthermore, local communities can provide translation services, act as community liaisons, work on environmental assessment contracts and contracts with communities to gather Traditional Knowledge.

Investors and Financiers

Investors and financiers provide funds for companies to carry out most of the exploration activities. This investment can come from private individuals or institutions via the stock market. Public companies are registered with the stock exchange, like the Toronto Stock Exchange, and are governed by regulations regarding reporting, press releases and technical material made available to the public regarding projects and corporate governance. As potential mineral projects move through the development cycle, multiple stages of financing are required to advance the development of a project.

Opportunities for Indigenous Peoples and Northern Communities' Involvement and Input in the Mineral Exploration Phase

Community Involvement

There are opportunities for involvement and input by community residents during the exploration phase especially before the detailed exploration stage. It is in the best interest for a company to approach Arctic communities in order to explain their presence in the area, where they will be working, why certain types of tasks will be performed, and to possibly gain an insight into the local issues and concerns. An early opportunity for communication and cooperation between community residents and exploration companies is the avoidance of sacred or cultural sites which should remain protected from any phase of mining activity. It is important that

communication is maintained throughout the field work and once complete that a follow-up meeting occurs explaining the results and analysis.

Early consultations can be an opportunity for indigenous communities to raise their environmental/social and cultural concerns about a project and have them be integrated into the mine plan and environmental date collections efforts. The community should, therefore, ask companies relevant questions such as:

- What are the employment/business opportunities?
- What types of jobs are available for members of the local community?
- How long will the exploration phase last?
- Do they intend to hire locally?
- What is the duration of a particular job?
- Is training available?
- What activities will affect local communities and what should we expect from these exploration activities follow-up actions?
- How will these activities affect the land and land use by Indigenous people and local communities?

The answers provided by the company/prospector to these questions can help prepare the community should the exploration project lead to larger investment and manage expectations of the reality of an exploration phase project. During discussions, community members can take this opportunity to ask additional questions, raise concerns, and learn about the exploration process. Community members may be concerned about environmental and social effects. See Section 1.2 for a detailed discussion of these effects.

Facts and Figures

In Greenland, the Bureau of Minerals and Petroleum holds an annual amateur mineral hunt, designed to encourage Greenlanders to learn more about geology and mining. Officials also offer courses in geology and advanced mining education to better prepare the local labour force for employment in the mining industry (Greenland, Warming Fuels Dream of Hidden Wealth; THE ASSOCIATED PRESS, November 27, 2009).

Facts and Figures

Russia - *The Indigenous peoples association Yamal, initiated in 1989, requires industrial consultation prior to land transfer for oil and gas extraction. Three recent federal laws have helped form an increasingly solid basis for Indigenous representatives: (1) the guarantees of rights for Indigenous people (1999); (2) the principles for establishing Indigenous communities (2000); and (3) the formation of territories for the traditional use of nature (2001).*

(Source: AMAP Assessment 2007: Oil and Gas Activities in the Arctic – Impacts and Potential Impacts)

Governance Overview

The acts and regulations pertaining to mineral exploration will differ among countries. Upon obtaining a prospector's permit and before initiating detailed exploration activities, environmental studies

and a series of authorizations are needed from one or more levels of government.

The Appendix provides contact information for each country's responsible government mining authority, which in turn can point out country-specific mineral exploration regulations

Arctic governments acknowledge the increasing role and participation of Indigenous peoples in decision-making processes affecting their individual contexts, culture and land. Furthermore, the Arctic Council supports the active engagement of the Permanent Participant representatives in its deliberation as key participants of the Council – not as Observers.

Much of the Arctic region is State-owned and in many countries, mines are managed more locally by regional governments. When mines are developed by companies, the government sets requirements for through taxes, leases, outright sale, royalties and regulation of the production. In relation to mining, governments look to find a balance between regulation and incentives. Government mining policies typically focus on[4]:

- generating export income;
- generating tax and royalty revenues;
- generating employment;
- attracting foreign investment;
- assuring the availability of important minerals in time of war;

Protecting Indigenous people's rights concerning ownership of resources;

- safety and environmental issues; and,
- protecting subsistence resources.

1.2 Environmental and Social Effects

There are various environmental and social effects an Arctic community may experience during mineral exploration. The environmental impacts during mineral exploration are usually low, especially during the preliminary phase, and will vary depending on the method of exploration used. Countries and companies have regulations and codes of conduct for exploration purposes that will define the way that prospectors and exploration companies must work in the field. These require that

Facts and Figures

Examples of environmental and social best practices may be available from government agencies or industry associations. These documents would describe how mining companies work to minimize the impacts of exploration. Most companies have a Code of Conduct that dictates the manner in which they do business.

(Source: Natural Resources Canada)

[4] "Mining in the North Circumpolar World," September 2007, *University of the Arctic*. See http://www.uarctic.org/singleNewsArticle.aspx?m=504&amid=3173

companies strive for environmentally appropriate performance at the earliest stages of exploration in order to foster positive relationships with communities. These codes of conduct and regulations also require that field workers understand that they have to respect the rights of others, operate safely, and take care not to harm the wildlife, land and water. Companies need to follow national and regional laws and respect the communities near the Arctic areas in which they work. With these measures in place, negative impacts are reduced, but they are still possible.

Potential Environmental Effects and Mitigation Measures

The Arctic environment is unique and conducting mineral exploration activities can be challenging. Some of these challenges include: permafrost covering much of the Arctic terrain; distinctive vegetation and wildlife; minimal precipitation; a generally cold climate; and large distance between communities. This means to operate in the Arctic, some field work needs to be scheduled appropriately due to the short non-winter season, when there is no or minimal snow cover in prospective areas. Alternatively, some activities related to mineral exploration activities are more intrusive (detailed exploration) and are suggested to take place during the winter months, reducing impact on the land. At the same time, there are challenges working in the Arctic due to the large distance between communities. Working in remote areas may mean that the improper containment or mishandling of fuel or explosives may lead to pollution that can easily go unnoticed in snow covered terrain.

Mitigation measures are actions used to reduce, accommodate or eliminate the impact of an activity on the environment. Examples of impacts and how they are mitigated are shown in a table below. Mitigation measures during the exploration stage can be improved through communication between the exploration company and the local community.

Table 1.1 Environmental Effects during the Exploration Phase

Type	Activity	Mitigation
Land Use	Camps, cut lines, drill pads, sump pits, road construction and landing strips	Local notifications and consultations Minimize disturbed area Use existing roads where possible Fill and reclaim sumps Perform work during season in which the disturbance would have a reduced impact (i.e. winter)
Water Quality	Waste from drilling and bulk sampling programs (rock, mud and other fluids) Movement of metals through groundwater and eventually	Sludge boxes, filtration control, straw bales Use of non-toxic drilling fluids Backfill of waste rock

Type	Activity	Mitigation
	impacting salmon	
Wildlife	Animals attracted to garbage and food waste near exploration camps	Local notifications and consultations Effective waste management practices (i.e. burn garbage and food waste) Fly-out glass/cans
	Migratory patterns affected by presence of humans and equipment	Local notifications and consultations Wildlife awareness courses for workers[5] Flight/vehicle paths around migrating animals Obtain information from local wildlife officials
Cultural	Disturbance of archaeologically and culturally important sites	Local notifications and consultations
	Activity occurring in subsistence areas	Local notifications and consultations
	Reindeer grazing and calving disturbed by exploration	Reindeer herders consulted as part of environmental assessment process

Potential Social Effects and Community Responses

Social impacts at the exploration stage are likely to be minimal. Financial benefits may accrue to some individuals, and there is a possibility that this may result in divisions within the community. Learning about impacts may help community members understand and anticipate the effects of exploration. It is in the best interest of the exploration individuals/members representing companies to build positive relationships with the neighboring Arctic communities since exploration is usually the initial mining contact. Positive social effects can best be enhanced through communication between the exploration party and the community that identifies actions necessary to develop these benefits.

The management of community expectations is one of the key issues during the mining exploration stage as exploration does not lead to mine development and construction in the great majority of cases.

[5] For example, at the Red Dog Mine, migrating caribou, as well as other animals, have the right of way at all times along the transportation corridor. Drivers are required to stop their vehicles and follow appropriate procedures to ensure that the migration is not affected by traffic.

Listed below are some possible social effects and responses to those effects:

Table 1.2 Social Effects during the Exploration Phase

Type	Positive and Negative Effects	Community Responses
Employment	Social effects: During the exploration phase some community members may obtain employment. However, this is a small group and there will be those who benefit and those who do not participate.	The community and company could work to ensure the employment process is transparent. It may be possible to contract more people on a rotational basis.[6]
Local business	Where they exist, local businesses may get an opportunity to provide services.	The mining company could clearly define the services needed and community residents must spread this information appropriately through the community. Building capacity with local businesses in nearby communities helps.
False expectations	The presence of an exploration team could lead to the belief that a full-scale mine is in the near future, creating numerous job opportunities. It could also raise fears of an impending disruption to the environment and way of life.	Transparent communication could be developed between the exploration representatives and the community (leaders) that divulges the current activities and manages future expectations.[7]

Environmental Studies during Exploration Activities

Depending on the stage of mining exploration an environmental baseline study may be performed. Although a full study of this magnitude would only be performed at the advanced stage of exploration, a reduced version of the study may be used during exploration activity that could include samples of water and soil, and an inventory of environmental features, vegetation and wildlife. Detailed harvest records and mapping of subsistence use areas are also helpful to establish baseline subsistence patterns.

Companies are encouraged to make contact with communities, which provide an opportunity to gather local and non-proprietary traditional knowledge from community members. Prior to

[6] Exploration companies can also be encouraged to help build local capacity by implementing training programmes for residents so that employment rates increase over time.

[7] This should occur in a public setting so that the information is available to all residents and the burden is not upon community leaders to share this information.

release of traditional knowledge, the communities should seek clarification on how that information will be used. The use of traditional knowledge, as well as scientific knowledge, can assist in making informed decisions regarding the protection of the environment.

Development and Implementation of Monitoring Programs

Environmental monitoring is the process of tracking environmental features and any changes that may occur. During the exploration phase of mining, especially at the outset, there would be negligible impact in the area being explored. Monitoring could be as simple as assuring that there is no evidence of the presence of the prospector left in the exploration area. This type of monitoring could be performed through a simple checklist that helps exploration personnel with documentation and act as a reminder of tasks.

Once the exploration phase has advanced in size and activity, the amount of land disturbance will be relatively small in comparison to other mining phases but will require a more detailed monitoring process. With the need to monitor larger areas and more activities, the methodology in which information is collected, inputted and tracked must evolve as well. This process could include more complex data sheets and computer programs.

In general, exploration companies perform most of the environmental monitoring. In some countries (e.g. Sweden) there are regional government offices responsible for this task. It is desirable for the communities to have established agreements with the monitoring authority on the particulars. In the Arctic, monitoring might include checking:

- fuel storage or staging area;
- disposal of waste;
- proper storage of food;
- clean-up of the site; and
- Ensuring that no waste remains after drilling rigs leave.[8]

Companies also follow the conditions of any permits or licences granted to conduct exploration. Government inspectors may visit the site to make sure that conditions imposed on the licences and/or permits are being met and that all regulations are being respected. For larger exploration projects, more detailed monitoring plans may be required for activities such as fuel and waste disposal. At this stage key items for discussion between the locals and their government representatives may be such as what rights the locals have, what are the mechanisms to influence the process, what is the timeline and the expected effects at each phase of the project?

[8] Rural communities often have little financial resources available to them. As such, it would beneficial to have the regional government also monitor to ensure the exploration company does not trespass on private land.

Key items that Arctic communities can discuss with companies include the possibility of business opportunities such as: 1) participating in performing environmental monitoring; 2) preparing reports to the government on the project, 3) engaging in administrative work, and 4) the publication and explanation of the results and other topics of interest such as traditional use, cultural protection and perceptions / understanding. Many companies also have a Corporate social responsibility policy. Corporate social responsibility policies guide the way companies integrate social, environmental, and economic concerns into their values and operations in a transparent and accountable manner.[9] Local communities should try to optimize the use of such policies to negotiate with the mining companies.

[9] Definition taken from the Government of Canada's Corporate Social Responsibility (CSR) website at: http://www.international.gc.ca/trade-agreements-accords-commerciaux/ds/csr.aspx?lang=eng The Government of Canada as a CSR Strategy for the Canadian extractive sector operating abroad. The strategy includes four main pillars: 1) support for host country resource governance capacity-building initiatives; 2) endorsement and promotion of widely-recognized international CSR performance guidelines; 3) support for the development of a CSR Centre of Excellence; and, 4) the creation of the Office of the Extractive Sector CSR Counsellor.

1.3 Employment and Other Economic Opportunities

Potential Employment and Other Economic Opportunities

> ***Facts and Figures***
>
> *Early engagement can serve as a turning point for communities. A community can increase its involvement through newsletters, meetings, radio, and surveys informing the population of the exploration activities.*
>
> *(Source: Natural Resources Canada)*

Job opportunities during exploration are usually limited and short term, lasting only a few weeks to a few months. However, these opportunities are often attractive to Arctic communities because they allow their inhabitants to gain useful experience and skills that may be transferable to other economic sectors. The duration of the jobs depends on whether the exploration project is successful. Projects usually hire specialists – geologists, geophysicists, drill operators, and pilots – to carry out the exploration work. To become a specialist requires a university or college degree or on-the-job training. However, projects may also require less specialized personnel, including field assistants, camp staff, line cutters, prospectors, and samplers, which often can be drawn from the local work pool.

Exploration projects may require environmental baseline work. This work can also provide opportunities for local people to assist with fisheries and wildlife studies. Companies will train community members to make sure they are safe and equipped to do the job.

Additional economic opportunities for community residents during early exploration are limited. Each community is unique and will be equipped differently to capture possible economic opportunities.

Types of business opportunities generated by exploration include:

- Digging and trenching with heavy equipment;
- Tree planting (in areas south of the tundra);
- Construction of camps/recruiting camp staff;
- Food and accommodation;
- Expediting;
- Helicopter/air support rental;
- Equipment/vehicle rental and fuel;
- Drilling contracting;
- Transportation and freight services;
- Environmental baseline studies;
- Subsistence studies;
- Traditional knowledge studies;

- Community or cultural advisor or liaison for cultural awareness training;
- Assist with protecting cultural/historical/archaeological sites; and
- Providing translation services

Usually small exploration companies have only a few full-time employees and they are generally specialists, such as geologists. When it comes to organizing a field program, companies commonly employ another company to organize activities like camp setup and transportation. If local community businesses have this capacity, they will be in a good position to provide these services.

> ***Facts and Figures***
>
> *The close location of communities to major exploration and mining projects presents a window of opportunity for Indigenous people and industry. Local communities are increasingly becoming recognized as key contributors to the minerals and metals sector for labour and supply, especially in remote areas.*
>
> *(Source: Natural Resources Canada)*

Enhancement Measures for Employment and Other Economic Opportunities

Discussions

Early discussions between the company and the community will help determine which jobs are available. Community members may want to help the company by organizing a venue for interviews and advertising available positions throughout the community. They may also decide to conduct a skills and education inventory of its members.

Exploration projects usually have tight schedules and budgets. During discussions with community residents, the exploration company will describe its plan and time frame. If local personnel/businesses do not presently have the capacity to assist the exploration company then it is unlikely they will have enough time to develop the business in sufficient time for the current exploration season. However, coordination and discussions between community members and the company can keep local residents informed of its exploration expectations for the next season so that it can take steps to prepare for future economic opportunities.

Training Opportunities

Exploration activities may offer Indigenous communities a number of options for economic and business development, including the training of Indigenous staff. Some communities have developed their own training programs to teach people how to conduct prospecting. Because of their knowledge of the land around them, local community members are in an excellent position to take an active part in the exploration activities.

Community members should inquire with companies, government agencies and educational institutions to see what training programs are available and the requirements necessary for

participation in these programs. Some local residents have formed their own exploration companies as there are potential economic benefits through these activities.

1.4 Effects on Traditional Ways of Life

Costs and Benefits to the Traditional Ways of Life

Depending on the extent of exploration the impacts on traditional ways of life can differ, from almost none to quite significant. Because 'exploration activity' is the first form of contact with mining activities, initially interest among community members will lie in concern about impacts to the environment, and on the impacts of exploration activities on traditional land use. The onus is on the exploration individual/company to explain the potential impacts to land, even on a small scale, and how it will be properly remediated. As exploration activity further increases and drilling is involved, there will be more noticeable activity related to an explored area. Community input into environmental matters can help exploration companies determine or avoid potential impacts to hunting, fishing, sacred grounds, and other traditional land uses.

Another effect is the potential for employment or contracting services. Again, small-scale exploration activities offer few opportunities for local residents. However, as exploration expands, residents can prepare themselves for upcoming work by being proactive in communication with the exploration entity and building capacity, if needed, to fulfill the company's needs. Because of the scale and length of the economic effects related to exploration activities, it is unlikely to have a significant long term impact on the traditional economy.

International Instruments

A number of international treaties and conventions exist that speak to the guidelines for *consultation*, *participation* and *respect of the human rights* of Indigenous peoples. Not all Arctic countries are parties to these instruments. For those that have, these documents provide important standards to safeguard indigenous peoples' rights.

Some examples of conventions and instruments that speak to rights that may be applicable to Indigenous peoples and northern communities in the Arctic region include:

- International Covenant on Economic, Social and Cultural Rights, 1966;
- Convention 169 of the International Labour Organization, 1989;
- World Bank Operating Policy on Indigenous Peoples, 2005;
- Declaration on the Rights of Indigenous Peoples, 2007;
- Convention on Biological Diversity (articles 10c and 8j); and
- The Akwe:Kón Guidelines**.**

1.5 Case Studies

Greenland – Fostering Interest in Minerals and Mining

Greenland aims to develop its mineral resources sector into a leading industry to support economic development and job creation. A key objective of this economic policy is to develop alternatives to the fishing industry. Mineral resource development should provide benefits for the Greenlandic society, ensuring a reasonable share of the profits from exploitation. Activities have to be open to participation of local labour and business. The observance of safety and environmental standards is paramount.

In the *Mineral Resources Act* it is stated that Greenland labour and enterprises must be prioritized in mineral activities when available and as much as possible of the processing of the minerals must be performed in Greenland. Furthermore a Social Impact Assessment must be prepared and submitted, describing what impacts and benefits to people and communities are likely to happen and how to manage these impacts and benefits. To support the regulation, an agreement between the minerals company, Government of Greenland and the relevant municipality is made. The following issues are essential in the Greenlandic context to this agreement:

- Recruiting Greenlandic labour;
- Engaging Greenlandic enterprises;
- Focusing on knowledge transfer (e.g. education programmes) in order to ensure long term capacity building of local competence within the mining industry and mining support industries; and
- Preserving socio-cultural values and traditions.

Initiatives for fostering popular interest in mining and minerals have been undertaken through the years by private persons and governmental institutions. These include courses for learning how to prospect for minerals and how to polish stones. In Greenland it is possible to make a living as a rock collector and to train to become a miner. Information material is disseminated regularly through public meetings and magazine articles.

Three of the initiatives are presented here in detail:

UJARASSIORIT

Ujarassiorit is a mineral hunt competition started in 1989. It has now become a Greenlandic tradition. Mineral hunters of any age can submit samples of rocks they have found in the countryside for examination by the Bureau of Minerals and Petroleum, Government of Greenland.

Occasionally, the collected samples lead to an initiation of exploration projects by mining companies. Ujarassiorit is managed and financed by the Government of Greenland via the Bureau of Minerals and Petroleum along with industry sponsors.

Ujarassiorit is grassroots exploration that makes use of local knowledge, and creates a greater interest in and knowledge of Greenland's minerals and rocks. Today many of the mineral hunters are members of The Mineralogical Society of Greenland (Kalaallit Nunaanni Ujaqqeritooqatigiit), founded in 2000 and currently comprised of 400 members. Among other activities, the Society arranges conferences and local rock polishing workshops.

Ujarassiorit hands out shipping material at every post office, so that rock samples can be sent free of postage. A visual description of each sample is done by a geologist and the submitter

receives a letter with information about the rock type and constituent minerals. If the sample has been sent for chemical analysis, the submitter receives another letter with the results.

The mineral hunt generates great interest, with nearly 1000 submitted samples each year. About 1/4 of the rock samples are sent for chemical analysis. Winners of the mineral hunt are selected by the judges, who are geologists from the Bureau of Minerals and Petroleum and the Geological Survey of Denmark and Greenland (GEUS). Prizes are in total DKK 120.000 (USD 20-24.000) hereof 55.000 for 1st prize.

SMALL SCALE MINING

Along with implementing the new Mineral Resources Act in 2010, Greenland also issues mining licenses for small scale exploration and exploitation for up to five persons per license.

