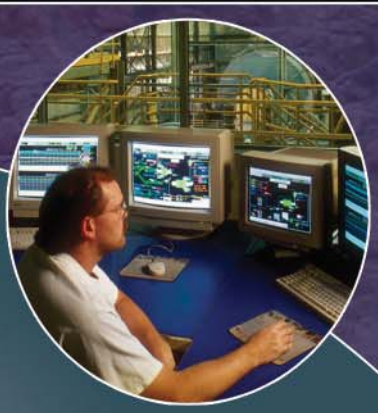
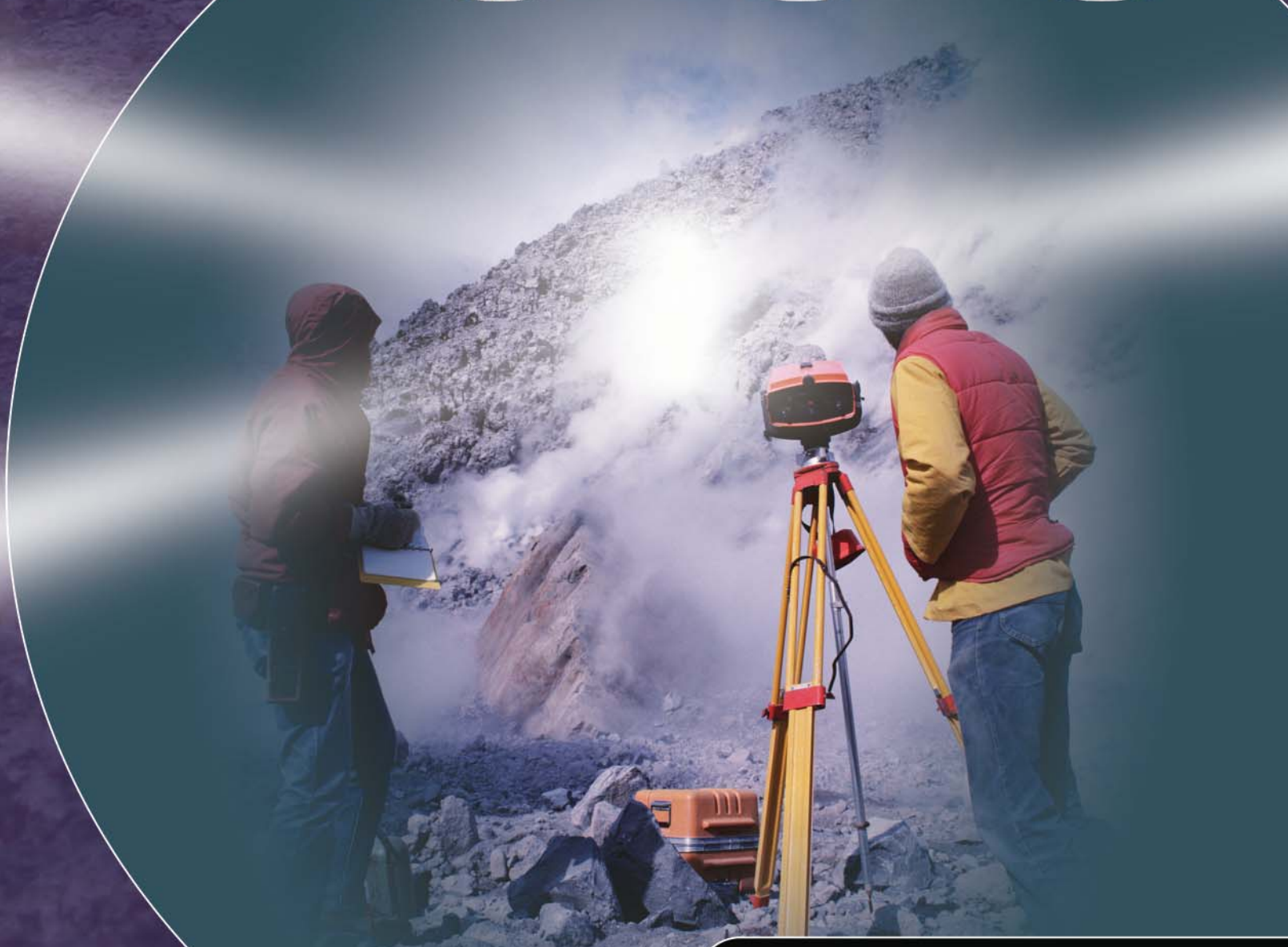
PROSPECTING THE FUTURE

Meeting Human Resources Challenges In The Canadian Minerals And Metals Industry





Final Report

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THE STUDY

Prospecting the Future: Meeting Human Resources Challenges in Canada's Minerals and Metals Sector is a comprehensive sector study of the short- and long-term human resource issues and challenges facing the minerals and metals industry. Its assessment of current and emerging human resource needs and gaps served as a foundation for a series of recommendations designed to maintain the strength of the minerals and metals sector well into the future.

The study was a 2.5 year long project that commenced in February of 2003 and ended in July 2005, with the detailed industry research phase occurring from October 2004 to May 2005.

The Mining Industry Training and Adjustment Council (MITAC) Canada managed the project under the guidance of the Minerals and Metals Industry Sector Study Steering Committee (MMISSSC). *Prospecting the Future* was funded by the Government of Canada's Sector Council Program.

Key Findings

An aging workforce

The age of the minerals and metals industry workforce is higher than that of the overall Canadian workforce. Over 50% of workers are aged 40 to 54, an age group that represents 39% of the total Canadian workforce. There is a markedly lower proportion of employees below age 30 in the sector, particularly in the skilled trades and semi-skilled mining occupations.

Significant retirements on the horizon

With its comparatively older workforce, the mining sector will experience a significant loss of older, experienced workers due to retirement in the next decade. Employers predict that 24.5% of current workers will retire within 10 years, while 40% of employees surveyed in the research indicated they plan to retire within that time period. The largest percentage of workers planning to retire is in the skilled trades occupational group (44.6%).

Human Resources Gap

The retirement projections signal a looming human resources gap in the minerals and metals industry, but other factors indicate the gap will widen beyond retirees. Since 2002, mining GDP growth has been about twice the rate of the Canadian economy and economic indicators point to continued growth and increased exploration activities in the sector for several more years. More than simply replacing retired workers, the industry will need to expand its labour force to meet this demand-driven growth.

Supply challenge – Education and training programs

It is projected that an estimated 13,800 students will enroll in mining-related post-secondary programs over the next decade. However, these numbers are well below the predicted demand for

highly skilled employees. The industry currently faces a number of challenges in recruiting post-seceondary-educated employees, including competition from a number of other sectors in Canada and from employers in other countries. In addition, there have been declining numbers of mining engineering graduates and a loss of some mining-specific programs in recent years.

Supply challenge – Non-traditional groups

The minerals and metals sector has historically faced challenges recruiting women, who currently account for 13% of all employees in the industry. Although the sector has had some success in recruiting Aboriginal employees, there are continuing challenges, including the fact that Aboriginal workers are under-represented in the more highly skilled positions. Less than 3% of employees in mining are members of visible minorities. In addition, the industry employs very few recent immigrants to Canada.

Supply challenge – Other factors

The minerals and metals industry faces other challenges as it seeks to meet its human resources demands: competition from such industries as oil and gas, electricity utilities and construction; limited awareness and inaccurate perceptions about today's mining jobs; and concerns about working in commuter mining operations.

Supply advantage – Attractive features of mining

The mining industry also has a number of strengths which should boost attraction and recruitment—most notably, attractive wages and benefits packages. Although wages are higher in oil and gas, mining employees earn more than their counterparts working in utilities, forestry, manufacturing and construction. Job security is also an attractive feature of jobs in the minerals and metals sector.

Supply and demand gap

Researchers analyzed the potential supply-and-demand gap for mining human resources under three scenarios: no-growth, low-growth and high-growth. For each scenario, the study predicted the number of jobs that would need to be filled, and the numbers that could be filled by traditional supply sources, principally post-secondary educated graduates. Under the no-growth scenario, the industry will still face a potential labour supply gap of 27,560 workers over the next 10 years. The potential supply gap with a low-growth scenario will be 47,350 workers. Under the high-growth scenario, the labour supply gap will be 70,810 workers over the next decade.

Strategies and Action Items – Final Recommendations

Prospecting the Future included development of recommended strategies and action items to address the major human resources issues facing the minerals and metals industry. The

recommendations were based on consultations with the Minerals and Metals Industry Sector Study Steering Committee (MMISSSC), the MITAC project team and representatives of various communities of interest.

Four primary objectives were identified as key to ensuring a sufficient supply of skilled workers to the industry over the next 10 years, and therefore pivotal to the industry's human resource strategy:

Objective A: Meet current and projected human resource demand by increasing and making best use of all potential sources of supply.

Objective B: Address existing and expected skill gaps in the industry.

Objective C: Ensure standardization of skills and consistency of training delivery in order to facilitate recruitment, establish clear educational requirements and increase worker mobility.

Objective D: Ensure that all stakeholders are aware of and understand the critical human resources issues currently facing the minerals and metals industry.

Strategies were developed for each objective, each of which is summarized below. The full study also includes action items for each strategy, suggested timelines and suggested lead organizations and partners to implement the items.

Objective A: Meet current and projected human resource demand by increasing and making best use of all potential sources of supply.

The research results suggest that Canada will need to hire as many as 81,000 new employees to meet current and future demands, and to fill positions vacated by retirees.

Strategy A1: Promote the minerals and metals industry to youth as a safe, modern, environmentally friendly and technologically advanced career option.

Strategy A2: Develop a national strategy that focuses on the engagement, recruitment and retention of Canada's Aboriginal workforce focusing on sites and operations that neighbour Aboriginal communities.

Strategy A3: Actively target non-traditional groups in promotion and recruitment efforts to expand labour supply sources

Objective B: Address existing and expected skill gaps in the industry.

Research findings suggest that the industry could lose up to 40% of the existing workforce in the next 10 years due to retirement and early retirement. This significant loss of skills represents a major risk to the sector, especially given that skill gaps currently exist in the workforce.

Strategy B1: Mitigate the risk to industry associated with an aging workforce and pending retirements through proactive human resource-practices and succession planning (especially for long-life mines).

Strategy B2: Develop programs to bring back retired workers and retain older workers to minimize the impact of the workforce exodus and facilitate the capture of knowledge and experience that will be necessary to maintain skills levels within the industry.

Strategy B3: Encourage industry to develop mentoring programs to facilitate the transfer of knowledge from older experienced workers to their replacements.

Strategy B4: Develop a collaborative, cross-industry strategy for educational preparation, training/educational programs, continuing education/life-long learning, and employer-provided training to facilitate the availability of a skilled labour force.

Objective C: Ensure standardization of skills and consistency of training delivery in order to facilitate recruitment, establish clear educational requirements and increase worker mobility.

Mining-specific occupations are generally not credentialed in Canada (with the exception of basic common-core training in Ontario and Quebec). In the future, there will be a need for advanced training and further education to help employees meet increasingly complex tasks. In addition, there is a need to identify required common-core skills to facilitate the development of career paths, maintain occupational and professional standards and enhance worker mobility.

Strategy C1: Present a clear case for the potential benefits of occupational standards, certification and program accreditation to employers and other industry stakeholders.

Strategy C2: Develop and implement occupational standards for key industry occupations.

Strategy C3: Implement national occupational standards and standardize credentialing of professional occupations within Canada.

Objective D: Ensure that all stakeholders are aware of and understand the critical human resources issues facing the minerals and metals industry.

It is critical that key players in the minerals and metals industry understand the importance of human resources to the continued success and competitiveness of the industry, and that they begin proactive, strategic human resources planning.

Strategy D1: Develop and implement a communications strategy that emphasizes the impending human resource crisis facing the minerals and metals industry. The strategy is intended to raise awareness and understanding of the issues and to promote collaboration between the industry stakeholders who have an important role to play in overcoming the human resource challenges facing the industry.

CHAPTER 1: BACKGROUND TO *PROSPECTING THE FUTURE:*

In 1993, a joint committee of employer and union representatives commissioned *Breaking New Ground: Human Resource Challenges and Opportunities in the Canadian Mining Industry,* a comprehensive review of human resources in the mining sector.

Within ten years, changes to the industry and emergent trends in Canada's labour force led to widespread recognition that the time had come for a new report on current and future human resource needs.

In response, industry stakeholders formed the Minerals and Metals Industry Sector Study Steering Committee (MMISSSC)—a consortium of stakeholder communities[1]—to explore these new or emerging human resource issues. In February 2003, they launched *Prospecting the Future: Meeting Human Resource Challenges in the Canadian Minerals and Metals Industry,* a sector study funded by the Government of Canada's Sector Council Program. The Mining Industry Training and Adjustment Council (MITAC)—Canada, managed the project under the guidance of the MMISSSC.

1.1 The study's purpose and objectives

Prospecting the Future: Meeting Human Resource Challenges in the Canadian Minerals and Metals Industry had one overall goal: to provide a forward-looking, comprehensive report on the short- and long-term human resource issues facing the minerals and metals industry. The study was designed to serve as the foundation for a national human resource strategy and action plan to address these issues.

Consequently, the study provides an in-depth assessment of the industry's human resources situation and identifies the key factors— both positive and negative—that currently affect the industry, as well as those expected to have an impact in upcoming years. In addition, the study provides recommendations and strategies to deal with current and future human resource issues.

This report is the product of the second of two phases of research conducted to diagnose the industry's short and long-term human resource issues and challenges.

Phase I: A situational analysis of the minerals and metals industry
Phase II: A detailed analysis of the minerals and metals industry

Phase I, undertaken from February through June 2004, included an overview of the human resource issues, challenges and opportunities facing the industry; as well as a comprehensive environmental scan. It also identified possible implications for the industry's human resources and identified various information gaps that needed to be addressed through extensive consultation with industry and other communities of interest.

1 The MMISSSC is composed of representatives from the Canadian minerals and metals industry, including labour, the Aboriginal community, industry and professional associations, businesses, education, and provincial, territorial and federal governments.

In addition to the information gaps identified in Phase I, Phase II encompassed in-depth analysis of human resource supply and demand. The key objectives were:

- to develop a detailed, current and forward-looking industry profile that would address the business and regulatory environment, the impact of technological change and the sector's human resource profile;
- to identify human resource issues and their root causes;
- to identify unique practices with respect to human resource planning and strategies; and
- to develop recommendations for a human resource strategy.

To meet these project objectives, the research team adopted a comprehensive approach based on the synthesis of information obtained through multiple lines of evidence.

1.2 Project scope

Canada's minerals and metals industry encompasses a range of activities, which leads to varying estimates of GDP, employment and exports, depending on what definition of the mining sector is utilized. In addition, different organizations and agencies use different definitions to describe which activities the sector includes and excludes.

Prospecting the Future examines the industry from the standpoint of exploration, extraction and primary refining (smelting), but excludes the further processing of the metals and ores that would traditionally be associated with manufacturing activities.

The scope of the project's research can be better understood using Natural Resources Canada's (NRCan) mining stages as defined by Statistics Canada's Industrial Classification System known as NAICS (North American Industrial Classification System).

1.2.1 NRCan Mining Stages

The NRCan definition of mining is based on four stages, each composed of key activities that correspond to NAICS codes.

Stage I – Mineral extraction and concentrating industries

- Exploration for, and development of, mineral deposits
- Mining, quarrying, milling (crushing and mechanical separation) and other preparation customarily done at the mine site
- Inclusive of metal, non-metallic mineral and coal production

Stage II – Smelting and refining industries

• Smelting and refining of ferrous and non-ferrous metals

• Extracting alumina from bauxite ore, producing aluminum from alumina and rolling or extruding basic shapes from aluminum

Stage III – Metal and non-metal semi-fabricating industries

• Manufacturing or processing steps required to produce semi-finished or semi-fabricated forms for use as an input in other industries

Stage IV – Metal fabricating industries

• Further processing and manufacturing products of Stage III.

The scope of the study was limited to Stage I and part of Stage II, including only non-ferrous smelting and refining (excepting aluminum). (Stage III and Stage IV activities would typically be encompassed as part of the manufacturing sector.)

1.2.2 NAICS Definitions of Stage I and Stage II

Canada, the United States and Mexico use NAICS codes to classify establishments by the type of activity in which they are primarily engaged. NAICS identifies twenty sectors at the broad two-digit level and refines them further by moving from three-digit to six-digit classifications. The longer codes designate specific industries and sub-sectors within the broadly defined sectors[2].

NRCan definitions of Stage I and Stage II mining are based on the four-digit NAICS, as shown in Figure 1.

Figure 1: Four-digit NAICS

Stage I:

• NAICS 2121: Coal Mining;

• NAICS 2122: Metal Ore Mining[3]; and

• NAICS 2123: Non-metallic Mineral Mining and Quarrying.

2 NAICS Association website: http://www.naics.com/info.htm
3 Metal ore mining includes zinc, nickel, lead, copper, gold, silver and uranium.

Stage II:

• NAICS 3311: Iron and Steel Mills and Ferro-alloy Manufacturing;

• NAICS 3313: Primary Production of Alumina and Aluminum; and

• NAICS 33141: Non-ferrous Metal (except aluminum) Smelting and Refining.

The industry definition applied in Prospecting the Future includes all three NAICS categories of Stage I, but only part of Stage II. The Stage II industry activities of interest to the sector study are those within NAICS 33141: Non-ferrous Metal (except aluminum) Smelting and Refining. Excluded are:

• NAICS 33142 – Copper Rolling, Drawing, Extruding and Alloying;

• NAICS 33149 – Other Nonferrous Metal Rolling, Drawing, Extruding and Alloying;

• NAICS 3311 – Iron and Steel Mills and Ferro-alloy Manufacturing; and

• NAICS 3313 – Primary Production of Alumina and Aluminum.

In addition to the extraction activities in coal, metal ore and non-metallic mineral mining covered in Stage I, contract drilling (except oil and gas) and support activities (NAICS 213117 and NAICS 213119, respectively) are also included. The scope of the project, as defined by the MMISSSC, is summarized in Figure 1.1, including a brief description of each industry activity.

1.2.3 Commodities

The study focused on the top ten minerals and metals in Canada, by value of production: gold, nickel, potash, coal, copper, iron ore, cement, zinc, sand/gravel/stone and diamonds. The study also planned to cover mining-related activities in Canada's oil sands (exploration and extraction only), but oil sands employers declined to take part. For more information on the oil sands HR issues, please contact the petroleum sector council via www.petrohrsc.ca.

1.2.4 Levels of Analysis

Since the minerals and metals industry is highly diverse in terms of type of operation, commodity produced, location and company size, the sector study focused on the different processes and locations that produce various commodities. Wherever possible, analyses were completed on the basis of the following:

• Geographic Coverage: A national, integrated profile of the industry that examines all geographic regions in Canada. Research findings reflect issues that are national or regional in scope, including discussions of remote and rural areas.

Figure 1.1: North American Industrial Classification System (NAICS) Codes for the Minerals and Metals Industry

NAICS (2002)	NAICS Title/Description
2121	*Coal Mining* Establishments primarily engaged in one or more of the following: (1) mining bituminous coal, anthracite, and lignite by underground mining, auger mining, strip mining, culm bank mining, and other surface mining; (2) developing coal mine sites; and (3) beneficiating (i.e., preparing) coal (e.g., cleaning, washing, screening, and sizing coal).
2122	*Metal Ore Mining* Establishments primarily engaged in: (1) developing mine sites, mining, and/or beneficiating (i.e., preparing) iron ores and manganiferous ores[1] valued chiefly for their iron content; and/or (2) producing sinter iron ore (except iron ore produced in iron and steel mills) and other iron ore agglomerates.
2123	*Non-metallic Mineral Mining and Quarrying* Establishments primarily engaged in developing mine sites, or in mining or quarrying non-metallic minerals (except fuels). Also included are certain well and brine operations, and preparation plants primarily engaged in beneficiating (e.g., crushing, grinding, washing, and concentrating) non-metallic minerals.
213117	*Contract Drilling (except Oil and Gas)* Establishments primarily engaged in diamond, test, prospect and other types of drilling, for minerals other than oil and gas.
213119	*Other Support Activities for Mining*[2] Establishments, not classified to any other Canadian industry, primarily engaged in performing mining services, for others, on a contract or fee basis. Establishments engaged in the exploration for minerals are included. Such exploration is often accomplished using purchased services of specialty businesses, such as contract drilling services to obtain core samples.
33141	*Non-Ferrous Metal (except Aluminum) Smelting and Refining* This industry comprises establishments primarily engaged in smelting non-ferrous metals, except aluminum, from ores; and refining these metals by electrolytic or other processes. Establishments engaged in secondary activities, such as rolling or extruding basic shapes, from metal produced in the same establishment, are included.

1 Metal ore mining includes zinc, nickel, lead, copper, gold, silver and uranium.
2 Exclusion(s): Establishments primarily engaged in performing geophysical surveying services for oil and gas, on a contract or fee basis (NAICS 541360, Geophysical Surveying and Mapping Services)

- Type of Activity or Operation: Because different mining methods are applied in different locations, depending on the depth, type and grade of ore bodies being accessed, Stages I and II cover a variety of production activities and operations. Stage I includes surface mining, underground hard-rock mining, and soft-rock mining. For the purposes of this study, Stage II operations include refining and smelting processes (limited to non-ferrous metals (excluding aluminum). Exploration and supplier/contractor perspectives were also considered in the research.

- Size and Type of Establishment: The study examined differences by firm size (large, medium, and small), and type (junior, major, service providers, suppliers).

1.2.5 Occupations

A key research objective was to identify human resource issues related to several essential benchmark occupations or occupational groups. While the research team included all occupations in the employment projections, they paid particular attention to five key occupational groups associated with mining-related activities, as set out in Figure 1.2.

Each of the key occupations listed above are part of the National Occupational Classification (NOC) system.[4] The NOC codes relevant to the sector study and their descriptions are contained in ***Appendix A.***

Figure 1.2: Occupational Groups and Typical Occupations

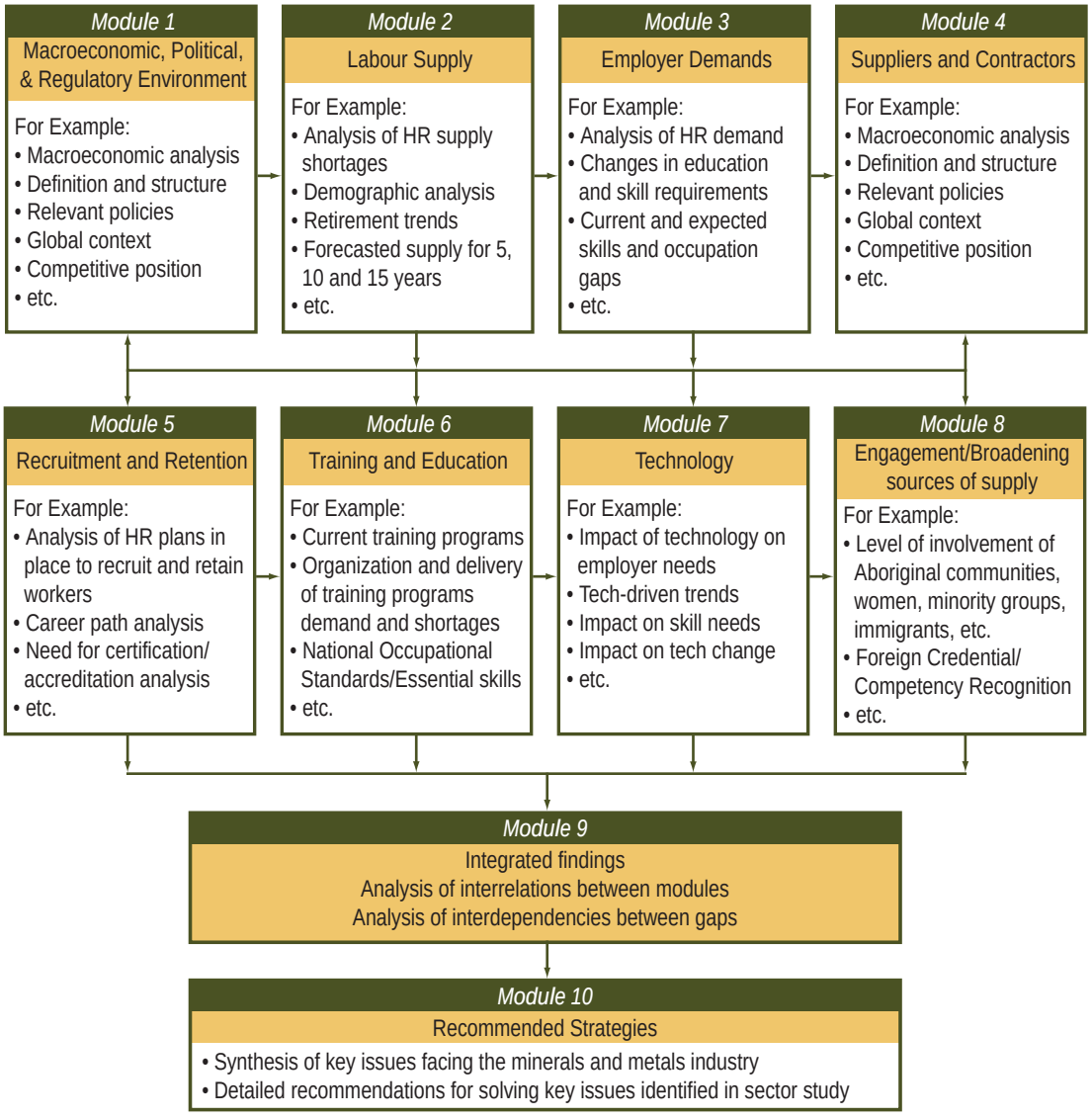
Occupational Group	Typical Occupations
Physical Scientists	• Geologists • Geochemists • Geophysicists
Professional Engineers	• Mining and Mineral Engineers • Geological Engineers • Metallurgical Engineers • Other Engineers (e.g., environmental)
Technicians /Technologists	• Chemical Technicians/Technologists • Geological Technicians/Technologists • Mining Technicians/Technologists
Skilled Trades/Transportation	• Machine Operators • Machinery & Transportation Equipment Operators • Heavy Equipment Operators
Semi-skilled Occupations	• Supervisors, Mining & Processing • Crane Operators, Drillers, Blasters • Central Control Room Operators • Underground Miners • Mine Service Workers

4 The National Occupational Classification (NOC) is a system developed by HRSDC for describing the occupations of Canadians. At the most detailed level, it defines 520 occupational groups identified as unit groups (HRSDC, National Occupational Classification Training Tutorial).