These licences come in two types:

1) **Licence with non-exclusive rights:** For a period of 3 years, covering one of the four Greenland municipalities. The licensee has a right to use non-mechanical equipment and explore/exploit and sell rocks.
2) **Licence with exclusive rights:** For a period of 3 years, covering 1 km^2 and giving the right to explore for and exploit the licensed minerals. Requirements include yearly reporting on what minerals have been collected, how many kilos, how much have been sold, etc.

The small scale licence differs from an ordinary one on a number of parameters, including limited obligations of reporting to the government, no exploration commitments, some types of activities are not allowed and consequently some kinds of surveys are not required. The number of persons employed through the licence is limited and open only to Greenland inhabitants.

A permanent resident and taxpayer of Greenland may carry out non-commercial collection of loose minerals without a licence.

EDUCATION – GETTING A JOB IN THE MINING SECTOR

In 2008 the Mining School in Sisimiut was established. It is a part of the Building and Construction School in Sisimiut (Sanaartornermik Ilinniarfik). The schools offer a number of programs with possibility of getting a job at a mine: Common Core, civil engineering (Arctic Engineering), Arctic Entrepreneur, Mining Entrepreneur, explosion manager etc.

The Common Core course has been a great success. The course takes 10 weeks and has been offered since 2008. Over 95per cent of enrolled students have completed the studies. The students often need an English "crash course" of 6 weeks prior to beginning, as the Common Core is performed in Greenlandic and English to meet requirements from the sector.

Other schools offer other programs of relevance for the mining industry, including business colleges (accountants), catering schools etc.

For further information, please visit: www.bmp.gl, www.ujarassiorit.gl and www.sanilin.gl.

2.1 Overview

Mine development and construction is the second phase of the mining cycle and focuses on assessing the potential value of a mineral deposit, determining if it can be mined profitably to the benefit of the mining company and, if so, building the mining facilities and developing the mine.

> ***Facts and Figures***
>
> *Markus Ekberg, CEO of Endomines in Finland stated that the gold mine development in Ilomantsi could commence as the planned cash cost for production was $420/oz. When the gold price is above $1000/oz, it is an excellent time to build towards production.*
>
> *(Source: Nordic Focus- Endomines-Karelian Gold, 2009, Finland)*

The companies involved in developing the mine plan, financing, permitting, production decision and construction of the mine are often different than those involved in mine exploration and as a result, new people will be brought into the community. While the arrival of newcomers could be a strain on traditional activities and existing social networks and services, economically, it could mean additional sources of funding and investment into the community.

In order to build a mine, the ore deposit must be large and valuable enough to pay for the costs of construction (capital costs) and the costs to operate the mine (operating costs). It may be possible to mine diamonds in a remote area with little infrastructure available, whereas mining lead may not be feasible. This is because diamonds have a high value for a low volume, whereas lead is lower value but high volume. In the example of gold, a ton of ore is typically required to produce an ounce of gold.

Factors that determine if a resource is economical to mine include:

- Accessibility of the resource;
- Type of mineral;
- Size of the resource;
- Value of the resource;
- Commodity prices;
- Distance from markets and supply points (e.g., availability of energy in remote areas);
- Ability to recover the resource in an environmentally safe way;
- Regulatory regime; and
- Availability of qualified work force.

The main activities of mine development include:

- Collecting more technical, environmental and socio-economic data to increase the company's knowledge of the resource to determine mine feasibility. This means more samples, more drill holes, and more field tests;
- Developing the mine plan and infrastructure;
- Consultations between governments and mining companies to make sure that regulations are adhered to. Mining companies also consult with communities to make sure that their needs and requirements are addressed;
- Evaluating financial, socio-economic and environmental impacts;
- Obtaining permits and licenses;
- Final financial bank feasibility, project evaluation and production decisions; and
- The mine and its facilities are built, ready to start operations.

Time Frames

Mine development can take anywhere from three to ten and even twenty years. The time needed depends on where the mine is located, how large and complex the development is (including infrastructure needs and availability), and the regional regulations and review processes. It could take:

- Two to three years for test work and studies (environmental baseline studies and feasibility studies);
- One to three years for environmental assessment and permitting; and
- Two to four years to build the mine and infrastructure.

Costs

The major cost of developing a mine depends on:

- The type of mine;
- Size of the mine (the larger the mine, the higher the cost);
- Location of the mine;
- Critical infrastructure in the area, including transportation corridors and power; and,
- The amount of work and time required to do the test work, collect the data, and complete environmental studies and permitting.

Facts and Figures

Start-up costs for mines can range from a few hundred million dollars to over a billion as is the case for the Diavik diamond mine in the Northwest Territories, Canada.

(Source: BHP Billiton Diamonds and Diavik Diamond Mine)

Mine Development and Construction Activities

If initial exploration leads to positive results, the project moves to the deposit evaluation and mine planning stage. During this stage, the mining company will increase its activities and investment to determine if the mineral deposit is worthwhile i.e. economically viable, and if a mine can be developed. It is in this stage that the mining company will prepare the design of the mine.

Once evaluation, planning and consultations with the communities have been completed, a decision on building a mine has been taken, and an environmental assessment has been completed, construction can start. Depending on the country, location and type of mineral, mine development activities may include:

Detailed Drilling

The drilling extracts drill cores (cylindrical samples of the rock) for analysis. Detailed drilling (drill holes spaced at close intervals) is required to precisely define the shape and size of the deposits. This may involve the use of more equipment, including drilling rigs and the drilling of more densely spaced holes. The usual practice is to add in-fill drill holes within the wider drilling grids and step-out or perimeter drilling. Detailed drilling may involve the clearing of additional areas, the use of several drilling rigs, and possibly the construction of new access roads.

Typically, when drilling is undertaken, no other equipment is involved other than the drill rigs themselves and ancillary small generators, pumps, etc., as well as vehicles such as trucks, ski-does, etc., to transport fuel for the drill, core samples and workers. The number of people working at the site depends on the company, the number of rigs used, the deposit, etc., however, it requires fewer people compared to the construction stage.

Detailed Analysis and Evaluation

Samples are analyzed to identify the grade (the quantity of metals, diamonds or other commodities in proportion to ore) and to assess the value of the deposit.

Bulk Sampling

Bulk sampling gives large and representative mineralized samples. It is used to determine the metallurgical characteristics of the material. The sample is tested in a testing plant that recovers the minerals. This may involve using larger drill bits in coring, more drilling in concentrated area, possible pit digging with a backhoe and the possible generation of more waste. A test mine may be built to identify new technologies needed to recover the minerals.

Bulk sampling is an integral part of advanced exploration and potential development studies. Large samples of mineralized material frequently hundreds to thousands of ton are called bulk samples. These are selected in such a manner to be representative of the potential mineral deposit being sampled. They are used to determine the metallurgical characteristics of the material and simulate as closely as possible the results that could be achieved during mining. The sample is

sent for metallurgical testing, first at "bench scale" in a laboratory and ultimately at "pilot scale" in an actual mill. Bulk sampling usually involves earthmoving equipment and large diameter drill rigs.

Environmental Baseline Studies

Environmental work takes place during the mine development stage along with other field activities. Environmental baseline studies establish the state of various aspects of the environment in the region prior to the initiation of a mining project. The environmental baseline study can be used to compare with the forecasted application model of the project. This process will help to determine the future potential changes and where mitigation measures are necessary.

Mining companies will generally use consultants to prepare studies and environmental assessment documents. There may be one, or more than one, consultant involved in this process. Normally, the government or regulatory agency then assesses the documents prepared by the company (or their consultants). Experts within the government or consultants to the government will verify the documents prepared by the company.

The company covers the cost for the studies and for the preparation of the studies. The government pays for the assessment of the reports (through salaries of their experts, etc.) and for public and aboriginal consultations during the assessment. In the end, both the mining company and the government cover the costs of the actual assessment.

Preliminary Design and Engineering (Prefeasibility)

The preliminary design and engineering stage of mine development and construction occurs during the prefeasibility period. Prefeasibility is an intermediate activity meant to verify a project's potential before investing money into additional detailed work.

Feasibility Studies

Feasibility studies are a series of planning studies and evaluation reports of the geological, engineering, economic, legal and site data. The purpose of the feasibility studies is to evaluate all aspects of a project, review the plans, identify risks, refine the cost estimates, and decide whether a mineral deposit can be mined profitably.

Table 2.1 Feasibility Study Topics and Questions

Geology and resource determination	Size of the deposit Grade of the minerals or metals in the deposit
Mine planning	Type of deposit Type of mine (open pit / underground) Equipment needed to mine
Process plant test work and plant design	Extraction method

	Need for smelter (or pipeline for slurry or roads for truck transport of ore to a port facility)
Infrastructure planning	Roads, airstrips, camps and complexes[10]
Water and waste management planning	Amount of water supply Stormwater management Discharge quality requirements Plans to address issues
Environmental and socio-economic planning including health impact assessment	Issues from the environmental and socio-economic studies including those brought up by local communities in the consultation process Plans to address issues Mitigation
Mine closure and reclamation plan	Best approaches for reclamation and closure Long term / in perpetuity monitoring
Operating cost estimates	Number of workers required Types and amounts of equipment and supplies are required during operations Annual operating costs
Capital costs	Costs to plan, design, permit and construct the facilities
Financial analysis	Capital and operating costs of the project Costs to borrow money to build and operate the mine Annual costs and earnings Expected profit or loss

Mine Closure and Reclamation Plan

An important step in planning is the mine closure and reclamation plan. This plan is a detailed report on how the mine site will be cleaned up and restored once mining operations are completed. The direct closure impact of all areas of a mine site should be addressed as an integral part of

Facts and Figures

A closure and reclamation plan explains how the company will rehabilitate the mine site once the ore runs out and the mine closes.

(Source: Natural Resources Canada)

[10] The cost and access to energy is crucial here.

the engineering design. This includes removal of structures, how to handle tailings, how to dispose of chemicals and hydrocarbons, waste rock slope stability, pit shut-down, and revegetation of terrain.

Governments may insist that the company provides a financial assurance - e.g., a bond, letters of credit, an actual cash fund or other financial assurances can also be utilized - to cover unexpected closure problems or failures. This financial assurance can be required before the start of construction. If mine closure and reclamation are too expensive, the proposed mine may not move on to production.

Permitting and Environmental Assessment

As the mine development activities increase and become more intense, permits and licences will be required. If feasibility studies are encouraging and show that there is a potential project, the mining company will most likely need to submit a project description to governments or local authorities. This will start the environmental assessment process. This process must be complete before the start of construction.

The purpose of an environmental assessment is to understand the possible impacts from the activity and to incorporate environmental factors into decision making to minimize or avoid adverse environmental effects. The environmental assessment process and the many consultations required to determine if the project can develop into a mine are opportune times for the community to voice concerns, since community knowledge and concerns may result in changes in the project.

Agreements between communities and mining companies

Facts and Figures

Alaska, U.S.A. - BHP entered into a Memorandum of Understanding with the villages of Point Lay and Point Hope for the purpose of reaching certain objectives and expectations, which include: employment opportunities, educational and training opportunities, consultation protocols, and the identification and mitigation of impacts.

Community agreements are signed between mining companies and Arctic communities at either the mine development or construction phase in order to establish formal relationships between them, to reduce the predicted impact of a mine and secure economic benefit for affected communities. Agreements are increasingly used by communities to influence decision making about resource exploitation in their lands. Such agreements come under a number of different names. The negotiation of these provides an excellent opportunity for the mining company and the local community and its members to develop a good relationship, and build on the communication established in the exploration phase. These agreements can include topics such

as local infrastructure development, waste management, hunting / fishing restrictions, employment, training, terms of mine shutdown and remediation, financial provisions, environmental monitoring, and business opportunities, Indigenous organizations may have opportunities to enter into legally binding agreements with mining companies to ensure the protection of health and well-being of the Indigenous people for future generations.

Sales Contracts

During early feasibility, assumptions are made on sales of the mineral(s) to be mined. However, before final feasibility, the actual terms and conditions of mineral sales may be established to help secure mine development financing. This is the role of a sales contract - which is the sale of a product to a customer.

Transport

Important to consider for sales contracts is the establishment of affordable transportation to get the mineral ore to the customer. This may require the construction of ports and ships, pipelines and roads.

Final/Bankable Feasibility

During final/bankable feasibility, all existing feasibility studies are reviewed. The permitting, environmental assessment, closure costs, and negotiated agreements are also reviewed. The objective is to determine a final costing for the project so that the final investment decision can go ahead.

Project Financing

Once a final costing is known, the mining company may need to secure project financing. The bankable study is used to demonstrate a project's feasibility and to help secure investment. Companies may need to borrow the money from a bank or raise money by issuing stocks on the stock market.

Investment Decision by Mining Company

The final investment decision – whether to build the mine – happens when the final feasibility study is finished, project financing is secured, and permits are received. The Board of Directors of the mining company will make the final decision on whether to move ahead and build the mine.

Although it is hard to imagine, given how much work, money and time have been invested to get to this point, the decision could be to not go ahead with the project because of uncertainty in the markets and commodity prices. This means that all agreements negotiated to this point are

conditional agreements that depend on whether the company decides to go ahead. Planned projects may be revisited years later as commodity prices change.

Construction

Construction refers to the development of the entire facility, including the mine, processing plant, and all related infrastructure. Infrastructure development includes all facilities needed to support the operation, other than the mine and process plant. This stage requires most of the money and provides most of the jobs. A company does not usually commit to construction until the details of all permitting and regulatory requirements have been confirmed and all environmental appeals or litigation have been resolved.

Activities during construction include:

- Site preparation;
- Clearing and initial preparation for mining;
- Shaft sinking for underground mine and pre-stripping at open pit mines;
- Construction of accommodations;
- Construction of process and site facilities (i.e., mills, offices);
- Building roads and airstrips (installation of power lines and railway);
- Training programs for personnel; and
- Installation of environmental protection equipment.

Main Stakeholders in Mine Development and Construction

Junior Exploration Companies

Many junior exploration companies are not usually directly involved in mine development. They do not have the resources, neither money nor technical people, to develop and build a mine. Some junior companies, when they find something promising during exploration, will seek a senior mining company to invest in the property and take on the role of manager and operator. Most senior companies will only buy the mine project site once they are confident that the project is viable, which requires that the feasibility and environmental assessment be completed. Other junior companies will decide to become mine operators, and will seek the financing to develop the mine. Junior companies that become mine operators of one or a few miners are known as mid-tier companies.

Mid-tier and Senior Mining Companies

Mid-tier and Senior mining companies are the main players in mine development. They are the manager and operator, and are involved in all activities from exploration through construction and operation. Mid-tier and Senior companies can buy a project from a junior company, or from

another mid-tier or senior company, at any point from the pre-feasibility to the completion of the environmental assessment.

Consulting Firms

Consulting firms could be hired by the mining company to help them with feasibility studies, environmental studies, detail design, construction management, and project management activities.

Equipment Suppliers

Equipment suppliers manufacture and sell equipment to the mining company and often provide maintenance services in the operating phase.

Governments

Governments review environmental assessments, set the rules for permitting, manage the permitting process, and issue the required permits. They also manage and regulate royalty, rents and revenues from companies or the mineral rights holder. Governments may offer programs to assist communities and individuals with taking advantage of economic opportunities during mine development and construction.

Financial Institutions

Once a project has reached the development stage, the cost of proceeding through development and production is very high compared to the initial exploration phase. Most mining companies will raise funds through a combination of individual and institutional investors through the markets and by borrowing money from the banks. For very large deposits that cost enormous amounts of money to develop, potentially over a billion dollars, large mining companies will sometimes combine their resources into a partnership.

Construction Companies

Construction companies and contractors are hired to build the roads and plant sites, put up the buildings, and construct the processing plant and infrastructure needed for mine operation to go into production. They provide skilled workers, heavy mobile equipment, tools and supplies, and a history of successful construction in similar industries.

Construction companies and other contractors often provide employment for local workers, which can

Facts and Figures

Labrador, Canada - Voisey's Bay Development: Vale Inco provides preferential employment and business opportunities for Labrador Aboriginal persons and companies. A total of $515 million in contracts was awarded to Aboriginal companies during the construction phase of the project.

(Source: Aboriginal Engagement in the Mining and Energy Sectors: Case Studies and Lessons, Aboriginal Engagement Task Group of the Intergovernmental Working Group on the Mineral Industry)

often lead to permanent employment at the mine.

Local Communities / Indigenous Peoples

Members of these groups could be represented in any of the above actors directly involved in mine development and construction.

Opportunities for Indigenous Peoples' and Northern Communities' Involvement and Input in the Mine Development and Construction Phase

Community Involvement

The mine development and construction phase offers community members the greatest opportunity for involvement. In particular, the environmental assessment process and the many consultations required to determine if the project can develop into a mine are opportune times for the community and the mine developer to identify employment prospects.

Additional opportunities are created through the environmental assessment consultation process, designed to incorporate input from local residents and the mining company. For consultations to be of optimal value to communities, communities can prepare in advance by doing the following:

- Identifying potential impacts that need to be considered in project development (i.e. land disturbances near sacred sites, disturbances to wildlife, subsistence, cultural and traditional use sites);
- Setting up ways to communicate for current and ongoing consultations (i.e., key contacts, translation needed for elders);
- Assessing needs for advice and information gathering;
- Identifying the service and labour needs of the project;
- Conducting a skills inventory of residents interested in working at the mine;
- Identifying community business opportunities and capacities; and
- Beginning skills training.

With an objective to promote the preservation of Indigenous cultural and spiritual heritage in the Arctic sites that have sacred significance and enjoy high biodiversity and natural values, the Program on Conservation of Arctic Flora and Fauna (CAFF) has in the past supported a proposal by the Russian Association of Indigenous Peoples of the North to protect sacred and ritual sites.[11]

[11] Arctic Human Development Report, 2004

To help community residents to address various issues raised during consultation, they may decide to set up committees to help ensure impacts are recognized, communicated and mitigated. Possible committees could include the following:

- Environmental impact statement review committee;
- Environmental review during operations;
- Environmental and socio-economic monitoring committee that may include maintenance and monitoring in the long term or in perpetuity after closure;
- Community wellness committee;
- Business opportunities development committee;
- Training/hiring committee;
- Community sustainability upon mine closure committee; and
- Emergency response.

Having community development and infrastructure plans in place before development will be of great value to the community throughout the mine development and construction process. Communities should be involved in discussions with government agencies as early as possible during the licensing and permitting process.

Company Involvement

During mine development and construction, the opportunity for meaningful community input is critical for companies to earn the community's trust. This is the time, before a project goes into operation, for local residents to voice key concerns and priorities vis-à-vis the mining project, ensure they understand the project, and communicate to the developer the potential impacts from the community's perspective. In this way the company's environmental assessment can incorporate community input to help address deficiencies in information and make the necessary changes in mine planning including eventual reclamation of the mine area. Such input is vital to both ensuring a comprehensive environmental assessment while at the same time continue building the relationship with the community members.

Understanding that traditional knowledge is often proprietary in nature, it also may provide information about traditional land uses, alerts developers to migratory patterns of wildlife, and can inform developers about sensitive areas (hunting, cultural sites, migratory routes, etc.). Traditional knowledge may also be used to help identify environmental impacts, evaluate how serious they are, and select ways to reduce any negative impacts. As part of the consultation process the company can arrange site visits for community members to facilitate their understanding of the project and mining area.

Governance Overview

Mine development and construction regulations are typically complex and vary between countries. However, the purpose of many of the regulations is to ensure that development of the mine occurs in a way that will benefit people and minimize potential negative impacts on the environment. Key regulations and permits relate to mining activities, land, water use, fish, wildlife, mine closure and reclamation plans.

Permits, licences, and regulations are issued at a local, regional and national level. Contacting one of the governmental mining authorities in your country will direct you to the acts and regulations for the administration of exploration, construction and operational activities, and closure. The Appendix provides contact information for each country's responsible government mining authority.

2.2 Environmental and Social Effects

Potential Environmental Effects and Mitigation Measures

Minimizing the land area impacted by mining activities is a goal of regulators and stakeholders and of mining companies. Every mine development is unique and will affect the environment in different ways. The Arctic region will have particular environmental challenges due to mining because of:

- the lengthy recovery and repair time needed by the impacted environment due to the cold weather;
- lack of infrastructure may slow down some mitigation and rehabilitation activities;
- permafrost, unique to the North, is easily disturbed;
- dependence of local and northern inhabitants on subsistence activities which may be affected by mining; and,
- many climate change impacts are being felt first in the Arctic, which could result in environmental impacts such as variances of water supply.

Environmental impact assessments address how the development will affect the environment during mine development, operations and mine closure. Studies, including baseline studies, can start as early as the advanced exploration stage and include the development of a detailed description of the environment. They enable the comparison of the environment before, during and after development and make it possible to track changes in condition.

The following are surveys that may be needed due to the possible effects that may occur in an area of study:

- Archaeological
- Vegetation (tundra-shrubs, mosses)
- Fish/Wildlife
- Social
- Cultural
- Economic
- Environmental
- Air quality
- Water quality
- Surface and ground water
- Noise
- Permafrost
- Subsistence
- Cumulative impacts
- Geochemistry
- Geotechnical stability
- Noise
- Human health impacts: exposure to dust, toxic chemicals or radioactivity.

> ***Facts and Figures***
>
> *Habitat fragmentation is caused by linear developments such as roads and pipelines and can inhibit animal movements, particularly for migratory species, such as caribou. Efficient use of roads and raised pipelines are examples of mitigation measures.*
>
> *(Source: Arctic Oil and Gas 2007, Arctic Monitoring and Assessment Programme)*

Modern technologies, open communication with communities, sound planning, rigorous impact monitoring, and appropriate personnel can help to reduce and eliminate impacts.

Effects that could occur in the Arctic and possible mitigation measures taken are noted in the table below.

Table 2.2 Environmental Effects during Mine Development and Construction

Type	Condition	Mitigation
Land Use	Possible disturbance from uncontrolled access to mine site	Installation of security gates
	Possible disturbance from construction of access roads, buildings, workshops, processing plant, and permanent camp	Use community feedback in design and layout of buildings. Community feedback at mine closure is also crucial to ensure that the closure plan fits the long term local use for the area. Plan to minimize land disturbance due to road construction.
	Possible disturbance from bulk sampling and extensive drilling programs	Detailed planning to minimize land disturbance
	Possible pollution and contamination	Fuel storage standards

Type	Condition	Mitigation
	from fuel and chemical storage	Spill plans Fuel management programs
	Melting of permafrost	None identified
Water quality	Chemicals in water discharge, mud or dirt getting into water bodies; sedimentation / erosion; water contamination.	Control drainage Proper collection and treatment Ensure discharge criteria are met Segregation of reactive rock Divert surface waters and precipitation around site
	Possible pollutant releases from melting of multi-year ice	None identified
Wildlife	Animals attracted to garbage and food waste	Waste management programs
	Migratory patterns affected by presence of humans, noise from aircraft, noise from blasting	Use environmental baseline work to understand activity in the area Educate employees and contractors to understand their responsibilities towards wildlife
	Disturbance of destruction of fragile plant communities. Vegetation monitoring will help ensure that disturbance is minimized.	Identify fragile plant communities and develop mitigation measures specific to the plant community.
Planning Dam safety	Site location and hazard potential including seismicity, hydrology, and slope stability, seepage control, operations and maintenance, and emergency contingency planning	Design and construction quality Monitoring of structural integrity Operations and maintenance Emergency contingency planning
Acid Rock Drainage	Possible pollution and contamination generated when metal sulfide minerals are exposed to air and water • ARD causes metals to dissolve from ore, waste rock, tailings	It is very important to understand the potential for ARD and metal leaching and the site wide water balance in order to design the mining operations and control measures to prevent contamination. Design, manage and maintain a facility that can effectively prevent ground water and surface water contamination and install at the time the waste and process units are constructed. Minimize the amount of contaminated water by minimizing contact between reactive mine wastes and water and maximizing the reuse of contaminated water. • Test mine waste rock and tailings for ARD and metal leaching • Understand baseline environmental conditions

Type	Condition	Mitigation
		• Chemicals are added to cyanide containing wastewater to destroy cyanide: Inco sulfur dioxide process, Noranda copper and ferrous sulfate process; Alkaline chlorination; hydrogen peroxide. • Or cyanide can be recovered through an AVR recovery process.
Soil and Land Use Impacts	Direct impacts: • Physical alteration/loss of habitat and vegetation • Soil contamination (particles, contained metals) Indirect impacts: • Wildlife • Subsistence users	Prevention and control measures • Minimize footprint • Backfill tailings • Backfill waste rock • Consolidate wastes • Reclaim/revegetate

Potential Adverse Social Effects and Mitigation Measures

While mine development brings new opportunities for employment and business to a community, it may also create Without proper planning and collaboration, mine development may create new, or intensify existing, social tensions or concerns of the community. Because of the sparse populations in the Arctic, a large influx of people needed for construction and development can have a significant impact on nearby communities.

Adverse impacts of mine development for local people could include less time to spend on traditional activities, and separation of workers from their families for extended periods of time.

Negative effects that could occur and possible mitigation measures taken are noted in the table below.

Table 2.3 Social Effects during Mine Development and Construction

Type	Effects	Mitigation
Cultural	Possible loss or damage of archeological and heritage sites	Protection of land, and of archeological and heritage sites through consultation and cooperation between companies and local communities and Indigenous people.
	Impacts on traditional and non-traditional land use	Define restrictions for hunting to ensure safety of operations and personnel,

Type	Effects	Mitigation
		protection of traditional subsistence activities, and distinguish between subsistence and sport activities by agreement and in consultation with Indigenous residents and local communities to seek a balance between various access and safety issues. Cultural training requirements for exploration parties and mine workers. Communication, collaboration and job training for local communities.
	Impacts on local community, social and economic systems	
Community Capacity	Opportunities for enhancing the capacity of communities Increased training and skills development	
Employment	Increased employment opportunities Mine related employment may fluctuate for short periods of time. Wage employment could also lead to less time to spend on traditional activities and a strain on families as there could be extended separation periods for members.	Programs could be created to minimize the separation stress experienced by families. Communication between worker and company to determine if work could be organized around particular traditional activities. Company organizes work schedules so that at least one family member is at home to support family activities.
Influx of external workers	The arrival of external workers to communities could be a strain on traditional activities and existing social networks and services. An extended presence of outsiders with money could lead to increase exposure to drugs or other vices.	The community and company can work together to offer cultural and community awareness training. The company should have worker conduct policies properly developed and communicated to staff. The company should perform a social impact assessment to determine the capacity and need for social services as a result of their presence. . The company could provide support to maintain traditional activities in the community.
Local Investment	The mining company can provide funds and business opportunities to the community and its members. Tension amongst community members if they believe that benefits are not being fairly distributed. Potential for competition (and price inflation)	The company and community can work together to determine collective benefits for company dollars and an equitable distribution of business opportunities to those capable of providing goods and services. Formal mine-community agreements can facilitate investment and local and mine

Type	Effects	Mitigation
	for existing resources from other uses.	company benefit.

Environmental Assessment

An environmental assessment (EA) is a government-mandated process to identify and assess the potential environmental impacts of a project. The purpose of the environmental assessment is to identify the impacts of the project and determine ways to mitigate them or compensate for them. The result of the environmental assessment is not to approve the project, but to show that the environmental impacts are understood and can be mitigated. At the end of the assessment, the project will still need permits before it can be built.

In a typical EA process, there are mandatory elements for public participation. The involvement is required to start when an application for a project is submitted. However, usually the public and Indigenous groups are contacted earlier in the process.

Typically national and/or regional legislation will describe the process that must be followed for environmental assessments. This will include when an environmental assessment is necessary and will describe the roles and responsibilities of the government bodies and the company.

Environmental assessments should make full use of the traditional knowledge of Indigenous peoples and members of local communities. The mining company is responsible for soliciting traditional knowledge or making possible its inclusion. It is up to the community to determine how that information may be used in interaction with non-indigenous community sources, for example: non-disclosure, partial disclosure; disclosure in-camera/confidentially, or others means of useful input. Should Indigenous communities choose to share their traditional knowledge, it can be used to determine and evaluate environmental impacts and select ways to minimize or mitigate them.

Facts and Figures

The Yukon Environmental and Socio-economic Assessment Act (YESAA) creates a single assessment process for all projects - it applies throughtout the Yukon and to the federal, territorial, and Yukon First Nation governments. For further information: http://miningyukon.com

Development and Implementation of Monitoring Programs

Environmental monitoring is usually a condition for permits and is necessary to provide early warning of negative impacts so that corrective actions can be put in place quickly.

The objective of environmental monitoring is to make sure that all impacts are identified and mitigated. A mining company usually performs the monitoring, analyzes the results, and reports them to government agencies or sometimes to community monitoring agencies.

Environmental monitoring during mine development includes monitoring of:

- water flow and quality;
- air quality;
- fish habitat;
- birds and both terrestrial and sea mammals;
- vegetation changes;
- noise, and
- human exposure to dust, toxic chemicals or radioactivity.

Scientists typically analyze these test results; however, individuals from the local community are often trained to carry out sampling and some analysis procedures. As an example, direct changes in Arctic plant communities are watched for, as well as the presence of non-native species. Vegetation is sampled and analyzed in a lab, particularly for metal mines, for potential metals uptake and transfer to wildlife.

Mining operations can have serious environmental consequences due to the movement of large quantities of materials that are then exposed to the environment for long periods of time. There are many ways to prevent, control, and remediate contamination, for example:

- Understand waste characteristics, water balance, and environmental conditions;
- Minimize footprint and minimize contact with water;
- Design for closure;
- Appropriate monitoring and inspection; and
- Implementation, compliance, and enforcement of environmental regulations.

2.3 Employment and Other Economic Opportunities

Potential Employment and Other Economic Opportunities

Employment Opportunities

Arctic communities can experience enormous increases in employment during mine construction, depending on the size of the mine. A wide variety of jobs, from entry-level to professional, may be available to communities. The mine developers and contractors are the major employers. Other employment sources are secondary support industries and service providers. If a community cannot meet minimum education requirements they may be able to work with the mining company to waive the requirement for a period. The education requirement can motivate young people to stay in school. Other possible arrangements (mentoring, internships, etc.) may enable locals to become qualified and enter the full-time workforce.

Facts and Figures

Yukon, Canada – The mining company, Alexco Resource Corporation, provided funding for four two-week on-site training sessions with a focus on safety for underground miners. The course provides opportunity for people to learn the skills necessary to work in Yukon's mining industry.

(Source: Yukon Mine Training Association Newsletter Issue 8)

The economic benefits due to increased employment can be significant for a community. Since many of the skills learned during mine development are transferable, a community can benefit from the increased skill base of its residents. The table below describes various jobs and their education requirements. There could also be other arrangements like mentoring or internship programs, or something like the First Nations "Wage Subsidy Program" as both a way for local inhabitants to get started in the work and as an incentive to become a full-time part of the qualified workforce.

Facts and Figures

Canada - The First Nations Wage Subsidy Program was established to encourage industry to utilize the First Nation workforce, hiring individuals who may be under-qualified for a position, but who can be further trained through on-the-job experience.

(Source: Yukon Mine Training Association - www.yukonminetraining.com/

Table 2.4 Jobs Types and Education Requirements

Type of Job	Education Requirements	Examples
Entry-Level	High School or equivalent	Trades helpers Heavy equipment operators Housekeeping services
Semi-skilled	High School or equivalent Some work experience	Warehouse technicians Administrative assistants Trades occupations
Skilled	College diploma or trades certification	Trades occupations Safety coordinators Environmental technicians
Professional	University degree	Managers Engineers Geologists Environmental scientists Biologists Archaeologists Accountants

Other Economic Opportunities

Communities can experience significant economic benefits during mine development and construction. Communities and the mining company should work closely early in the consultation process to develop alliances and partnerships in the areas of training, employment and business opportunities. Some of these opportunities could include:

- Camp catering and housekeeping;
- Site services;
- Surveying;
- Construction services;
- Contract mining – both underground and open pit;
- Supply of goods (e.g., safety equipment, oil, gas);
- Aircraft support – helicopters – fixed wing;
- Airport maintenance;
- Laboratory services;
- Cultural awareness training;
- Translation services;

- Environmental consulting;
- Translation services;
- Community or cultural advisor / liaison; and
- A legacy project (arena, swimming pool).

Facts and Figures

At Cominco's Red Dog mine in Alaska, in 1999, 58 percent of the workers and contractors employed by Cominco Alaska were from the NANA Regional Corporation, Inc.,(NANA) local communities. While this number is significant, Nana and Cominco still strive to obtain 100per cent employment supplied by the Nana community.

(Source: International Council on Metals and the Environment – Mining and Indigenous Peoples: Case Studies)

Enhancement Measures and Monitoring Programs for Employment and Other Economic Opportunities

Preparation

Potential business opportunities will increase as a project moves through the steps of mine development and construction. Communities should prepare to take part by asking these questions:

- What businesses currently exist in the community?
- What businesses are required by the project?
- What is the available skill set of community members?
- Are their joint venture possibilities?

The process of building a business base in a community takes time and a strong understanding of mining. A good example of this comes from the Northwest Territories in Canada, where two large diamond mines were developed within five years of each other. As communities and local businesses gained experience, they increased their capacity and were much better equipped to take advantage of the opportunities presented by the second development.

Businesses may grow when longer-term contracts become available during mine operation.

Community-Company Agreements

Specific undertakings were made between the diamond mines and local communities to identify and develop local businesses. Agreements such as Impact and Benefits Agreements may be developed between companies and communities that include information regarding the role of each party. These agreements include provisions for employment, business opportunities and training and scholarships. They may also contain provisions related to the protection of the environmental or cultural values, mine operations and end of mine life issues such a cleanup, and remediation. These agreements become confidential legal contracts that will only be made public if agreed to by the community and the mining company.

Facts and Figures

Discovery of a tar-like substance found in a river draining the property at Musselwhite Mine led to concern that an oil spill had gone unreported. A commitment to operate a joint monitoring program with the Joint Venture company and First Nation personnel restored faith in the program and trust in the relationship when it was discovered that the unknown substance was mosquito larva.

(Source: International Council on Metals and the Environment – Mining and Indigenous Peoples: Case Studies)

Joint Ventures

Indigenous businesses can enter into joint ventures with other established businesses. A joint venture (JV) is a simple business arrangement between two companies or between an Indigenous community and a company capable of supplying services or materials to an exploration or mining company.

A JV agreement defines the relationship between the two parties and specifies the training and employment opportunities. It also defines how profits from the JV business activities will be distributed.

JVs are an excellent way to develop local business capacity to prepare for and take advantage of business opportunities related to mine development. Through a JV, a community business can increase the scope of its current services in order to help meet the service and support needs of the mine developer. Examples of successful JVs include those that provide helicopter support, fuel supply, catering, housekeeping, environmental consulting and contract mining services.

Monitoring

Once agreements have been made, they should be revisited throughout the development and construction phase. Because this phase can last a number of years, agreement objectives need to be reviewed and evaluated against the actual occurrences.

2.4 Effects on Traditional Ways of Life

The mine development and construction phase generally takes a number of years, and contact between the mining company and local communities will naturally increase. Every mine will

impact a community in its own way but one thing is certain: there are a number of people needed for the construction of a mine. This means that there will be a number of non-local people coming to the area, and the local community will serve as a labor pool and a source of needed services. Another option for introducing non-local workers is an enclave. An enclave would be in housing separate from the community and where workers are brought in for multi-week shifts and then are taken out minimizing social contact with the local community and potential negative social effects.

An influx of non-local population could impact traditional ways of life. Even though these individuals may participate in cultural awareness programs, they are likely to influence the local community through their actions and the relationships they develop. As the development and subsequent construction of the mine progresses, community members are likely to play a larger role as they receive training and better understand the needs of the mine. Role models in the community could change from elders with traditional skills to younger adults recently trained to perform labour activities while building the mine.

The mine footprint could have a potential impact on traditional land-use. The noise and activity associated with construction could influence the behavior of birds and wildlife thus affecting hunting. Reductions in water quality during construction could harm aquatic resources. Storm water collection could mitigate impact on local waters. The actual mine itself could be projected for an area of land where Arctic medicinal plants and berries are harvested. Community input is important to assist in the planning stage to help minimize land disturbance and impact on culturally sensitive areas.

International Guidelines

There are a number of international treaties and conventions that speak to the consultation, participation and human rights for Indigenous peoples. The Berlin Guidelines created in 1991, and revised in 2000, (http://commdev.org/files/814_file_UNEP_UNDESA_EnvGuidelines.pdf) state that governments and mining companies should at a minimum:

1. *Recognize environmental management as a high priority, notably during the licensing process and through the development and implementation of environmental management systems. These should include early and comprehensive environmental impact assessments, pollution control and other preventive mitigation measures, monitoring and auditing activities, and emergency response procedures.*

2. *Recognize the importance of socio-economic impact assessments and social planning in mining operations. Social-economic impacts should be taken into account at the earliest stages of project development. Gender issues should also be considered at a policy and project level.*

3. *Establish environmental accountability in industry and government at the highest management and policy-making levels.*

4. *Adopt best practices to minimize environmental degradation, notably in the absence of specific environmental regulations.*

5. *Reinforce the infrastructure, information systems service, training and skills in environmental management in relation to mining activities.*

6. *Recognize the linkages between ecology, socio-cultural conditions and human health and safety, the local community and the natural environment.*

7. *Encourage long term mining investment by having clear environmental standards with stable and predictable environmental criteria and procedures.*

2.5 Case Studies

Relocation of a mining town: the case of Kiruna:

Kiruna is the largest underground ore mine in the world. Kiruna is a municipality of 20,000 square kilometers located above the Arctic Circle in northernmost Sweden in the area known as Lapland. It has a low population density with approximately 18,000 of the municipality's 23,000 people concentrated in the town of Kiruna. While originally characterized as a single-resource community, it now comprises a growing diversification of its economic resource base.

The town was established in 1905 for the purpose of hosting the workers involved in mining iron ore. Since then the mining and number of inhabitants have increased and fluctuated in response to the demand for iron. This iron mine has for a long time been run by a state-owned company, Luossavaara Kiirunavaara Aktiebolag (LKAB), which has supported thousands of local jobs through its history and provides great economic benefit to the state of Sweden, achieving over six billion Swedish Krona (SEK) in operating profit in 2005.

Moving the town

In 2004, LKAB informed the Kiruna municipality and the community about mining related subsidence, caused by earlier mining activities. They also reported their future plans for extensive mining activities which will mine the ore-body that extends underneath the existing town. This underground mining causes ground deformation making it highly unstable for buildings above the mine. These occurrences threaten the existing urban structure and as a result, a decision was made to relocate as much as one-third of the town's buildings.

In 2007, the new location was agreed on. Soon after that, the work began.

Some parts of the community were excited about the new Kiruna, as deduced from a survey questionnaire taken in 2006. This extraordinary measure will clearly have an enormous impact on the physical environment, architecture, and local community. At the same time, it provides an opportunity to rebuild a large part of the town and a completely new city centre in a sustainable way. The media attention on the town itself caused diverse reaction among the community: suddenly this small unknown town in the north was the focus of attention by many journals, TV and radio programmes. On the other hand, others were anxious about what was going to happen to their local environment.

Surprisingly, the idea of moving the town has not severely antagonized the local community. One could expect adverse reactions, but in Kiruna the people know how important the mining and LKAB are. LKAB has always shown an interest in a well-functioning local community. This is in part the reason why locals have always trusted the mining company and still seem to be trustful, despite the extreme measure of relocating the town that has begun.

3.1 Overview

Mine operation is the third phase of the mining cycle. It is the process of producing a mineral product for sale. A mine is operating when earth and/or rock are being excavated from the ground and the processing plant is producing a marketable product.

There are two types of mines: underground and open pit.

A mine operation has four main work areas:

- ***Excavation areas*** – where earth and rock containing minerals are excavated.
- ***Processing plant*** – separates the rock that contains saleable material (ore) from the surrounding rock that is not saleable (waste rock). Mineral processing is done in multiple stages and uses different processes depending on what is being mined. Some mine operations do not have a processing facility on site so the mined material is sent somewhere else to be processed.
- ***Waste storage*** – includes areas for both waste rock and the material rejected from a mill, which is called tailings.
- ***Supporting areas*** - are services to a mine operation and may include repair shops, labs to test the quality of mined material, change rooms, living quarters, warehouses, and offices.

Every mine operation has mining and processing target rates. One key element is to determine rates of mining and processing that will ensure that all costs can be covered from the sales of the product. These rates are evaluated during the feasibility studies before a mine starts operating. The rates are calculated to provide the highest level of efficiency, which considers the capital investment, size of ore body, and life of the mine. Producing too much too fast could increase costs and hurt profits and result in possible negative environmental impacts; producing too little, too slowly, could hurt the economics of the mine because of the reduced sales. The mine and the process must be designed and built to achieve the right balance.