1.3 Overview of research methodology

The research was organized around 10 modules. Figure 1.3 lists each component and examples of key themes for each is area covered in the research. The full research matrix by module is contained in ***Appendix B.***

Figure 1.3: Framework for Minerals & Metals Sector Study Report



Source: Request for Proposal, *Prospecting the Future*

Phase II of Prospecting the Future included extensive research and consultation and used multiple lines of evidence from primary and secondary research activities. The consultations gleaned input from labour, business, the Aboriginal community, human resource professionals, owners and operators, industry associations, education and training institutions (including students), governments, and others communities of interest in the industry. The activities completed for the sector study included the following:

Primary Research

- National surveys of
    - minerals and metals industry employers representing companies with operating metal or non-metallic mineral mines, exploration companies and aggregate producers;
    - suppliers and contractors to the minerals and metals industry;
    - employees in the minerals and metals industry;
    - educational institutions offering programs specific to the minerals and metals industry;
- Interviews with representatives from a range of communities of interest, including employers, industry and professional associations, educators, government, unions, and special-interest groups;
- Case studies to identify unique practices in the minerals and metals industry;
- Focus groups with human resource managers in the industry, other employees in the industry and new entrants/recent graduates of post-secondary educational mining programs;
- Focus groups with youth to discuss the image of the minerals and metals industry as a potential career choice; and
- A roundtable with participating communities of interest to develop action plans to address the industry's human resource issues.

Secondary Research

- Building on and updating research and statistics from Phase I;
- Additional review of provincial, national and international information related to the minerals and metals industry; and
- Reviewing qualitative and quantitative information from sources such as Statistics Canada, Natural Resources Canada and a wide variety of current mining-specific articles and research.

The research team consulted and involved the MMISSSC throughout the research process. Each of the activities listed previously is described in greater detail in ***Appendix C.*** The final completion status and coverage for each activity appears in Section 1.3.1, followed by the estimated coverage of industry operations and employment obtained from the surveys.

1.3.1 Completion Status

The research team set minimum targets for each of the primary research activities. Figure 1.4 summarizes the final completions, minimum targets and completion rates.

Figure 1.4: Summary of Actual and Target Completions by Research Activity

Research Activity	Completions	Minimum Target	Completion Rate
Employer Survey (# firms)	48	50	96%
Supplier/Contractor Survey	46	68	68%
Employee Survey	694[1]	600	116%
Education Survey	19	19	100%
Key Informant Interviews	59	60	98%
Focus Groups	10	10	100%
Case Studies	5	5	100%

1 The number of surveys used for the analysis in the report. A total of 694 employee surveys were received (e.g., administrative support, employed outside of Canada, etc.)

Figure 1.5: Key Informant Interviews and Focus Groups Completed

Community of Interest	Target Completions	Actual Completions
Key Informant Interviews		
Employers	10	12
Professional/Industry Associations	15	13
Educators/Trainers	10	11
Government	10	11
Labour Organizations	10	10
Special Interest	5	2
Total Interviews	60	59
Focus Groups		
Employers	3	3
Employees	2	2
New Entrants/Graduates	3	3
Youth	2	2
Total Focus Groups	10	10

The researchers used informant interviews and focus groups to target specific communities of interest. This process resulted in new interview leads and other contacts suggested by individuals with specific knowledge about human resource and other issues affecting the industry. Figure 1.5 summarizes focus group and interview completions.

1.3.2 Coverage

Due to the complex structure of the minerals and metals industry (multiple ownership of mines, headquarters versus site management, etc.), the employer survey calculates coverage (rather than response rate). Coverage has been calculated in two ways:

- First, for the estimated total number of active mining and smelting and refining operations in Canada, and

- Second, for the estimated total labour force of Canada's mineral and metals industry in exploration and production related occupations.

It is important to reiterate that estimated coverage is based on the parameters set for the sector study (as set out earlier in Section 1.2). For instance, the total number of active mines in Canada reported by the Mining Association of Canada (MAC) exceeds 800. This total, however, includes a much larger range of commodities than the focus of the present study.

Figure 1.6: Coverage of Active Minerals and Metals Industry Sites and Workforce Represented in Employer Survey Completions

Type of Operation/Workforce	Estimated Universe[1]	# Covered by Completed Surveys	Coverage (%)
Active Mining Sites	148	107	72.3%
Coal Mines	23	16	69.6%
Metal Ore Mines	55[2]	42	76.4%
Non-Metallic Mineral Mines	70[3]	49	70.0%
Smelting Operations	17[4]	10	58.8%
Refining Operations	na	10[5]	na
Exploration Sites	na	148	na
Minerals and Metals Industry Workforce	78,184	32,086	41.0%

1 The estimated universe for mining operations was derived from the Mining Association of Canada (MAC) Facts and Figures 2003 report, adjusted for commodities and operations specific to the scope of the study.
2 Excluding magnesium, tungsten, ferroniobium, tantalum, cesium, and rubidium mines.
3 Non-metallic mineral mines excluding aggregate, salt, asbestos, graphite, phosphate, sodium sulphate, and diatomite mines.
4 Operations include only non-ferrous smelting and refining.
5 Excludes survey responses for refineries listed by aggregate, coal and diamond producers, and refineries associated with smelters.

Figure 1.6 highlights the completions and coverage for the employer survey by type of mining activity and by the estimated exploration, refining and smelting-related workforce.

As Figure 1.6 shows, respondents to the Prospecting the Future employer survey represent close to 75% of active mining sites. The most complete coverage was obtained for metal ore mining (76%). A list of firms that participated in the employer survey is contained in ***Appendix D.*** Survey responses were received from all regions, for small, medium and large operations/ and firms; for most commodities; for all types of mining activities of interest to the research and for union and non-union operations. Employee data collected through the employer survey accounted for more than 40% of employment in Canada's minerals and metals industry.

1.4 Research challenges

There were some key challenges associated with the scope of the minerals and metals industry defined for the study and the level of detail available from statistical and other informational resources. The following is an overview of the research challenges, and how they were addressed:

- **Overlapping occupations with other sectors.** Unlike some sectors in which occupations are specific to the industry, the minerals and metals industry has only a limited number of occupations that can be defined as "mining only" occupations. For example, electricians, and civil, mechanical and electrical engineers can be found in a variety of industries. Given this overlap with other industries, determining minerals and metals-based employment could not be done by utilizing NOC codes alone. However, 2001 Census data provided a detailed breakdown of occupational data[5] by four-digit NAICS codes for mining. These statistics enabled the researchers use the census data to estimate employment for those occupations that would primarily represent work unique to the minerals and metals sector, as well as for the proportion of workers in generic occupations.

- **Inclusion of oil and gas at the four-digit NAICS Level.** Employment data by NAICS code was only available at the four-digit level. Therefore, the research team used 2001 Census NOC data to estimate the proportion of the labour force involved in the oil and gas industry, then adjusted the industry's labour force estimates to exclude employees in occupations related to the oil and gas industry. This was particularly important for *NAICS 2131—Support Activities for Mining,* which includes support activities for oil and gas.

In summary, despite the challenges associated with the sector study, the results should be viewed with considerable confidence, as the research was based on information provided by more than 900 individuals and organizations associated with the Canadian mining sector.

In addition, the 2004/05 *Prospecting the Future* sector study was based on extensive primary data collection activities incorporating the use of both quantitative and qualitative research approaches. The use of these "multiple lines of evidence" helps to ensure that the report and recommendations reflected the input of employers, employees, suppliers and contractors, education and training providers, labour representatives, government officials and other stakeholders.

5 At the NOC four-digit level.

CHAPTER 2: THE BUSINESS AND REGULATORY ENVIRONMENT

This section surveys the business and regulatory environment of the Canadian minerals and metals industry and analyzes how key factors impact or will impact the industry. This information is based on a comprehensive review of the most recent Canadian and international literature and statistical data available on the sector, and builds on the results of the preceding study, *Phase I – A Situational Analysis of the Minerals and Metals Industry.*[6]

2.1 Canada's position as a world leader in production

Figure 2.1 shows that Canada's production of minerals and metals represents a considerable share of total world production for several commodities.

Figure 2.1: Canada's Production and Share of Total World Production – Selected Minerals – 2003 (Ranked by Value)

Commodity	Share of World Production	Rank of World Production
Potash	32%	1st
Uranium	29%	1st
Nickel	12%	3rd
Zinc	9%	4th
Diamonds	7%	6th
Gold	9%	7th
Copper	4%	8th
Iron Ore	3%	10th
Coal	1%	13th

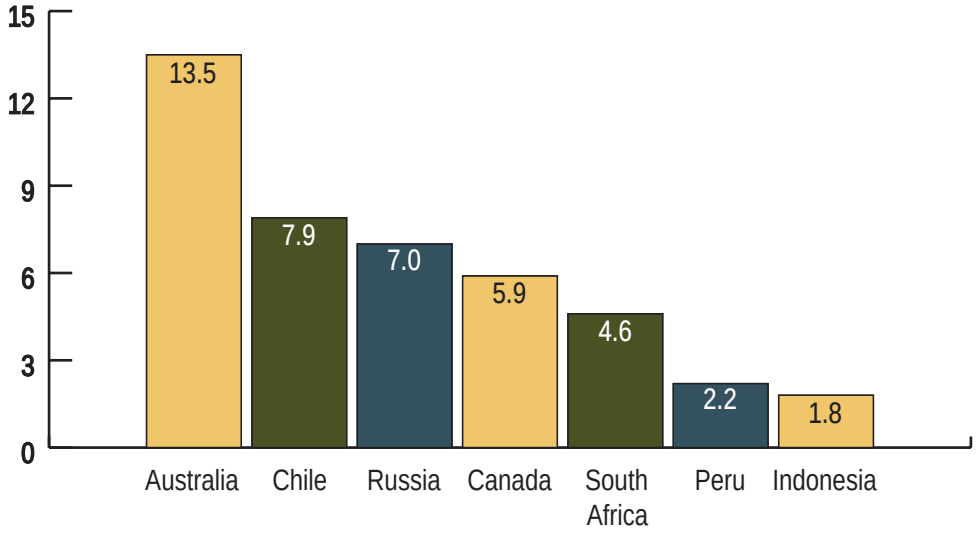
Source: British Geographical Survey, *World Mineral Production,* 1999-2003

Since much of Canada's production is destined for overseas markets, we are also a major world exporter of these commodities. Furthermore, unlike many other major producing countries (e.g., the United States, Russia, and China), Canada's mineral production exceeds domestic demand, enabling the sector to account for a considerable share of total world exports for several commodities. For example, although Canada ranked thirteenth in terms of total global coal production in 2003, much of the country's coal is destined for international markets, making us the world's eighth largest exporter of coal. On a balance-of-trade basis (that is, exports less imports), we are the world's fourth-largest net exporter of minerals and metals (after Australia, Chile and Russia).[7]

Figure 2.2 highlights Canada's global position as a net exporter.

6 The final report for Phase I is available on-line at www.prospectingthefuture.ca.
7 United Nations, Handbook of World Mineral Trade Statistics, 1995-2000.

Figure 2.2: Canada's Net Trade Balance – Minerals and Metals (2000)



Source: United Nations, *Handbook of World Mineral Trade Statistics,* 1995-2000.

As a major player in the global minerals and metals industry, Canada is home to more than 65% of the world's exploration and mining companies. Our mining and exploration firms hold the largest share of the global exploration market, as compared to the United States, South America, Central America, Europe and Africa. In 2004, more than 1,100 of the world's listed exploration and mining companies were Canadian, accounting for more than 30% of global mineral exploration;[8] The majority of these firms, however, do not have active operations in Canada.

2.2 The Canadian industry

The Canadian minerals and metals industry consists of more than 800 active mining operations that produce a wide variety of commodities.[9] Of those companies, 706 were involved in the production of the commodities of interest to the present study, 84% of which were aggregate producers (that is, stone, sand, and gravel).

Figure 2.3 shows that the average establishment size is highly variable in Stage I activities, which range from small exploration firms or "juniors" to large multi-national corporations.[10] Although aggregate producers account for the majority of establishments in the industry, the highest concentration of workers is in the production of iron ore, with an average of 1,001 employees per establishment, followed by nickel-copper-zinc production, with an average of 672 employees per establishment.

Note that the employment figures presented in Figure 2.3 represent employment in only a portion of the mining sector (Stage I), as total employment in the sector was estimated to be in excess of 78,000 persons.

8 Natural Resources Canada. Canada's Minerals and Metals Industry: An Economic Overview. July 2004.
9 Maps of mine location by commodity are available on the Natural Resources Canada website at http://mmsd1.mms.nrcan.gc.ca/maps/intro_e.asp.
10 Similar data was not available for Stage II, therefore workforce estimates pertain to Stage I operations only.

Figure 2.3: Number and Average Size of Stage I Establishments by Selected Commodities (2002)

Commodity[1]	Number of Establishments	Total Employees (Stage 1 Only)	Average Number Employees/ Establishment
Metals			
Gold	30	6,965	232
Silver-Lead-Zinc	3	1,391	464
Iron	4	4,002	1,001
Nickel-Copper-Zinc	15	10,079	672
Misc. Metal Mines	12	2,735	228
Non-metals			
Potash	11	3,312	301
Diamonds	19	1,358	71
Stone	186	3,776	20
Sand and Gravel	406	4,223	10
Mineral Fuels			
Coal	20	5,093	255
Total	706	42,934	61

Source: Natural Resources Canada (NRCan). Canadian Minerals Yearbook 2003. Statistical Report.
1 Excluded are establishments involved in the mining of peat, gypsum, salt, shale, clay and refractory, and miscellaneous non-metals including asbestos.

2.2.1 Resource Endowments and Reserves

Firms seeking to invest in the minerals and metals industry are primarily interested in the availability of world-class ore bodies and mineral endowments. While Canada is renowned for its abundant natural resources, including its minerals and metals, Natural Resources Canada has noted that the combination of limited exploration and mine development (for base and precious metals), combined with increased demand, has resulted in a continual decline in Canada's ore reserves since the mid-1980s.

Estimates of "proven reserves" and "probable reserves" at Canada's producing mines and newly associated deposits suggest that Canada has fewer known reserves of most mineral products than at any time since 1982. Between 1978 and 2002, nickel reserves declined by 36.5%, copper reserves declined by 60.5%, silver reserves declined by 63.7%, molybdenum reserves declined by 77.8%, and lead reserves declined by 90.3%. [11]

As detailed in Figure 2.4, Canadian reserves of key metals has declined, and in some instances, current reserves are at only one-half the levels of the early 1990s.

11 Mining Association of Canada, Facts and Figures, 2003.

Figure 2.4: Canadian Reserves of Selected Major Minerals (2004)

Year	Metal (Proven/Probable Reserves)				
	Copper (000+)	Nickel (000+)	Lead (000+)	Zinc (000+)	Gold (tonnes)
1990	11,261	5,776	5,643	17,847	1,542
1995	9,250	5,832	3,660	14,712	1,540
2000	7,419	4,782	1,315	8,876	1,142
2002	6,774	4,920	872	6,871	1,023
% chg (1990-02)	-40%	-15%	-85%	-62%	-34%
Years of Production Available[1]	10 years	22 years	8 years	7 years	7 years

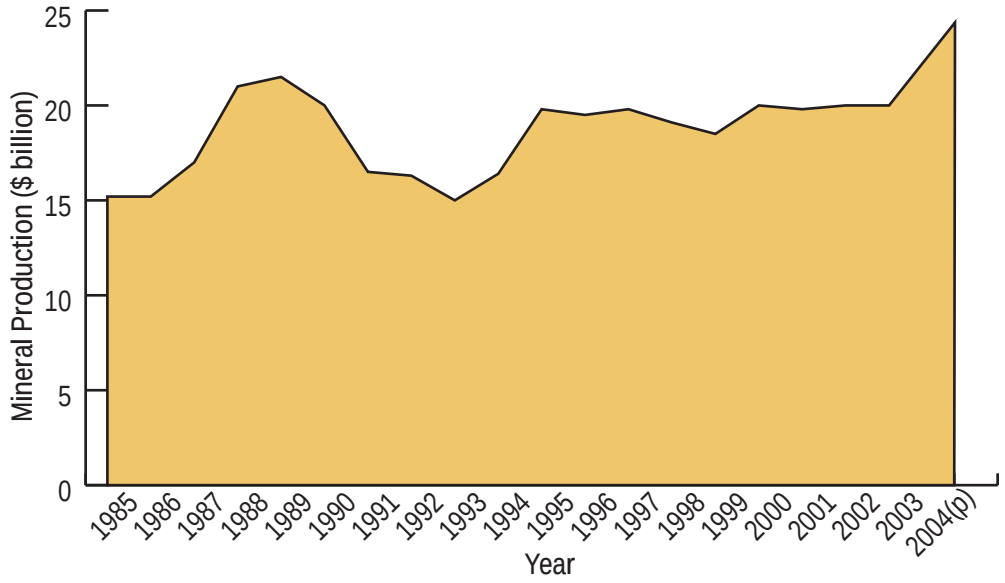
Source: NRCan, Canadian Reserves of Selected Major Metals, and Recent Production Decisions, Feb 2004
1 Years of production available given current reserves at current production rates, December 2002

Recent increases in commodity prices, however, have fuelled considerable exploration activity throughout Canada, which means that the estimates in Figure 2.4 of current or probable reserves are likely to have increased by 2005. Nevertheless, to maintain existing production levels over the medium- to long-term, the decline in reserves suggests that the industry will still need to invest considerable resources in exploration and new mine development.

2.3 Gross Domestic Product (GDP) of Canadian minerals and metals production

Preliminary estimates show that mineral and metal production in Canada was valued at approximately $24.2 billion in 2004, eclipsing the previous record of $21.5 billion set in 1989. The GDP trends between 1985 and 2004 shown in Figure 2.5 clearly demonstrate the recent economic upswing in the industry.

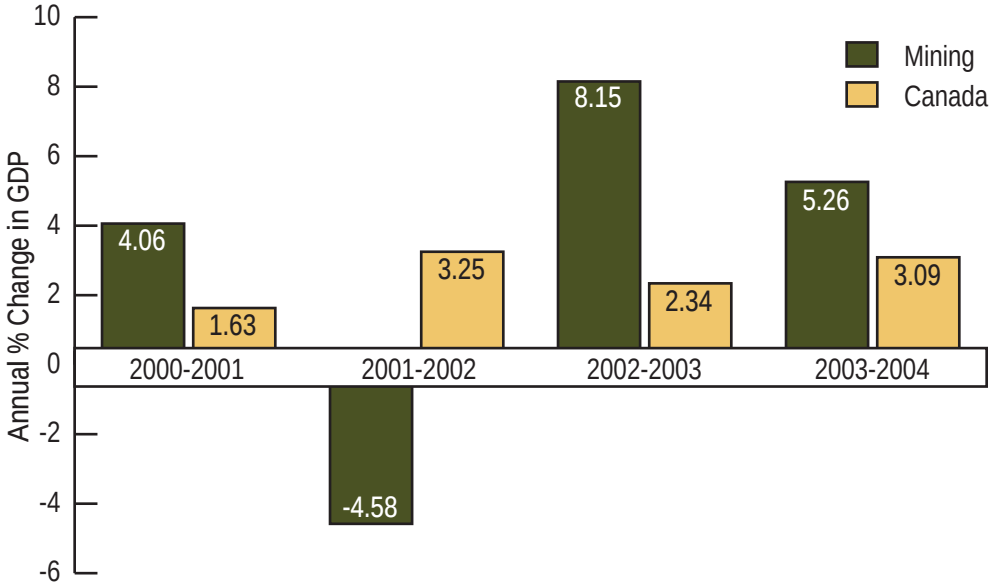
Figure 2.5: GDP of Canadian Minerals and Metals Production (1985-2004)



Source: Statistics Canada

Figure 2.6 illustrates that, despite the fact that mining GDP is much more volatile than the Canadian economy, the recent upturn in commodity prices has accelerated mining GDP growth to about twice the rate of the Canadian economy over the past two years. Continued industry growth could provide a challenge to meeting growing industry demand for workers.

Figure 2.6: Change in GDP – Mining (Stage I) and the Canadian Economy (2000-2004)



Source: Statistics Canada CANSIM table 379-0017

In 2004, Canadian mineral production increased by 20.4% over 2003, and metal production increased to $12.5 billion, from $9.7 billion in 2003, an increase of 28.9%. However, the actual volume produced for most metals changed only marginally. The single exception was nickel, where production volume increased by 17.0%. In comparison, iron ore production decreased by 15.6%, although its production value increased by 7% between 2003 and 2004.[12]

Non-metallic mineral production also grew significantly in production value in 2004. For example, the value of potash production increased by 20.0%, reflecting an increase in production volume of 16.9% since 2003.

Diamond production volume increased by more than 340% between 2001 and 2004, from 3.7 million carats in 2001 to 12.6 million carats in 2004.[13] And, although it stabilized to a more modest 17.3% increase in volume between 2003 and 2004, it also increased in value by 34.8%. Altogether, production value of diamonds climbed from $624 million in 2000 to $2.1 billion in 2004.[14]

By 2004, Canada had become the third-largest producer of diamonds, by value, in the world. In fact, Canadian production should increase when the Jericho mine begins scheduled production in Nunavut in 2006, and both the Snap Lake mine in the Northwest Territories and Victor mine in northern Ontario, begin production in 2007.[15] Recent and expected mine openings and closures are examined further in Chapter 3.

In 2004, metallic minerals accounted for the majority of Canadian production (51.7%), followed by non-metallic minerals (41.3%) and coal (6.6%). Based on dollar value, nickel is the most important metals commodity and diamonds are the most important non-metals commodity. Figure 2.7 summarizes the production and dollar value of the top commodities in Canada, by order of value, in 2004.

12 Natural Resources Canada, Information Bulletin – Mineral Production, March 2005.
13 Natural Resources Canada, Canadian Minerals Yearbook: Diamonds, 2003 and Information Bulletin – Mineral Production, March 2005.
14 Natural Resources Canada, Information Bulletin – Mineral Production, March 2005.
15 Tahera Diamond Corp. and DeBeers Canada websites.

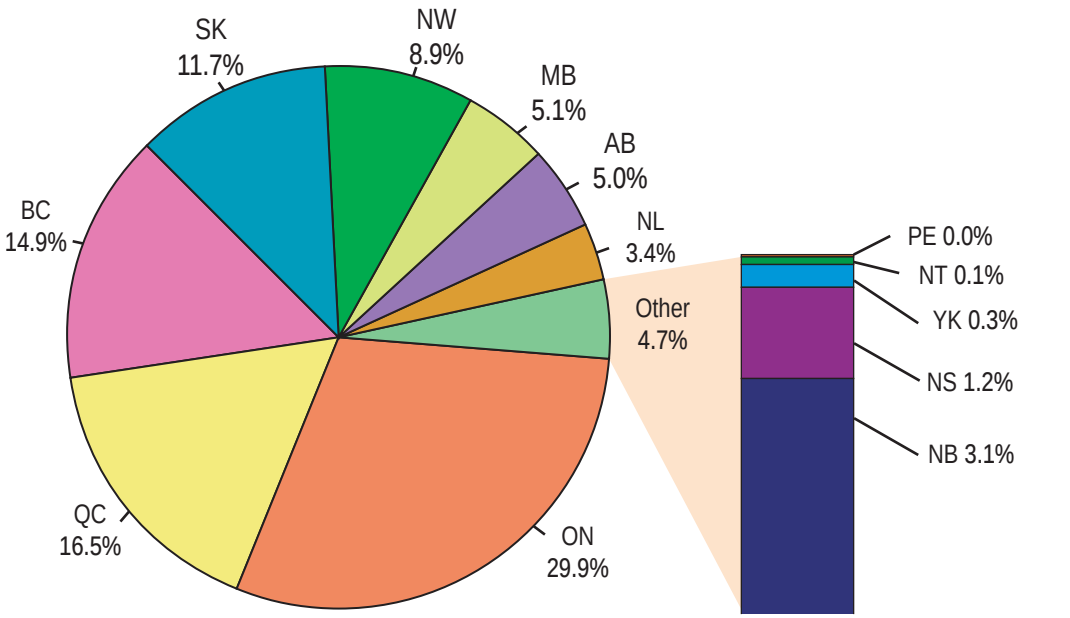
Figure 2.7: Production and Value of Canada's Leading Commodities (2004 preliminary estimates)

Commodity	Actual 2004 Production (000 tonnes except where indicated)	Value ($ billion)
Nickel	181.9	$3.3
Gold	128,732.9 (kg)	$2.2
Diamonds	12,618.1 (000 ct)	$2.1
Copper	541.8	$2.0
Potash (K_2O)	10,791.7	$1.9
Coal	66,019.0	$1.6
Cement	14,884.1	$1.6
Iron Ore	28,131.1	$1.4
Sand & Gravel[1]	248,159.3	$1.1
Stone[1]	127,558.8	$1.1
Zinc	735.7	$1.0

Source: NRCan, *Information Bulletin – Mineral Production, March 2005.*
1 Excludes shipments of sand, gravel and stone to Canadian cement, lime and clay plants

In terms of production, preliminary figures from 2004 reveal that Ontario accounted for 29.9% of Canada's minerals and metals production, while Quebec contributed 16.5%. British Columbia was third in production, at 14.9%, and Saskatchewan was fourth, at 11.7% of total national minerals and metals production.

Figure 2.8: Share of Canadian Minerals and Metals Production by Province and Territory (2004)



Source: NRCan

Figure 2.8 details the share of production by province and territory in 2004.

For further detail on industry structure and performance by province or territory, please refer to the *Prospecting the Future Phase I – A Situational Analysis of the Minerals and Metals Industry* report.