Time Frames

The operating life of a mine can be as short as several years or as long as several decades. It can also be seasonal, or operations can be yearlong, and shipments of processed ore can be seasonal when access is difficult. Overall revenues must be able to at least recover exploration and construction expenses. Factors that affect how long a mine will operate include:

- Price for the product in the world market;
- Production costs and production rates;

- Processing method
- Quality (grade) and quantity of ore that is economic to mine in the deposit;
- Size and shape of the body of material to be mined;
- Best possible economic mining rates;
- Mining methods, equipment, and associated costs;
- Depth of mining required below surface;
- Ground conditions and ability to mine safely; and
- Location.

Generally, with higher metal prices, lower-grade rock becomes ore. However, when the price of metal is low, only higher-grade rock is able to be used as ore.

Costs

Mining uses labour, capital, energy and other inputs, all of which cost money. During mine operations, labour is usually the highest cost. Power, fuel and other consumables (e.g. heavy equipment, drill bits, tires, and spare parts) are the next greatest expense.

The location of a mine has a major impact on both construction and operating costs. If the mine is located in a remote area, the mine operator may have to build a winter road to bring in supplies and take out ore or concentrate, and a diesel power plant to generate electricity. A major expense for remote mines is transportation costs to fly workers in and out of the mine, as well as the use of ice roads or sea lifts to bring in supplies or ship them out once a year to remote, northern mines. However, if the mine is located in a less remote area, it may be on an existing road system and close to power grids, or a company may negotiate with the government to provide or support building a road for access and power to help lower costs.

Mine Operation Activities

Commissioning

Commissioning involves testing to see whether a new facility, process or equipment performs as it was designed. All processing and mining equipment must be commissioned before going into full production.

Production

During production, waste rock must be removed to recover the ore. Ore and waste both cost money to excavate and process, and so, to be efficient, mines try to mine as much ore and as little waste as possible.

When an operation starts up, a lot of waste must be excavated in order to reach the ore or the specific geology of the deposit. In underground mines, this is called pre-production development.

In open-pit mining, this is called pre-stripping. This early stage of mining can last from a few days to more than a year, depending on how much waste there is and how fast it can be removed.

Once enough waste has been removed, the mine is able to send ore to the processing plant, and the processing plant begins processing the ore. At this point, the mine is in "production".

During production, waste still needs to be excavated in order to keep uncovering more ore. In underground mining, this is now called "development"; in open-pit mining, this is called "stripping." Development and/or stripping go hand-in-hand with production and are crucial to maintain production.

Full production generally means that the average mining and processing rates are meeting or exceeding the target rates developed during the feasibility study phase.

Improved market conditions may allow a mine to sell more product than planned and/or to sell it at a higher price than expected. When this happens, the mining company may try to increase production. Sometimes a mine operation can increase production for a short time using its existing equipment and people, but the only way to achieve permanent increases is to expand the mine.

Mine Expansion

Some mines may experience an expansion phase. Mine expansion can include:

- Enlarging the existing mine;
- Opening up more mine areas;
- Buying more equipment and hiring more people;
- Expanding the processing plant to process more ore;
- Changing the processing plant to process faster; and
- Doing more exploration work to try to find more ore.

Main Stakeholders in Mine Operation

Junior Exploration Companies

As a project goes into production, the junior company often sells all or most of its ownership to a senior mining company, although there are exceptions with junior companies retaining their interest in the mine. If a junior mining company sells its ownership, the mid-tier or senior mining company becomes the sole or majority owner and uses its expertise to operate the new mine.

Mid-tier and Senior Mining Companies

Mid-tier and senior mining companies have the central role in the mining industry. They arrange financing, plan, develop, and manage mine operations. They also sell the product. Most senior mining companies have been in the mining business for decades and have several mine operations throughout the world. Mining generates a lot of money, but it also costs a lot of money to start and operate a mine.

Consulting Firms

Consulting firms provide special knowledge and capability to mine operations. A mine operation could require assistance in areas such as rock and soil mechanics, safety, engineering, occupational health, labour relations, environmental science, and others.

Equipment Suppliers and Manufacturers

Equipment suppliers have expert knowledge of and experience with the machinery they supply. They are usually certified journeymen mechanics or electricians, or will have engineering degrees, along with many years of work experience. During operations, equipment suppliers will help assemble and commission equipment, provide training, advice on preventive maintenance, and provide ongoing technical support. In a large mine, they may set up shop to ensure that the equipment is properly maintained.

Governments

Inspectors from various departments and levels of government may conduct inspections to make sure operators are complying with applicable environmental regulations. The government also collects royalties and taxes.

Service Providers

Some organizations are needed to provide special services that a mining company cannot or chooses not to perform. Examples include helicopter and airplane services, on-site explosives manufacturing, site security, catering, mine operations, environmental specialists, graphic design, and publications.

Note: it could be that there are no local communities

Financial Institutions

Institutions such as banks, investment companies, securities brokerages and stock exchanges focus on the financial needs of mining companies. A variety of institutions take part in providing loans, managing cash and investment holdings, obtaining investor funding, public listings, buying and selling shares, coordinating mergers and acquisitions, and posting bonds for closure liabilities.

Educational Institutions

Secondary schools feed into the colleges and universities, so teachers and counsellors are beginning to work more closely with the regional mining industry to be able to help students plan their careers. Educating youth on the myriad of issues associated with mining offer youth an opportunity to develop critical thinking and career preparation skills that may be put to work not only in mining and mine-related infrastructure, but also in environmental management, engineering, science, or in roles as future community leaders, and other associated positions.

Major universities and research institutes conduct important scientific and social research. Funded by government and industry, researchers work with mine operations to gather information and to share findings. The results of research can be used by many mines to improve performance.

Educational institutions educate graduates in the fields of geology, engineering, business, science, and communications, as well as other essential fields such as surveying, environmental science, natural resources management, trades, engineering technology, computers, and office administration.

Most of the jobs at a mine that are challenging and involve responsibility usually require at least a completion of high school. This is to ensure that the person can do the job safely and properly.

Facts and Figures

In an effort to improve northern education, the University of the Arctic is a network of universities, colleges and organizations committed to higher education and research in the North. Its primary objective is to create a strong, sustainable circumpolar region by empowering Northerners and Northern communities through education and shared knowledge

(Source: Arctic Human Development Report, 2004).

Industry Associations

Mining companies may participate in national associations to address common issues and provide a unified voice to the public and government. Some countries may have some type of "Association of Mines" that represents the mining and exploration activity in the region as a whole. Mining associations may also help in delivering benefits to members, and providing forums for discussion and collective work. Industry associations are not normally directly involved in mining operations.

Customers

The customer is ultimately the most important player in the industry. There are immediate customers and final customers. Immediate customers to mining companies include smelters, refineries, steel mills and many types of manufacturing plants, and selling agencies. Final customers are the retail consumers of all of the everyday goods that contain materials that came out of the ground. Final customers drive the markets that influence the selling prices.

Customers are many and varied depending on the mineral product being produced and sold. Base metals such as copper and zinc are used for a variety of everyday goods. Precious metals such as gold and silver are used for jewelry and electronic components. Coal and oil sands are used to provide fuel and energy. Industrial minerals such as talc and potash are used to produce a variety of goods such as fertilizer, cement, baby powder, and cat litter. Diamonds are used in jewelry, industrial cutting blades and drill bits.

Local Communities / Indigenous Peoples

Indigenous inhabitants and residents of local communities can be involved in the mining activities in many different ways such as in environmental (water and health quality), land use, employment and other committees.

Economic Opportunities for Indigenous Peoples' and Northern Communities' Involvement and Input in the Mine Operation Phase

Community

Community involvement should occur throughout the mining cycle by means of consultation, participation in various committees, direct and indirect project planning, employment, provision of businesses services and project monitoring. The type and amount of community input and communication depend on many things, including if and what agreements are in place.

Mine operations can help build capacity for the future through training, employment, business support, and scholarships, and from lessons learned in experiences with the many legal, contractual, environmental, technical and financial processes associated with a modern industrial operation. Major benefits for communities are possible from increased employment, business opportunities, and community infrastructure. Today more mining companies are looking at additional ways that local communities can benefit, including the potential for payments to local entities or tribes.

Facts and Figures

Russia - A centre to support small business initiatives and help adapt the local population adapt to the market economy principals was established in Nikel. The centre, near the Norwegian border, would ideally become a place for business cooperation between Russia, Norway and Finnish companies.

(Source – Barents Observer 2009-07-22)

Local businesses that have provided services in the previous mining phases can expand this opportunity during the longer term of mine operation. Mine development and construction business opportunities tend to be for one to three years, while during operations contracts may be five or

more years and may be renewable. In Yukon, Canada, First Nation economic development corporations have already been eager to assist in the construction and supply of existing mining operation and promising exploration programs on a competitive basis.[12]

Communities should prepare to take part in mine operations by continuing to ask these important questions:

- What businesses are currently available?
- What businesses are required?
- Is there on-the-job-training for community members?
- What type of employment opportunities exist for the community?
- What are the capabilities of the community?
- Are there good joint venture partners available?
- How long will the mine operate?
- What will be the environmental impacts of the mining project on the ecosystem?
- Will there impacts on the health of local inhabitants?
- Will there be impacts on the traditions of the local community?
- What possible after effects of a mining project could occur?
- Are there possible lasting effects of a mining project on a community?

While answering these questions, the community should also talk with the mining company to make sure the relevant and required decisions are made. The community should review any agreements that are in place with the mining company to understand commitments that have been made in terms of contracting and employment. During mine operations, many opportunities will exist, whether using wholly owned businesses, joint ventures or community members for employees.

Facts and Figures

Yukon, Canada- The Yukon Mine Training Association, formed in the summer of 2007, is a partnership between the Yukon mining industry and the Yukon First Nations. Federal and territorial governments and mining companies have provided support, facilities and personnel. The association has offered dozens of courses training from environmental programmes, underground mining, heavy duty equipment operation and First Nations' Elders mine site mine site tours. The program has contributed to building mining and First Nations relations and to assisting Yukon in building its mining work force. For further information: http://www.yukonminetraining.com

The following list identifies some of the possible business opportunities available to communities:

[12] See First Nations Partnerships and Engagement, Mining and Exploration Portal, Government of Yukon: http://www.yukonminetraining.com/

- Camp catering and housekeeping;
- Site services;
- Surveying;
- Ongoing construction services;
- Recycling services;
- Contract mining;
- Supply of goods – e.g. Safety equipment;
- Aircraft support – e.g. helicopters and fixed wing;
- Airport maintenance;
- Laboratory services;
- Cultural awareness training;
- Translation;
- Community or cultural advisor / liaison;
- Environmental consulting;
- Trucking;
- Community and/or cultural advisor/liaison and,
- Road maintenance.

Communities should also check with federal/national and regional governments for additional help and resources.

Companies

Company representatives can facilitate the input and involvement of Indigenous and northern community residents by visiting communities to gain a better understanding of the local way of life and culture and provide face-to face updates on the operation and answer questions. They may also publish project updates in newsletters and local newspapers to keep local people informed. To assists in the understanding of the mining operation so that communities can have informed discussions about the project and provide meaningful input and involvement, companies may bring young people and elders to the site, host community visits, support family visit, and meet with leaders and community representatives. To provide opportunities for employment or services, companies may meet community employment officers for human resources and conduct community-based training.

Companies can also visit local schools to give educational presentations and answer questions from students, as well as encourage students to attend company hosted career shows to introduce the types of jobs available and the education required.

Governance Overview

Governments have regulations to ensure mining occurs in a safe and environmentally conscious manner that is designed to protect indigenous ways of life and human health. Companies must

comply with the requirements of both national and regional regulations. There are boundaries and requirements on how companies must operate environmentally on the mining site such as the Berlin Guidelines (see *International Guidelines*, page 41), or provisions of the company's management system such as a corporate code of conduct, Safety and Environmental Management Plan and other mining industry guidelines. A mining operation will most likely need a variety of permits or licenses that take into account possible impact of the activity. The permits/licenses could relate to:

- Fisheries;
- Rivers;
- Explosives;
- Waste water;
- Dams;
- Wetlands;
- Threatened and endangered species;
- Air quality;
- Transmission lines;
- Road and airstrip construction; and/or
- Domestic sewage.

3.2 Environmental and Social Effects

Potential Environmental Effects and Mitigation Measures

As in each of the mining phases, the intent during operation is to minimize the environmental impact to the water, land, air wildlife and people as much as possible. Through the use of local and traditional knowledge, improved technologies, and lessons learned, potential impacts are better understood and more effectively mitigated.

Some examples of environmental impacts that may require mitigation measures are included in the table below.

Table 3.1 Environmental Effects and Mitigation Measures

Type	Effects	Mitigation
Cultural	Possible loss or damage of archaeological and heritage sites	Protection of land, and identification and protection of archaeological and heritage sites through consultation and cooperation between companies and local communities and Indigenous people.
	Impacts on traditional and non-traditional land use	Define restrictions for hunting to ensure safety of operations and personnel,

Type	Effects	Mitigation
		protection of traditional subsistence and sport activities, and distinguish between subsistence and sport activities by agreement and in consultation with Indigenous residents and local communities to seek a balance between various access and safety issues.
	Impacts on local community social and economic systems	Cultural training requirements for exploration parties and mine workers. Communication, collaboration and job training for local communities
Land Use	Tailings waste and tailings dams	Adhere to strict government rules and regulations
	Land disturbance from mining activities – excavations in the mine, storage of waste rock	Minimize the mining footprint by using good planning and community input
Air quality	Effects from dust from mining vehicles on roads, pilot plant operations, dry material piles, ore crushing, dry tailings piles Air emissions / contaminants from power sources and mineral processing Possible pollution and contamination from air emissions from: Power sources: generators, engines Contaminants Heat-using mineral processing equipment Impacts: - can degrade air quality - can impact health of workers and nearby residents - can damage vegetation - metals emissions can impact sediment, water quality and aquatic life Emissions from trucks and onsite power generation	Water roads to minimize dust emissions Use dust suppressants Enclose pilot plant areas Cleaner power sources Emission control equipment Prevention and Control: • Alternate power sources – wind, solar • Emission control equipment – scrubbers, filters, absorption units Monitor emissions to determine impacts on vegetation and air quality

Type	Effects	Mitigation
Water Quality	Impacts on water flows and quality	Water quality monitoring and flow supplementation
	Dirt, rocks, or contaminated water enter streams or lakes	Establish a water management plan Train employees and contractors on the water management plan Use of non-toxic or less toxic chemicals when possible Reduce, reuse, recycle and remove toxic or harmful substances
Wildlife	Animals attracted to garbage and food waste	Use best practices for incineration of food waste and garbage Remove waste that cannot be incinerated Establish a waste management plan and use to educate employees
	Migratory patterns affected by presence of humans, noise from aircraft, noise from blasting	Use environmental studies and observation of animal behavior and modify operations as required Avoid certain operational activities during migration periods Install net over large ponds of tailings impoundment water or the pit water where birds could come into contact with contaminated water
Fish	Impacts on fish and fisheries	Protection of spawning and rearing areas, fish farming
Surface Water and Ground Water Concerns	Possible pollution and contamination from: • Underground mine water • Open pit mine water • Seepage/runoff from waste and tailings disposal sites • Sedimentation/erosion from waste and tailings disposal sites • Chemical releases from mills	Mitigation Goals: • Minimize contact between mine waste and water • Maximize water reuse Prevention/control: • Backfill • Segregation of reactive rocks • Divert surface waters and precipitation around site • Containment – covers, liners • Evaporation • Collection and treatment

Type	Effects	Mitigation
	Direct impacts: • Water contamination with acidity metals • Water quantity reduced during/after mining	

Potential Social Effects and Mitigation Measures

Mining operation brings risks and opportunities for the communities and people who live nearby. By identifying these risks and opportunities, local residents can work to reduce negative impacts while gaining maximum benefits from the development. The table below identifies some potential social impacts.

Table 3.2 Social Effects and Mitigation Measures

Type	Effects	Mitigation
Community Capacity	Local capacity to be meaningfully involved in the many aspects of the mine operation that may affect the community, such as, planning, environmental and technical reviews, legal and contractual agreements, consultations	Keep all stakeholders informed of and involved in project planning. Facilitate meaningful community reviews of project documentation and plans, as well as environmental impact and socio-economic analysis. This can be achieved through scheduled informational and consultation discussions in a way to maximize community involvement and by allowing sufficient time for review and comment on documents and provide input into plans and mitigation strategies. (Example: housing and accommodation needs)
Community/Industry Agreements Trust Relationship	If new mine ownership occurs previous agreements may be affected and Trust Relationships and established lines of communication may be lost.	Make sure that agreements between original Mine Developer and the Community are still valid and the agreement obligations of one owner transfer to the other. Allow for renegotiations of agreements due to changes in the original mine plan, detected environmental or socio economic effects, or changes in environmental conditions.
Employment	Increased employment Employment opportunities could also lead to less time to spend on traditional activities and a strain on families as there could be extended separation periods for members.	The community and company can communicate early to help determine potential impacts and establish a dialogue of understanding between industry and local inhabitants. Support groups and programs could be created to minimize the separation stress experienced by families. Allow for flexible work schedules such as subsistence leave so that workers are still able to participate.
Strangers in the community	The arrival of "outsider" mine workers to communities could be a strain on	The community and company can work together to offer cultural awareness. This

Type	Effects	Mitigation
	traditional activities and existing social networks and services.	could also be required through agreements or other mechanisms like permitting. The company should have worker conduct policies properly developed and communicated to staff. The company should perform a social impact assessment to determine the capacity and need for social services as a result of their presence. The company could provide support to maintain traditional activities.
Local Investment	Increased business opportunities. Tension amongst community members if they believe that benefits are not being fairly distributed.	The company and community can work together to determine collective benefits for revenue and an equitable distribution of business opportunities to those capable of providing goods and services.
Land Use	Land use and activity that have been impacted by the previous phases of mining may be restricted in some manner.	Ensure that community members have a voice in the creation of the reclamation plan. A reclamation committee may be formed to evaluate and monitor the plan in the future.
Local Business	There is likely an increase in skill set and ability developed during the phases of mining that may transfer to other business opportunities once a mine closes. However, there is a significant risk of a reduction in local investment and work.	Assist with development of new economic opportunities that can use the skill sets and abilities developed during mining phases.

Facts and Figures

Red Dog, Alaska – Cominco: To ensure compliance with their agreement and to provide feedback to the mine's management on matters affecting the environment and traditional lifestyles, the Cominco–NANA Agreement established a subsistence advisory committee. The committee, made up of elders from Noatak and Kivalina, the two villages nearest the mine, meets quarterly, or as required, to review reports generated from the extensive environmental monitoring required by government regulations and Cominco.

(Source: International Council on Metals and the Environment – Mining and Indigenous Peoples: Case Studies)

Environmental Studies and Development and Implementation of Monitoring Programs

Sound environmental practices are critical to avoiding or mitigating environmental impact. The appropriate training of employees is important for the implementation of key environmental work procedures. Employees must recognize this, particularly those who are responsible for implementing environmental plans.

The purpose of monitoring is to measure and evaluate impacts compared to baseline conditions before the operation, as well as to detect anomalous pollution occurrences requiring an

emergency response. Companies and governments continually monitor the mining operation to identify any changes. If changes are found, the company can respond to the changes to prevent any long-term damage. Some changes are noticed immediately through monitoring (water samples) and others take a longer time to determine trends and impacts (wildlife monitoring). The basis for knowing that changes have occurred is the baseline studies that were begun early in the advanced exploration stage.

During operations, the government and mining companies monitor several factors, depending on the site and the mine. The most common factors monitored are:

- Waste water;
- Wildlife;
- Air quality;
- Water quality;
- Aquatic impacts;
- Fisheries and fish habitat; and
- Reclamation research.

Facts and Figures

Companies with community-based consultation programs have their boards report to the local communities through annual reports and meetings.

(Source: Natural Resources Canada)

It is common for Indigenous peoples and members of local communities to participate in or conduct the monitoring programs and studies. In rare cases, external monitoring agencies may be formed to act as a watchdog. They make sure that companies meet their regulatory requirements, and they check that the regulators are doing their job.

The results of monitoring should be publicly reported so that everyone will know what is happening.

3.3 Employment and Other Economic Opportunities

Potential Employment and Other Economic Opportunities

When a mine goes into operation, it needs to hire both permanent employees and contractors. Companies may advertise in local, regional and national papers, depending on the jobs to be filled. Some companies may have agreements to work directly with Indigenous groups and communities to find and hire local candidates, as

Facts and Figures

Yukon, Canada - A partnership between the Yukon Mining Training Association and the Champagne and Aishihik First Nations has led to training in environmental monitoring and sampling. The First Nations learn basic soil and water sampling. The trained members will be able to monitor their own wells more easily and provide skills for potential employment in the mining and resource industry.
(Source: YMTA {Yukon Mine Training Association} Newsletter Issue 8 –Winter 2010)

is the case with the Ekati diamond mine in the Northwest Territories, Canada.[13]

If local communities do not have candidates with the required skills and professional qualifications, the company must look to other labour sources and the recruitment search is extended regionally, nationally and sometimes internationally. Companies prefer to hire locally where people already live. The local candidates are already close to mining sites and are familiar with the land, geography and climate.

The more recent mine operations in the Arctic region have recognized the potential of local Indigenous communities as a source of employees.

Employment and training opportunities are usually the most significant benefits for a community during mining operations. As a mine goes into operation, the percentage of local workers increases significantly.

Careers in the mining industry are very diverse. Jobs vary from trades to high-tech, and use various skills. Mining companies employ hundreds and sometimes thousands of workers at each mine. The following list provides examples of jobs in a typical mining operation.

Types of Mine Operations Jobs

- Miners
- Heavy equipment operators
- Pipefitters
- Environmental scientists
- Supervisors
- Accountants
- Administrators
- Laboratory technicians
- Public relations specialists
- Administrative assistants
- Drillers and blasters
- Mechanics
- Carpenters
- Geologists
- Safety experts
- Clerks
- Managers and executives
- Marketing personnel

[13] For further information:
http://www.bhpbilliton.com/bb/ourBusinesses/diamondsSpecialtyProducts/ekatiDiamondMine.jsp

- Truck drivers
- Electricians
- Welders
- Surveyors
- Engineers and technicians
- Trainers
- Computer technicians
- Security officers
- Human resource specialists
- Nurses

Enhancement Measures and Monitoring Programs for Employment and Other Economic Opportunities

Training

All new employees should expect to receive orientation training before starting on the job. This training helps employees to understand the mining operation, but more importantly, makes certain they are safe on the job. Other training for new employees may include on-the-job training, cross-cultural training, trades training, apprenticeships, and literacy and life skills training. Training can occur on-the-job, in a classroom, by computer-based programs, and by one-on-one instruction and mentoring.

Companies may partner with local communities, government and others to provide community-based training. Other companies may partner with local colleges and schools to provide technical training.

Recruitment

Companies will have standards for recruitment of employees. They will conduct interviews and make sure that potential employees pass thorough pre-employment medical and security checks. Through the relationship established with the company, a community can help potential employees learn about the interview process.

Once employed, personal opportunities may include basic training to skills enhancement, from career planning to apprenticeships, and a wealth of other opportunities.

Wages

Jobs in mining typically pay high wages, and as a person gains more skills and experience, his/her pay will increase. Actual wages depend on the type of mine, its location, nature of the job, and supply and demand of workers.

Facts and Figures

Australia – Hamersley Iron Pty Limited -An Aboriginal Training and Liaison Unit (ATAL) was established as a means of increasing Aboriginal participation in Hamersley and mining industry, in general, and of supporting Aboriginal people in the preservation of their traditions and culture through consultation and cooperation. ATAL develops and manages a range of programs designed to help Aboriginal people achieve self-sufficiency and independence while maintaining their traditional links with the land. There are a number of training programs to equip local people with the skills necessary for working in the mining industry and to encourage the development of local Aboriginal businesses. Through its consistently consultative approach, ATAL has succeeded in establishing an effective working relationship with local Aboriginal communities.

(Source: International Council on Metals and the Environment – Mining and Indigenous Peoples: Case Studies)

On-the-Job Training Opportunities

There are many training opportunities for mine employees and contractors during operations. All new employees receive orientation training that usually includes an introduction to the company's vision and mission, safety practices, rules of behavior, and information about site facilities and services.

Some positions require job-specific training. Training on equipment, procedures, and the importance to the overall process is provided when the employee starts the new job so the work will be done safely and properly.

Mine operators recognize that there is value in employees learning the skills of another job (cross-training). If a position is vacant, another employee who has been trained could take over until a replacement is found.

Mine operations usually have a number of trade apprentices. Becoming a certified tradesperson requires an apprentice to work under a journeyman for a certain amount of time, finish school and pass exams.

The mining company may provide training that is designed to help employees and improve the company as a whole. Mining companies sometimes create special initiatives for employees. Examples include: literacy programs, completion of secondary school, pre-trades programs, community-based training, life-skills training, drug and alcohol awareness and rehabilitation, and management development programs.

Monitoring

There are a number of topics that can be monitored to help track employment to determine successful activities and what needs to be improved for better employment results going forward.

Facts and Figures

To address employment challenges at the Red Dog Mine in Alaska, two members of the company and two local members of the NANA region sit on the employment committee.

(Source: International Council on Metals and the Environment – Mining and Indigenous Peoples: Case Studies)

Recruitment techniques: Evaluating the manner in which industry is looking for potential employees is important. Is the message getting passed to the appropriate segment of the population? Does industry come to the community? Do they hold trade fairs?

Tracking number and type of workers: Determining how many employees are from the local community and what types of jobs they are employed in will show strengths of the local skill pool but also gaps and training needed to assist people in obtaining new jobs. Exit interviews are a useful tool to track potential solutions to turnover. Tracking causes for terminations also gives local communities and the companies' opportunities to improve worker retention.

Re-visiting agreements: Check into what company and community employment and economic objectives were set in the early consultation agreements. Are the objectives being met? Where are they falling short? Do they need to be modified?

In some cases a company employee will monitor these employment matters and help determine methods to improve results. An individual from the community can also assist in the monitoring of employment and economic opportunities and report results through the appropriate channels. In other cases an employment committee is created.

Facts and Figures

Canada – In 2009, 34 per cent of the workforce of Diavik Mine, 300 km northeast of Yellowknife, was Aboriginal. Diavik continues to work towards its goal of a workforce composed of 40 per cent Aboriginal workers.

(Source: CBC News, Thursday, November 26, 2009)

United States – The workforce at Red Dog Mine, 106 miles north of the Arctic Circle, consisted of nearly 55 per cent NANA Native Corporation shareholders.

(Source: Red Dog Mine Fact Sheet, www.reddogalaska.com)

Maximize Economic Opportunities

Communities can play an active role in increasing the type and amount of economic opportunities available to them by:

- Hiring a professional business manager to maximize their benefits from a project. These skills may be available in the community or a community may need to look outside to fill this need;
- Developing their own business and training capacity;
- Beginning discussions about the development of partnerships with the mine developer as early as possible;
- Taking an inventory of the community's assets;
- Speaking to members from other communities to learn from their experiences; and
- Taking long-term perspectives (post-closure issues and socio-economic transition, training, strategic planning of resources).

Facts and Figures

Communities can realize significant economic opportunities during every stage of the mine operation, including business opportunities, revenue agreements, skills development, and training, as well as investments in local infrastructure. In regard to revenue agreements, in some cases, communities may stand to earn shares of the profits, which may help them be in a better position at the mine's end of life.

(Source: Natural Resources Canada)

3.4 Effects on Traditional Ways of Life

Benefits and Costs to the Traditional Ways of Life

Effects from mining operation can be similar to those occurring in mine development and construction. While mining operation generally lasts longer than the development and construction phase, the number of people involved is significantly less. Jobs in mining operation tend to be long term and high paying. Employing people from nearby communities reduces costs related to employee transportation. Reliance on the wage economy can reduce reliance on traditional activities and the time and motivation to participate in such activities. Once individuals have mining skills and experience there are greater opportunities to work in other mining operations. This can draw members of the community away from families and larger community social structures for even longer periods of time.

Facts and Figures

Webequie First Nation is the only community near a nickel-copper deposit found by Noront Resources in the James Bay lowlands of northern Ontario, Canada. The community decided that a Joint Venture (JV) was the way to capture some benefit from the Exploration Stage. Webequie negotiated a JV with Cyr Drilling Ontario Ltd. in August 2008. Webequie owns 20per cent of the JV company. Cyr provides the training and jobs. Webequie has the option to buy out Cyr in 2013. Mining might go ahead at the site, or it might not. Either way, Webequie is positioned to capture benefits from exploration activity right away and can contract out to other exploration companies that may come into their area.

(Source: Cyr Drilling International Ltd. 25 January 2010 http://cyrdrilling.com)

In addition, those individuals benefitting from high wages from mine work can disrupt the traditional social structure that exists in the community. Social status may change in relation to income. Another option for introducing non-local workers is an enclave. An enclave would be in housing separate from the community and where workers are brought in for multi-week shifts and then are taken out, minimizing social contact with the local community and potential negative social effects.

Typically the reversibility of, or recovery from, environmental impacts created from an activity is directly related to the length of time an activity occurs. Migratory patterns, wildlife corridors, and fish in streams may continue to be impacted throughout mine operations thus impacting traditional activities.

3.5 Case Studies

Red Dog Mine - Providing opportunities for community members through training and education

The Red Dog zinc–lead–silver mine is located 200 kilometers north of the Arctic Circle on land owned by the NANA Regional Corporation, Inc. in the foothills of the DeLong Mountains of northwestern Alaska. The mine is one of the world's largest producers of zinc concentrate.

Joint development of the Red Dog mine formally began in 1982, with the signing of an agreement between NANA Regional Corporation, Inc. and Cominco Ltd. (now Teck), a Canadian mining company with considerable experience working in the Arctic. Under the terms of the agreement, the mine has adopted specific measures to ensure that its operations have minimal effect on the traditional way of life of the local Inupiat people and that stringent procedures are in place to protect the regional environment, while guaranteeing shareholder participation in the economic benefits of a modern mining project. Key aspects of the agreement include:

- a guaranteed financial return through advanced net smelter return royalties and net proceeds royalties;
- a management committee made up of equal numbers of senior NANA and Teck Alaska representatives to regularly review operations performance and future plans;
- specific measures to promote the employment of Indigenous shareholders at all levels of the project; and,
- Specific measures to protect traditional ways of life and the environment.

The development and construction phase of mining is when the community and mine developer are most likely to identify employment prospects. In 1982, when the Red Dog agreement was signed, the parties recognized that very few NANA shareholders possessed the requisite skills for working at a mine and that considerable time, money and effort would have to be invested in training and related programs. In order to address such challenges, an employment committee, made up of four voting members drawn equally from Teck and NANA, was set up, an employment plan was developed which included provisions for enhancing its recruitment and training process and by 1998, Teck had invested US $8.8 million in training. Due to the extensive training and recruitment program, the mine has created modern jobs and new opportunities for the NANA people in a way that allows them to preserve their culture and traditional subsistence way of life.

4.1 Overview

Mine closure is the last phase of the mining cycle. Due to the nature of mineral deposits, they all have a finite life. While some deposits are very large and may generate a mine life of 50 years or more, other deposits may only produce a mine life of a few years. All mines have one thing in common – no matter how long they last, they will all close. Mining is a temporary use of land.

Today, mine closure is defined as the orderly, safe and environmentally sound conversion of an operating mine to a closed state. Areas affected by mining activity should become viable and self-sustaining ecosystems that are compatible with a healthy environment and with human activities.

Mines close for different reasons, but the two most common are:

- Running out of the ore resource; and
- Low commodity or metal prices, which make the mine uneconomic to operate.

While closure is the last phase of the mining cycle, planning for closure starts before the mine development phase. Governments have rules and regulations covering the closure process.

Mine closure is usually one of the most discussed issues with governments, companies and the public. Communities are concerned about what will be "left behind." All stakeholders want to make sure that there are no contaminated sites.

Time Frames

The time frame needed for mine closure depends on many factors, including the size and complexity of the operation, mineral mined, tailings characteristics, the impacts the mine has had on the environment, and the extent of regulatory review. Public input may also be a factor as some of the issues involved may raise public concerns that can take time to address.

Typically, it may take 2 to 10 years to shut down a mine. If long-term monitoring or treatment is required, it may take decades before closure is considered complete

Mine Closure and Environmental Restoration Activities

Planning for mine closure should start during mine planning. The public should be able to review proposals for closure during the public consultations that occur as part of the project's environmental assessment. Usually a mine closure and reclamation plan must be submitted to regional and federal governments. It is important that the public views and concerns related to

mine closure are heard and addressed during the environmental assessment process and that communication on closure between the community and the mine operator continue throughout mine operation.

The development of a mine closure plan for any mine is site-specific, and may take years of study and detailed engineering before being completed. It details how the mining company will close the mine site and return the surrounding land, as closely as possible, to its pre-mining state or to some other agreed state that could be more useful to the community. Mine closure and reclamation activities include decisions on what to do with every component of the mine that was planned and put in place at the development stage, including, but not limited to:

- Buildings and other structures;
- Roads and airstrips;
- Tailings and disposal facilities;
- Waste rock management, quarries and open pits;
- Petroleum and chemical storage areas and facilities;
- Pipelines and electrical transmission lines;
- Sewage and waste disposal areas and facilities;
- Mine and site drainage systems;
- Mine workings;
- Mine shaft, passage ways, and decline openings;
- Site water quality, including water flows leaving the site;
- Recycling materials; and
- Revegetation of the site.

A mine closure and reclamation plan should also:

- Indicate how progressive reclamation of the site will occur during the life of the operation;
- Provide cost estimates to close and reclaim the mine site;
- Prepare a plan for temporary closure of the mine;
- Develop a plan for post-closure monitoring of the site; and
- Make sure that the site is left in a condition that will require little or no long-term care and maintenance.

Facts and Figures

Canada – In general terms, Canadian mining regulation jurisdictions require proponents to submit "mine closure plans" (also referred to as reclamation or rehabilitation plans prior to receiving approval to commence mining activities. Mine closure plans are normally supported with financial assurance provided by the proponent to the jurisdictional authority in various forms acceptable to that authority. The financial assurance may be a few million dollars for a small mine or over $100 million for a large mine. The purpose of this money is to ensure that the government will not be left with the responsibility of paying for a mine closure.

Agreements reached between the local community and the company might also include commitment to involve locals in the clean-up and reclamation activities, including post-closure monitoring.

Mine closure plans should be flexible and adaptable to new techniques and methods for protecting the environment and reducing environmental risks while ensuring responsibilities are met. Good communications and consultation between governments, companies, and communities of interest will lead to the best solutions.

When all production has stopped, employees are progressively laid off leading up to the shut-down. A small labour force is kept on to permanently shut down equipment. The mine closure plan will indicate what types of skills are needed to shut down and demobilize equipment.

The mine owner should provide plenty of notice of the shut-down of a mine before it occurs to various stakeholders, including the community, indigenous peoples, employees, and employee representatives if any, various levels of government, media, mining associations, and other interested parties.

Decommissioning

Decommissioning follows mine shut-down. Small crews decommission (take apart) mining and processing facilities and equipment. Decommissioning includes:

- Draining hydraulic fluids and oils from mobile equipment;
- Draining pipelines;
- Removal and recovery of saleable equipment and parts;
- Clean-up and salvage of buildings;
- Recovery of warehouse materials, tools and consumables (i.e., oils, grease, etc.); and
- Properly disposing of all waste.

Reclamation

Reclamation is the process of restoring disturbed land as closely as possible to its original condition. The process of reclamation can occur either during the life of the mine (progressive reclamation) or after the mine has closed (reclamation).

All mine sites must be reclaimed according to applicable governmental regulations. In the Arctic this typically involves a number of activities including re-shaping the land and re-introducing native grasses and ground cover. Reclamation is done according to the approved closure and reclamation plan, which must be continuously updated by the mining company and approved by the responsible government authority. In areas which were originally tundra, reclamation will be especially challenging. Best practices and innovations are encouraged. For example, in Yukon, Canada, the annual Robert E. Leckie Award recognizes outstanding reclamation and restoration

projects by quartz or placer mining operators. The award is decided by representatives from the mining association, the private sector and the Yukon government.[14]

Post-Closure

Environmental activities continue long after a company has finished mining an area. The owner is obligated to reclaim the affected land and to monitor the success of the reclamation activities. The period of post-closure activity and monitoring varies and depends on the result.

Some mines may require long-term care and maintenance after closure. Examples include sites where:

- Mine discharge waters need to be treated;
- Tailing containment structures require periodic monitoring and maintenance; and
- Remediation technologies need to be monitored in order to ensure that the transfer of ownership or the potential insolvency of the mine operator does not allow the mine closure or post-closure obligations to go unfunded or unsupported.

Main Stakeholders in Mine Closure and Environmental Restoration Activities

Mining Companies

The mining company is responsible for full and proper environmental closure and reclamation of the mine operation once mining stops. The company must put the closure plan into action, implement decommissioning activities, and monitor the effectiveness of the closure activities. As reclamation is completed, funds from the initial deposit are released back to the company. Throughout the closure process, the industry is accountable to, and required to consult with, those affected by closure activities.

Governments

Government regulators and agencies enforce mining law and mining-related permits. Regulatory agencies then assess closure plans and make suggestions as required. If the company cannot close the mine properly, the government will use the deposit (money) provided by the company before the mine started to operate. Industry and governments are expected to maintain and promote open and transparent discussions with the various community, public and special

Facts and Figures

The most successful mine closures occur when the mining company, government and community are involved in the design of the mine closure plan early on in the mining process.

(Source: Natural Resources Canada)

[14] For more information: http://www.emr.gov.yk.ca/mining/leckie.html

interest stakeholders and indigenous peoples, if the government recognizes them as a government entity.

Others

Consulting firms, service providers, communities and non-governmental organizations (NGOs) and indigenous peoples may also play a role in mine closure.

Opportunities for Indigenous People and Northern Communities' Involvement and Input in the Mine Closure and Environmental Restoration Phase

Community and Company

Mine closure is the last phase of the mining cycle. Even though it is inevitable, mine closure can still be an emotional and difficult time for communities located near the mine site.

Because communities should have been involved throughout the first three phases of the mining cycle, they should be familiar and agreeable with the mine closure and reclamation plan. In larger Arctic communities, community members affected by closure include the employees, their families, suppliers, and business owners. However, in small Arctic communities, everyone will be affected by the mine closure. The planning process for mine closure should start during the mine development phase of the mining cycle.

Communities can manage the impacts of mine closure by planning well in advance, communicating with the mining company and government, understanding the process, and providing input. The goal is to develop strategies to lessen the negative impacts of the closure and identify economic diversification opportunities. These strategies may include:

- Participating in the development of the mine closure plan early on in the mining process;
- Building community capacity to manage opportunities and impacts;
- Building community capacity to participate in mine closure environmental monitoring;
- Providing training and competency development;
- Development of a regional or community economic development plan; and
- Developing alternative and secondary industries (suppliers).

During the mine closure phase, the mine can still create some value for the community in the form of jobs in reclamation and long-term maintenance and environmental monitoring. Alternative job creation and economic activities following closure can also be identified. However, in smaller Arctic communities that have a very small workforce and little infrastructure, economic activities following closure do not always exist.

With proper environmental monitoring training, local community members can be involved in site assessment and reporting. Training can also be provided in the areas of community engagement and social capacity to make sure that rehabilitation plans and activities are in line with the values and interests of community members.

The economic opportunities generated during mine closure are smaller than those associated with other phases of mining. However, by the time closure occurs, community businesses will be well experienced in providing services. By using innovation and creativity, communities can capture the limited economic opportunities of closure.

Business opportunities related to closure activities include:

- Reclamation of the site;
- Establishing drainage systems;
- Water sampling and analysis;
- Possible ongoing water treatment;
- Dismantling transmission lines; and
- Ongoing site security.

Facts and Figures

Through training and experience, the skills acquired in the mining industry can be transferable to other economic activities, often within the same community.

(Source: Natural Resources Canada)

The skills required for this work are largely gained during mine development and mine operation.

Governance Overview

The mine owner is responsible for mine closure and reclamation. During project evaluation and mine planning, the owner submits an initial closure plan that includes the costs to close the mine. It is expected that prior to this time, mining companies would have negotiated agreements with Indigenous groups and local communities that contain provisions for mine closure to cover issues such as local involvement in clean-up and remediation strategies, processes and activities.

Federal, national and/or regional governments are responsible for reviewing the closure plan and ensuring the mining company has the financial means for proper mine closure, including reclamation. Each country has mining-related acts and regulations for the administration of the mine closure activities.

Norms for Mine Closure

There are a number of key tasks that are related to mine closure that are undertaken by the mining company and regulated by the government. Some of these tasks include:

- Reclamation of open pits, underground openings, tailings and waste rock;
- Environmental impact monitoring;
- Assessment of embankment stability; and

- Air and water quality assessment.

When the responsible government is satisfied that the operator has met the requirements for decommissioning of the jurisdictional authority and the objectives of the closure plan, it will inform the mining company that the site is considered closed. In some cases, long-term monitoring will be required.

4.2 Environmental and Social Effects

Potential Environmental Effects and Mitigation Measures

Mine operators try to limit negative environmental impacts throughout the various phases of mining. As well, significant advances in mining methods and technology for mine reclamation have minimized many negative impacts. Mining companies and governments are cooperating to develop cost-effective long-term closure strategies.