Canada's mining and smelting industries generate considerable wealth for Canada due to their significant exports of Canadian mineral production to overseas/US markets. While Stage I and Stage II production accounted for less than 5% of Canada's total GDP in 2004, net exports (i.e., exports less imports) of minerals and smelted products totalled $17.7 billion in 2004–almost one-third of Canada's total trade surplus in 2004. As Figure 2.9 shows, the mining sector has been a major contributor to Canada's trade surplus during the past five years.

Figure 2.9: Mineral Net Exports and Canada's Trade Surplus 2000-2004

Year	Balance of Trade Stage I/Stage II ($Billion)	Total Canadian Trade Surplus ($Billion)	Mining Share of Total Trade Surplus (%)
2000	$15.2	$56.2	27%
2001	$14.7	$61.0	24%
2002	$15.2	$47.5	32%
2003	$15.4	$44.9	34%
2004	$17.7	$56.1	32%
Average 2000-2004	$15.6	$53.1	29%

Source: NRCan, Minerals and Mineral Products (Including Coal) – Exports and Imports
http://mmsdl.mms.nrcan.gc.ca/mmsd/trade/bal_coal.htm

2.4 Other impacts on the Canadian economy

In addition to the considerable export-related earnings derived from mineral production, the Canadian mining sector directly or indirectly supports numerous other sectors. For example, the Mining Association of Canada reports[16] that in 2001, the sector was responsible for 61% of total railway freight volume, and 67% of the volume of products shipped through Canadian ports. Trading in mining-related companies represented 27% of the total volume of shares traded on the exchange.

The report also notes that the mining sector has invested heavily in research and development (R&D). The sector spent $370 million on R&D in 2001, making it the ninth-largest R&D sector among all industries in Canada. The Sudbury mining cluster, which boasts considerable research capacity, highlights the research focus of Canada's minerals and metals industry. Mining research also takes place at Cambrian College, the Ontario Geological Survey (OGS), Laurentian University, the federal CanMet Labs, Inco and Falconbridge.

The not-for-profit Canadian Mining Industry Research Organization (CAMIRO) is run by the mining industry to manage collaborative mining research to improve the technology and reduce the costs of exploration, project development, mining and processing of mineral deposits. The Mining Innovation, Rehabilitation and Applied Research Corporation (MIRARCO) is a not-for-profit applied-research and technical service organization formed through collaboration with Laurentian University and the private and public sectors. [17]

16 Mining Association of Canada, Meeting the Innovation Challenge: A Globally Competitive Mining Industry for Canadians, 2002.
17 The research community in Sudbury is described in greater depth as part of the Sudbury region case study.

2.5 Exploration and investment

Globally, Canada is one of the top three destinations for exploration capital, vying with Australia for first place over the past two decades. Over $830 million went to Canadian exploration, and more than $258 million to deposit appraisal in 2004, an increase of close to 60% from 2003. These types of expenditures are expected to increase by another 3%[18] in 2005. In 2004, approximately 25% of total Canadian exploration and deposit appraisal expenditures was for diamonds, second only to gold.[19]

Ontario and Quebec consistently spend the most on mineral exploration and deposit appraisal ($296.8 million and $204.4 million respectively in 2004). However, the importance and commitment of the minerals and metals industry to the most northern regions of the country is reflected in the relatively large exploration expenditures reported for companies in the Northwest Territories ($109.4 million) and Nunavut ($172.0 million). Between 2003 and 2004, the Territories saw an estimated 122% increase in exploration expenditures, while Nunavut saw a 43% expenditure increase. Most of the exploration investment in these two territories is targeted at diamond development. Figure 2.10 details 2002 to 2004 exploration and deposit appraisal expenditures, by province or territory, including spending intentions for 2005.

18 Natural Resources Canada. Information Bulletin: Exploration. March, 2005.
19 Natural Resources Canada. Information Bulletin: Exploration. March, 2005.

Figure 2.10: Mineral Exploration and Deposit Appraisal Expenditures in Canada 2002 - 2005[si] ($millions)

Province/Territory	2002	2003[p]	2004[p]	2005[si]	Expected Change (%) 2004-2005
Newfoundland & Labrador	35.7	21.0	29.4	40.6	38.10
Nova Scotia	3.4	6.6	9.3	13.9	49.46
New Brunswick	3.0	2.4	9.0	10.8	20.00
Quebec	114.3	150.1	204.4	209.2	2.35
Ontario	140.2	190.8	269.8	313.8	16.31
Manitoba	26.7	25.9	31.0	37.1	19.68
Saskatchewan	38.8	42.4	76.7	85.2	11.08
Alberta	5.8	4.8	6.1	8.2	34.43
British Columbia	34.1	49.9	128.4	110.5	-13.94
Yukon	7.2	12.3	18.2	32.4	78.02
Northwest Territories	60.0	49.8	109.4	109.5	0.09
Nunavut	64.9	85.4	172.0	157.0	-8.72
Total	534.1	641.3	1,090.6	1,128.2	3.45

Source : NRCan, *Information Bulletin,* March 2005
p=preliminary data, si= spending intention

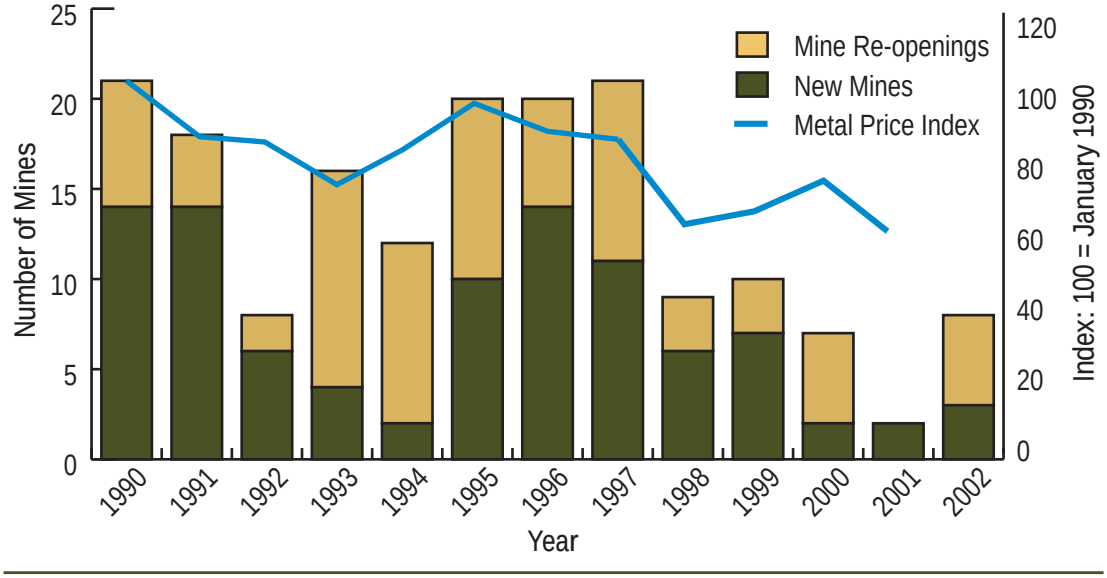
There has been a significant shift between junior and senior firms with respect to off mine-site exploration expenditures. In Canada, spending by juniors increased by 49% in 2003 to $284 million and increased a further 87% in 2004, reaching $531 million. By 2004, the share of juniors reached about 50% for the first time since 1987-88. Spending by juniors is expected to increase another 14% in 2005. Seniors' expenditures increased in 2004 to $560 million.

The increased presence of junior companies on the exploration and deposit appraisal front could have implications for future human resource supply and demand. In particular, as juniors step up their exploration activities, they could find it difficult to attract the workers they will need, given competition from the sector's large corporations as well as the oil and gas industry. Chapters 3 and 4 of this report examine the supply-and-demand issues related to both exploration activities and the needs of smaller firms.

2.6 The economic environment

Although advances continue to be made in domestic production, they are easily offset by changes in world demand or changes in external markets, since mining is heavily dependent on outside capital investment. Mining is a highly cyclical industry, and the level of mining investment is strongly related to the prices of minerals. The cyclical nature of commodity prices presents a significant challenge to the Canadian minerals and metals industry. Figure 2.11 shows the clear correspondence between metals prices and mine openings.

Figure 2.11: Mine Openings and Metal Prices: 1990-2002



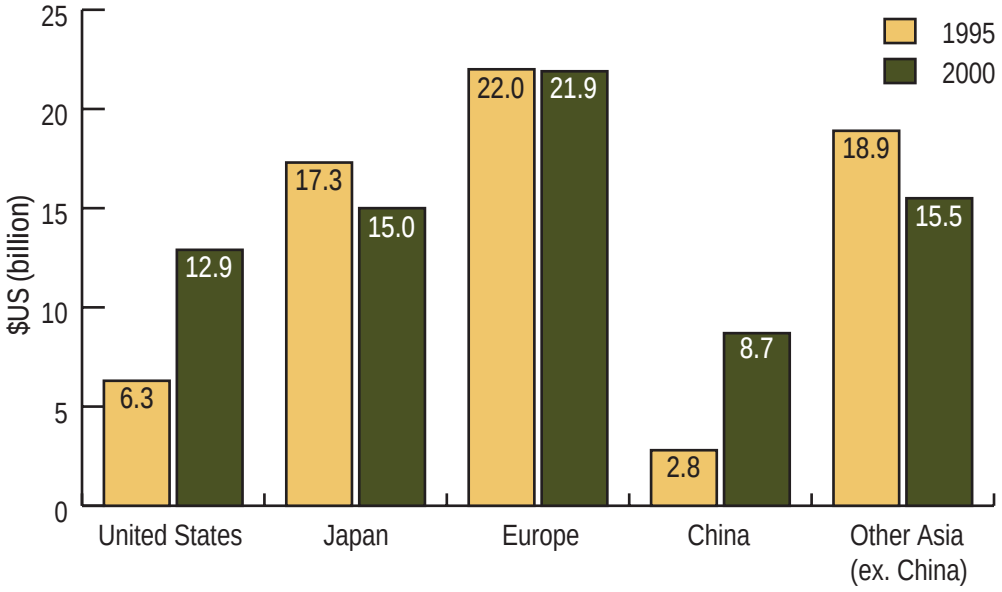
Source: NRCan, Canada's *Minerals and Metals Industry,* 2002.
Note: The metal price index includes copper, gold, lead, nickel, silver and zinc. The index is weighted by the relative share of Canadian production of each commodity. Based on $US.

One challenge facing the sector is the high cost of Canadian labour when compared with emerging global competitors. Despite these high costs, however, the Canadian industry boasts several advantages that help to counter the upward pressure of industry wages. These advantages include high worker productivity, an efficient transportation infrastructure, and high-quality ore deposits. Furthermore, as pointed out in some of the interviews with employers, firms are generally more interested in the quality of resources than in the costs of labour.

2.6.1 Global Demand for Mineral Products

We can attribute much of the recent upturn in metals and minerals prices to the significant economic expansion in Asia, in general, and the growth in China's economy, in particular. While world trade data is not recent, estimates completed by the United Nations suggest that China's net imports of metals and mineral products tripled between 1995 and 2000. Figure 2.12 highlights the difference in estimated net imports for selected countries in 1995 and 2000.

Figure 2.12: Net Importers of Minerals/Metals – Selected Countries 1995 & 2000



Source: NRCan. *Canadian Minerals Yearbook 2003.* Statistical Report.

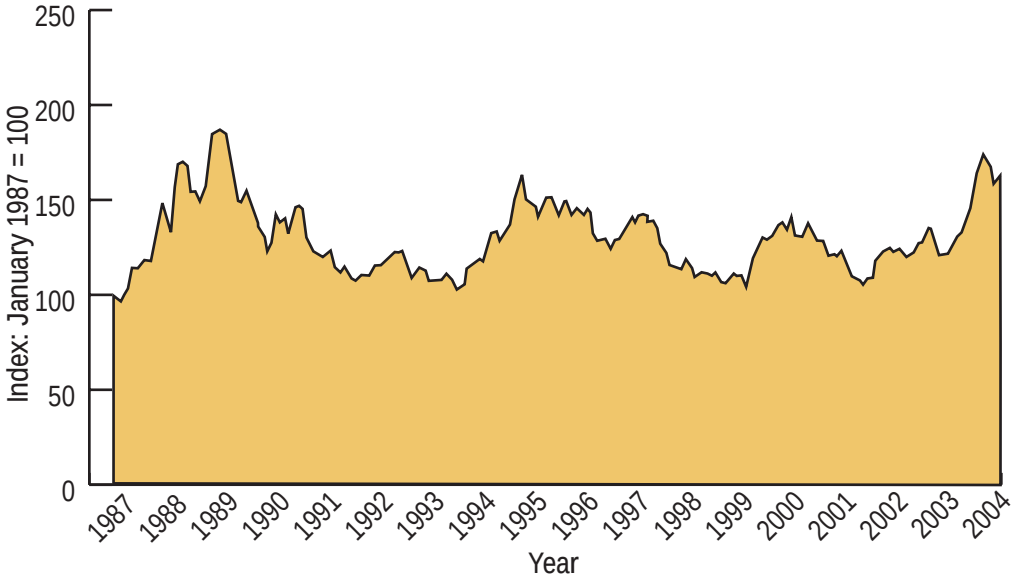
Forecasts produced by numerous agencies, including Canada's Export Development Corporation (EDC) suggest that, in the short term, China will continue to account for a significant proportion of incremental world demand for coal and industrial metals. For example, the EDC identifies the following trends:[20]

- Of the 8.2% increase in world iron and steel production in 2004, 40% of the increase could be attributed to China;
- Metal ore exports from Canada to China are estimated to increase at an average annual rate of 50% per year during the period from 2003 to 2005; and
- China's aluminium production has doubled during the past four years, making it the world's largest aluminium producer.

During interviews, key informants suggested that, while it would be unlikely that demand growth will maintain current levels, the rapid industrialization of China's economy, combined with a resurgence in U.S. and OECD demand, would likely result in a period of sustained demand for many key minerals products. In addition, after several years of low or limited investment in new supply (on a world basis), stakeholders believed that demand would continue to outpace new supply for the next two-to-three years. They noted, however, that due to the cyclical nature of mineral prices, in the absence of a world supply arrangement for minerals (similar to the Organization of Petroleum Exporting Countries – OPEC – for oil), the sector could witness a correction in the medium term when sources of new supply begin to exceed existing demand.

20 Export Development Corporation, Fall 2004 Outlook, Sector Export Outlook.

Figure 2.13: Monthly Metals Price Index, January 1987 to June 2004



Source: NRCan
Notes: Based on Canadian Dollar prices as of June 2004. Includes copper, zinc, nickel, lead, gold, and silver.

2.6.2 Commodity Prices

Commodity prices for most metals have risen sharply over the past two years when reported in U.S. dollars. Stronger metal prices have served to stimulate mineral-related activities in Canada. During this same period, however, the Canadian dollar had strengthened significantly in comparison to its U.S. counterpart. When expressed in Canadian dollars, for the most part, metal prices rose more moderately. Figure 2.13 tracks monthly metals price index from 1987 to 2004.

21 The information contained in Section 2.6.3 is based on information provided by Natural Resources Canada.

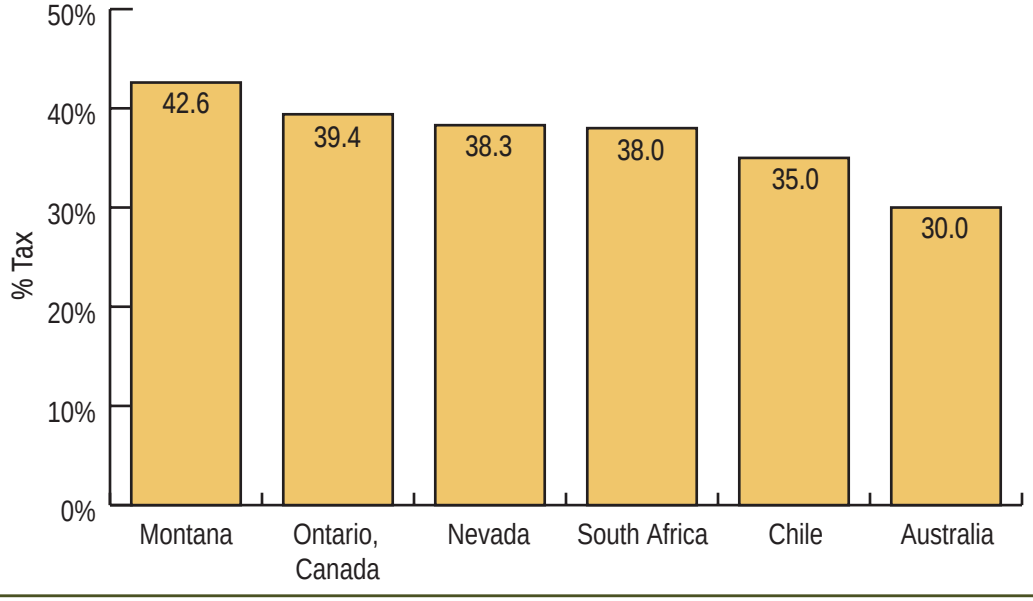
2.6.3 Taxation[21]

Under the Canadian federal system of government, the federal, provincial and territorial governments have the authority to tax mining operations. Canadian mineral resource operations are subject to essentially three levels of taxation:

- Federal Corporate Income Tax: calculated as a percentage of net corporate income, and applied by the federal government;
- Provincial/Territorial Income Tax: calculated similarly to the federal corporate income tax, but applied by provincial and territorial governments. Capital taxes also apply in some provinces; and
- Provincial and Territorial Mining Taxes and Royalties: imposed by provincial and territorial governments, usually as a %age of production profits or revenues calculated at the mine mouth.

Canada's system of mineral resource taxation was designed to respond to the needs of mining through the principles of competitiveness, integration and stability, and flexibility applied in the tax system.

Figure 2.14: Estimated Overall Tax Rate – Selected Jurisdictions Gold Producers – December 2004



Source: Placer Dome, *2004 Annual Report.*

2.6.4 Competitiveness

Federal, provincial and territorial governments monitor the competitiveness of their tax rates compared to other mining jurisdictions. Each level has recently introduced tax reductions to maintain a favorable climate for the mining industry. For example, the federal government, in its 2003 budget, introduced several measures to improve the global competitiveness of the Canadian mining sector. Gradual changes, to be fully phased in by 2007, include:

- Lowering the federal corporate tax rate for Canadian resource income from 28% to 21%;
- Gradually eliminating the Resource Allowance (a 25% deduction of resource profits) and replacing it with deductible provincial and territorial mining taxes and royalties;
- Gradually introducinga 10% tax credit for certain exploration expenses; and
- Phasing out of the Large Corporation Tax.

The 2005 Budget also proposed additional tax rate reductions for implementation beginning in 2008. Many provincial and territorial governments have also reduced their corporate income and mining taxes to improve the business climate for the industry.

Compared with other jurisdictions, the tax treatment of companies operating in Canada is similar to that of many other countries, as Figure 2.14 shows.

2.6.5 Integration and Stability

To simplify tax administration and to foster compliance, the two levels of government closely integrate their taxation systems. With minor exceptions, they use the same tax base for calculating corporate income taxes at the federal and provincial/territorial levels, using the same provisions, deductions and definitions.

Federal, provincial and territorial mining ministers meet annually with industry to discuss the taxation regime and other issues that would improve Canada's investment climate for the industry. Other meetings take place regularly to discuss specific tax issues that may arise. Governments normally consult with industry groups before implementing significant changes to their tax rates or provisions pertaining to the mining sector. As a result, the mining taxation system has been relatively stable, with few major changes in the last three decades.

2.6.6 Flexibility

The mining business is characterized by highly fluctuating commodity prices and a long lead-time for new mine developments and major expansions. In recognition of these factors, the federal corporate income tax system includes several provisions to provide flexibility to companies:

- Mining companies can carry losses forward (10 years) and back (three years) to provide some measure of income averaging.

- To reduce their taxable income, mining companies can use the Accelerated Capital Cost Allowance and Canadian Exploration Expense provisions to claim a full, immediate deduction of their pre-production capital costs. In effect, they can postpone tax payments until capital investment is fully recovered, so that project cash flow is protected during the period when debt servicing is particularly burdensome.

- Canada provides a unique mechanism through Flow-Through Shares that allow junior mining-exploration companies to "flow" their exploration expense deductions to their investors, thus reducing the investors' taxable income. Flow-Through Shares have been a major means for junior mining companies to raise funds for exploration.

Most of the other taxes applied to mining operations are based on a percentage of net income, which enables companies with low profits to pay lower taxes. Many of the previously imposed taxes on capital are being phased out.

2.7 The regulatory environment

Numerous statutes and regulations govern the minerals and metals industry. The main goal of this legislation is to achieve each government's policy objectives. While acts and regulations are created separately, they are connected, because regulations are the instrument that enables the implementation of acts. The authority to make regulations is provided through the associated act, but enforcement is usually established as part of the regulations.[22]

In total, there are 19 federal Acts and 14 federal regulations that relate to the mining industry. They range from the specific, such as the *British Columbia Indian Reserves Mineral Resources Act,* to the general, including the *Income Tax Act* and the *Canada Labour Code.* The Canada Labour Code governs industrial relations, occupational health and safety, and hours, wages, holidays and leave standards. Several associated regulations that pertain specifically to the minerals and metals industry are authorized under the *Canada Labour Code,* including the *Coal Mines (CBDC) Occupational Safety and Health Regulations; Coal Mining Safety Commission Regulations; Saskatchewan Uranium Mines and Mills Exclusion Regulations; and Uranium Mines (Ontario) Employment Exclusion Order.*

Unlike the provinces, which have authority over their respective natural resources, authority for natural resources in the Northwest Territories and Nunavut has not yet been devolved from the federal government. The Yukon recently received provincial-like jurisdiction over its natural resources. Therefore, a number of federal Acts are specific to the territories, including the Nunavut Waters and Nunavut Surface Rights Tribunal Act and the Territorial Lands Act. The Canada Mining Regulations govern minerals mined on lands under federal jurisdiction in the Northwest Territories and are enabled by the Territorial Lands Act.

22 Department of Justice, Guide to Making Federal Acts and Regulations, 2nd Edition.

Provincial legislation (including the Yukon) also governs mining activities in their respective jurisdictions. The legislation enacted by federal and provincial governments with respect to the minerals and metals industry in Canada is extensive and varies by jurisdiction. Figure 2.15 below lists the number of federal, provincial and territorial Acts and regulations that are directly relevant to the minerals and metals industry in that jurisdiction.

Figure 2.15: Number of Acts and Regulations by Province or Territory (2005)

Province/Territory	Number of Acts	Number of Regulations	Acts and Regulations	Responsible Ministry or Department
Newfoundland & Labrador	9	23	32	Department of Natural Resources
Prince Edward Island	2	0	2	Department of Environment, Energy and Forestry
Nova Scotia	10	6	16	Department of Natural Resources
New Brunswick	7	9	16	Department of Natural Resources
Quebec	2	4	6	Ressources Naturelles, Faune et Parcs
Ontario	21	12	33	Ministry of Northern Development and Mines
Manitoba	13	17	30	Department of Industry, Economic Development and Mines
Saskatchewan	11	26	37	Department of Industry and Resources
Alberta	9	12	21	Department of Energy
British Columbia	10	28	38	Ministry of Energy and Mines
Yukon	10	6	16	Department of Energy, Mines and Resources
Federal (including the NT and NU)	19	14	33	Department of Natural Resources & Indian and Northern Affairs Canada

Sources: Federal and provincial ministry or department websites.

British Columbia has the most Acts and regulations (10 Acts and 28 regulations) governing its mining industry. Saskatchewan ranks second, with 11 Acts and 26 Regulations, followed by Ontario, Newfoundland and Labrador, and Manitoba.

Conversely, Quebec has the fewest Acts and regulations. Federal jurisdiction concerns Aboriginal issues, national issues (e.g., environmental legislation) and mining in the Northwest Territories and Nunavut.

According to The National Round Table on the Environment and the Economy (NRTEE), to promote investment in mining and exploration development, government and industry need to work together to improve the efficiency and effectiveness of the regulatory regimes governing non-renewable development in northern Canada. To this end, in 2001, the multi-stakeholder Industry Government Overview Committee was struck.

2.7.1 Immigration Policy and Foreign Credential Recognition

Canada's immigration policies may be contributing to the industry's labour shortage by turning away highly skilled, competent workers at the border.

Canadian immigration policy relies on a human-capital, points-based system that is based heavily on formal educational attainment. Consequently, Citizenship and Immigration Canada's immigration criteria and processes may limit the ability of Canada's mining industry to recruit foreign-born workers and allow them to use those skills once here. At present, the selection criteria introduced by the federal government in 2003 requires applicants to obtain a score of 67 or more in order to gain entry into Canada,[23] (an improvement over previous legislation that required applicants obtain a score of 75 or more).[24]

Many industries (e.g., mining, primary industries and manufacturing) are particularly concerned with the difficulty that some individuals with certain types of skills could have in obtaining the minimum score, given the low weight assigned to individuals with non-university education. This restriction could impede the supply of skilled workers in trades and semi-skilled occupations to Canada.

The government has also recently reduced the number of points awarded for different levels of education. Generally, trade certificates or college diplomas of the same duration are now awarded only slightly fewer points than university degrees. This is a key change, as major skill shortages in trades occupations are reportedly being experienced by many Canadian industries. Nevertheless, despite these changes to the overall pass mark and education selection factors, the points system may still impede attracting and recruiting foreign labour.

Immigration policy is closely linked with the recognition of foreign credentials. Failure to have adequate systems in place to recognize such credentials means that the skills of many immigrants are underutilized. Although Canada's immigration selection process does not require immigrants to undergo an assessment of credentials prior to entering Canada, failure to have foreign credentials recognized once they become members of the labour force may impede their ability to find work in Canada.

Consequently, while the mining industry experiences a skills shortage, there is a vast "skill wastage" among the immigrant population. Immigrant skill-utilization has emerged as a significant issue in relation to Canada's Immigration policies. [25] Two factors contribute to the wastage issue:

23 Citizenship and Immigration Canada. http://www.cic.gc.ca/english/skilled/notice-passmark.html
24 Citizenship and Immigration Canada. http://www.cic.gc.ca/english/skilled/qual-5.html
25 Reitz, J.

- Incorrect perceptions of the validity of credentials in other countries; and
- The "protectionism" of labour, professional organizations and government with respect to certification and credentials.

To help address some of the challenges faced by immigrants trying to have their credentials recognized, as well as skill shortages in the Canadian economy, Human Resources and Skills Development Canada (HRSDC) has established a Foreign Credential Recognition (FCR) program.[26] FCR's priority, however, is on regulated occupations with previously identified skills shortages, such as engineering, nursing and medicine. For non-regulated occupations, HRSDC is working with employers via sector councils.[27]

Currently, there are several credential-assessment services in Canada, serving various provinces. The Canadian Information Centre for International Credentials provides information about credential assessment processes.[28] An Assessment of Credentials compares degrees and diplomas to Canadian standards but does not guarantee that a regulatory body or employer will recognize credentials. For a fee, a number of credential-assessment service providers will do assessment while a worker is still outside Canada, although some employers and regulatory bodies may ask that additional assessments be completed once inside Canada.

Based on a synthesis of information collected through surveys, key informant interviews, site visits and focus groups, human resource issues are among the key challenges facing employers in the Canadian minerals and metals industry today. Most key informants interviewed noted that recognition of foreign credentials is problematic if recruiting from outside of Canada. In one example, a mining professional with over 20 years' experience had to wait several years before being recognized at his particular level. Language can also be a significant issue. Overall, skilled workers may be lost to the mining industry because they are not able to score enough points to enter Canada under the skilled worker category, or because once they get here, their credentials are not recognized.

2.8 Issues and challenges for the minerals and metals industry

Another major concern for the minerals and metals industry is firms' ability to compete globally as a result of globalization of the industry. A decrease in competitiveness could result in companies moving out of Canada or investing in offshore operations.

Interviews and a literature review identified a numerous factors that could limit the Canadian industry's global competitiveness. In addition, the expansion of production in developing countries could have negative implications for human resources issues within the Canadian minerals and metals sector. These factors are presented below:

26 Human Resources and Skills Development Canada. 2004. Current Success and Continuing Challenges of Foreign Credential Recognition. Conversation Series 14.
27 ibid.
28 Citizenship and Immigration Canada, http://www.cic.gc.ca/english/skilled/work-3.html

2.8.1 The Kyoto Protocol

The foremost issue that emerged in the interviews is the potential impact of requirements set on the Canadian mining sector under the Kyoto Accord. The Canadian mining industry has taken energy issues very seriously, and has been a member of the Canadian Industrial Program on Energy Conservation for almost three decades. With approximately 30% of production costs related to energy, energy efficiency is a vital component of international competitiveness. Although energy efficiency improvement can reduce greenhouse gas emissions (GHG), Canada-wide, the industry faces a major technological and competitive challenge in meeting Canadian emissions reductions under the Kyoto Protocol.

The major challenge is the economic viability and technical availability of GHG-reducing solutions, given that the first Kyoto commitment period begins January 1, 2008. While the emissions reductions for the country equate with 6% below 1990 levels, the target for Large Final Emitters is much more onerous. In essence, the Canadian climate-change strategy will require a 12% reduction in GHG emissions below 2010 business-as-usual levels, using a 2000 base year. While energy-efficiency opportunities are available, the vast proportion of mineral-producing nations face no Kyoto obligations, placing Canada at a potential competitive disadvantage when faced with mineral prices set on the international marketplace.

The Mining Association of Canada (MAC) has noted that the sector has already made considerable strides in reducing greenhouse gas emissions. For example, the MAC notes that total GHG emissions for the 2003 reporting year are down by 16.4% in metal mining and 39.1% in the nonferrous metal smelting and refining sector. A more important reflection of performance is that GHG emissions per unit of production show a 3.5% improvement in metal mining, and 43.4% improvement in the nonferrous metal-smelting and refining sector relative to 1990 levels.

As a price taker, the Canadian mining industry cannot pass on its higher production costs, yet Kyoto's requirements will oblige the sector to face increased electricity, fuel, and transportation costs. Canada's mining companies already deal with the costs that result from being located long distances from market, from having to mine deeper deposits, and from having to do so in harsh, cold environments.

Furthermore, from a competitive standpoint, the United States and Australia have not ratified the Kyoto Protocol, and the developing world has no Kyoto obligations in the first commitment period of 2008-2012. Although many countries have moved to take some action towards improving energy efficiency, the fact remains that 66% of global nickel production, 88% of copper and zinc production, and 95% of lead production come from countries that face no GHG emissions reduction obligations.

For an energy-intensive industry that produces 80% of its commodities for export, Kyoto obviously has major competitive implications.

2.8.2 Operating Costs

Another threat to competitiveness identified by representatives of industry was the increasing cost of operation. For example, anticipated increases in energy costs could have a substantial effect on the costs of production over the next five years for operations such as smelting.

In addition, increasing employee expenditures associated with the rising costs of health care, salaries and other benefits will challenge Canadian firms to remain competitive at a global level. Survey data supports this finding, with 74.5% indicating it was a modest-to-major issue affecting firms' abilities to meet their human resource needs.

Although the minerals and metals industry's salaries and benefits are generally considered to be very competitive relative to other industries, the industry is losing this edge to the energy sector, a major competitor for the industry's human resources. While this issue is of particular significance in the Western provinces where the oil and gas industry is focused, key informants from across Canada noted that recruitment efforts on the part of the oil and gas industry are Canada-wide. For example, firms in Alberta have approached local union representatives in Newfoundland to recruit skilled trades people from the province.

Analysis of operating costs for major Canadian producers with operations in Canada and overseas locations suggests that Canadian operating costs are as low, or in fact lower, than operating costs in other jurisdictions. Based on information available in annual reports for multinational mining establishments, the cost of gold production in Canada is slightly lower than that of Australia and South Africa. Production costs for selected jurisdictions are presented in Figure 2.16.

Figure 2.16: 2004 Operating Costs – Selected Jurisdictions – Index Basis Gold (Canadian Production Costs = 100)

Jurisdiction	Producer A	Producer B	Producer C
Canada	100	100	100
South America	57		
United States		71	86
Australia		114	
Chile		91	91
South Africa		132	
Brazil			59
Russia			75

Analysis of such information should be interpreted with caution, as the operating cycle of the mine (start-up, main production, end of life) will greatly affect the mine's operating costs. In addition, in a review of "other considerations" that companies identify as risk, overseas operations generally include discussion of substantially other factors such as:

- regulatory delays;
- limited transportation infrastructure;
- work stoppages due to inability to secure necessary power or supplies;
- instability of the workforce, and
- changing tax and ownership provisions.

Canada's competitiveness in other commodities suggests that the country remains a relatively low-cost producer, although it faces stiff competition in other jurisdictions. A study completed by NRCan suggests that Canadian costs to produce copper ($0.67US/lb) in 2003 were lower than that of Australia ($0.82US/lb) or Indonesia ($1.05US/lb), but higher than that of Chile ($0.51US/lb).

It should be noted, however, that Canadian producers' competitiveness has been affected by fluctuations in the currency markets. For example, while the Canadian dollar has appreciated by 28% against the US dollar between 2002 and 2005, the Australian dollar witnessed an appreciation of more than 43% against the US dollar during this same period.[29]

Given these potential risk factors, Canada is at a competitive advantage in many respects.

2.8.3 Land Access

Access to land and security of tenure are key considerations for making investment decisions in the minerals and metals industry.[30] Land-access issues include First Nations' treaty rights, as well as protection of parkland. In one interview, land access was identified as a "delicate issue" affecting investment in the minerals and metals sector. In some regions of the country, fears over security of investments due to unsettled land claims can limit exploration activities and stifle capital investment in the development of new mines. However, land-claim settlements do not appear to be an issue in all provinces.

2.8.4 The Global Labour Force

Currently, there is a global shortage in many of the skilled trades, engineering and geology occupations. For example, one of Australia's largest gold mines recently delayed plans to reopen because insufficient numbers of skilled workers—including truck drivers—could not be found to

29 Source: OECD Main Indicators, April 2005.
30 R.A. Malatest & Associates Ltd. (2004). A Situational Analysis of the Minerals and Metals Industry.

operate the mine.[31] In Sudbury alone, it is predicted that a critical shortage of skilled labour will occur within the next 30 months, due mainly to retirements. One article stated that up to 5,000 replacement workers will be needed in certain key occupations, including heavy-duty equipment operators, millwrights, welders and transport drivers.[32] Skill gaps are discussed further in Chapter 4 of this report.

The global nature of the industry, and the prevalence of large multi-national firms, have contributed to the creation of a global labour force in the mining sector. A discussion with employers revealed that new entrants into Canada are often attracted to the minerals and metals industry because of the opportunity it provides for world travel, making it difficult to recruit for Canadian operations. One "selling feature," however, to keep companies investing and operating in Canada could be leading-edge social, environmental and community-based human resources practices.

2.9 The business and regulatory environment – human resource implications for the mining sector

Canada is a major mineral-producing nation, and has achieved its position on the basis of high-quality deposits, efficient transportation infrastructure, and cost-effective production. Mining is a key contributor to Canada's economic performance, and mining-related exports currently account for almost one-third of Canada's trade surplus in 2004. During the last two years, economic growth in Canada's mining sector has been more than double that of the overall Canadian economy.

Economic projections suggest that world demand will continue to outpace world supply for several minerals. The significant increase in demand from China will likely support the current boom in commodity prices. While it is unlikely that high prices for commodities will last indefinitely, the rapid pace of industrialization in China and other Asian economies suggest that Canada will have stable and long-term demand for most mineral commodities.

Notwithstanding the considerable economic stimulus provided by Canada's mining sector, it is clear that additional investment in exploration and development will be required to ensure sufficient supply for future production. In addition, Canada will need considerable numbers of workers with exploration and development skills.

As identified in this report, Canada faces competitive challenges from a number of jurisdictions. Traditionally, Canada has been able to offset wage differentials through higher worker productivity, lower associated costs (e.g. transportation costs) and higher-quality ore reserves. To maintain this competitive advantage, it is essential that Canada maintain its "productivity advantage" by continuing to promote the country's leadership role in innovation, and by ensuring that the proper supports for education and training are in place to supply the industry with an adequately skilled workforce. Otherwise, in light of developments in the global industry, Canadian competitiveness could erode.

31 The Toronto Star website. http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article_Type1&c=Article&cid=1110235811921&call_pageid=970599119419 (08 March 2005)

32 Northern Ontario Business website. Labour Expert Working to Close 'Incredible' Gap. www.northernontariobusiness.com/regional/Sudbury/ (18 February 2005)

CHAPTER 3: INDUSTRY LABOUR DEMAND

An important component of this report's research was to identify the current and future demand for workers in the minerals and metals industry. Estimated demand for workers reflects the following considerations:

- demand to fill replacement positions created by retirement or voluntary separation; and
- demand to fill new positions created by the general expansion of the industry (demand growth).

The report's analysis of labour demand incorporates several data sources, including:

- Canadian Occupational Projection System (COPS) data;
- employer estimates of retirement, voluntary separation and replacement;
- employee estimates of retirement, early retirement and voluntary separation; and
- other factors (i.e., industry demand growth, planned new mines/expansion, etc).

This section surveys trends and characteristics of the mineral and metals industry labour force, and analyzes industry projections of human resource requirements over the next 10 years.

3.1 Human resource profile

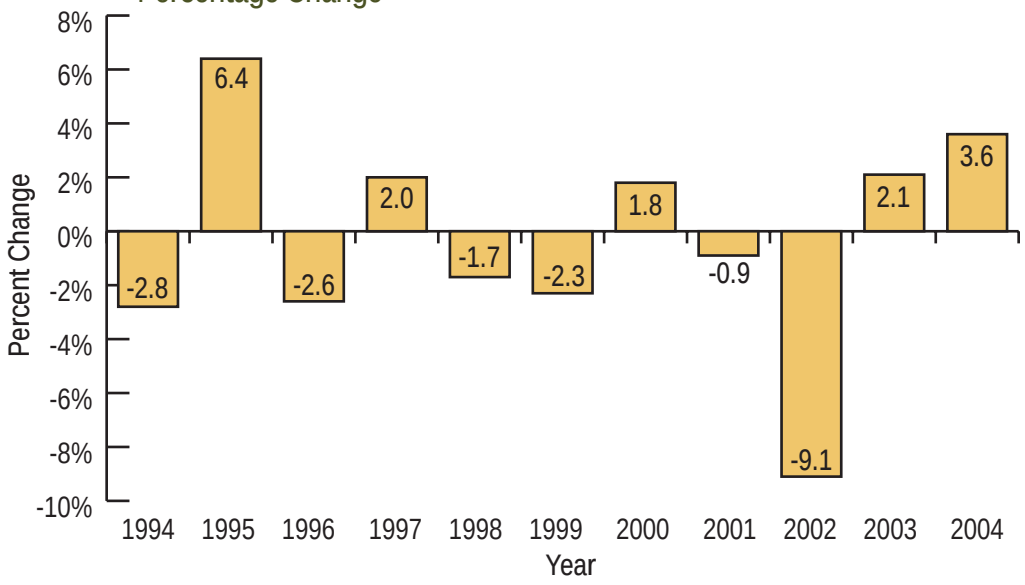
This study used data from Statistics Canada's 2001 Census and 2003 Labour Force Survey (LFS) and information provided in reports produced by the Mining Association of Canadian and Natural Resources Canada to develop an industry profile. Where Statistics Canada data sources do not provide information about such factors as education level, employer and employee survey data collected for the Prospecting the Future sector study are used.

The authors caution that survey data provide only a partial picture, as not all commodities or types of operations in the Canadian minerals and metals industry are well-represented. Survey information, however, should provide a reasonable indication of the factors that characterize the industry's labour force.

3.1.1 Labour Force Trends in the Canadian Minerals and Metals Industry

The 2003 LFS shows that over the past decade, labour force growth has generally fluctuated between approximately ±2%, with the exception of 1995, which saw an increase of 6.4% from the previous year, and 2002, which saw a decrease of 9.1%. After 2002, the labour force expanded, increasing by 3.6% from 2003 to 2004. Annual percentage change in the number of workers from 1994 to 2004 is summarized in Figure 3.1.

Figure 3.1: Labour Force Trends in the Minerals and Metals Industry (1994-2004) – Percentage Change



Source: Statistics Canada, LFS

Labour force trends within the different industry sub-sectors vary. Since the mid-to-late 1990s, the number of workers in metal ore mining and coal mining has declined. The decrease in metal ore mining was the most substantial, falling by 37.4% from 1996 to 2003. This decline resulted from the downward trend in commodity prices from 1995 to 1999, and again from 2000 to 2001, combined with improved productivity per worker. Metal prices have, however, increased over the past two years, resulting in an increased demand for workers, at least over the short term. Figure 3.2 shows that the minerals and metals industry labour force consisted of an estimated 78,184 participants.

Figure 3.2: Estimated Employment in the Minerals and Metals Industry[1]

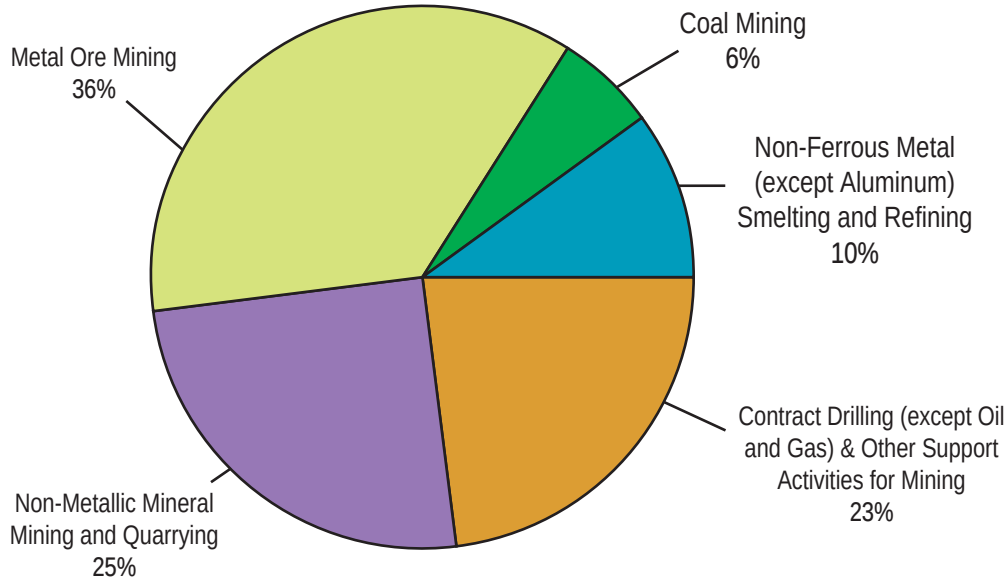
	Estimated Total Labour Force	% Total Labour Force
Stage I		
2121-Coal Mining	5,747	7.3%
2122-Metal Ore Mining	26,867	34.4%
2123-Non-Metallic Mineral Mining & Quarrying	17,986	23.0%
Stage II		
33141-Non-Ferrous Metal Smelting & Refining	10,061	22.5%
Services Related to Mining		
2131 (Adjusted for oil & gas)	17,564	12.9%
Total Labour Force	78,184	100.0%

1 Estimates based upon the 2001 Census and the 2003 Labour Force Survey

In contrast to the declining workforce in metal ore and coal mining, support activities for mining and oil and gas extraction (NAICS 2131), have seen significant growth, including a wide range of contracted services for both the minerals and metals industry and the oil and gas industry. The increase in this portion of the labour force is driven largely by the expansion of Canada's oil and gas industry in Alberta. This study therefore adjusted the labour force estimate, to reflect only the mining-related portion of the workforce.

Figure 3.3 summarizes the distribution of workers by various activities (as defined by NAICS) in the minerals and metals industry. The distribution has been adjusted to exclude oil and gas workers from NAICS 2131 (support activities for mining and oil and gas extraction), and to include only those NAICS 3314 workers involved in nonferrous (except aluminium) smelting and refining.

Figure 3.3: Distribution of the Minerals and Metals Labour Force by Mining Activity (2003)

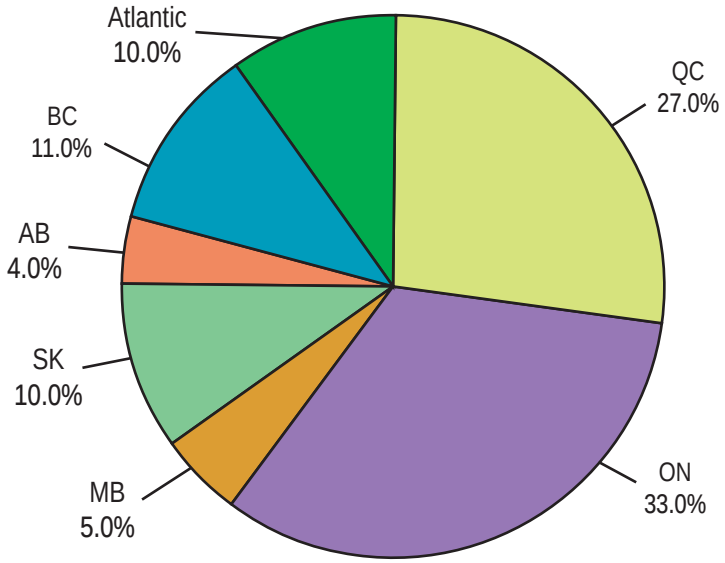


Source: Statistics Canada, 2003 LFS

3.1.2 Distribution of Canada's Minerals and Metals Labour Force by Province

Figure 3.4 highlights the distribution of the minerals and metals industry labour force by province in 2003. As the chart shows, the majority of the labour force works in Ontario and Quebec, with the two provinces accounting for approximately 60% of Canada's minerals and metals industry labour force.

Figure 3.4: Estimated Percent Employment in the Minerals and Metals Industry by Province (2003)



Source: Statistics Canada, LFS data
Note: NAICS 2131 was adjusted to exclude support activities for oil & gas. Data were not available for any of the territories.

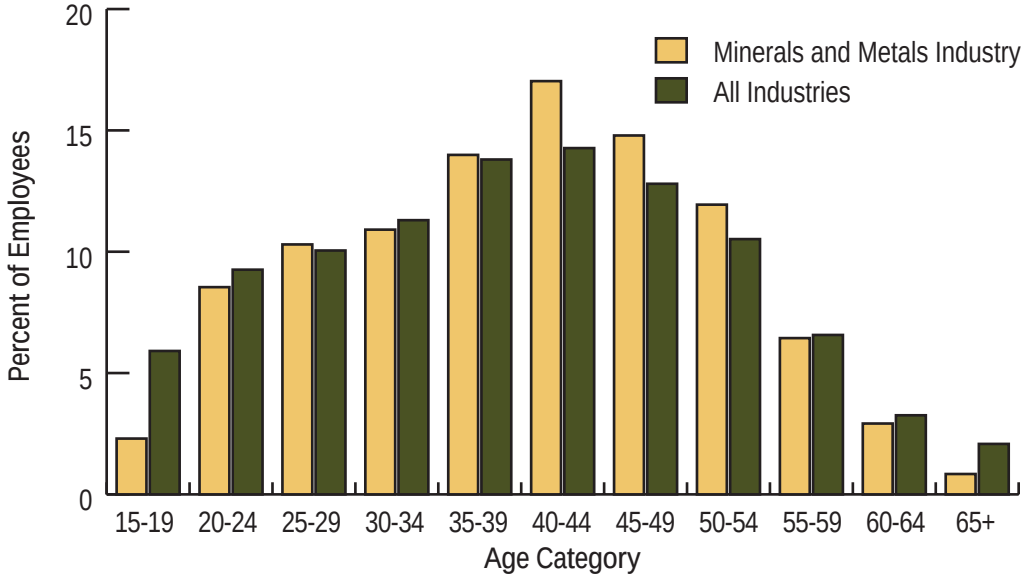
3.2 Characteristics of the labour force

This section reviews some key demographics of the mineral and metals industry labour force, including age structure, educational attainment and workforce diversity. Because comprehensive information is not available from any single source, these demographics are examined using a variety of sources.

3.2.1 Age Composition of Workers in the Mining Sector

According to the 2001 Census, individuals aged 40 to 54 years comprised the largest segment of the minerals and metals industry workforce, representing close to 50% of workers. In contrast, among the entire Canadian workforce, this group represents only 38%. It should be noted that the minerals and metals industry workforce of interest to this sector study could in fact be older, as the support services for the oil and gas industry cannot be removed from the census data available for age by industry. The age structure of the minerals and metals industry and the Canadian workforce overall is presented in Figure 3.5.

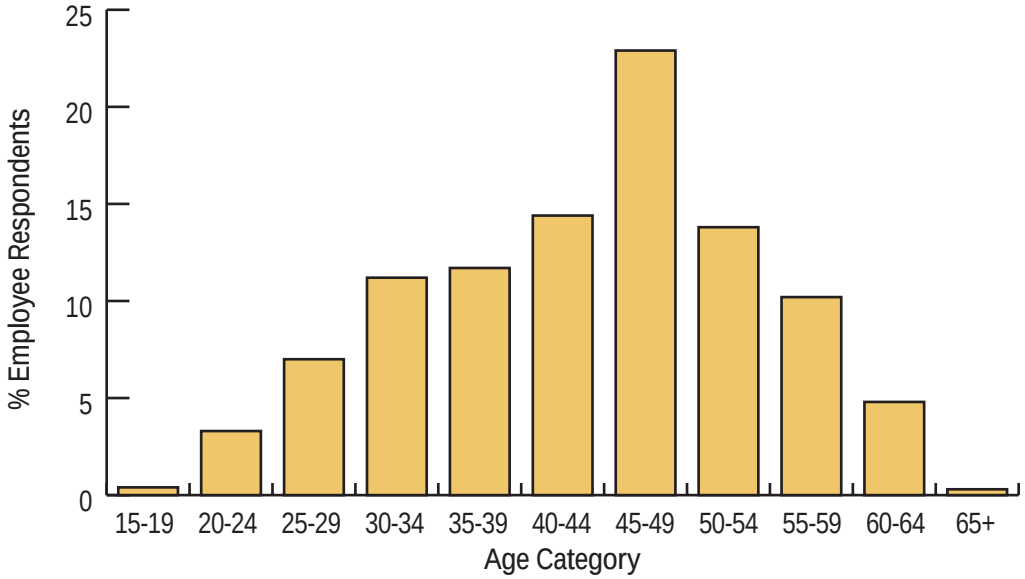
Figure 3.5: Age Composition of the Canadian Minerals and Metals Industry (2001)



Source: Statistics Canada, 2001 Census

Figure 3.6 shows that the age distribution for employee survey respondents was similar to that reported in Census 2001 data, although survey the respondents' distribution was slightly older. The median age of employees who participated in the survey was 45 years.

Figure 3.6: Age of Employee Survey Respondents (Employee Survey) (2005)



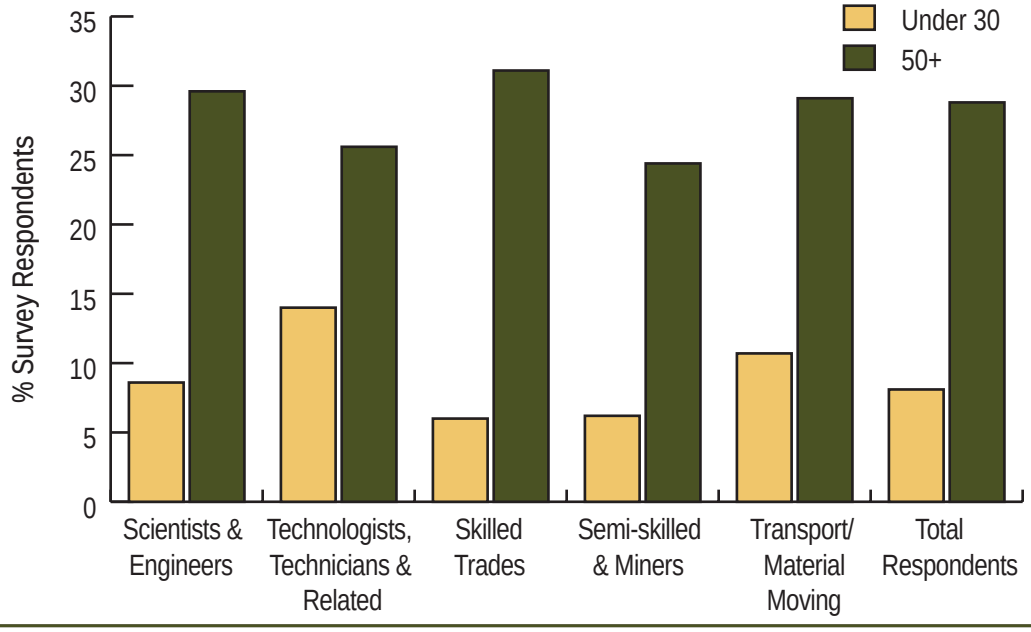
Source: *Prospecting the Future* Employee Survey (n=668); Non-response (NR) have been excluded.