Some key potential environmental impacts during mine closure and potential mitigation measures are shown in the table below.

Table 4.1 Environmental Effects during the Mine Closure Phase

Type	Effects	Mitigation
Land Use	Possible failure and long-term stability of waste rock piles and mining slopes	An annual inspection until permanent stability is demonstrated. Community-based monitoring programs by agreement.
	Possible failure and long-term stability issue of tailings containment structures	Periodic monitoring and maintenance with the participation of the community by agreement.
Water quality	Possible acid mine drainage or metal leaching	Water treatment and implementation of long-term water monitoring plans with the participation of the community by agreement.
Successful Mine Closure	Erosion leading to failures of waste disposal facilities, open pits; Run-off / leachate from disposed waste; Poor water quality in mine pits and underground; Access to and productivity of mined lands; Potential failures of waste disposal facilities and open pit mines and long-term erosion	Physical stability to withstand erosion and chemical deterioration; Re-establishing vegetative cover; Resolution of long-term land ownership and control, including financial assurance. Strategies to create physical stability Strategies to create chemical stability

	Poor quality leachate or run-off from waste disposal facilities;	

Potential Social Effects and Mitigation Measures

Mine closure has potential long-lasting socio-economic impacts on a community. The immediate impact is the loss of jobs at the mine and income used to support the growth of a community. It also has a direct and indirect impact on local employment and businesses.

Careful planning from the start of the operations will help prepare communities for closure. From the date the mine opens communities have to plan for closure. Some of the main impacts and how they are minimized are shown in the table below.

Table 4.2 Social Effects during the Mine Closure Phase

Type	Effects	Mitigation
Community/Industry Agreements Trust Relationship	If new mine ownership occurs, previous agreements may be affected and Trust Relationships and established lines of communication may be lost.	Ensure that agreements between the original Mine Developer and the Community are still valid and that the agreement obligations of one owner transfers to the other. Allow for renegotiations of agreements due to changes in the original mine plans, detected environmental and socio-economic effects, or changes in environmental conditions.
Land Use	Land use and activity that has been impacted by the previous phases of mining may be restored but may be restricted in some manner.	Ensure that community members have a voice in the creation of the reclamation plan. A reclamation committee may be formed to evaluate and monitor the plan in the future.
Local Business	There is likely an increase in skill-set and ability developed during the phases of mining that may transfer to other business opportunities once a mine closes. However, there is a significant risk of a reduction in local investment and work.	Assist with development of new economic opportunities. Location/isolation of many Arctic communities can limit opportunities.
Loss of Employment	There is an improved skill-set amongst the workers of the mine; however it may be difficult to find new work in the general vicinity where these skills can be	Early planning for laid-off workers. Programs of re-insertion into community and job transfer.

	applied.	
Social Investment	With the mine closure and withdrawal of the mining company the local communities will need to look for a new source of funding for activities, programs and projects that were traditionally funded by the mining company.	Long-term management of funds must be considered at an early stage. Throughout the life of the mine, new projects must be evaluated with this reduction in funding in mind.

Development and Implementation of Monitoring Programs

Facts and Figures

Indigenous peoples could be involved in a variety of areas in mine rehabilitation, monitoring, and management. The proper closure and rehabilitation of a site may involve ongoing treatment and maintenance. As such, site monitoring and assessment are needed to minimize risks to the community and environment. As the community members are sometimes located near a site, they are often in a better position to monitor, manage and assess it.

A monitoring program is used to assess the effectiveness of reclamation and mitigation measures after site shut-down and to identify corrective actions where needed. The mining company, together with governments will develop an environmental monitoring program to comply with conditions of regulatory approval.

At some sites, a committee may be formed of government, company and community representatives to screen the mine closure and monitoring process. This monitoring program applies to all aspects of the mine life. During mine development and mine operation, the company monitors the impacts on water, wildlife and air, and provides this information to the regulators, local community and indigenous people.

Monitoring programs, during the mine life and post-closure, assess:

- Any unforeseen environmental impacts; and
- The effectiveness of the mitigation measures.

Facts and Figures

Cominco's Polaris mine in Nunavut, Canada, ceased production in 2002, after 21 years of operation. Input on historical and future land use by the local residents was used to develop site-specific soil quality remediation objectives for the site.

(Source: Natural Resources Canada)

The length of the monitoring phase is reviewed and confirmed when the mine closes and depends on the potential impacts and risks to the environment. If the site needs long-term care and maintenance, the mining company or the successor responsible party remains responsible for

the site, including remediation of any additional environmental issues arising after closure. The monitoring period may be extended to ensure remedial objectives are met.

Government regulators will do audits to validate the mining company's conformity to the closure plan. These could draw community-based monitoring and audits if such are set up in agreements.

4.3 Community Employment and Other Economic Opportunities

Potential Employment and Other Economic Opportunities

The number of jobs available during mine closure is usually limited. The work involved in mine closure provides specialized business and employment opportunities that can often be applied to other mine sites. The main jobs available are for:

- Trades personnel – to dismantle equipment;
- Equipment operators and mechanics – to complete the earth-moving work necessary for reclamation;
- Inspectors – to inspect, sample and audit the closure activities as part of the safety and environmental plan;
- Security and first aid personnel – in accordance with applicable laws and management plans; and,
- Cultural and/or community advisor or liaison.

Since 1996, the Russian Government has financed Local Development Programs (LDP) in the coal municipalities impacted by mine closure. Despite a poor start in distributing funds, by 1998, LDP subsidies were disbursed directly to municipalities to mitigate different phases and aspects of local employment problems which arise from mine closure. Funds have been distributed to over 78 coal municipalities that have been impacted by mine closure; each year, 12-15 municipalities account for half of the total LDP financing (Paper No. 42, June 2003, Mine Closure and its Impact on the Community: Five Years After Mine Closure in Romania, Russia and Ukraine, Michael Haney and Maria Shkaratan; A joint publication with the Infrastructure and Energy Department, Europe and Central Asia).

Enhancement Measures and Monitoring Programs for Employment and Other Economic Opportunities

Preparation

It is vital that the community look beyond the closing of the mine for a source of sustainable economic growth. Mine closure can usually be predicted, so communities can look to develop new economic activities years before the mine closes. Whether the future economic base will be

tourism, manufacturing, or any other activity, sound planning and use of the community's skill base will be essential.

Facts and Figures

Zinkgruvan, Sweden - In Sweden, mining has been conducted for more than 150 years in the community of Zinkgruvan, 14 kilometres south-east of Askersund. The tailings facility at Ammeberg, the original location of the Zinkgruvan processing plant, has been successfully remediated and is today a thriving vacation community which provides many employment opportunities for local residents.

(Source: *http://www.lundinmining.com/s/SustainableDevelopment.asp*)

There are great examples of how communities have gone through the mine closure process and developed other non-mining-based economies.

Transfer of Skills and Training

Facts and Figures

Through training and experience, the skills acquired in the mining industry can be transferable to other economic activities, often within the same community.

(Source: Natural Resources Canada)

It is beneficial for industry, governments and communities to work together to develop programs to provide retraining skills and opportunities for laid-off employees. The skills that an employee gains while working for a mining company may allow him/her to advance into other areas like trades, construction, medical technology, and administration. With proper environmental monitoring training, local community members can be involved in site assessment and reporting. Training can also be provided in the areas of community engagement and social capacity to make sure that rehabilitation plans and activities are in line with the values and interests of community members.

4.4 Effects on Traditional Ways of Life

Benefits and Costs to the Traditional Ways of Life

The closure of a mine could see wage employees return to a more traditional lifestyle in the local community. However, the transition from wage employment back to the pre-mining activity may not be smooth or preferred. Individuals with a mining skill set may choose to seek jobs in mining projects further away, thus putting additional stress at home and the communities, as valuable

members are not around to contribute. Alternatively, the skills and experience gained while working throughout the mining process can boost the human capital within the community.

Communities that were once heavy economic beneficiaries of mining activities due to employment of community members, increased local business and the sale of goods and services will see a dramatic decrease in the wage economy when the mine closes. This dramatic change can put additional stress on families and the social cohesion of community residents.

Even with best practice reclamation attempts there may be some long lasting environmental effects after mine closure. Movement, dust, noise and other activity in an area over the long term may have impacted wildlife movement, bird migration, or fish activity in streams. As individuals return to traditional hunting and fishing activities, they may need to look in new areas, possibly further away, to perform these relevant traditional tasks needed for community survival.

4.5 Case Studies

4.5 Case Studies

Keno Hill Silver District –First Nation of Nä-Cho Nyak Dun and Alexco Resource Corporation

Background and Context:

The Keno Hill Silver District is a high-grade silver district located in central Yukon within the traditional territory[15] of the First Nation of Nä-Cho Nyak Dun (NND).

Prior to initial contact with European missionaries and fur traders, and later miners, the First Nation led a traditional land-based lifestyle, trapping, hunting, fishing and gathering food in the area. NND is based in the town of Mayo, about 45 kilometers from Keno Hill, and 540 kilometers (by road) north of Whitehorse, Yukon's capital city.

NND is one of 11 of the 14 Yukon First Nations which have settled their aboriginal land claims with Canada and Yukon through a modern, comprehensive treaty (a 'land claims agreement' under Canada's Constitution). The NND Agreement came into effect in 1995. At the same time, NND became a self-governing First Nation through a unique Self-Government Agreement.

The Keno Hill district is one of Yukon's oldest mining areas, and between 1913 and 1989 yielded more than 217 million ounces of silver. United Keno Hill Mines Ltd. (UKHM)ceased production after silver prices fell. The Government of Canada inherited the environmental liabilities of UKHM when the company became insolvent. In 2006, Alexco Resource Corporation (Alexco), through its wholly-owned subsidiary, Elsa Reclamation and Development Company Ltd. (ERDC) became the owner of the Keno Hill assets. Under an agreement approved at that time, ERDC is to contribute to the clean-up of the Keno Hill district and will take responsibility for future, ongoing environmental care of the site.

In May, 2008, Alexco and the First Nation of NND signed a cooperation agreement which ensures opportunities for the NND in all aspects of care and maintenance and reclamation, development and operation of the Keno Hill property.

Throughout 2008 and 2009, the Nä-Cho Nyak Dun, ERDC, and the federal and Yukon governments collaborated on preparing a closure plan for the site. During this period, Alexco began exploring and re-developing mines within the Keno Hill district. Production began at the Bellekeno mine in early January 2011.

Legacy and Future Closure Planning:

[15] A First Nation's Traditional Territory is a large extent of land which the First Nation traditionally used and occupied. Unlike its Settlement Land parcels, which are owned by the First Nation, a First Nation does not own Traditional Territory (it is mostly Crown land) but the First Nation has certain treaty rights including the right to harvest fish and wildlife for subsistence, and the right of involvement in certain public boards and committees involved in land-resource management in the area. The cooperation agreement entered into by Alexco and NND is not a result of an obligation arising from the land claims agreement.

The development and implementation of a closure plan for the Keno Hill property is critical to mitigate historical impacts and to minimize future impacts on the NND's traditional territory. Through early consultation activities regarding the mining plan, ERDC and the NND worked through the following questions:

- What are NND's objectives for the closure plan?
- What are the concerns related to the closure plan?
- What are the values that NND shares regarding the site?

The NND's and other stakeholders' objectives were gathered and work plans were developed in order to evaluate closure options for the site. In order to provide for additional NND input to the closure plan, a traditional knowledge program was initiated. NND members and elders provided valuable resource information on topics such as traditional medicines, and fish and wildlife.

The NND stayed actively engaged in closure plan discussions throughout the process by means of community meetings and workshops. Their input continues to help guide decision-making and planning for the project.

In preparation for economic activities associated with the mine closure, a mentorship program was initiated aimed at building capacity in the NND community. Two summer jobs for NND youth were created for involvement in closure planning activities. Additional capacity building is anticipated in the community through training opportunities related to mining environmental issues, mine closure, planning and/or environmental surveillance. Additionally, a further project called the Environmental Monitoring Program is being proposed with the intent of providing the NND with adequate training resources for work at the Keno site.

The combination of mentorship and training programs will lead to increased capacity in environmental monitoring, ecosystem interaction, traditional knowledge application and scientific examination in determining how particular physical activities should be undertaken and how these could affect the land and the traditional territory.

The First Nation of Nä-Cho Nyak Dun and Alexco are involved in all aspects of mining including: environmental assessment, exploration, development, operation and closure of the Keno Hill Mines. Annex I provides additional information and the context in which their relationship has developed.

Useful Resources

1 *First Nation of Na-Cho Nyak Dun: Yearly Report; Re: Closure Planning for the Keno Hill Silver District (*Prepared by: Josée Lemieux-Tremblay, Mining Liaison Coordinator for the Keno Hill Closure PI)
http://nndfn.com/images/uploads/pdfs/yearly_report_2008_2009.pdf

2 http://www.yukonmining.com/Documents/Why%20Yukon/Mineral%20Property%20Profiles/Keno%20Hill%20Property%20(Bellekeno).pdf

3 (http://commdev.org/content/document/detail/1494/) Box 1: Novoshakhtinsk: Best Practice in Development of a Business Support Infrastructure (Mine Closure)

4 *Aboriginal Mining Guide: How to negotiate lasting benefits for your community*; The Canadian Centre for Community Renewal in collaboration with Tr'ondek Hwech'in and the Canadian Northern Economic Development Agency, 2009.
http://www.miningguide.ca

5 NRCan. 2008. Aboriginal Engagement in the Mining and Energy Sectors: Case Studies and Lessons, Aboriginal Engagement Task Group of the Intergovernmental Working Group on the Mineral Industry
http://www.nrcan.gc.ca/smm-mms/abor-auto/pdf/stu-etu-eng.pdf

6 Yukon Government public website information about First Nation land claims and self-government agreements: http://www.eco.gov.yk.ca/landclaims/

Conclusion

We hope *The Circumpolar Information Guide on Mining for Indigenous Peoples and Northern Communities* has been a useful and informative resource for communities. The following sections contain additional resources for your perusal: a glossary, a clearinghouse of government websites at the national and sub-national levels; information on Indigenous business; information on International Legislation, Declarations and Guidelines; and suggestions for additional reading.

Glossary

Assay
To analyze the proportions of metals in an ore; to test an ore or mineral for composition, purity, weight, or other properties of commercial interest.

Assayer
A person who analyzes ores and alloys, to determine the value and properties of their precious metals.

Bulk sampling
The taking of large samples, which may consist of large-diameter drill core, the contents of a trench or mine working, or a car or train load of ore material, for metallurgical testing in mine evaluation.

Geochemical survey
A survey involving the chemical analysis of systematically collected samples of rock, soil, stream sediments, plants, or water.

Geophysical survey
A scientific method of prospecting that measures the physical properties of rock formations. Common properties investigated include: magnetism, specific gravity, electrical conductivity and radioactivity.

Journeyman
One who has fully served an apprenticeship in a trade or craft and is a qualified worker in another's employ.

Open-pit / underground mines
Open-pit mining refers to a method of extracting rock or minerals from the earth by their removal from an open pit or borrow. The term is used to differentiate this form of mining from extractive methods that require tunnelling into the earth. Open-pit mines are used when deposits of commercially useful minerals or rock are found near the surface; or the material of interest is structurally unsuitable for tunnelling (as would be the case for sand, cinder, and gravel). For minerals that occur deep below the surface, or the mineral occurs as veins in hard rock, underground mining methods extract the valued material.

Prospector
A person engaged in exploring for valuable minerals or in testing supposed discoveries of the same.

Sampler
One whose duty it is to select and prepare samples of materials and products for an assay or analysis.

Showing
A mineral occurrence that has been located but whose extent is not known.

Subsidence
The downward settling of the Earth's surface with little or no horizontal motion. The movement is not restricted in rate, magnitude, or area involved. Subsidence may be caused by natural geologic processes, or by human activity, such as subsurface mining or the pumping of oil or groundwater.

Tailings
The materials left over after the process of separating the valuable fraction from the worthless fraction (gangue) or an ore.

Additional Resources

1) Aboriginal Business

(i) Native Investment and Trade Association: *www.native-invest-trade.com*
(ii) Northeast Aboriginal Business Centre: *www.aboriginalbusinesscentre.com*
(iii) Aboriginal Business Canada: *strategis.ic.gc.ca/epic/internet/inabc-eac.nsf/Intro*
(iv) Yukon Indian Development Corporation: http://www.yidc.ca/home/
(v) Canadian Northern Economic Development Agency: http://www.cannor.gc.ca/index-eng.asp
(vi) Yukon Government, Department of Economic Development: http://www.economicdevelopment.gov.yk.ca/

2) Best practices

(i) Guidelines for Social Impact Assessments for Mining Projects in Greenland *www.bmp.gl*
(ii) A Framework for Responsible Exploration: *www.e3mining.com*
(iii) Links to Good Practice Guidelines for the Mineral Industry: *www.pdac.ca/pdac/good-practices.html*
(iv) Yukon Mineral and Coal Exploration Best Management Practices and Regulatory Guide, August 2010, Yukon Chamber of Mines: http://www.yukonminers.ca/Libraries/Documents/BMP_RG_October28_FINAL_WebFile.sflb.ashx

3) Case Studies

USA:
www.reddogalaska.com

Yukon:
(i) http://www.nndfn.com/
(ii) http://www.eco.gov.yk.ca/pdf/nacho_nyak_dun_fa.pdf
(iii) http://www.cyfn.ca/
(iv) http://www.ainc-inac.gc.ca/al/ldc/ccl/fagr/ykn/nac/ndsga/ndsga-eng.pdf
(v) http://www.alexcoresource.com/s/Home.asp

4) Government Sites

Greenland:

(i) http://www.ujarassiorit.gl/
(ii) http://www.bmp.gl
(iii) http://www.sanilin.gl

(iv) Mineral Resources Act in English: http://www.bmp.gl/administration/legal_foundations.html

Bureau of Minerals and Petroleum
P.O. Box 930
3900 Nuuk
Greenland
Ph: +299 34 68 00
Fax: +299 32 43 02
Email: bmp@nanoq.gl

Canada:

(i) Canadian Environmental Assessment Agency: *www.ceaa-acee.gc.ca*
(ii) Citizen's Guide to Mining in the NWT: *nwt-tno.inac-ainc.gc.ca/pdf/mn/CitizensMiningGuide_e.pdf*
(iii) Exploration and Mining on Crown Lands in Nunavut Guidebook*: www.ainc-inac.gc.ca/nu/nuv/mng_e.html*
(iv) Guide to exploration and development in the NWT: *nwt-tno.inac-ainc.gc.ca/pdf/mn/CitizensMiningGuide_e.pdf*
(v) Indian and Northern Affairs Canada: *www.ainc-inac.gc.ca*
(vi) Minerals and Metals Sector: *www.nrcan.gc.ca/mms*
(vii) NRCan Aboriginal portal: *www.nrcan.gc.ca/aboriginal*
Maps of Aboriginal communities and mining activities: *www.nrcan.gc.ca/aboriginal/aboriginal-maps-e.htm*
(viii) Minerals and Metals Policy of Canada: *www.nrcan.gc.ca/mms/prod-serv/pubs-poli_e.htm*
(ix) Natural Resources Canada: *www.nrcan.gc.ca*

Canada - Federal Legislation:

(i) Canadian Environmental Assessment Act: *laws.justice.gc.ca/en/C-15.2/index.html*
(ii) Canadian Environmental Protection Act: *laws.justice.gc.ca/en/C-15.31/*
(iii) Metal Mining Effluent Regulations: laws.justice.gc.ca/en/F-14/SOR-2002-222/index.html
(iv) Canada Mining Regulations: *laws.justice.gc.ca/en/T-7/C.R.C.-c.1516/index.html*
(v) Indian Act and Indian Mining Regulations*: laws.justice.gc.ca/en/I-5/index.html*
(vi) Migratory Birds Convention Act: *www.pnr-rpn.ec.gc.ca/nature/migratorybirds/dc00s06.en.html*
(vii) Department of Fisheries and Oceans: *www.dfo-mpo.gc.ca*
(viii) Fisheries Act: *laws.justice.gc.ca/en/F-14/index.html*
(ix) Aboriginal Fisheries Strategy: *www.dfo-mpo.gc.ca/communic/fi sh_man/afs_e.htm*
(x) Navigable Waters Protection Act: *laws.justice.gc.ca/en/N-22/*
(xi) Explosives Act: *www.nrcan.gc.ca/mms/explosif/over/over_e.htm*
(xii) Canadian Species at Risk Act: *laws.justice.gc.ca/en/s-15.3/text.html*
(xiii) Northwest Territories Waters Act: *laws.justice.gc.ca/en/N-27.3/index.html*
(xiv) Mackenzie Valley Land and Water Board: *www.mvlwb.com/html/introduction.htm*