3.2.2 Age Composition by Selected Occupation

The Canadian Occupational Projection System (COPS), maintained by Human Resources and Skills Development Canada (HRSDC), provides insight into the expected employment market for employees in various occupations, including age of workforce in certain NOC categories. Information at Job Futures.ca reports that mine service workers and operators in oil and gas drilling (NOC 841) have a relatively high percentage of workers under the age of 25 and predicts that, because of the influx of younger workers, retirement (to 2007) will be below average. However, this estimate includes the oil and gas industry.

Based on employee survey data, all occupational groups were characterized by a significant proportion of employees aged 50 or older. In contrast, the proportion of employees younger than 30 was markedly lower, with less than 9% in the physical sciences and engineering, and less than 7% in the skilled trades and semi-skilled or mining occupations under the age of 30. Technicians and technologists who participated in the survey had the highest proportion (close to 15%) of workers under the age of 30. Figure 3.7 shows that survey respondents in technologist and technician positions were younger, while skilled trades people tended to be older. The average age of technologists and technicians was 42.5 years, compared with an average age of 44.7 years for skilled trades people.

Figure 3.7: Age of Employees by Occupational Group (2005)

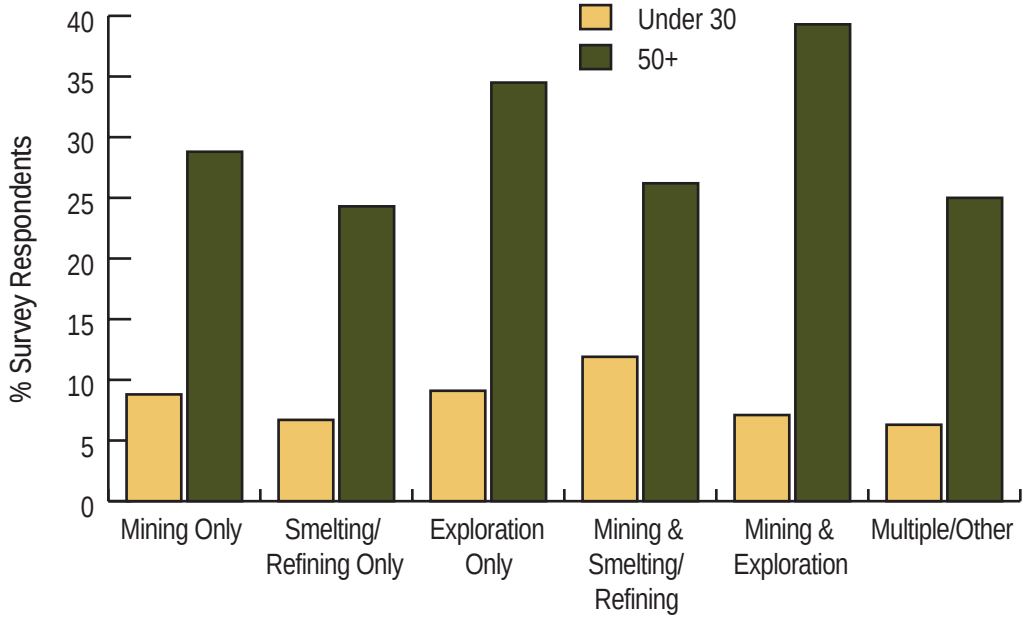


Source: *Prospecting the Future* Employee Survey (n=694)

3.2.3 Age Composition by Type of Operation

Employee age by type of operation was also explored using employee survey data. Figure 3.8 illustrates that there are more individuals over 50 years of age involved in exploration activities (i.e., exploration alone or a combination of exploration and mining) than in other operations.

Figure 3.8: Age of Employees by Type of Occupation (2005)



Source: *Prospecting the Future* Employee Survey (n=694)

3.2.4 Educational Profile

Professional or technical positions in the minerals and metals industry require a designation from a post-secondary institution. Physical scientists and professional engineers require university degrees, and technologists and technicians require the completion of a two-to three-year diploma program from a college, technical institute or CEGEP. The skilled trades require journeyman certification for non-apprentices. The 2001 Census revealed that 59% of employees in the minerals and metals industry had completed an apprenticeship or post-secondary education program.

Mining occupations are not designated as skilled trades and do not require a post-secondary education or trades training. Historically, many mine workers did not complete high school because most entry-level positions did not require high school graduation.

This is apparent in Figure 3.9, which shows the highest level of education completed by survey respondents. Among the semi-skilled occupations and miners, 22.5% reported that they had not completed high school, compared with the overall survey average of 9.9%.

Figure 3.9: Highest Level of Formal Education Completed by Major Occupation Group (2005)

Education Level	Physical Scientists & Engineers (n=192)	Technologists/ Technicians (n=86)	Skilled Trades (n=151)	Semi-skilled and Miners[1] (n=173)	Other[2] (n=36)	Survey Average (n=638)
Did not complete high school	0.0%	2.3%	9.3%	22.5%	36.1%	9.9%
High school	0.0%	9.3%	8.6%	39.9%	36.1%	16.3%
Technical/ Apprenticeship/ Vocational certificate	0.0%	24.4%	59.6%	11.6%	11.1%	21.8%
College diploma	0.0%	50.0%	15.2%	16.2%	8.3%	17.3%
Undergraduate degree	61.5%	8.1%	4.6%	7.5%	2.8%	21.5%
Masters degree	27.1%	2.3%	0.7%	0.0%	0.0%	7.9%
Doctoral degree	8.3%	0.0%	0.0%	0.0%	0.0%	2.3%
Post-Graduate diploma	0.5%	2.3%	0.0%	0.6%	0.0%	0.6%
No response	2.6%	1.2%	2.0%	1.7%	5.6%	2.4%
Total[3]	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%

Source: *Prospecting the Future* Employee Survey

1 Semi-skilled occupations and miners include construction equipment operators, service equipment operators, earth drillers (excluding oil & gas), mining machine setters, operators and tenders (i.e., separating, filtering, clarifying, precipitating, still, crushing, grinding and polishing machine setters, operators and tenders), explosives workers, blasters and ordnance handling experts.

2 Other includes transportation, supervisor, management and training/safety positions.

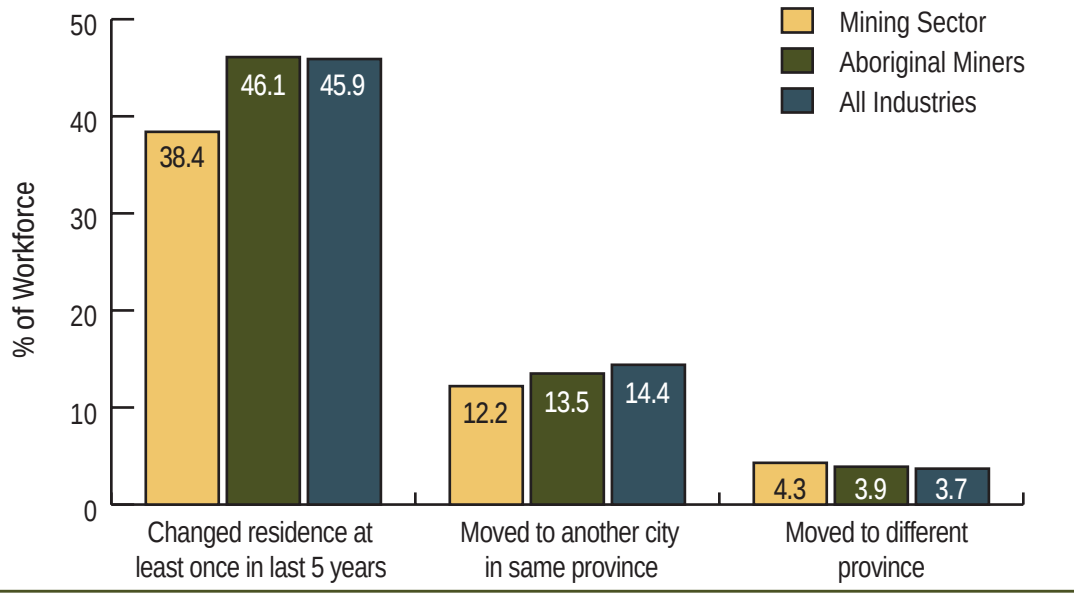
3 Totals may not add up to 100% due to rounding.

Of the 694 respondents, approximately 50% indicated they had completed some type of post-secondary education. Another 22.3% indicated they had completed a technical, apprenticeship or vocational certificate. One-year certificate programs are available at many colleges, but these are typically laddered into diploma programs.

3.2.5 Mobility in the Labour Force

When compared with the overall industry average, the mobility of the workforce in the minerals and metals industry is lower than in all industries overall. Figure 3.10 compares labour mobility in the minerals and metals industry workforce with the overall industry average for the 1996–2001 period. The chart also presents labour mobility in the Aboriginal minerals and metals industry workforce.

Figure 3.10: Labour Mobility of the Mining Workforce (1996 - 2001)



Source: Statistics Canada, 2001 Census

In the employee survey, 25% of respondents indicated that they had relocated to a new community to work in the minerals and metals industry at least once in the past five years. Close to seven out of ten (67.8%) employees who responded to the survey had worked in another sector before the minerals and metals industry. Most workers came from the construction sector (18.0%) and the forestry and logging industry (8.2%). A further 5% moved from the manufacturing sector to the minerals and metals industry.

3.3 Labour force diversity in the minerals and metals industry

As the "baby boomers" grow older and Canada's low population growth rate continues, labour force diversity is becoming an important factor when planning for human resources. That is, employers need to attract non-traditional groups to work in their industries. The extent to which different groups are represented or targeted by the minerals and metals industry is discussed below.

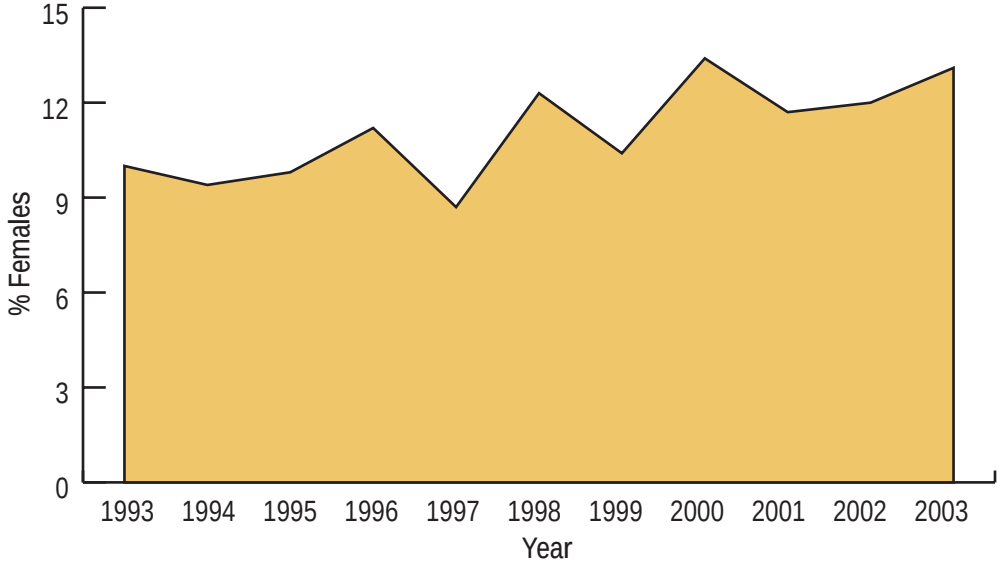
3.3.1 The Female Workforce in Mining

Mining has traditionally been a male-dominated sector. Despite the fact that since 1974, women's groups, mining companies and government legislation have targeted the creation of a gender-free mining industry, gender inequity remains.[33] Women continue to be under-represented in the minerals and metals industry, accounting for only 13.1% of all employees in 2003. This is substantially lower than the national average, where women represent 46.9% of the workforce.[34]

33 Esply, S., Francis, H., & Castonguay, M. 2002. Hardrock Mining and the Evolution of Roles for Women. p.1
34 Statistics Canada, Census 2001.

According to LFS 2003 data, women are generally not employed in coal mining and have just started to appear in non-ferrous metal production and processing. The industry has a smaller proportion of women than the oil and gas-extraction industry Nevertheless, as Figure 3.11 highlights, the percentage of women in the minerals and metals industry has generally been increasing over the past decade.

Figure 3.11: Female Representation in the Minerals and Metals Industry (1993-2003)



Source: Statistics Canada LFS, 2003

Figure 3.12 shows that males make up a significant proportion of production workers in the mining sector. In fact, more than 95% of the workforce associated with many of the production occupations is male. Female representation is higher in finance and administration (62.8%).

Figure 3.12: Gender Profile of Workers by Selected Occupation (2001)

NOC	NOC Title	Male	Female
8221	Supervisors – Mining and Quarrying	99.2%	0.8%
8231	Underground Production/Development Miners	98.5%	1.5%
9611	Labourer – Mineral and Metals Processing	94.8%	5.2%
8441	Mine Labourers	90.2%	9.8%
NAICS 212	Mining Average – All Occupations	89.8%	10.2%
Group A	Management Occupations (all)	90.2%	9.8%
Group B	Finance & Administration Occupations	37.2%	62.8%

Source: Statistics Canada, Census 2001

3.3.2 Aboriginal Workers

Census data from 2001 shows that Aboriginal workers made up approximately 4.8% of the minerals and metals industry workforce. Figure 3.13 provides the Aboriginal workforce as a proportion of the total workforce for each of the NAICS classifications of interest to the present study.

Figure 3.13: Aboriginal Representation in the Minerals and Metals Industry Workforce (2001)

NAICS	Percent of Total Workforce
2121 - Coal Mining	2.9%
2122 - Metal Ore Mining	6.3%
2123 - Non-metallic Mineral Mining and Quarrying	4.0%
2131 - Support Activities - Mining and Oil & Gas Extraction[1]	6.2%
3314 - Non-ferrous Metal (except Aluminum) Production and Processing[1]	1.8%
Total	4.8%

Source: Statistics Canada, Census 2001

1 Note: the labour force numbers have been adjusted for NAICS 2131 and NAICS 3314 to align with the industry definition used in this sector study.

However, the percentage of Aboriginal workers in the minerals and metals industry is much higher than in other industries and the Canadian workforce overall. For example, in 2001, Aboriginal persons accounted for only 2.2% of the electricity generation, transmission, and distribution sector, and at the national level, Aboriginal persons accounted for only 2.6% of the Canadian workforce.[35]

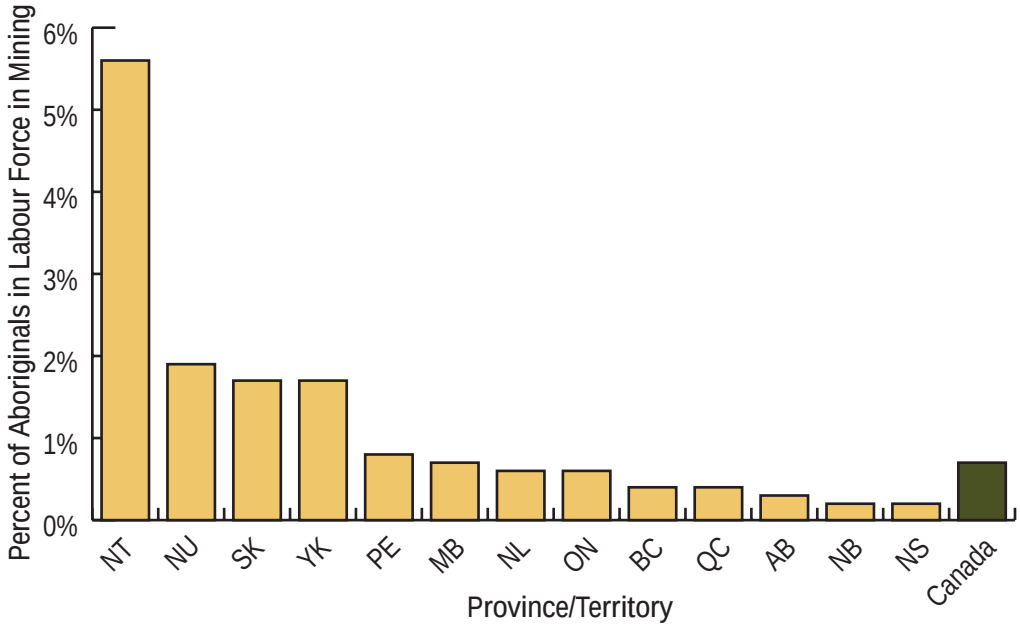
That said, as a whole, there is a higher proportion of Aboriginal workers in the minerals and metals industry (4.3%) than in the energy sector.

In some parts of the country, such as the territories and in northern Saskatchewan,[36] firms have a well-established history of working with Aboriginal communities and engaging the Aboriginal labour force. This is evident in Figure 3.14, which provides participation rates for the Aboriginal workforce in mining by province and territory.

35 Statistics Canada. Census 2001.

36 The Saskatchewan case study focuses on the development of relationships between Aboriginal communities, mining firms and other communities of interest.

Figure 3.14: Aboriginal Labour Force Participation Rates in Mining by Province and Territory (2001)



Source: Statistics Canada, *Census 2001*

Undoubtedly, Aboriginal labour force distribution will reflect the provincial Aboriginal populations to some extent. It is nevertheless apparent that in some provinces, the industry is more successful at engaging the Aboriginal population than in other provinces.

In 2001, the Northwest Territories had the highest percentage of the participating Aboriginal labour force (5.6%) working in the minerals and metals industry. Among the provinces, Saskatchewan engaged the highest percentage, with 1.7% of the provincial Aboriginal workforce in the industry, compared with the national participation rate of 0.7%.

In more recent developments, such as the diamond industry in the North and Inco's Voisey's Bay operation in Newfoundland,[37] industries have begun to pay specific attention to engaging the Aboriginal labour force and establishing partnerships between the company and the communities. Efforts are also being made to facilitate the economic development of the region. For example, at the Ekati mine in the Northwest Territories, of the 800 direct employees, 39% are Aboriginal. Similarly, 37% of employees at the Diavik mine are Aboriginal.[38]

Some industry representatives suggest that, while some firms have long-standing associations with the local Aboriginal communities and many new operations are establishing relationships with the surrounding Aboriginal communities, other well-established mining centres do not actively

37 A case study was completed to examine the development of the relationship between the Innu and Inuit and the Voisey's Bay operation in Newfoundland and Labrador.
38 Quebec Mining Industry Labour Sectoral Working Group, Sector Assessment, 2004.

engage the local Aboriginal workforce. In addition, there is evidence that Aboriginal workers are under-represented in more-skilled positions, because they are often hired for entry-level positions that do not require certification. In northern Saskatchewan, a key challenge to engaging the local labour force to its full extent is the lack of qualified personnel for high-level jobs due to the lack of educational opportunities in the area. Similarly, the 2004 Quebec sector study noted that:

> *"Aboriginal/community groups are under-represented in highly skilled positions, including trades, professional and management categories. Continuing efforts to promote advanced education will be required to improve employment in these areas." (p.28)*

The importance of the Aboriginal population to the minerals and metals industry should not be underestimated. The advances made in working with Aboriginal communities in some parts of the industry give them advantages over many other sectors. Continuing to build these relationships and developing long-term sustainable skills and employment opportunities for Aboriginal workers will be key to maintaining a skilled labour force in the industry.

3.3.3 Other Groups

In Figure 3.15, Census data for 2001 reveals that less than 3% of the minerals and metals industry workforce are members of a visible minority.

Figure 3.15: Visible Minority[1] Representation in the Minerals and Metals Industry Workforce (2001)

NAICS	Percentage of Total Workforce
2121 - Coal Mining	3.4%
2122 - Metal Ore Mining	2.0%
2123 - Non-metallic Mineral Mining and Quarrying	1.3%
2131 - Support Activities - Mining and Oil & Gas Extraction**	3.0%
3314 - Non-ferrous Metal (except Aluminum) Production and Processing[2]	4.3%
TOTAL	2.5%

Source: Statistics Canada, Census 2001

1 As defined by the Employment Equity Act, visible minorities are "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour".

2 Note: the labour force numbers have been adjusted for NAICS 2131 and NAICS 3314 to align with the industry definition used in this sector study.

There are far fewer visible minorities in the minerals and metals industry than in other industries. With representation of only 7.0% in the energy sector, and only 6.4% in the oil and gas industry, and well below the national average of 12.6%.

3.3.4 Language Profile of Workers

In Canada-wide interviews with employers, language was mentioned as a barrier in certain areas of the country. For example, interviewees in Ontario noted that language can hamper mobility between Ontario and Quebec due to each province's certification requirements. Canadians who speak no French have difficulty obtaining certification in Quebec, while Canadians who speak only French have trouble obtaining certification outside of Quebec.

Employers in northern parts of the country, who often access the local Aboriginal workforce, also noted that language could be a potential barrier. In many northern areas, the local Aboriginal dialect is primarily spoken, with English used as a second language.

3.4 Industry labour force demand

An analysis of industry labour demand reveals factors that affect the state of current industry status and forecast trends, such as:

- mine openings and closures;
- predicted human resource requirements;
- voluntary separation, staff turnover and length of employment; and
- retirement and early-retirement projections.

Chapter 7 of this report focuses on skill requirements and identifiable gaps between industry skill needs and the skills of the available labour force.

3.4.1 Demand-Side Pressures

The balance between mine openings and re-openings and mine closures or suspensions is an important factor in determining industry demand for labour.

Mine Closures and Suspensions

Based on information from annual reports of key companies, the industry could experience employment losses between 2009 and 2010 because several large mines are predicted to exhaust current reserves and close. For example, the Barrick Gold Hemlo operation in Thunder Bay is expected to run out of gold reserves in 2009 or 2010. The mine employs 781 permanent staff and 156 contractors. When the Placer Dome Porcupine Operation closed its underground mine in 2005, it displaced employees, while the open pit mine (Parmour) has a life expectancy of only seven or

eight more years. A third example is the Teck Cominco Highland Valley Copper Mine where, at current rates of production, mine reserves could be exhausted by 2011, potentially displacing close to 1,000 employees. Figure 3.16 summarizes planned closures of major mining operations, the number of workers who will be affected and the location of the mine site.

Figure 3.16: Planned Closures/Suspensions of Major Mining Operations in Canada

Mine/Location	Description	Employment Impact
Hemlo Thunder Bay	Minimum ore reserves will allow 4-5 more years of mine life at current rates of production	781 direct employees 156 contractor positions
Highland Valley Copper British Columbia	Mine expected to close in 2011, although mine life could extend to 2013 depending on mine life	950 direct employees
Kemess South British Columbia	Kemess South has reserves to continue operation until 2008	350 direct employees
Abitibi-Témascamingue Nord-du-Québec[1]	Seven mine closures in the two mining regions of Quebec expected over the next 5 years	1,495 direct employees

1 Quebec Mining Industry Labour Sectoral Working Group, *Sector Assessment,* 2004.

Growing exploration and ongoing research and technological innovation could counter this closure trend through the development of new or expanded operations.

Mine Openings, Re-openings and Expansions or Extensions

The recent increase in exploration and the potential for new mine development will absorb some employees laid off due to mine closures. For example, the rapidly developing diamond industry could provide opportunities for experienced miners who are located in, or willing to travel to, the more northern parts of Canada. Labour-force mobility between mining operations and between provinces could become an increasingly important factor to the industry.

In 2003, two new mine openings (the Diavik diamond mine in the Northwest Territories and the Melford gypsum mine in Nova Scotia) provided a total of 900 new direct mining jobs. During the same period, 1,700 jobs were lost due to mine closures or suspensions.[40] In 2003, six new mine openings and six re-openings were expected for 2004, thus increasing labour force demand in 2004 as evidenced by the 3.64% increase in the labour force over the previous year. Figure 3.17 provides examples of mine openings planned within the next 10 years. Note that, although there are substantial exploration and feasibility studies underway, many respondents indicated that new mine openings are difficult to forecast until these activities are completed. However, the firms that participated in this study estimated 18 mine openings.

40 Natural Resources Canada, Canadian Minerals Yearbook, 2003.

Figure 3.17: Planned Openings of Major Mining Operations in Canada

Mine/Location	Description	Estimated Employment Impact
Tahera Diamond Corp – Jericho Project, Nunavut	Under Construction – Production 2006	125-175 direct
Northgate Minerals Corporation – Kemess North, British Columbia	Initiated the environmental review process	475 direct, 74 seasonal
INCO Canada – Creighton, Sudbury	Phase 1 mine development is underway	525 direct
Abitibi-Témascamingue Nord-du-Québec[1]	11 projects under development expected to open over the next five years	1,650 direct
DeBeers Canada Inc. – Snap Lake Diamond Mine, Northwest Territories	Under Construction – Production 2007	550 direct
DeBeers Canada Inc. – Victor Diamond Project, Ontario	Undergoing federal and provincial Environmental Assessment – Production 2008	380 direct
INCO Canada – Voisey's Bay, Newfoundland	Under Construction – Production 2006	1200-1600 direct
Cameco Corp. – Cigar Lake Uranium Mine, Saskatchewan	Under Construction – Production 2007	250 direct

1 Quebec Mining industry Labour Sectoral Working Group, *Sector Assessment,* 2004.

Industry representatives noted that almost every sector of the mining industry would be witnessing considerable demand-driven growth during the next five years.

3.5 Employment projections

Based on the HRSDC publication Job Futures derived from COPS, predictions are that job candidates seeking employment in mining-related occupations will have a "fair" job outlook—implying that such individuals will experience some difficulty in securing employment in this sector. One key COPS finding is that demand for managers will likely exceed that for production workers. COPS forecasts identify the older age structure (and impending future retirements) as key reasons for the above-average growth in employment in managerial occupations. COPS employment forecasts are summarized in Figure 3.18.

Figure 3.18: Projected Employment Outlook – Selected Mining-Related Occupations – HRSDC Estimates (2004)

NOC	Job Title	Job Outlook to 2007[1]	Unemployment Rate
841	Mine Service Workers and Operators in Oil and Gas Drilling	Fair	7.6%
822	Supervisors, Mining, Oil and Gas	Good	2.0%
823	Underground Miners, Oil and Gas Drillers and Related Workers	Fair	6.0%

Source: Jobfutures.ca

1 Definitions (taken from http://www.jobfutures.ca/en/QandA-occupations.shtml#whatDo):

"Good" means that opportunities for finding work are relatively strong, chances of employment loss are relatively weak, and earnings are relatively attractive as compared to those of other occupational groups.

"Fair" falls between "Good" and "Limited". For example, jobs may be more difficult to find, the probability of unemployment may be higher, or earnings may be lower than in comparable occupational groups that are rated "Good". Conversely, jobs may be easier to find, unemployment less likely, and earnings higher than in comparable occupational groups that are rated "Limited".

"Limited" means that new workers and those re-entering the work force will have difficulty finding stable work and/or that earnings are not attractive compared to those in other occupations. For new workers, such as school-leavers (i.e., graduates and drop-outs) and immigrants, "Limited" usually means they have a low probability of finding permanent work and, if they find a job, relatively low earnings. For employed workers, "Limited' will often mean a higher probability of loss of work, a higher probability of experiencing unemployment spells, and lower earnings."

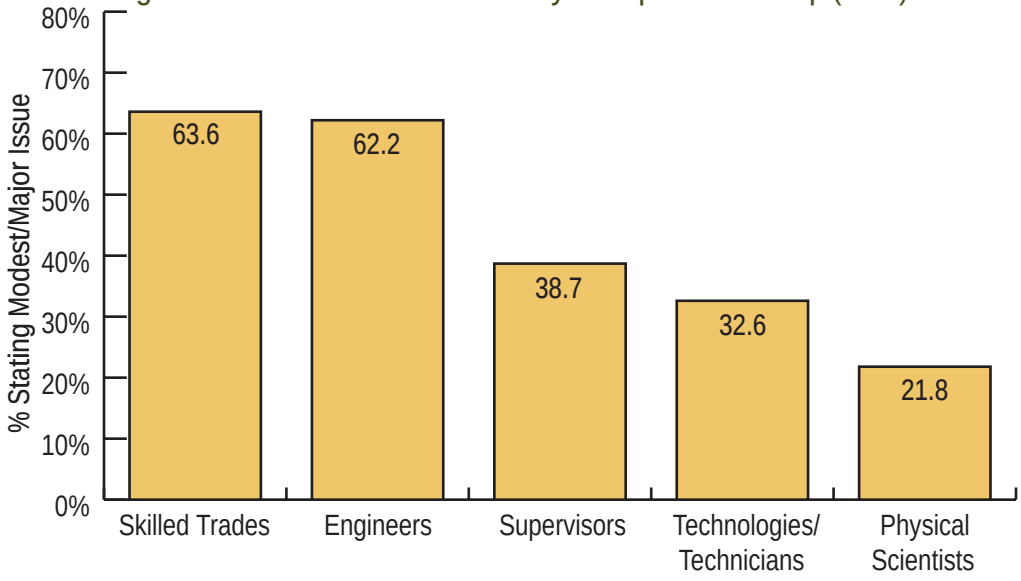
It is important to remember that the COPS forecast outlook was completed during 2002 and 2003. Therefore, employment projections likely did not take into account the significant increase in commodity prices and the subsequent increase in mining-related production that occurred in 2003. That is, much of the analysis was predicated on the relatively high unemployment rate in the sector in 2002. In addition, COPS does not have industry-level projections for the Canadian mining sector and the employment forecasts cover only a portion of occupations. As suggested in Phase I of *Prospecting the Future,* the COPS forecast may not reflect the true state of the industry, since employers were asked to forecast their future employment needs over the next two, five and 10 years. Given recent survey responses, the latest COPS outlook does appear to be an inaccurate reflection of the current state of the minerals and metals industry.

Forecasting employment needs proved to be a challenge, with many employers noting that it would be difficult to estimate the future number of employees required. While employers could identify the number of new hires required to fill replacement positions (retirement, voluntary separation), few employers could provide estimates of "demand" related to new hires due to expanded industry growth. Employment projections are thus estimated from the forecast data that was provided in the survey as well as other information, such as staff turnover and rate of voluntary separation.

3.5.1 Employee Turnover

Employers were asked about the extent to which staff turnover (people leaving for reasons other than retirement) has been an issue for their firms over the past 5 years for specific occupational groups. Figure 3.19.provides employer ratings by occupational group.

Figure 3.19: Turnover as an Issue by Occupational Group (2005)



Source: *Prospecting the Future* Employer Survey (n=56)

Overall, employers did not consider staff turnover to be a major issue for any of the occupational groups, particularly for physical scientists, where turnover was an issue for only 21.8% of respondents. However, the rate of employee turnover was cited as a moderate-to-major issue for skilled trades people (63.6%) and engineers (62.2%). It is also interesting to note that the proportion of employees surveyed who felt that they would be leaving through voluntary separation was highest among technologists, technicians and related occupations (20.8%), and physical scientists and engineers (15.5%).

One reason that staff turnover is not an issue for many employers might be that the average length of employment is typically quite high. Overall, the average length of employment with the same employer was reported to be 12 years by employers, and 10 years by employees. The average overall length of employment in the minerals and metals industry, as reported by employees, is 17.6 years. Figure 3.20 contains employer and employee estimates of the average number of years individuals work for their firm, by occupational group.

As older workers are replaced by new entrants, however, voluntary separation rates in the minerals and metals industry will probably increase to reflect industry averages of between 2% and 3% per year.

Figure 3.20: Average Length of Employment by Occupation (Years – Employer and Employee Estimates)

Survey Source	Length of Employment...	Physical Scientists & Engineers	Technologists, Technicians & Related	Skilled Trades Workers	Semi-skilled Occupations & Miners	Overall Average
Employer Survey (n=56)	...with same employer	10.6	11.2	12.3	13.0	12.0
Employee Survey (n=667)	...with same employer	9.5	6.9	11.6	11.1	10.1
Employee Survey (n=572)	...in the industry overall	17.2	14.3	18.6	18.6	17.6

Source: *Prospecting the Future* Employee, Employer Surveys (2005)

3.5.2 Retirement Projections

Many sectors are concerned about possible future skills shortages due to substantial retirement of older, experienced workers—particularly shortages that might be driven by demographic and regional needs. For example, the Quebec sector study reveals that 25% of the mining workforce in the Abitibi-Témiscamingue region was over 50 years of age, with 11% over 55 years. More alarming is the situation in the North Shore and Labrador Trough region, where 61% of the mining workforce will have retired between 2003 and 2008.[43]

The employer survey provided retirement data. All but two of the surveys supplied information for current retirements, while only 50% provided retirement estimates for five and 10 years out. For 2004, the rate survey respondents reported the relatively low retirement rate of 2.6%. But within five years, forecasts predict that 14.5% of workers will retire, while almost one quarter (24.5%) of the workforce covered by the survey is expected to retire over the next 10 years. However, these forecasts reflect employer-survey responses only.

In addition to employer estimates of retirement, employees were asked about their retirement plans. Employee retirement and early retirement plans are summarized in Figure 3.21.

43 Quebec Mining Industry Labour Sectoral Working Group, Sector Assessment, 2004.

Figure 3.21: Summary of Employee Expectations for Retirement and Early Retirement (2005)

Expected Time to Retirement	Early Retirement		Retirement		TOTAL	
	# Respondents	% Total Respondents	# Respondents	% Total Respondents	# Respondents	% Total Respondents
1 year or less	10	1.6%	12	1.9%	22	3.5%
2 to 5 years	44	6.9%	41	6.5%	85	13.4%
6 to 10 years	72	11.3%	75	11.8%	147	23.1%
TOTAL	126	19.8	128	20.2%	254	40.0%

Source: *Prospecting the Future* Employee Survey (n=635); DK/NR were not included

Based on employee expectations, 19.8% plan to take early retirement and 20.2% plan to retire over the next 10 years, for a total of 40.0% of the workforce.

Figure 3.22 highlights expected retirement by major occupational group and includes those who indicated they would retire early. For example, over the next 10 years, 44.6% of skilled trades workers in the minerals and metals industry expect to retire.

Figure 3.22: Employee Retirement Expectations (2005)

Occupational Group	% Retiring within 5 Years	% Retiring within 10 Years[1]	Average # Years to retirement
Physical Scientists/Engineers	18.0%	36.8%	13.1
Technologists/Technicians	18.2%	42.9%	11.3
Skilled Trades	18.5%	44.6%	12.9
Semi-skilled and Miners	11.3%	40.4%	13.2
Average[2]	16.5%	40.9%	12.9

Source: *Prospecting the Future* Employee Survey (n=574), DK/NR were not included

1 Cumulative over the full 10-year period

2 There is a slight difference in the average reported in this table and the average reported in Exhibit 3.20 due to differences in non-response for the different survey questions.

Comparing employer and employee anticipated retirement behaviour reveals two things. First, expected retirements for both groups over the five-year period appear to be in line with each other. However, a discrepancy arises when expanding the estimate to the ten-year period, where employers forecast approximately one-quarter of the workforce to retire, whereas 40% of employees who completed the survey expect to retire over the same period. The reason for this difference is likely due in part to employees knowing that they expect to retire early, where employers would not have this information. It has been similarly noted that in some instances, employees will work past their eligible retirement date due to financial and other reasons.

When the rate of retirement forecasted by employers is extrapolated to the estimated labour force of the minerals and metals industry, the total number of individuals retiring from the sector over the next 5 to 10 years is substantial. Figure 3.23 shows the estimated percentage of retirements in the minerals and metals industry for the next five to 10 years. Chapter 4 looks at retirement projection numbers in detail.

Figure 3.23: Estimated Retirement Trends for the Industry – Employer and Employee Forecasts (2005)

Time Period	Employer Estimate % Retiring	Employee Estimate* % Retiring
Five Years (2005-2009)	14.5%	16.9% [1]
10 years – cumulative (2005-2014)	24.5%	40.0%

Based on 2004 labour force baseline of 78,184 workers
1 Includes employees planning to take early retirement

Retirement projections imply that significant new hiring will be required to address retirement alone. In addition, the industry can also expect to face hiring pressures to accommodate increased production (demand-driven growth), as well as voluntary separation as employees seek employment in competitor sectors.

In examining the planned separation route(s), analysis was undertaken for those individuals who plan to leave the sector within the next 10 years (approximately 52.8% of the employee sample). Figure 3.24 shows that a significant proportion of workers (20.6%) noted that they would likely take early retirement from the sector, ranging from 18.4% of physical scientists and engineers, to 23.4% of technologists, technicians and related occupations. In the skilled trades, 24.6% of employees indicated that they would be leaving in the next 10 years through retirement.

Figure 3.24: Exit Plans for Mining Employees who Plan to Leave the Industry Within the Next 10 Years – By Major Occupational Group (2005)

Reason/Group	Physical Scientists & Engineers	Technologists, Technicians & Related	Skilled Trades	Semi-skilled Occupations, Miners & Other	Total
Sample Size	206	77	130	174	587
% citing voluntary separation	15.5%	20.8%	7.7%	6.9%	11.9%
% citing early retirement	18.4%	23.4%	20.0%	22.4%	20.6%
% citing retirement	18.4%	19.5%	24.6%	19.5%	20.3%

Source: *Prospecting the Future* Employee Survey

3.6 Human resource implications

Trends in employment/workforce (i.e., demand growth) and the labour force profile of the minerals and metals industry suggest that the industry needs to consider how certain labour-force characteristics could affect future operations and human resource planning. Several trends or factors emerge as potential challenges.

Retirement

Results from most lines of evidence indicate that retirement planning should be a key priority for the mining sector. For example:

- The age of the workforce is older than the Canadian workforce, overall.
- The loss of skills and knowledge of employees who are planning to leave the sector within the next 10 years, taking with them 21.4 years of mining sector experience, will be a major issue for the industry overall and for individual employers.
- Retirement is not currently viewed as a major issue by many employers, despite the fact that, based on employer estimates, approximately 25% of the 2004 workforce will be eligible to retire in 2014.

The considerable proportion of the existing workforce that could retire within the next 10 years could have significant ramifications for the mining sector. The possible risks include:

- increased cost of production associated with lower worker productivity among new entrants; and

- influx of new entrants into the workforce, which may have a negative impact on both safety and productivity (i.e., new workers are less productive and less knowledgeable).

Diversity

There is a need for labour-force diversification with respect to increasing the participation of females, Aboriginal people and visible minority groups within the minerals and metals industry. With fewer young workers entering the labour force and increased competition from other industries for the same shrinking pool of labour, accessing and engaging other parts of the labour force will become key.

The Aboriginal labour force is increasingly being recognized as central to the minerals and metals industry. However, further efforts could be made on the part of some firms with well-established operations in areas that have nearby Aboriginal communities, but have not yet succeeded in engaging that population. In addition, it will become increasingly important to ensure that training and skills development provide opportunities for future sustainable employment and opportunities to move beyond entry- level, labourer positions.

Unionization

The strong presence of labour organizations in some parts of the industry will influence the strategies that can be adopted and implemented by employers. Therefore, the industry will need to develop joint strategies that reflect the interests of both employers and unionized workers in terms of meeting current and future labour supply and skills requirements.

CHAPTER 4: LABOUR SUPPLY AND DEMAND ISSUES

In terms of labour supply and demand issues facing the mining sector, a key objective of the research for this report was to identify the extent to which current and future labour supply would meet the sector's current and future workforce requirements.

The research team utilized several approaches to establish the extent to which the mining sector would have sufficient new entrants for maintaining or expanding the existing workforce.

4.1 Overview

To examine both supply and demand factors, the research team used historical trends, current and future enrolment projections, and demand-related information provided by employers and other stakeholders.

Labour Supply Factors

Traditional sources of labour supply for any industry include the following:

- New entrants from specific education and training programs;
- Individuals who immigrate to Canada and are employed in the mining sector, and
- Experienced workers in other sectors who are hired to work in the mining sector.

The research analysis included an examination of the first two traditional sources of labour supply. In analyzing sources and trends for the sector's labour supply, the research team used several data sources, including the 2001 census; enrolment and graduation rates from Statistics Canada immigration data; employee survey data; and survey data provided by post-secondary education institutions contacted as part of this study. While the scope of this project did not include an analysis of the mining sector's attractiveness to other workers in the Canadian economy, the researchers did look at the types of employees who entered the metals and mining industry from other sectors.

Demand Considerations

Demand considerations included an analysis of the following issues:

- New labour required to support an increase in production (mine expansion);
- Replacement hires required to fill positions vacated due to retirement and voluntary separations; and
- Adjustments for known or likely events, including opening of major new mines or planned closures of existing mines.

The researcher team's information about demand requirements incorporates feedback from employers and key informants, employee opinion, and available statistical data from the Mining Association of Canada, Natural Resources Canada, and Statistics Canada. This chapter also incorporates elements of employer demand detailed in Chapter 3.

4.2 Labour supply considerations

The following supply-side considerations were examined to establish the likely sources of new workers for the Canadian mining sector over the next 10 years.

4.2.1 Enrolment and Graduation Trends

The main source of scientists, professional engineers, technologists/technicians and skilled trades people is the Canadian post-secondary education system. Therefore, the research team explored enrolments in, and graduation from, programs offered through Canadian universities, colleges, and technical institutes for occupations related to those fields.

Historically, enrolment in mining-related programs is tied to the cyclical nature of the industry. In boom times, enrolments begin to increase, then fall off again when the cycle goes into a downswing. Declines in enrolment in the latter part of the 1990s and early 2000s resulted in fewer graduates from mining-related engineering programs.

For example, in a 2002 national survey of Canadian engineering professionals, only 5% of members reported working in the minerals and metals industry, down from 7.6% in 1997.[44] However, given the boom cycles in many mining commodities and in the oil and gas industry, educators expect enrolments to increase again. Survey respondents expect enrolments in mining-related programs to increase over the next 10 years at an estimated average annual rate of 3.3% for universities and 7.5% for colleges, university-colleges and technical institutes. But, while these students have been attracted and recruited to their field of study, the challenge remains for employers to attract, recruit and retain them for the Canadian minerals and metals industry workforce.

There are two important caveats to the supply estimates developed for this study. First, while we know that the industry relies on the more generic skilled trades, such as millwrights and machinists, these trades were not included in the scope of the education survey. These occupations are common to many sectors, and supply trends cannot be ascertained for the minerals and metals sector in isolation.

Second, the educational and training programs available for mining-related occupations are targeted towards occupations in the physical sciences, professional engineering, technological/technical areas and skilled trades. Many mining service and support occupations are non-certified or semi-skilled, and require only high school.[45] In fact, historically, underground service and support workers often had not completed high school when they entered the minerals and metals industry, and were instead trained by the employer.

44 Canadian Council of Professional Engineers, 2003 National Survey of the Canadian Engineering Profession; Canadian Council of Professional Engineers, 1997 National Survey of the Canadian Engineering Profession.

45 However, these individuals typically receive industry-based training (as discussed in Section 4.4).

Employers in the Sudbury area noted that Sudbury's main employers have increased entry-level requirements. New hires must now have at least high school completion (or equivalent) and many positions require, at the minimum, a college diploma. However, this does not appear to be consistent Canada-wide. Firms operating in more remote, less-populated northern areas of the country continue to recruit individuals with less than high school for mining support and service occupations. In these areas, industry-provided or industry-supported training is a key element in developing the local workforce. These firms adjusted their standards to better suit the local labour force and provided additional training as required.

The Physical Sciences

The following provides a discussion of enrolment and graduation trends for the physical sciences, engineering, and technical and technological programs. A review of institutions offering mining programs and the programs available is presented in Chapter 7.

Geology, geochemistry and geophysics are key to the minerals and metals industry, particularly in exploration activities. These program areas, however, do not serve the minerals and metals industry alone, as their graduates can specialize in other areas. According to the Canadian Council of Professional Geoscientists (CCPG)[46] there are 7,600 geoscientists licensed to practice in Canada. Of these, approximately 1,780, or 23%, were employed in the minerals and metals industry in 2001.[47]

To estimate enrolment and graduation patterns in these programs, the research team used Statistics Canada data published in the 2005 Canadian Association of University Teachers (CAUT) Almanac of Post-Secondary Education[48] for enrolments and graduates from geological and earth sciences programs. In 2005, a reported 1,659 undergraduate students, 684 master students and 424 doctoral students were enroled in geological and earth sciences at Canadian universities. Figure 4.1. he estimated enrolments and graduates from geological programs related to the minerals and metals industry are provided in Figure 4.1.

Figure 4.1: Geology Program Estimated Enrolments and Graduates (2001/2002)

Degree	Enrolment	Graduates
Undergraduate	382	74
Masters	157	66
Doctoral	98	17
Total	637	157

Source: 2005 CAUT Almanac of Post-secondary Education

46 Canadian Council of Professional Geoscientists website: http://www.ccpg.ca/index.html
47 The number employed in the minerals and metals industry is based on 2001 Census data. Labour force survey data for 2003, estimates there were 7,800 in that year.
48 Canadian Association of University Teachers (CAUT) website: http://www.caut.ca/en/publications/almanac/default.asp

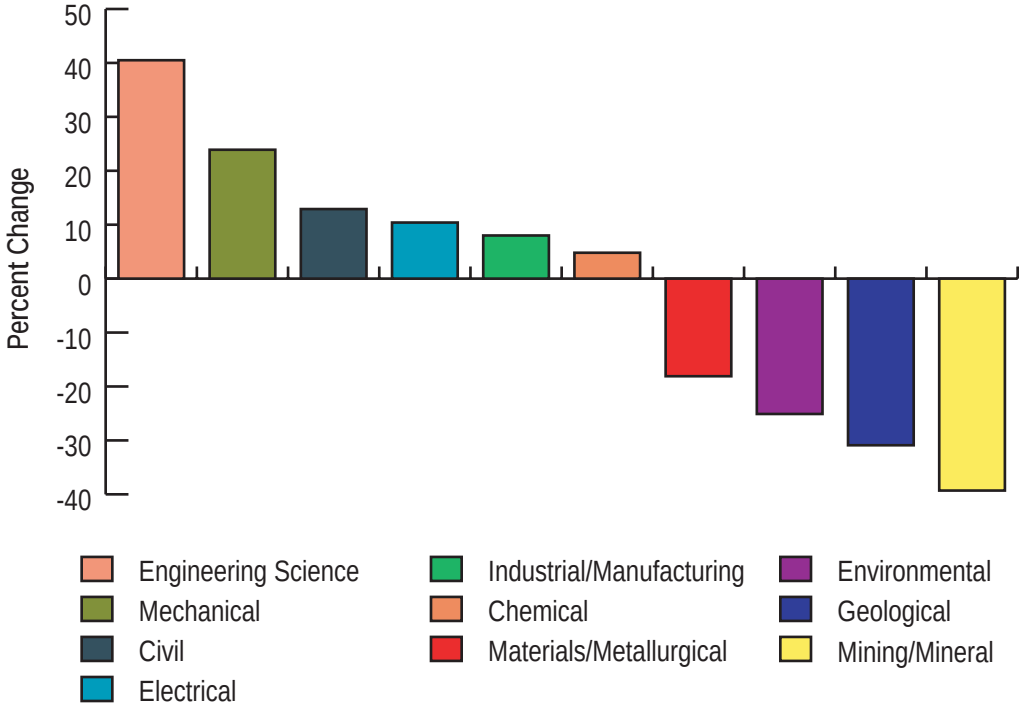
Graduates from these programs will be critical to exploration activities that are being undertaken in Canada now and in the future, given evidence that the supply of geoscientists may not be meeting current demand. As noted by some industry representatives, these occupations are highly affected by the cyclical nature of the industry. For example, several stakeholders noted that during periods of low or limited exploration in Canada, geologists typically leave the sector to seek work in other industries or pursue employment overseas.

Engineering Programs

A recent report of the Canadian Council of Professional Engineers noted that there had been a 19% increase in overall engineering enrolments at Canadian universities from 1998 to 2002. However, the report also noted that, "Since 1998, 40% fewer students have enrolled in mining/minerals engineering . . . Research findings also reveal that within the last five years, fewer students have enrolled in geological, materials, and metallurgical engineering."[49]

Overall, undergraduate enrolments in geological, materials/metallurgical and mining/minerals engineering programs were among the four lowest for all engineering program areas reported in 2002/03.[50] Figure 4.2 highlights the cumulative change in the undergraduate enrolment rate over the 1998 to 2002 period for a number of engineering programs.

Figure 4.2: Cumulative Rate of Change in Undergraduate Enrolments in Engineering for the 1998 – 2002 Period



Source: Canadian Council of Professional Engineers

49 Canadian Council of Professional Engineers. Canadian Engineers for Tomorrow. Engineering Enrolment and Degrees Awarded 1998-2002, p.1.

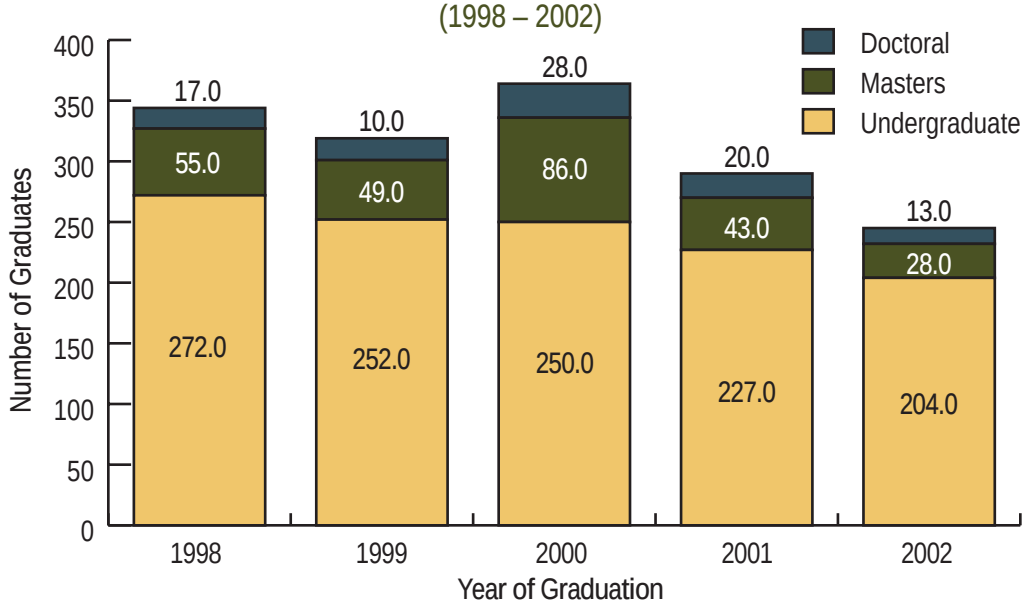
50 The fourth program area is environmental engineering.

Data for the 2002/03 school year, collected by the Canadian Council of Professional Engineers, reveals that enrolment in geological, materials and metallurgical, and mining and minerals was 1,321 for undergraduates, 340 full-time masters and 255 for full-time doctoral studies.