Norway

(i) The Norwegian Minerals Act:
http://www.regjeringen.no/en/dep/nhd/aktuelt/nyheter/2010/Mineralloven-pa-engelsk.html?id=606042

(ii) The Directorate of Mining: http://www.dirmin.no/default.aspx

(iii) The Geological Survey of Norway: http://www.ngu.no/en-gb/

Norwegian Legislation (non-exhaustive list)

(i) Act of 19 June 2009, No. 101: relating to the Acquisition and Extraction of Mineral Resources (The Norwegian Minerals Act):
http://www.regjeringen.no/upload/NHD/Vedlegg/lover/mineralsact_translation_may2010.pdf

(ii) Act of 27 June 2008 No. 71: relating to Planning and the Processing of Building Applications (the Planning and Building Act):

http://www.regjeringen.no/en/doc/Laws/Acts/Act-of-27-June-2008-No-71-relating-to-Planning-and-the-Processing-of-Building-Applications-the-Planning-and-Building-Act-the-Planning-part.html?id=570450

(iii) Act of 13 March 1981 No.6 Concerning Protection Against Pollution and Concerning Waste: http://www.regjeringen.no/en/doc/Laws/Acts/pollution-control-act.html?id=171893

Norwegian Mining Authorities (non-exhaustive list):

(i) Directorate of Mining with Commissioner of Mines at Svalbard: www.dirmin.no.
(ii) Norwegian Geological Survey (NGU): http://www.ngu.no/en-gb/
(iii)The Climate and Pollution Agency: http://www.klif.no/no/english/english/
(iv)The Norwegian Directorate for Nature Management: http://english.dirnat.no/
(v) The Directorate for Civil Protection and Emergency Planning : http://www.dsb.no/en/Hygiene/English/

Government of Yukon, Canada

(i) Government of Yukon: http://www.gov.yk.ca/
(ii) Yukon's mining and exploration portal: http://miningyukon.com/
(iii) Mining in Yukon, First Nations Involvement
http://miningyukon.com/communityenvironment/firstnations/
(iv) Department of Energy, Mines and Resources: http://www.emr.gov.yk.ca/mining/
(v) Department of Economic Development: http://www.economicdevelopment.gov.yk.ca/
(vi) Department of Environment: http://www.environmentyukon.gov.yk.ca/

(vii) Yukon Environmental and Socio-economic Assessment Board: http://www.yesab.ca/
(viii) Yukon Water Board: http://www.yukonwaterboard.ca/

(ix) Yukon Land Use Planning Council: http://www.planyukon.ca/

Legislation:

(i) Quartz Mining Act: http://www.gov.yk.ca/legislation/acts/qumi.pdf
(ii) Placer Mining Act: http://www.gov.yk.ca/legislation/acts/plmi.pdf
(iii) Waters Act: http://www.gov.yk.ca/legislation/acts/waters.pdf
(iv) Environment Act: http://www.gov.yk.ca/legislation/acts/environment.pdf
(v) Yukon Environmental and Socio-economic Assessment Act:
http://www.yesab.ca/act_regulations/documents/YESAAACTBillC-2.pdf
(vi) Territorial Lands (Yukon) Act: http://www.gov.yk.ca/legislation/acts/telayu.pdf

Government of Nunavut, Canada

(i) The Government of Nunavut's Mineral Exploration and Mining Strategy:
http://www.edt.gov.nu.ca/docs/parnautit_eng.pdf
(ii) Nunavut exploration overview 2009 from Nunavut Geoscience:
http://nunavutgeoscience.ca/eo/index_e.html
(iii) Also for your information the Government of Nunavut will be holding a Uranium Forum in advance of any policy on uranium sometime this fall/ early next year.
http://www.ctv.ca/CTVNews/Canada/20100912/uranium-nunavut-100912/
(iv) NTI Mining Policy: http://www.ntilands.com/mining_policy.html
(v) NTI Uranium Policy: http://www.tunngavik.com/documents/publications/2007-09-11-Uranium-Policy.pdf

Institutions of Public Government

(i) Nunavut Planning Commission: http://www.nunavut.ca/ Nunavut Water Board:
http://nunavutwaterboard.org/ Nunavut Impact Review Board: http://www.nirb.ca/AboutUs.html

(ii) Nunavut Waters Act: *laws.justice.gc.ca/en/N-28.8/index.html*

United States of America

(i) USDOI **Bureau of Land Management (BLM)** mining operations oversight and associated legislation, both specifically in Alaska and generally:

(ii) BLM Alaska Minerals Program - http://www.blm.gov/ak/st/en/prog/minerals.html
(iii) BLM's general Mining Site - http://www.blm.gov/wo/st/en/prog/more/non-energy_minerals.html
(iv) BLM general Coal Operations - http://www.blm.gov/wo/st/en/prog/energy/coal_and_non-energy.html
(v) "Mining Claims and Sites on Federal Lands" -
http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy.Par.28664.File.dat/MiningClaims.pdf

(vi) The U.S. Department of Interior **Office of Surface Mining and Remediation (OSMRE)** has about $1.7 million in remediation work in Alaska (in 2009 DOI Economic Impacts report). In addition, the OSMRE general scope, operations and policy might be helpful as resource such as their ongoing projects and work with tribes.

Main DOI OSM website – http://www.osmre.gov/index.shtm

(vii) For section on Federal legislation, so citing the Surface Mining Control and Reclamation Act of 1977 (SMCRA) - http://www.osmre.gov/topic/LRG/LRG.shtm

FEDERAL Major Authorizations and Permits

(i) US EPA Section 402 NPDES Water Discharge Permit
(ii) US EPA Air Quality Permit review
(iii) US EPA Safe Drinking Water Act (UIC Permit)
(iv) US ACOE Section 404 Dredge and Fill Permit
(v) US ACOE Section 10 Rivers and Harbors Act
(vi) US ACOE Section 106 Historical and Cultural Resources Protection
(vii) NMFS/USFWS Threatened and Endangered Species Act Consultation
(viii) NMFS Marine Mammal Protection Act
(ix) NMFS Essential Fish Habitat
(x) NMFS/USFWS Fish and Wildlife Coordination Act
(xi) USFWS Bald Eagle Protection Act Clearance
(xii) USFWS Migratory Bird Protection

Federal Agencies:

(i) US Environmental Protection Agency: http://www.epa.gov/
(ii) US Army Corps of Engineers: http://www.usace.army.mil/Pages/default.aspx
(iii) US Fish and Wildlife Service: http://www.fws.gov/
(iv) National Marine Fisheries Service: http://www.nmfs.noaa.gov/
(v) Bureau of Land Management: http://www.blm.gov/wo/st/en.html
(vi) U. S. Forest Service: http://www.fs.fed.us/
(vii) National Park Service: http://www.nps.gov/index.htm

EPA Authorities and Permits

(i) National Environmental Policy Act (NEPA) – compliance and/or review
(ii) National Pollutant Discharge Elimination System (NPDES) permits
(iii) Underground Injection Control (UIC) permits
(iv) CWA Section 404 permit review
(v) ADEC Air Quality permit review

EPA Region 10 website:

(i) http://yosemite.epa.gov/r10/ECOCOMM.NSF/Programs/mining

National Environmental Policy Act: http://www.epa.gov/oecaerth/basics/nepa.html
EPA Region 10 – Alaska Mining Information Plan – the EPA Region 10 provides mining information sessions to interested Tribal Governments in Alaska.
EPA Indian Policies and Links to the Executive Orders on Government-to-Government Consultation and Environmental Justice can be found at: http://www.epa.gov/indian/

State Departments and Divisions

(i) State of Alaska Department of Environmental Conservation
http://dec.alaska.gov/

(ii) State of Alaska Department of Fish and Game
Habitat Permits and studies for Mining activities
Division of Habitats: http://www.habitat.adfg.alaska.gov/

(iii) Department of Natural Resources
http://dnr.alaska.gov/mlw/mining/index.htm
Division of Mining Land and Water http://dnr.alaska.gov/mlw/hottopics/
Permits, land conveyance, Claims.

State Reports and Guides

(i) Alaska's Mineral Industry 2008, Department of Natural Resources Division of Geological and Geophysical Surveys special Report 63
http://www.dggs.alaska.gov/webpubs/dggs/sr/text/sr063.PDF

(ii) Revenue Sources Book 2007
State of Alaska Department of Revenue – Tax Division
http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?255

(iii) State of Alaska Office of Economic Development
http://commerce.alaska.gov/oed/minerals/mining.htm

(iv) Mineral Prospects List and Map, Alaska Department of Commerce
http://commerce.alaska.gov/oed/minerals/Mineral_Prospects/LINKED_RESOURCE_MAP.pdf

(v) Alaska Economic Development Resource Guide, 21st Edition, October 2009
Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs http://www.commerce.state.ak.us/dca/edrg/pub/EDRG2009.pdf
State Assistance Programs for Communities

(vi) State of Alaska Department of Labor and Workforce Development
http://avtec.labor.state.ak.us/Deptlist.htm
Alaska's Institute of Technology
Training Programs/Courses

(vii) Industry Sites
Alaska Miners Association
http://www.alaskaminers.org
Economic Benefits of Alaska's Mining Industry, January 2010
http://www.alaskaminers.org/mcd09sum.pdf

(viii) Nixon Fork Mine
Fire River Gold Company Website:
http://www.firerivergold.com/s/NixonFork.asp?ReportID=368220and_Type=Nixon-Fork-Gold-Mineand_Title=Overview
(Alaska Miners Ass.) http://www.alaskaminers.org/mcd09sum.pdf

(ix) Fort Knox Mine
Kinross http://www.kinross.com/operations/operation-fort-knox-alaska-usa.aspx
(Alaska Miners Ass.) http://www.alaskaminers.org/mcd09sum.pdf
Usibelli Coal Mine and Usibelli Company http://www.usibelli.com/
(Alaska Miners Ass.) http://www.alaskaminers.org/mcd09sum.pdf

(x) Pogo Mine
Sumitomo Metal Mining Pogo LLC www.smm.co.jp
(Alaska Miners Ass.) http://www.alaskaminers.org/mcd09sum.pdf

(xi) Red Dog http://reddogalaska.com/

(xii) Alaska Miners Association http://www.alaskaminers.org/mcd09sum.pdf

(xiii) Rock Creek Development
Novagold http://www.novagold.com/section.asp?pageid=3357
(Alaska Miners Ass.) http://www.alaskaminers.org/mcd09sum.pdf

Part 1: United States, Alaska

State of Alaska Major Authorizations

(i) Plan of Operations (DNR)
(ii) Reclamation and Bonding (DNR)
(iii) Waste Management Permits and Bonding (ADEC)
(iv) Certification of NPDES and ACOE Permits (ADEC)
(v) Sewage Treatment System Approval (ADEC)
(vi) Air Quality Permits (ADEC)
(vii) Fish Habitat and Fishway Permits (ADFG)
(viii) Water Rights (DNR)
(ix) Right of Way/Access (DNR/DOT)
(x) Tidelands Leases (DNR)
(xi) Dam Safety Certification (DNR)
(xii) Cultural Resource Protection (DNR)

(xiii) Monitoring Plan (Surface/Groundwater/Wildlife) (DNR/DEC)
(xiv) Coastal Zone Consistency Determination (DNR)

State of Alaska Major Authorizations

(i) Integrated Waste Management Permit – (ADEC)
(ii) Reclamation Plan Approval – (ADNR)
(iii) Monitoring Plan Approval - (ADNR/ADEC/ADF&G)
(iv) Financial Assurance (ADEC/ADNR)
(v) Dam Safety Certifications- (ADNR)
(vi) Fish Habitat Permits (ADF&G)
(vii) Air Quality Permits - (ADEC)
(viii) Plan of Operations Approval - (ADNR, State Land)
(ix) Coastal Zone Consistency Determination - (ADNR)
(x) Certification of NPDES and ACOE permits - (ADEC)
(xi) Sewage Treatment System Approval - (ADEC)
(xii) Water Rights - (ADNR)
(xiii) Right of Way/Access - (ADNR/DOT)
(xiv) Cultural Resource Protection - (ADNR)

State Agencies

LARGE MINE PERMITTING TEAM

(i) Department of Natural Resources (Lead State agency for coordination)
(ii) Department of Environmental Conservation
(iii) Department of Fish and Game
(iv) Department of Commerce, Community and Economic Development
(v) Department of Law
(vi) Department of Health and Social Services
(vii) Website: http://dnr.alaska.gov/mlw/mining/largemine/

5) International Legislation, Declarations and Guidelines

(i) The Berlin Guidelines on Mining:
http://commdev.org/files/814_file_UNEP_UNDESA_EnvGuidelines.pdf

(ii) Convention 169 of the International Labour Organization - Indigenous and Tribal Peoples Convention: www.ilo.org/ilolex/cgi-lex/convde.pl?C169
Relevant Articles: 6, 7 and 15.

(iii) UN Declaration on the Rights of Indigenous Peoples:
http://www.un.org/esa/socdev/unpfii/en/drip.html

(iv) International Covenant on Civil and Political Rights:

http://untreaty.un.org/English/millennium/law/human_rights/iv_4E.wpd
Relevant Articles: 1 and 27.

(v) International Covenant on Economic, Social and Cultural Rights:
http://www2.ohchr.org/english/law/cescr.htm

(vi) World Bank Operational Policy on Indigenous Peoples (OP/BP 4.10)

http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20553653~menuPK:4564187~pagePK:64709096~piPK:64709108~theSitePK:502184~isCURL:Y,00.html

6) Indigenous Peoples and Northern Communities

(i) The Norwegian Sami Parliament:
www.samediggi.no/artikkel.aspx?MId1=270&AId=3675&back=1

(ii) The Norwegian Reindeer Husbandry Administration: www.nrl-nbr.no/cms/
Sami Policy - www.sweden.gov.se/sb/d/2184/a/66267

(iii)Nordic Sami Cooperation: www.regjeringen.no/en/dep/fad/Selected-topics/Sami-policy/nordic-sami-cooperation.html?id=24390

(iv) Council of Yukon First Nations: http://www.cyfn.ca/

(v) Example of Land Claims and Self government Agreements from the Government of Yukon, Canada:
http://www.eco.gov.yk.ca/pdf/nacho_nyak_dun_fa.pdf
http://www.eco.gov.yk.ca/pdf/nacho_nyak_dun_sga.pdf

7) Mine-Site Rehabilitation

(i) Example of rehabilitated mine site: *www.britanniaproject.com*
(ii) Northwest Territories: *www.ainc-inac.gc.ca/ps/nap/recpolnwt/index_e.html*
(iii) Nunavut: *www.ainc-inac.gc.ca/ps/nap/recpolnuna/index_e.html*
(iv) Ontario: *www.mndm.gov.on.ca/mndm/mines/mg/rehab/default_e.asp*
(v) Orphaned/abandoned mines: *www.abandoned-mines.org*
(vi) Québec: *www.mrn.gouv.qc.ca/english/mines/rehabilitation/index.jsp*
(vii) Yukon, Assessment and Abandoned Mines: http://www.emr.gov.yk.ca/aam/

8) Mining Sequence

(i) www.mndm.gov.on.ca/mndm/mines/mg/mgimages/miningsequence_e.doc
(ii) www.placerdome.com/about/educentre/aboutmining.htm
(iii) www.debeerscanada.com/fi les_2/exploration_stages_posters.html

(iv) www.falconbridge.com/about_us/mining_life_cycle.htm
(v) www.mcq.org/roc/en/plan.html
(vi) www.serviceontario.ca/mining/english/default.htm

9) Mining Training Programs

(i)) Native access to engineering program: *www.nativeaccess.com*
(ii) Centre de formation professionelle Val-d'Or:
www.cfpvaldor.qc.ca/html/entreprises/modules.html
(iii) CANMET Experimental Mine of Natural Resources Canada:
www.nrcan.gc.ca/mms/canmet-mtb/mmsl-lmsm/mines/mech/mineexperimental/experimental-e.htm
(iv) Saskatchewan Institute of Applied Science and Technology:
www.siast.sk.ca/siast/educationtraining/academicpartner/undergroundminercore.htm

(v) Northlands College: *www.northlandscollege.sk.ca/Programs/mine_training.htm*
College of the North Atlantic: *www.cna.nl.ca/programscourses/program-details.asp?cProgCode=254*

(vi) Ontario Modular Training Programs:
www.edu.gov.on.ca/eng/training/apprenticeship/Skills/wrkfrce.html
Assayer Certification Training Program:
www.mechanical.bcit.ca/technology/chemsci/assay/index.shtml

(vii) Yukon Mine Training Association: http://www.yukonminetraining.com/
Building Environmental Aboriginal Human Resources: http://www.beahr.com/

10) National Mining Associations

Canada

(i) The Mining Association of Canada: *www.mining.ca*
(ii) Prospectors and Developers Association of Canada: *www.pdac.ca*
(iii) Canadian Aboriginal Minerals Association: *www.aboriginalminerals.com*
(iv) Canadian Institute of Mining, Metallurgy and Petroleum: *www.cim.org*

Norway

The Norwegian Mining and Quarrying Industries (Norsk Bergindustri):
http://www.norskbergindustri.no/English

11) Northern Context

The Mineral Industries of Denmark, the Faroe Islands, and Greenland
minerals.usgs.gov/minerals/pubs/country/2003/damyb03.pdf

Additional Reading

1. Bureau for Minerals and Petroleum (BMP) Guidelines for preparing an Environmental Impact Assessment (EIA) for Mineral Exploitation in Greenland available at: www.bmp.gl/minerals/EIA_guidelines.pdf

2. Canadian Institute of Resources Law, *A Guide to Impact and Benefits Agreement*, 1999. (can be ordered on-line at: *www.ucalgary.ca/~cirl/*)

3. Government of Canada, *Minerals and Metals: Towards a Sustainable Future*, Public Works and Government Services: Ottawa, Canada, 2000. (available at: *www.nrcan.gc.ca/mms/pdf/fu_e.pdf*)

4. International Institute for Environment and Development and World Business Council for Sustainable Development, *Breaking New Ground: Mining Minerals and Sustainable Development*.

5. Earthprint: Hertfordshire, England, 2002. (available for order from: *www.earthprint.com*)

6. International Institute for Sustainable Development, *Out of Respect – The Talthan, Mining, and the Seven Questions to Sustainability* (*http://www.iisd.org/publications/pub.aspx?id=606*)

7. Jepsen, D., Joseph, B., McIntosh, B., McKnight, B., *Mineral Exploration, Mining and Aboriginal Community Engagement Guidebook*, BC and Yukon Chamber of Mines: Vancouver, 2005.

8. Natural Resources Canada, *The Social Dimension of Sustainable Development and the Mining Industry, A Background Paper*, Public Works and Government Services: Ottawa, 2003. (available at: *www.nrcan.gc.ca/mms/pdf/sdsd-e.pdf*)

9. Natural Resources Canada, *A History of Mining and Mineral Exploration in Canada and Outlook for the Future*, Public Works and Government Services: Ottawa 2002. (available at: *www.nrcan.gc.ca/mms/topi-suje/hist_e.htm*)

10. The Northern Miner, *Mining Explained: A Guide to Prospecting and Mining*, Editor: Patrick Whiteway. (available for order by e-mailing northernminer2@northernminer.com)

11. The Sub-Committee of the Intergovernmental Working Group on the Mineral Industry, Reports on Aboriginal Participation in Mining. (available on-line at: *www.ainc-inac.gc.ca/ps/nap/aboparmi_e.html*)

Best Practices

12. Bureau of Minerals and Petroleum, (January 2009). BMP highlights – Application Procedures, Standard Terms and Rules for Field Work in Greenland (Mineral Prospecting and Exploration).

13. Bureau of Minerals and Petroleum. (March 2007). BMP guidelines – for preparing an Environmental Impact Assessment (EIA) Report for Mineral Exploitation in Greenland.

14. Excellence in Environmental Stewardship e-toolkit (EES) Version-01; E3Plus A Framework for Responsible Exploration, PDAC.

Case Studies

*15. First Nation of Na-Cho Nyak Du: Yearly Report; Re: Closure Planning for the Keno Hill Silver District (*Prepared by: Josée Lemieux-Tremblay Mining Liaison Coordinator for the Keno Hill Closure Pl)

16. International Council on Metals and the Environment. (1999). The Red Dog Mine Story, Cominco Ltd. (Case Study D). In Mining and Indigenous Peoples: Case Studies. Pp. 31-40.

Community Engagement

17. Aboriginal Engagement in the Mining and Energy Sectors: Case Studies and Lessons, Aboriginal Engagement Task Group of the Intergovernmental Working Group on the Mineral Industry, Report to Energy and Mines Ministers, 2008.

18. Aboriginal Mining Guide: How to negotiate lasting benefits for your community; The Canadian Centre for Community Renewal in collaboration with Tr'ondek Hwech'in and the Canadian Northern Economic Development Agency, 2009.

19. Aboriginal Peoples and Mining in Canada: Consultation, Participation and Prospects for Change; Prepared for The North-South Institute by William Hipwell, Katy Mamen, Viviane Weitzner and Gail Whiteman, Draft January, 2002.

20. Government of Canada. (2006) Mining Information Kit for Aboriginal Communities. Her Majesty the Queen in Right of Canada, Mining Information Kit for Aboriginal Communities (PDF Format, 2.4MB), Natural Resources Canada, 2006.

21. IBA Community Toolkit – Negotiation and Implementation of Impact and Benefit Agreements; Ginger Gibson and Ciaran O'Faircheallaigh (March 2010)

22. International Council on Metals and the Environment (ICME): *Mining and Indigenous Peoples: Case Studies, July 1999.*

23. International Council on Mining and Metals (ICMM): Good Practice Guide: Indigenous Peoples and Mining (Second Draft), July 2009. Prepared by Centre for Social Responsibility in Mining Sustainable Minerals Institute University of Queensland and Synergy Global

24. Community Relations in the Global Mining Industry: Exploring the Internal Dimensions of Externally Orientated Work. Corporate Social Responsibility and Environmental Management, 17, 1-14 (2010): http://onlinelibrary.wiley.com/doi/10.1002/csr.195/pdf

25. Meaningful Consultation and Participation in the Mining Sector? A Review of the Consultation and Participation of Indigenous Peoples within the International Mining Sector - The North-South Institute 2002: http://www.nsi-ins.ca/english/pdf/lit_rev/lit_rev_final.pdf

Northern Context

26. The Canadian North: Issues and Challenges 3rd Edition; Robert Bone, Oxford University Press, 2009.

27. Mining in the North Circumpolar World, University of the Arctic, by Lise Lyck, Copenhagen Business School.

Mining and Stewardship

28. Excellence in Environmental Stewardship e-toolkit, Prospectors and Developers Association of Canada (PDAC), 2009.

Oil and Gas

29. Arctic Council. Arctic Oil and Gas Assessment 2007, Arctic Monitoring and Assessment Programme (AMAP) http://www.amap.no/oga/

Annex I

Additional background on the Yukon Case Study (Keno Hill Silver District)

Yukon Context

- Yukon[16] is found in the north-west corner of Canada, bordering the U.S. State of Alaska.
- Established in l898, at the height of the Klondike gold rush, Yukon today has a population of about 34,000 people, one-quarter of whom are of First Nations descent.
- The mining sector has played a key role in Yukon's history and economy since the discovery of gold in the late 19th century. Yukon hosts significant deposits of placer and quartz gold, copper, lead, zinc, silver, tungsten, coal and one of the world's largest iron ore deposits. There are currently three hard rock mines in operation and the recent discovery of significant gold deposits south of the famed Klondike district has led to a modern-day staking rush in the territory.

Governance

- Yukon is unique among many northern regions because of its governance and the role of Yukon First Nations under land claims agreements.
- The Government of Yukon has most of the powers of a province and has had authority over natural resource management, including minerals, since 2003 through the *Yukon Act* and the legal transfer of federal administrative authority, called devolution. Yukon is at the forefront of settling land claims in Canada, with 11 out of 14 Yukon First Nations having signed comprehensive land claim and self-government agreements (tripartite agreements with Yukon and Canada). They have provided the foundation for a unique "government-to-government" relationship between the Yukon Government and Yukon First Nations.
- The Umbrella Final Agreement, signed in l993 between the Government of Canada, the Government of Yukon, and Yukon First Nations – as represented by the Council for Yukon Indians (now called the Council of Yukon First Nations), became the basis for individual First Nation Final Agreements.
- As comprehensive land claim agreements these treaties cover a range of matters, including identifying Settlement Land parcels that a First Nation owns, financial

[17] http://www.gov.yk.ca/aboutyukon/index.html

compensation, fish and wildlife, forestry, heritage, land use planning and development assessment.

- The "First Nation of Nä-Cho Nyak Dun Final Agreement" (NND's Land Claims Agreement) and the "NND Self Government Agreement", which came into effect in 1995, form the basis for NND's treaty rights and their powers, responsibilities and relationship to other governments.

Environmental Assessment

- Under the land claim agreements Yukon First Nations have a role in the environmental and socio-economic assessment process for mining as well as other proposed development projects in Yukon. The assessment process is managed by the Yukon Environmental and Socio-economic Assessment Board (YESAB)[17], an independent advisory board which makes recommendations to decision bodies, regarding whether a project should proceed and what conditions should be attached to permits and licenses. Yukon First Nations, through the Council of Yukon First Nations, are entitled to nominate 50 per cent of the members of the board, and one of three members of the executive committee.

Alexco Resource Corporation (Alexco)

- Alexco was formed in 2005, during bankruptcy proceedings of United Keno Hill Mines, with the initial purpose of bidding on the assets of the company and taking over the responsibility of monitoring, maintaining and eventually reclaiming the environmental impacts of mining on the property. Alexco was formally awarded the United Keno Hill Mines properties by a court decision following the resolution of the bankruptcy of United Keno Hill Mines in 2006.[18]

- Alexco's relationship with NND includes not only the legacy environmental aspects of the site but also includes exploration, development of a new mine, operation of a mill complex as well as operations and final reclamation of the area.

[17] http://www.yesab.ca/

[18] http://www.miningyukon.com/Documents/Why%20Yukon/Mineral%20Property%20Profiles/Keno%20Hill%20Property%20(Bellekeno).pdf

Alexco and First Nation of Nä-Cho Nyak Dun (NND): Opportunities, Accomplishments, Facilitating Factors and Benefits

A. Alexco and NND identified four opportunity areas that could benefit NND:

1. Direct employment:

- Administration, purchasing, human resources safety and first aid attendants.
- Environmental monitoring, sampling, report preparation.
- Care and maintenance work including operating equipment, operation of tanks, piping and pumping systems, and water sampling.
- Surface exploration – diamond drilling, core cutting, line cutting.
- Camp services including food preparation and janitorial services.
- Underground mining – drilling, blasting, equipment operation, ore haul and road maintenance.
- Mill workers – controls and mechanical equipment operation, tailings and concentrate haul heavy equipment operation, and trucking.

2. Contracting opportunities:

- Water and wastewater haul.
- Claim staking, line cutting.
- Fuel supply.
- Diamond drilling.
- Ore haul trucking/hot shot services.
- Concentrate trucking.
- Laboratory services.
- Heavy equipment construction, earth moving.
- Environmental monitoring.
- Hazardous sites remediation and demolition.
- Long term closure plan monitoring.
- Underground mining.
- Core box manufacture and supply.
- Camp catering.

3. Business partnering opportunities:

- District Closure Plan implementation will provide significant opportunities in heavy equipment contracting and long term environmental monitoring.
- Exploration and development opportunities off-property.

4. Legacy opportunities:

- Legacy concepts will be identified, goal is to generate benefits long into the future, beyond Alexco.
- Possible examples include a laboratory, new store, generations of successful service and supply businesses

B. Accomplishments to date:

- Implementation of underground mining and drilling training program with the assistance of Yukon Mine Training Association[19]. Alexco's camp at Elsa was utilized as a base for training.
- Establishment of a joint venture between NND Development Corporation and Procon Mining for underground mining and development.
- 15 NND members have been employed full time, casually or for summer student positions over the past several years in camp services, drilling and underground mining, equipment operation, core cutting, and environmental monitoring and reclamation work.
- In June, 2010 a seven-week training program for environmental monitoring and maintenance was held at the mine site with the assistance of Canada's Environmental Careers project. The program was carried out in conjunction with Canada's Building Environmental Aboriginal Human Resources (BEAHR)[20]. Eight NND individuals took this course.
- NND members are exploring individual business opportunities connected to the mine.
- NND is looking into opportunities related to environmental monitoring.
- Possible examples include a laboratory, new store, generations of successful service and supply businesses.
- First Nations have also been involved in environmental assessment and regulatory processes for cleanup of old workings and mining exploration and developments in their traditional territory.

C. Key facilitation factors:

- A cooperative industry (mine training programs)
- A cooperative mining company (Alexco working closely with NND)
- Facilitating Governments (Federal and Yukon government funding for mine training)
- Yukon government has been working directly with NND and Alexco to assist in developing training programs
- A progressive First Nation and community

D. Benefits to First Nation and/or community:

- Local employment opportunities.
- Local business opportunities.
- Development of respect for First Nations' traditional use areas.
- Lower local unemployment.
- Development of role models within the community (for example, NND has been working with Alexco to encourage students to stay in school).
- Opportunities for local entrepreneurs in contracting to the mine in sectors such as welding or freighting.

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[20] http://www.beahr.com/

E. Benefits to mining companies:

- Community support and engagement.
- Source of dependable local labour.
- Lower costs in respect to employee turnover, housing and transportation.
- Lower costs in respect to turnover and housing and transportation costs.

F. Benefits to governments:

- Lower social assistance payments.
- Development of a healthy sustainable local community.
- Positive economic development for Yukon.

Annex II

Statistics and Sources of Information on Mining Statistics In Arctic Alaska

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1) Number of mines in the Arctic currently under operation

- 4 Arctic mines producing: Fort Knox, Red Dog, Usibelli Coal Mine, and Pogo
- 3 Arctic mines under development: Big Hurrah, Nixon Fork-Medfra and Rock Creek

2) Number of people employed in mining sector in the Arctic – indigenous and non-indigenous population

- 2008 Total employment by the Alaska minerals industry was 3,392 full-time-equivalent jobs (no break down calculated), may contribute to an additional 2000 jobs indirectly.

3) Financial contribution of mines to total revenue

- 2008 Total value of Alaska's mineral industry $3.171 billion (not broken down by Arctic contribution)
- 2008 $96.1 million in royalty and tax payments to the State of Alaska and Alaska municipalities (not broken down by Arctic contribution)
- State mineral rents and royalties $6.6 million;
- Sales of rock, sand, and gravel $3.0 million;
- Mining license taxes $16.0 million
- Mining companies were the largest taxpayers in the Fairbanks North Star and Northwest Arctic boroughs (included as "Arctic" here—north of 64 degrees Lat).

4) Earnings from mines by mineral/metal

Total value of minerals in Alaska reached a record high of $2.9 billion in calendar year (CY) 2006.

Total value of gold: $344 million.
Total value of zinc $2.0 billion.
Total value Silver $190 million
Total value Lead $184 million.
Total value Sand and gravel: $24 million,
Total value Coal and peat $49 million.

Sources for Below:

Alaska's Mineral Industry 2008, Department of Natural Resources Division of Geological and Geophysical Surveys special Report 63
http://www.dggs.alaska.gov/webpubs/dggs/sr/text/sr063.PDF

Exploration Expenditures

Table 6: Reported exploration expenditures in Alaska by commodity, 2008, in US Dollars.

	Base metals	Polymetallic	Precious metals	Industrial minerals	Coal and peat	Other(1)	Total
2008	30,116,000	163,030,000	134,885,000	- -	W	19,238,000	347,269,000

(1) Includes uranium, tin, diamonds, magnetite sands, and tantalum.

- - Not reported.

W = Withheld; data included in "Other" column.

Exploration Expenditures (Combining Alaska Mining Districts Northern, Western and Eastern Interior which takes in all Arctic and some subarctic)

	Northern	Western	Eastern Interior
Placer	$153,380	$40,174	$143,800
Lode	$26,610,312	$7,918,622	$48,560,085
Exploration Employment workdays	35,107	3,689	20,769

Development

Northern Region

- 2008 Total development expenditures $45.0 million (all by Teck Cominco at Red Dog Mine, an 8.7 increase over the $41.4 million spent on development in this region in 2007).
- 2008 Employment allocated to development activity at Red Dog was approximately 58 full-time equivalent contract positions for the year.

Western Region

- 2008 reported expenditures approximately $124.9 million (in four projects-compared to $97.0 million for 2007, an increase of 28.8 percent)
- 2008 employment associated with these expenditures was 191 full-time-equivalent employees

Eastern Interior Region

- 2008 Total construction and other capitalized expenditures $151.9 million (14 projects reporting development activity compared to $50.2 million in 2007, an increase of $101.7 million, and a nearly 202.6 percent increase from 2007).
- 2008 Estimated employment allocated to development 127 persons.

Table 11: Reported mineral development expenditures and employment in Alaska by commodity and region, 2008.

	Northern	Western	Eastern Interior
Base Metals	$45,000,000	-	-
Polymetallic	-	-	-
Precious metals	-	-	-
Placer	-	$78,000	$285,000
Lode	-	$124,793,422	$151,351,172
Coal and peat	-	-	$260,000
Industrial minerals	-	-	$27,000
Other	-	-	-
Total	$45,000,000	$124,871,422	$151,923,172
Development Employment Workdays	15,000	49,545	33,104

Table 12: Reported mineral development expenditures in Alaska by commodity, 1982–2008.

Year	Base Metals	Polymetallic	Precious metals	Industrial minerals	Coal and peat	Total
2008	$45,000,000	$24,000,000	$319,702,594	$205,113	$7,260,000	$396,167,707

From the Executive Summary

- 2008 Total value of Alaska's mineral industry $3.171 billion ($844 million and 21 percent lower than 2007's record value of $4.015 billion)
- 2008 Total employment by the Alaska minerals industry was 3,392 full-time-equivalent jobs (a decrease of 166 jobs or 4.6 percent from the 2007 total of 3,558 full-time-equivalent jobs).
- Largest change in employment compared to the previous year was the drop in mineral development jobs from 735 to 516, a 30 percent decrease.
- Average monthly wage for mining in Alaska during 2008 was $7,472.
- 2008 Mineral industry paid a total of $96.1 million in royalty and tax payments to the State of Alaska and Alaska municipalities (down from $158.6 million paid in 2007 due to lower net income in the mining industry and decreasing property values).
- State mineral rents and royalties $6.6 million;
- Sales of rock, sand, and gravel $3.0 million;
- Mining license taxes $16.0 million
- Mining companies were the largest taxpayers in the City and Borough of Juneau and the Fairbanks North Star, Denali, and Northwest Arctic boroughs.
- The Alaska Industrial Development & Export Authority (AIDEA) was paid annual user fees of $16.2 million by mining companies for use of the DeLong Mountain Regional Transportation System and the Skagway Ore Terminal.
- Exploration expenditures were $347.3 million in 2008, more than $18 million higher than the record $329.1 million spent in the previous year. The year 2008 was the second consecutive period with expenditures above $300 million and the fourth consecutive year with expenditures that exceeded $100 million.
- At least 74 exploration projects in Alaska reported spending more than $100,000 each and 35 of those projects spent more than $1 million each. Exploration took place across Alaska, but more than 65 percent of the exploration funds were spent outside of the Arctic in southwestern Alaska.
- Significant advances were made on the Livengood (Money Knob) gold, Lik base-metal, LWM polymetallic, Lucky Shot gold, Niblack polymetallic, and Ucore uranium and rare-earth-element projects.
- Development expenditures for 2008, reported for 33 projects, totaled $396.2 million, up 24.3 percent from the $318.8 million spent in 2007 and the fifth year with development expenditures exceeding $200 million.
- Tailings storage facilities were expanded at Red Dog Mine. Construction of the Rock Creek Mine facilities was substantially completed during September and the startup process was initiated. Construction of heap leach facilities at Fort Knox Mine continued.

- 2008 Production values $2,427.1 million (compared to $3,367.0 million in 2007, a 28 percent decline however, still the seventh consecutive year with production value above $1 billion.). Higher gold production was noted, but silver, zinc, and lead production declined. Zinc accounted for 43.5 percent of the total production value, followed by gold at 28.8 percent.
- Of the Arctic mines, Red Dog Mine was the largest mineral producer in Alaska during 2008, with 54.5 percent of the production value. Other significant producers, in order of value of product, were Pogo Mine (12.5 percent), and Fort Knox Mine (11.8 percent).
- International mineral exports from all companies were valued at $853 million.
- Zinc production was 626,135 tons in 2008.
- Lead production was 153,705 tons.
- Gold production was 800,752 ounces
- Silver production was 14.6 million ounces.
- Sand and gravel production was 12.5 million tons and
- Rock production was 2.5 million tons.
- More than 1.5 million tons of coal was produced.
- Peat production was 83,789 cubic yards.
- Hard-rock (lode) gold production increased approximately 10.5 percent in 2008 to 743,993 ounces.
- Pogo Mine replaced Fort Knox Mine as the largest gold producer in Alaska.
- Placer gold production increased in 2008 by 5.4 percent to 56,759 ounces from 53,849 ounces in 2007.
- There were approximately 195 placer operations that reported production in Alaska in 2008 compared to 174 in 2007 (no breakdown for Arctic).

Major drilling programs were conducted during all phases of mining (exploration, development, and production) on various projects in most areas of the state in 2008.

2008 drilling programs

- 874,634 feet of core drilling,
- 250,278 feet of reverse-circulation drilling,
- 26,869 feet of core and reverse-circulation drilling on coal operations,
- 1,216 feet of placer churn/auger drilling.
- About 45 percent of the 2008 drilling footage was from exploration and development projects in the eastern interior region of Alaska and 27 percent of the drilling footage for 2008 was from exploration projects in southwestern Alaska. Fairbanks Gold Mining Inc. (Kinross Gold Corp.) had the largest reverse-circulation rotary drill program, with drilling related to development and exploration work at Fort Knox Mine and adjacent properties. BHP Billiton Ltd. had the largest coal drilling program.

- The Alaska Industrial Development and Export Authority (AIDEA) expanded the Skagway Port facility for storing and shipping mineral concentrates. The Alaska Railroad

transported 2.83 million tons of gravel and more than 600,000 tons of coal during 2008. Mineral products (coal, sand, and gravel) generated revenue amounting to $18.5 million

Information below from State of Alaska Department of Revenue – Tax Division 2007

http://www.revenue.state.ak.us/

Revenue Sources Book

http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?255

Total State Revenue

2007: $5,240.5 million;
2008 (forecast): 6,604.5 million;
2009 (forecast): 5,022.8 million;

State mining revenues, with General Purpose Unrestricted Revenue (GPUR) from the corporate income tax, mining license tax and coal royalties collected from the mining industry reaching $151.6 million in fiscal year (FY) 2007.

Total value of minerals in Alaska reached a record high of $2.9 billion in calendar year (CY) 2006.

Total value of gold: $344 million.
Total value of zinc $2.0 billion.
Total value Silver $190 million
Total value Lead $184 million.
Total value Sand and gravel: $24 million,
Total value Coal and peat $49 million.

Local Mining Revenues

In addition to state government revenue, local governments in Alaska which have mines operating within their borders receive revenue from them. In 2006, local governments received a total of $14.4 million from the mining industry. (1) These revenues primarily come from property taxes and sales taxes. Mines located in the unorganized borough, such as the Pogo mine in the Southeast Fairbanks Census Area, pay no taxes to local governments, but they provide employment in areas which traditionally have had high unemployment rates, and may provide infrastructure such as roads and airstrips.

(1) Alaska's Mineral Industry 2006, Special Report 61, Table 27 page 54

Economic Benefits of Alaska's Mining Industry, January 2010
http://www.alaskaminers.org/mcd09sum.pdf

In 2009, Alaska's mining industry provided:

- 3,300 direct mining jobs in Alaska.

- 5,200 total direct and indirect jobs attributed to Alaska mining industry.
- $320 million in total direct and indirect payroll.
- Some of Alaska's highest paying jobs with an estimated average annual wage of $83,000, 85per cent higher than the state average for all sectors of the economy, second after oil and gas sector wages.

Exploration

- $160 million spent on exploration, down 54per cent from 2008.
- 39 exploration projects spending more than $100,000, of which 17
- Exploration projects spent more than $1 million.
- $2 billion spent on exploration since 1981.

Development

- $262 million spent on mine construction, down 34per cent from 2008, on at least 6 developing and existing mines.

Production

- $2.4 billion in gross mineral production value from Red Dog, Greens Creek, Fort Knox, Pogo, and Usibelli Coal mines, placer mines, and rock, sand, and gravel operations, down 2per cent from 2008.
- More than 175 placer mines produced 54,000 ounces of gold.
- $106 million in production value from more than 120 active rock quarries, and sand and gravel operations.

Exports

- $750 million in mining exports, or 21per cent of Alaska's total exports.
- $12.3 million in local government revenue through property taxes and payments in lieu of taxes.
- $35 million in state government revenue through rents, royalties, fees, and taxes.
- $39.8 million in payments to Alaska Native corporations (FY09).
- Jobs for residents of more than 120 communities throughout Alaska–mostly year-round, and often in rural areas, where few other jobs are available.