Based on 1995 to 2000 graduation patterns, one source[51] suggested that, on average, university mining engineering programs available in Canada produce approximately 109 undergraduate, 20 MSc and 13 PhD mining engineer graduates per year. In 2002, there were 97 undergraduates, 22 masters degrees and 11 doctoral degrees awarded in mining engineering, a slight decline over the estimated graduates for the period from 1995 to 2000. Graduation patterns in geological and mining/mineral engineering from 2000 to 2002 reflect declining enrolments over the 1998 to 2002 period.

Figure 4.3 shows graduation trends from 1998 to 2002 for undergraduate and graduate degrees in geological and mining engineering programs.

Figure 4.3: Graduation Patterns for Mining-Specific Engineering Degrees[1] (1998-2002)
(1998 – 2002)



Source: Canadian Council of Professional Engineers
1 Mining-specific engineering degrees include geological and mining & mineral degrees.

Data provided in the education survey, however, suggests that declining trends have started to reverse, with increases in enrolment numbers expected for each of the next 10 years. Forecast enrolment estimates are provided in Section 4.3.

51 Archibald, J. (2002). The Status of Canadian University Programs in Mining Engineering.

Technologist/Technician Programs

Secondary data sources for college enrolments in mining-related programs are very general and often out-of-date. Enrolment data for 1999/2000 is available for the following programs: Chemical Technology, Engineering and Applied Science, and Primary Industries and Resources Processing Technology.[52] However, the proportion of students who are enrolled in mining-specific programs is unknown, therefore, the actual number of mining program students must be estimated. Graduate data for 2000/01 are available for the three colleges in Ontario that offer programs.

Figure 4.4. summarizes the number of gradates from the second- and third-year programs, as well as post-graduate diploma programs in mining, and in chemical engineering and metallurgical engineering technology programs.

Figure 4.4: Graduates of Ontario College Geology/Mining Programs (2001–2002)

Program	Program Length	# Graduates
Mining		
Geological Engineering Technician	2 years	37
Geological Engineering Technology	3 years	12
Geological Engineering Technology	Post diploma	10
Mining Engineering Technician	2 years	26
Mining Engineering Technology	3 years	24
Total Mining Program Graduates	--	109
Smelting/Refining		
Chemical Engineering Technician[1]	2 years	109
Chemical Engineering Technology[1]	3 years	203
Metallurgical Engineering Technology	3 years	1
Total Smelting/Refining Program Graduates	--	313

Source: Ontario Ministry of Training, Colleges and Universities. *Employment Profile: 2000-2001 Graduates*
1 Note that chemical engineering technicians and technologists are not unique to the minerals and metals industry.

4.2.2 Education Program Attrition Rates

Respondents to the education survey were asked to estimate the rate of attrition from the different types of programs. The average estimated attrition rates for certificate, diploma, and undergraduate, masters and doctoral degrees are presented in Figure 4.5.

52 2005 CAUT Almanac of Post-Secondary Education website: http://www.caut.ca/en/publications/almanac/default.asp .

Figure 4.5: Attrition Rates by Type of Program (2005)

Degree	Average Length	Average Attrition (%)
Certificate	1-2 years	28.0%
Diploma	2-3 years	15.4%
Undergraduate degree	3-4 years	7.4%
Masters degree	4-5 years	3.8%
Doctoral degree	5-7 years	1.7%

Source: *Prospecting the Future* Education Survey

Clearly, there is a negative relationship between attrition and length of program, with the attrition rate decreasing as the amount of time invested in education increases.

4.2.3 Where Do Students Go After Graduation?

While the survey detailed enrolment and graduation trends, it was not possible to ascertain the extent to which graduates secure employment in the minerals and metals industry.

Information obtained in the qualitative research component of the project, as well as from other sources, suggests that only a percentage of graduates from mining-related courses will actually seek or find employment in the minerals and metals industry. Evidence suggests this is by student choice. Some employers noted in focus groups and interviews that recruiting graduates to Canadian-based operations in the minerals and metals industry can be difficult.

For some occupations, there is a high level of demand from related industries, particularly oil and gas. Key informants also noted that the hydro industry in Ontario and Quebec, and civil engineering positions in more urban areas, present major competition for students and graduates. The issue of recruitment to the minerals and metals industry is further compounded by the global nature of the industry. Canadian graduates are sought after by firms worldwide, making the competition for Canadian graduates fairly intense at the global level. Even in cases where Canadian graduates are employed by Canadian firms, many are lured away by the prospect of travel to more "exotic" places in the world.

Other research on graduate outcomes supports the qualitative information collected in this study. Recent graduate outcomes surveys indicated a significant loss of mining graduates to other sectors of the economy. For example, the Ontario College Graduate Profile for 2000/01 revealed that 39% of graduates from mining programs at Cambrian College, Northern College and Sir Sandford Fleming College were working in a field related to their program of study.[53] Examples from other graduate outcome research include:

53 Ontario Ministry of Training, Colleges and Universities. Employment Profile: 2000-2001 Graduates, 2001.

- Cambrian College (2003 survey of 2002 mining program graduates)
    - 56% employed in field of study
    - 22% enrolled in further education
    - 22% employed in another area
- UBC Mining Engineering (2003 survey of 1998 graduates)
    - 70% employed in field of study
    - 20% employed in another area
    - 10% not in labour force
- BCIT Engineering, Electrical and Electronics (survey of 2003 graduates)
    - 64% employed in field of study

In examining enrolment and graduation trends for individuals in mining-related programs, it is necessary to include an adjustment factor to reflect the proportion of students who do not find employment in the mining sector. For the purposes of this study, the research team has assumed that between 63% (current average of the three institutes examined–low-growth scenario) and 70% (high-growth scenario) of mining graduates are employed in the sector after graduation. This rate is slightly higher than the examples highlighted above, and reflects improved employment opportunities for the current period (2005–2014) relative to the previous 10-year period.

4.3 Estimated labour force supply from training

Estimated current and future enrolment and graduate numbers are provided in Figure 4.6 for universities and colleges. The estimates of labour force supply from training are based on data provided by survey respondents (at five universities and 17 colleges or technical institutes), Statistics Canada data published in the *CAUT 2004 Almanac of Post-Secondary Education,* and information from the Canadian Council of Professional Engineers report on enrolment and graduation trends in Canadian universities.[54] Enrolments and graduation patterns for university programs could be broken down into mining engineering and geology.

The general nature of the information available precluded breakdown by program area at the college level. The college enrolment and graduate estimates are for the pooled programs and include certificate and diploma programs in mining/mineral engineering technology, geological engineering technology and other mining-specific programs (e.g., university bridging programs, Resources Drilling and Blasting Technician at Sir Sandford Fleming College, etc.)

54 2005 CAUT Almanac of Post-Secondary Education website: http://www.caut.ca/en/publications/almanac/default.asp .

Figure 4.6: Estimated University and College Enrolments and Graduates of Mining Programs

	2004/05	2006/07	2009/10	2013/14
University Enrolments				
Mining Engineering Estimates	539	628	696	750
Geology Estimates	637	679	746	845
Total University Enrolments	1,176	1,307	1,442	1,595
University Graduates				
Mining Engineering Estimates	106	164	152	165
Geology Estimates	157	93	103	116
Total University Graduates	263	257	255	281
College				
Total College Enrolments	1,295	1,490	1,763	1,961
Total College Graduates	744	913	1,200	1,277
Total Graduates – All Programs	1,007	1,170	1,455	1,559

Estimates based on Survey data, CAUT and CCPE data. (2005)

Based on survey responses and other data sources, an estimated total of 13,800 students will enroll in mining-related university programs over the next 10 years. Enrolment projections assume a 3% increase in enrolment/graduation rates under a "no-growth" scenario; a 5% increase in enrolment and graduation rates under a "low-growth" scenario; and a 6% increase in enrolment and graduation rates under a "high-growth" scenario.

One factor that should be considered in estimating labour supply from mining-program graduates is that foreign-student enrolments in these programs are also increasing. A recent study completed by the Canadian Council of Professional Engineers found that, since 1998, foreign student enrolment in Canadian engineering programs has almost doubled.[55] These students are attracted to Canadian institutions (particularly universities), due to the world-class training provided in Canada. Since many of these students will not remain in Canada to work for a Canadian company, the increases in enrolments may not reflect the actual supply for Canada's minerals and metals industry. However, foreign students could be an untapped supply source that firms in the minerals and mining industry could recruit.

55 Ibid.

4.4 Workforce supply – other sources

The mining sector has attracted workers from other industries as well as unskilled or semi-skilled workers entering the workforce for the first time. It should be noted that historically, many employers maintained apprenticeship programs in-house. Semi-skilled workers were hired to replace workers who had moved into the trades, or to be trained as certified trades people themselves. Analysis of the data from the employee survey suggests that a considerable proportion of mining-sector workers had previously worked in another sector. For example, of 694 employee survey respondents, 66.8% of employees noted that they had worked in another industry prior to joining the mining sector. Typical source industries included construction (18.5%); forestry and logging; (8.9%); and manufacturing (5.3%).

Stakeholders and employers interviewed during this study noted that there was considerable competition for workers across all industries. However, three sectors were seen as key competitors: oil and gas, electricity utilities and construction.

Oil and gas and electricity utilities have wage structures as high or higher than those of the mining sector, and require skill sets common to many of the mining occupations. The construction industry competes because it can offer employment in urban locations rather than the rural or remote regions associated with many mining operations. The electricity sector is a key competitor for the Ontario and Quebec industries.

4.4.1 Youth

New entrants—either students completing high school or other people under 25 years of age—can be viewed as another potential labour source for the Canadian mining sector. In examining this potential labour pool, it is important to note that the "youth pool" is shrinking as a proportion of the total Canadian population.

For example, during the period from 2001 to 2016, the proportion of Canada's total population accounted for by the 15- to 24-year-old age group is projected to decline from 13.5% (2001) to 12.2% (2016). In terms of actual numbers, the same number of young people are expected to be available (approximately 4.2 million) to the workforce in both 2001 and 2016, despite an 11% increase in Canada's total population during this period.[56] Consequently, the mining sector will continue to face the challenge of attracting sufficient new young workers from a demographic that represents a shrinking pool within Canada's total population.

Operations in Canada's northern regions have access to a younger labour pool, because these areas have higher proportions of youth than the rest of Canada. However, out-migration of youth in many areas is becoming an issue. For example, the North Shore and Labrador Trough mining region of Quebec is experiencing a large outflux of its young population, with approximately 10% leaving annually.[57] The supply-demand forecast does not include an estimate of the likely number of youth hires, as the degree of youths' attraction to this industry relative to others is not known at this time.

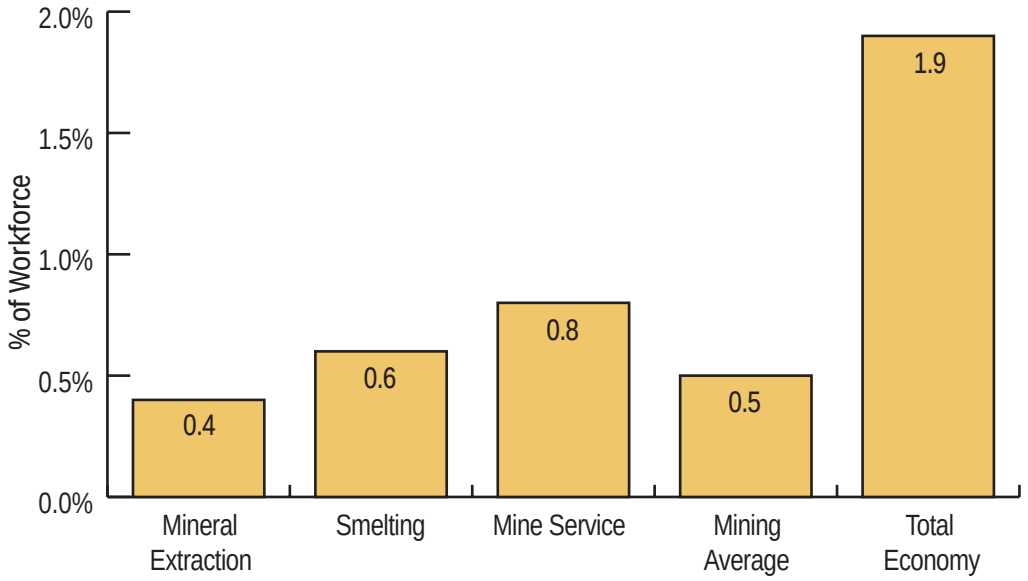
56 Statistics Canada, Population Projections, Medium Growth Projection, February 2005
57 Quebec Mining Industry Labour Sector Working Group, Sector Assessment, 2004.

4.4.2 New Canadians

In addition to graduates of post-secondary education programs, the mining sector has the opportunity to obtain new employees from individuals who have recently immigrated to Canada. The 2001 Census figures do not suggest that the mining sector has been a major employer of recent immigrants. Figures do suggest that of the 455,000 recent immigrants to Canada between 1996 and 2001 who were working, only a small number (an estimated 450 people) were working in the mining sector. Although data for this analysis is not recent (i.e., 1996-2001), it does underscore the limited ability of the sector to attract foreign-born workers into mining occupations.

Recognition of foreign credentials is an issue for immigrants seeking employment in the industry. Figure 4.7 highlights the share of recent immigrants by selected sub-sector for the Canadian mining sector (i.e., the percentage of immigrants who moved to Canada in the period from 1996 to 2001 who are working). As shown, the proportion of recent immigrants working in the mining sector (0.5% in 2001) was markedly lower than the national average of 1.9%.

Figure 4.7: Recent Immigrants as % of Total Workforce – Selected Mining Sectors & Total Canadian Economy (1996-2001)



Source: Statistics Canada, 2001 Census

4.5 Estimates of potential "supply-demand" gap in human resources for the Canadian minerals and metals industry

To provide a perspective on the extent to which the industry would be faced by a labour "deficit," the researchers completed an analysis of the gap between likely industry demand and available supply. It should be emphasized that the analysis was intended to indicate the possible magnitude of the labour supply-demand gap based on three alternative scenarios ("no-growth"; "low-growth"; and "high-growth").

To complete such an analysis, the researchers assume that industry- and post-secondary education will have limited ability to respond to change(s) over the short- to medium- term. In this context, the researchers used historical ratios of the proportion of mining graduates indicative of the sector's ability to attract recent immigrants to the sector. It should be noted, however, that industry - and post-secondary education institutions could change in the face of potential labour shortages. For example, post-secondary education institutions could increase the number of seats available for mining-related programs, and industry could increase real wage rates to attract more workers.

4.5.1 Supply-Side Considerations

There are several sources of labour supply for the mining industry:

- **Post-secondary education programs**. Approximately 59% of the current mining workforce has some post-secondary education. A key source of labour would be graduates of mining-related programs from Canadian colleges and universities. In addition to projections of total enrolment, each scenario also includes an examination of the likely proportion of graduates who actually found work in the mining sector upon graduation.

- **Immigration**. For the purposes of the supply-demand projections, the forecast incorporates an increase in overall immigration to Canada (in line with national immigration targets) as well as alternative scenarios with respect to the ability of the mining sector to attract such workers to the sector.

4.5.2 Demand-Side Considerations

Demand side factors include an analysis of trends that will affect the demand for mining employees, including:

- **Overall growth in mining-related production**. As noted previously, the mining sector is currently experiencing robust growth in terms of output, exports, GDP and employment, due to the strong world-wide demand for most mineral products. To identify demand-driven growth, this analysis makes projections about future employment growth based on demand-related requirements. In general, these projections would represent new positions required to produce higher volumes of ores and concentrates.

- **Need to meet replacement requirements**. Replacement workers will be needed to fill positions vacated by retiring employees, as well as those who leave the sector to seek employment in other sectors (i.e., oil and gas, electricity, etc.). Estimates about retirement and voluntary separation vary depending on which scenario is selected (i.e., employer estimates of retirement, employee estimates of retirement).

- **One-time adjustments for known or likely mine openings and closures**. For example, between 2010 and 2011, the Canadian mining sector could experience some significant adjustment associated with the depletion of deposits at the Hemlo and Highland Valley operations. Those closures will result in a likely decrease in industry demand for workers as a portion of displaced workers are absorbed into other existing mining operations. Similarly, the opening of Voisey's Bay and the planned start-up of uranium mines in Saskatchewan will serve to increase the sector's labour demands.

4.5.3 Development of Alternative Scenarios

Given the considerable range of developments that could affect the demand for workers in Canada's mining sector, the analysis of potential supply-demand requirements includes a no-growth, low-growth and high-growth scenario. These scenarios are presented to provide an overview of the possible magnitude of the sector's human resource requirements. In reality, the actual requirements will likely fall somewhere between the low-growth and high-growth scenario.

4.5.4 Supply-Demand Analysis: "No-Growth" Scenario

Demand Factors

The no-growth scenario assumes that the mining sector will witness a decline in most commodity prices, and that no new mining development will occur in Canada. The model assumes declining production-related employment—declining from the 3.64% increase witnessed in 2004 to 0.00% by 2009, with a decline in the workforce of 1.32% per year from 2010 to 2014.

Major Mine Openings or Closures

The model assumes very limited new mine openings with the exception of several mines that are currently in development (including Voisey's Bay), two new uranium mines, and one new major diamond mine. The model assumes the closure of the Highland Valley and Hemlo operations in 2010-2011, with job losses totalling 942 in 2010 and 1,000 in 2011.

Retirement

Retirement projections incorporate employer estimates, which are generally lower than those of employees. Employer estimates of retirement are 2.9% per year between 2004 and 2009, and 2.0% per year between 2010 to 2014.

Voluntary Separations

Voluntary separations are estimated to be approximately 2% per year—a conservative number based on employee estimates of voluntary separation over the next 10 years.

Immigration

The no-growth scenario assumes that the mining sector will attract a very low proportion of the immigrant workforce. Between 1996 and 2001, the mining sector attracted only 0.099% of the immigrant workforce. The no-growth scenario incorporates a 50% increase in the mining sector's share of the total immigrant workforce (i.e., 0.114% for 2005 to 2009, and 0.140% for 2010 to 2014) and also reflects the increase in total immigration to Canada.

Post-Secondary Education Graduates

Under a no-growth scenario, growth in enrolment is projected at 3% per year. As detailed in Figure 4.8, the no-growth scenario predicts that the mining sector will need to fill approximately 3,647 positions per year during the next 10 years. As depicted in Figure 4.8, supply through post-secondary education and training and immigration will fill only a portion (estimate 891 positions per year) of the industry's workforce requirements. In this context, the mining sector will face a potential labour supply gap of approximately 2,756 positions per year that will need to be filled through new youth hires, attraction of workers from other industries, and strategies to attract more workers from the new immigrant labour pool. Therefore, over the next 10 years, under a no-growth scenario, the minerals and metals industry will experience a potential labour supply gap of approximately 27,560 workers.

Figure 4.8: Estimated Supply and Demand Gap – No Growth Scenario

Factor/Period	Average Annual Estimates		
	2005-2009	2010-2014	2005-2014
Estimated Total Workforce (based on a total 2004 workforce of 78,184)	84,146	81,278	82,712
Hiring Required to Meet:			
Demand growth (expansion/contraction of existing mines, mine openings/closures)	1,777	-1,857	-40
Voluntary separations (2% of workforce)	1,683	1,626	1,654
Retirement	2,440	1,626	2,033
Total Annual Demand	5,900	1,395	3,647
Estimated Supply (mining-related PSE programs)[1]			
Number of graduates/year	1,101	1,277	1,189
Proportion who enter mining sector (63%)	694	804	749
Immigration (# who will enter mining workforce)	121	162	142
Total Sector-Related Supply	815	966	891
"Gap" to be filled by other sources (youth, workers in other sectors)	5,085	429	2,756

1 Portion of graduates who secure employment in mining sector upon graduation as discussed in Section 4.3

4.5.5 Supply-Demand Analysis: "Low-Growth" Scenario

Demand Factors

The low-growth scenario assumes that the mining sector will witness a decline in most commodity prices and that new mining development will occur in only a limited scale in Canada. The model assumes declining production-related employment—declining from the 3.64% increase witnessed in 2004 to the long-term average of 2.08% per year. This estimate also takes into account ongoing mine openings and closures of small-scale operations.

Major Mine Openings/Closures

The model assumes very limited new mine openings with the exception of several mines that are currently in development (including Voisey's Bay), two new uranium mines and one new major diamond mine. The model assumes the closure of the Highland Valley and Hemlo operations in 2010/2011 with job losses totaling 942 in 2010 and 1,000 in 2011.

Retirement

Retirement projections incorporate employer estimates, which are generally lower than that of employees. Employer estimates of retirement are 2.9% per year between 2004 and 2009, and 2.0% per year between 2010 and 2014.

Voluntary Separations

The study estimates voluntary separations to be approximately 2% per year—a conservative figure based on employee estimates of voluntary separation over the next 10 years.

Immigration

The low-growth scenario assumes that the mining sector will attract a very low proportion of the immigrant workforce. Between 1996 and 2001, the mining sector attracted only 0.099% of the immigrant workforce. The low-growth scenario incorporates a 50% increase in the mining sector's share of the total immigrant workforce (i.e., 0.114% for 2005 to 2009, and 0.140% for 2010 to 2014). It also reflects the increase in total immigration to Canada.

Post-Secondary Education Graduates

Growth in enrolment is projected at 5% per year, based on identification of the number of graduates from mining programs offered by Canadian universities/colleges, as well as the historical proportion of graduates who entered the minerals and metals industry after completing their studies.

As detailed in Figure 4.9, based on the low-growth scenario, the mining sector will need to fill approximately 5,715 positions per year during the next 10 years. As depicted in the table, supply through post-secondary education and training and immigration is projected to fill only a portion (estimate 980 positions per year) of the industry's workforce requirements. In this context, the mining sector will face a potential labour supply gap of approximately 4,735 positions per year through new-youth hires, attraction of workers from other industries, and strategies to significantly attract more workers from the new-immigrant labour pool. Therefore, over the next 10 years, under a low growth scenario, the minerals and metals industry will experience a potential labour supply gap of approximately 47,350 workers.

Figure 4.9: Estimated Supply and Demand Gap – Low Growth Scenario

Factor/Period	Average Annual Estimates		
	2005-2009	2010-2014	2005-2014
Estimated Total Workforce (based on a total 2004 workforce of 78,184)	86,786	93,900	90,343
Hiring Required to Meet:			
Demand growth (expansion/contraction of existing mines, mine openings/closures)	2,930	491	1711
Voluntary separations (2% of workforce)	1,736	1,878	1,807
Retirement	2,517	1,878	2,197
Total Annual Demand	7,183	4,247	5,715
Estimated Supply (mining-related PSE programs)[1]			
Number of graduates/year	1,169	1,491	1,330
Proportion who enter mining sector (63%)	736	940	838
Immigration (# who will enter mining workforce)	121	162	142
Total Sector-Related Supply	857	1,102	980
"Gap" to be filled by other sources (youth, workers in other sectors)	6,326	3,145	4,735

1 Portion of graduates who secure employment in mining sector upon graduation as discussed in Section 4.3

4.5.6 Supply-Demand Analysis:High-Growth Scenario

The high-growth scenario assumes that the mining sector will witness continued strength in commodity prices, although employment growth will abate from 3.64% per year in 2004 to 1.82% per year by 2014. This estimate also takes into account ongoing mine openings/closures of small-scale operations.

Major Mine Openings and Closures

The model assumes new mine openings in Ontario, Quebec, British Columbia and Saskatchewan, in addition to Voisey's Bay, two new uranium mines and one major new diamond mine. The model assumes that high copper and gold prices will delay the closure of the Highland Valley and Hemlo operations by two years, although total job losses will be unchanged.

Retirement

Retirement projections incorporate employee estimates, which are generally higher that that of employers. Employee estimates of retirement are 3.38% per year between 2004 and 2009, and 4.62% per year between 2010 and 2014.

Voluntary Separations

Voluntary separations are estimated to be approximately 2% per year—a conservative estimate based on employee estimates of voluntary separation over the next 10 years.

Immigration

The high-growth scenario assumes that the mining sector will attract a slightly higher proportion of the immigrant workforce. Between 1996 and 2001, the mining sector attracted only 0.099% of the immigrant workforce. The high-growth scenario incorporates a 75% increase in the mining sector's share of the total immigrant workforce (i.e., 0.121% for 2005 to 2009, and 0.158% for 2010 to 2014), and also reflects the increase in total immigration to Canada.

Post-Secondary Education Graduates

Growth in enrolment is projected to be at 6% per year, based on higher industry demand, identification of the number of graduates from mining programs offered by Canadian universities and colleges, and the historical proportion of graduates who entered the minerals and metals industry after completing their studies. The proportion of graduates who will work in the sector increases from 63% in 2004 to 70% by 2010.

Figure 4.10: Estimated Supply and Demand Gap – High Growth Scenario

Factor/Period	Average Annual Estimates		
	2005-2009	2010-2014	2005-2014
Estimated Total Workforce (based on a total 2004 workforce of 78,184)	87,689	99,655	93,672
Hiring Required to Meet:			
Demand growth (expansion/contraction of existing mines, mine openings/closures)	3,487	1,592	2,540
Voluntary separations (2% of workforce)	1,754	1,993	1,873
Retirement	2,964	4,604	3,784
Total Annual Demand	8,205	8,189	8,197
Estimated Supply (mining-related PSE programs)[1]			
Number of graduates/year	1,203	1,610	1,407
Proportion who enter mining sector (63%)	796	1,124	960
Immigration (# who will enter mining workforce)	129	184	1156
Total Sector-Related Supply	925	1,308	1,116
"Gap" to be filled by other sources (youth, workers in other sectors)	7,280	6,881	7,081

1 Portion of graduates who secure employment in mining sector upon graduation as discussed in Section 4.3

Figure 4.10 shows that the high-growth scenario will result in considerable recruitment challenges for the Canadian mining sector, as approximately 7,081 positions per year will need to be filled from youth or experienced workers from other sectors. While total employment under this scenario is not significantly higher than under the low-growth scenario, the higher retirement rate requires much higher numbers of replacement workers. Therefore, over the next 10 years, under a high-growth scenario, the minerals and metals industry will experience a potential labour supply gap of approximately 70,810 workers.

4.5.7 Supply-Demand Analysis—Gap Summary

The supply-demand "gap" projected in this research represents a hypothetical gap between industry needs and the capacity of the education and training systems to produce sufficient numbers of qualified graduates. In reality, mining employers will access other potential labour pools to address hiring needs, including:

- New entrants (youth or other unemployed workers);
- Existing staff to be promoted into management/supervisory roles;
- Trained staff currently working in other sectors;
- Use of contract positions for recently retiring staff; and
- Increased proportion of recent graduates who decide to work in the mining sector.

Nevertheless, the extent of the supply-demand gap suggests that there will be an immediate need for employers and education or training institutions to develop a coordinated strategy to address this sector's current and potential hiring needs. Figure 4.11 indicates that the supply and demand gap for human resources will pose a major challenge for the industry under any of the assumptions.

Figure 4.11: Estimated Supply and Demand Gap – Summary

	Cumulative Ten-Year Gap (2005 – 2014)		
Scenario (described above)	No Growth	Low Growth	High Growth
Estimated Total Workforce (based on a total 2004 workforce of 78,184)	82,712	90,343	93,672
Total Cumulative Demand	36,470	57,150	81,970
Total Cumulative Supply	8,910	9,800	11,160
"Gap" to be filled by other sources	27,560	47,350	70,810

4.6 Human resource implications

The supply-demand analysis suggests that the mining sector will need to recruit significant numbers of new workers to meet demand requirements, as well as fill positions vacated due to turnover and retirement. It is therefore important for policy-makers to consider the following trends and developments of current and future human resource strategies. They will need to keep in mind that:

- The pool of available youth who can work in the mining sector is not projected to increase substantially during the next 10 years. In fact, this group as a proportion of the total labour force is expected to decline over the forecast period;

- Employers should examine retention strategies, because the loss of experienced workers due to retirement or voluntary separation is significantly greater than that associated with new demand (production) requirements; and

- The mining sector has had a poor record in terms of attracting new immigrants into the sector. In the future, new immigrants will represent a major labour source for Canadian employers. The mining sector should examine strategies and policies to enhance the attractiveness of the sector to "new Canadians."

Other strategies that can be adopted by the mining sector include:

- Establishing mentoring or training programs for existing staff members for promotion into positions being exited by retiring employees;

- Developing a strategy to facilitate the integration of foreign workers with skills in mining-related occupations via federal immigration programs (i.e., immigration targets, immigrant scoring criteria, provincial nominee programs, use of the foreign worker program, etc.);

- Establishing closer linkages with post-secondary education institutions to provide more/better information as to current and future industry requirements;

- Maintaining employment during downtimes;

- Encourage industry to increase internship positions;

- Establishing marketing and promotional activities to encourage youth and non-traditional source populations (i.e., Aboriginals, females, visible minorities, etc.) to consider a career in a mining-related trade. Such promotion and marketing of these career choices may help reverse the declining enrolments in college and technical programs associated with mining-related trades;

- Developing a recruitment strategies that target on-campus students to increase the proportion of graduates who choose a career in the mining sector. In addition, the sector could advise students of the ability to transfer existing course credits into a mining-related discipline;

- Working actively on behalf of employers and post-secondary education institutions to provide employment placements to recent graduates, thereby reducing the proportion of graduates who do **not** eventually work in mining-related occupations; and

- Implementing programs to raise awareness of the variety of careers available in the sector, breakdown negative stereotypes, and attract non-traditional recruits to the industry.

In summary, trends in Canada's total labour force and general population are affecting the supply of workers to the minerals and metals industry, and these trends are not specific to the minerals and metals industry in isolation. All sectors face the same critical issues of an aging population, an exodus of experienced workers due to retirement, earlier retirement and a lack of new entrants into certain types of occupations, especially skilled trades.

CHAPTER 5: SUPPLIERS AND CONTRACTORS

This report surveyed not only employers, but the suppliers and contractors that supply equipment and provide services to the minerals and metals industry. Since their services include key exploration, mining and processing activities, as well as external services, these suppliers and contractors compete with mining firms for the same pool of labour. In addition, many suppliers and contractors serve both the minerals and metals industry, as well as competing industrial sectors such as oil and gas, forestry and construction. This chapter looks at the human resource profile of such suppliers and contractors, and its implications for the industry.

5.1 Outsourcing practices in the minerals and metals industry

The industry commonly outsources short-term or one-time capital projects such as construction, infrastructure replacement, and equipment builds, where labour is required for a fixed period of time. Outsourcing of exploration work and mobile heavy-equipment work is also common. Recently, however, the amount and type of outsourcing of labour to contractors has been on the rise.

This trend is particularly noticeable for mine construction, mine development, and mining operations. The latter, for example, includes several companies that are currently contracted to operate mines. Examples of mining operations using contracted workers include:

- Goldcorp's Red Lake Mine;
- Sudbury Joint Venture's McCreedy West Mine; and
- BHP Billiton's Ekati Diamond Mine–Misery Pit.

The mining industry also outsources when a company lacks sufficient in-house expertise. For example, outsourcing is often used for jobs such as shaft-sinking, a highly specialized activity that is intermittently required during mining operations. Because there are specific regulatory requirements for equipment, and a limited labour pool of workers with the required qualifications, this work is frequently contracted out.

The mineral exploration industry is in transition. To accommodate growth and expansion, majors are outsourcing more mineral exploration to juniors. Once dominated by majors, mineral exploration has now shifted to junior firms that, in turn, commonly outsource their work to contractors.

Other mining activities that are increasingly outsourcing their activities include:

- Transportation;
- Reclamation and environmental services; and
- Support Services (camp catering, maintenance, security, computer and technical services).

In the North, mining-support services are increasingly being contracted to local businesses, (often Aboriginal suppliers and contractors).

Coal operations, which have not adopted the large-scale use of contractors compared to other types of mining operations, are an exception to this outsourcing trend. They primarily outsource construction and mobile heavy-equipment work.

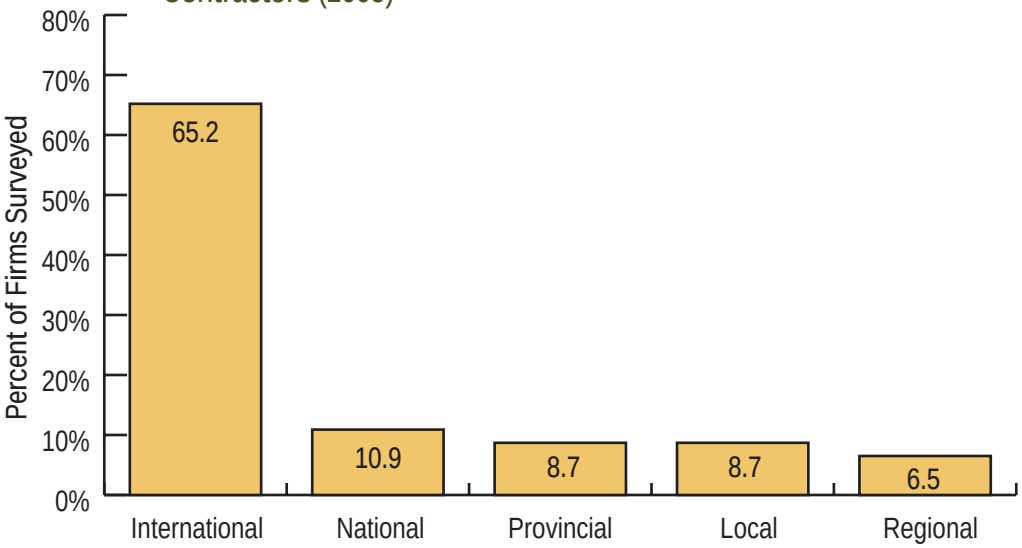
In mining, the cost of labour is the biggest issue for the minerals and metals industry in Canada, and the main reason given by key informants for the observed increase in outsourcing activities. Some large companies in Canada have created their own non-unionized contractors, who offer lower capital or operational costs than a unionized or in-house workforce. Outsourcing may be used to increase production while avoiding issues around labour-management relations. Not only do some companies consider outsourced labour to be economically advantageous, they also consider it more reliable. Furthermore, outsourcing requires no long-term commitment to employment, and reduces expenses associated with medical and pension benefits.

Key informants also give another reason for the outsourcing of labour: the increasing flexibility of the industry. Outsourcing increases the number of suppliers involved in mining activities, which allows industry employers to acquire the services of skilled labour quickly and easily. In addition, outsourcing allows companies to hire qualified retired individuals as consultants on a part-time or temporary basis. Given the cyclical nature of production and employment in the mining sector, use of contract resources is seen as an effective way to accommodate anticipated production savings.

5.2 Profile of supplier and contractor firms

This report also examined the scope of supplier and contractor firms' operations. Approximately two-thirds (65.2%) of respondent firms had operations that were international in scope, as detailed in 5.1.

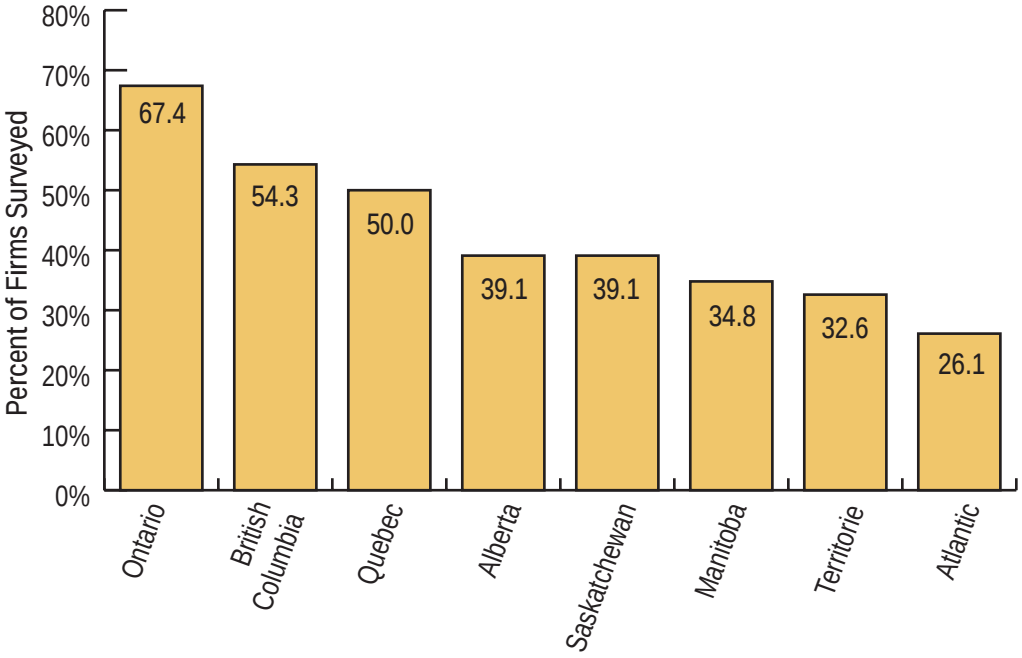
Figure 5.1: Scope of Operations for Minerals and Metals Industry Suppliers and Contractors (2005)



Source: *Prospecting the Future* Supplier and Contractor Survey (n=46)

Although the suppliers and contractors surveyed may not have offices in all provinces and territories, they typically provided services in all Canadian jurisdictions, as detailed in 5.2. Approximately two-thirds (67.4%) of respondents provided services in Ontario. The Atlantic region had the lowest representation, with services provided by 26.1% of responding firms.

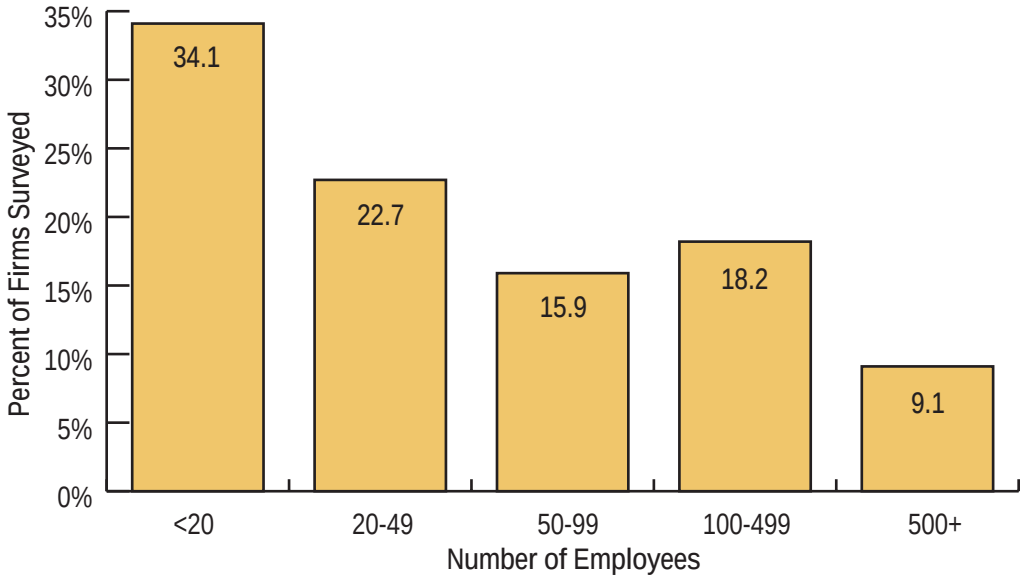
Figure 5.2: Jurisdictions Served by Suppliers and Contractors (2005)



Source: *Prospecting the Future* Supplier and Contractor Survey (n=46)
Note: Totals exceed 100% due to multiple responses.

Although the majority of supplier and contractor firms surveyed were international in scope, more than half (56.8%) had fewer than 50 employees in their Canadian operations, as shown in 5.3. In general, the smaller firms provided exploration, environmental and engineering services, while the larger firms contracted more generic types of services, such as heavy-equipment and maintenance services.

Figure 5.3: Establishment Size for Minerals and Metals Industry Suppliers and Contractors (2005)



Source: *Prospecting the Future* Supplier and Contractor Survey (n=44)

The majority of respondent firms supply or maintain equipment for the minerals and metals industry. In general, suppliers and contractors for services related to exploration and mining, environmental services, education and training and technology services and supply were well represented.

Supplier and contractor firms provide services to mining establishments that produce a range of commodities. Approximately 80% of firms surveyed provided contract services to metals producers; more than half (56.5%) provide service to non-metal producers (excluding coal and aggregates); 30.4% provide services to the coal industry, and 26.1% provide services to aggregate producers. [58]

5.3 Labour-force profile

The majority (64.3%) of the workforce represented in supplier and contracting firms that responded to the survey were in skilled-trades occupations. Due to the low response rate (46 suppliers and contractors), it is likely that skilled trades occupations are over-represented in these survey results. Semi-skilled occupations and miners accounted for 21.9% of the surveyed workforce, with approximately 80% employed in mining-specific occupations.[59] Physical scientists and engineers accounted for 8.6% of the surveyed workforce, of which 50.5% were in occupations specific to the geological sciences.[60] Technologists, technicians and related occupations accounted for 4.9% of responses.

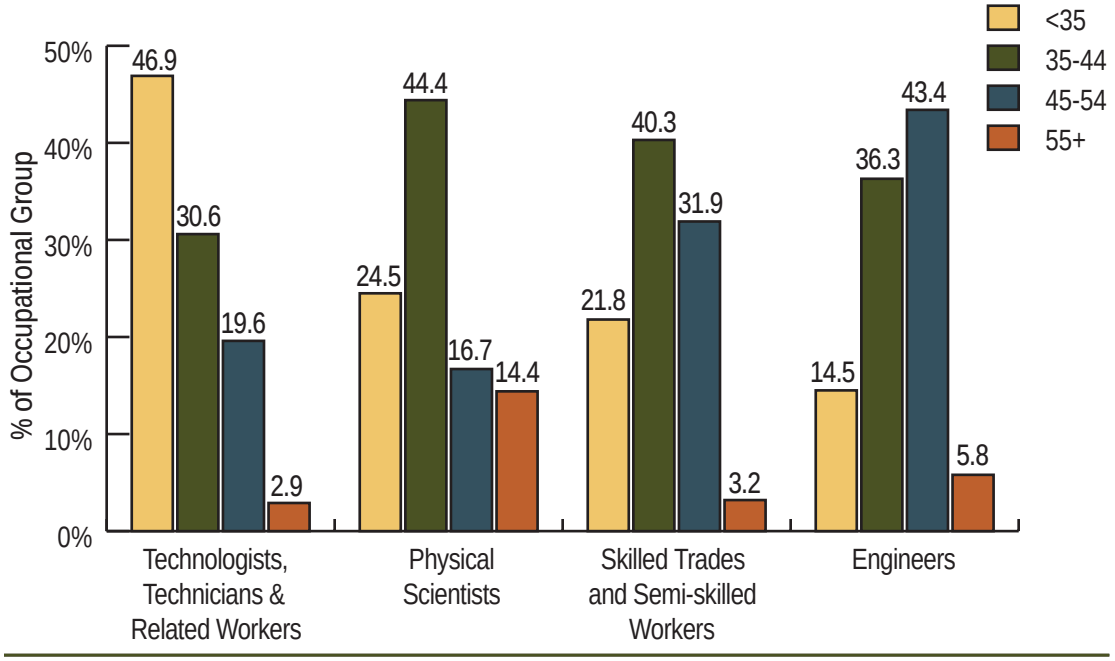
58 A single firm could supply services to different types of operations and to mining different types of commodities.

59 Mining-specific occupations include earth drillers (excluding oil and gas), mining-machine setters, operators and tenders (separating, filtering, clarifying, precipitating, still, crushing, grinding and polishing machine setters, operators and tenders), explosives workers, blasters and ordnance handling experts.

60 Geologists (including structural, hydrogeologists, field/exploration and environmental geologists), geophysicists (including exploration, environmental, development and production geophysicists), geochemists and geological engineers.

Figure 5.4 reveals that the age demographic of the workforce for suppliers and contractors is much younger than what is observed for the minerals and metals industry workforce. Technologists, technicians and related workers employed by supplier and contracting firms are the youngest workforce, with approximately 46.9% below 35 years of age. Physical scientists (44.4%), and skilled trades and semi-skilled occupations (40.3%) are typically between 35 and 44 years of age. Engineers working for suppliers and contractors tend to be older, with 43.4% between 45 and 54 years of age. It should be noted that few of those who work for suppliers and contractors are older than 55 years.

Figure 5.4: Age Profile of Supplier and Contractor Employees by Occupational Group (2005)



Source: *Prospecting the Future* Supplier and Contractor Survey (n=30, weighted average)

Only 17.6% (n=34) of reporting supplier and contracting firms surveyed have a workforce that is fully or partially unionized. Unionized labour was most common among the skilled trades and semi-skilled workers, although there were firms reporting some unionization among physical scientists, engineers, technologists and technicians.

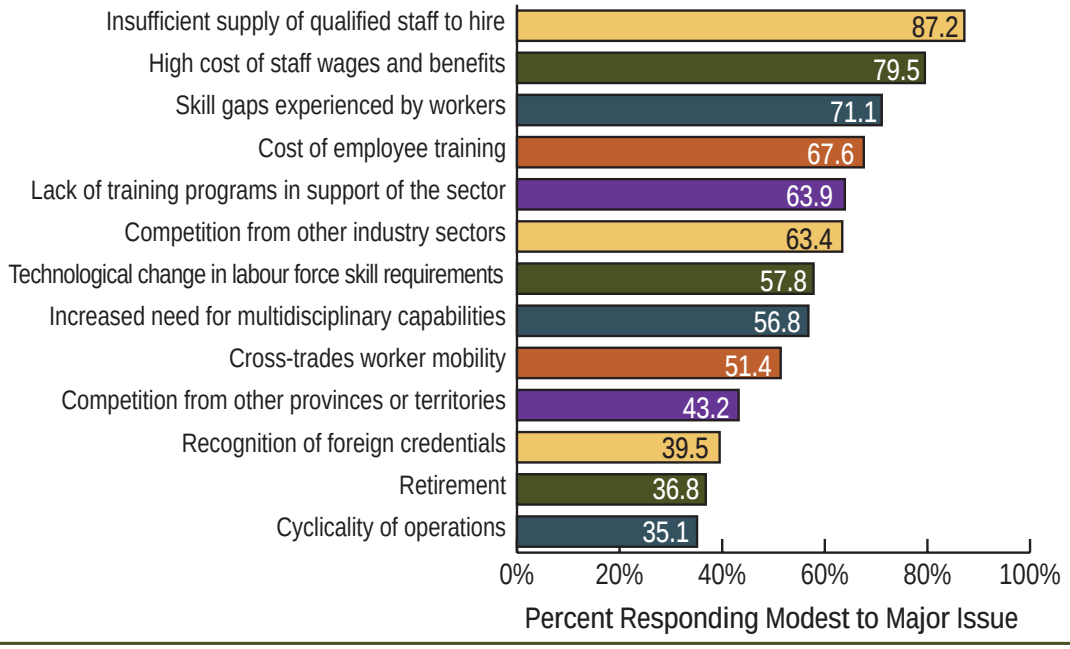
5.4 Human resource issues

Suppliers and contractors reported that they hired employees to replace those who were departing by voluntary separation or early or full retirement. They also reported that, in the last five years, staff turnover was not an issue with respect to physical scientists (77.8% reporting 'not an issue'), technologists and technicians (68.8%), or engineers (62.5%). However, 55.9% of suppliers and contractors considered staff turnover a modest-to-major issue for skilled trades occupations.

Among new employees hired in 2004, approximately 36.0% replaced those who departed by voluntary separation, with 5.5% replacing employees who had taken early or expected retirement. Retirements were highest among physical scientists (8.3%) and skilled trades and semi-skilled workers (6.1%), with the average retirement age reported to be 61.6 years. However, only 36.8% of supplier and contractor firms identified retirement as an issue in meeting current human resource needs, in contrast with minerals and metals industry employers, where 52.2% considered retirement an important factor in meeting their human resource needs.

5.5. summarizes survey respondents' answers regarding whether various factors were major, modest, or non-issues in terms of meeting their human resource needs.

Figure 5.5: Issues in Meeting Human Resource Needs of Supplier and Contracting Firms to the Minerals and Metals Industry (2005)



Source: *Prospecting the Future* Supplier and Contractor Survey (n=36 to 41)
Note: Totals exceed 100% due to multiple responses.

Suppliers and contractors reported that the largest issue in meeting current human resource needs is an insufficient supply of qualified staff (87.2%). This trend is expected to continue for the next two, five and ten years, as identified by 88.5%, 87.0% and 92.9% of reporting firms respectively. Within the existing workforce, 71.1% of firms identified skill gaps as an issue.

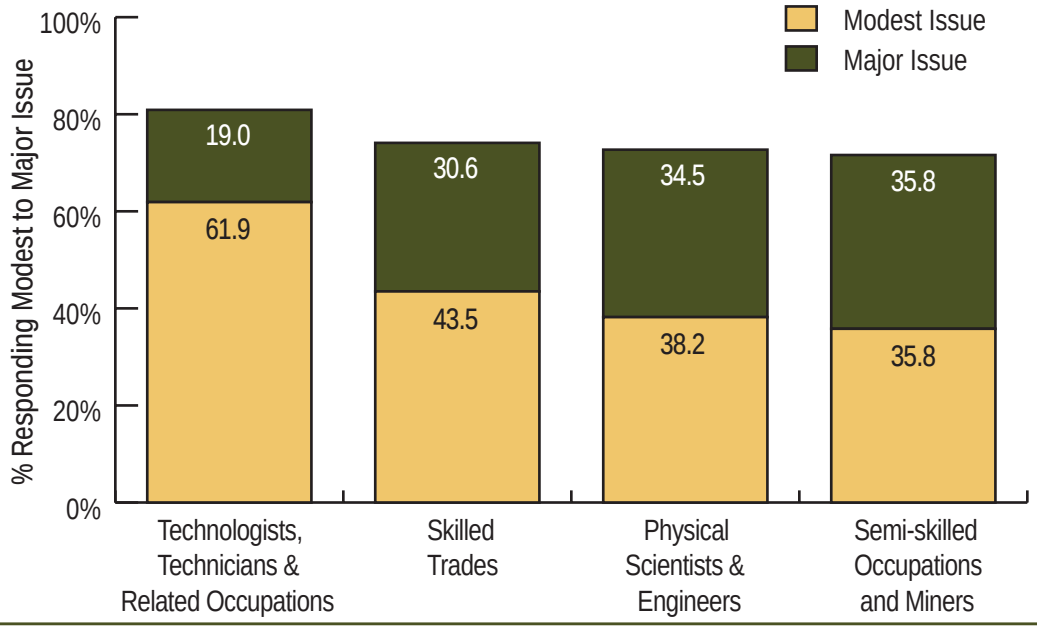
More specifically, access to training programs with adequately flexible schedules was often cited in survey responses. Mine safety training, in particular, was seen as lacking among technical staff (indicating a potential opportunity to develop a nationally recognized, or mandatory, course in mine safety for suppliers and contractors). Respondents cited cost as the largest barrier to providing

training to employees, with 67.6% identifying the cost of employee training to be an issue, and 63.9% identifiying a lack of training programs in the sector. Firms also cited the high cost of staff wages and benefits (79.5%) as a significant human resource issue.

For most suppliers and contractors (35.1%), cyclical operations are not a significant issue. Including only firms that provided services more specific to the minerals and metals industry, less than half (48.0%) reported the cyclical nature of operations to be a modest-to-major issue.[61]

Figure 5.6 identifies labour shortages as a modest-to-major issue for suppliers and contractors in all occupational groups within the next five years. They are also considered a major issue by more than one-third of suppliers and contractors for semi-skilled occupations and miners (35.8%) and for physical scientists and engineers (34.5%). Three-fifths (61.9%) perceive labour shortages to be a modest issue for technologists, technicians and related occupations over the next five years.

Figure 5.6: Extent to Which Labour Shortages Will Be an Issue for Supplier and Contractors in Canada from 2005 to 2009



Source: *Prospecting the Future* Supplier and Contractor Survey (n=32 to 39)

Over the next 10 years, 87.0% of suppliers and contractors expect to experience labour shortages in the skilled trades and for semi-skilled workers, while 63.0% of suppliers and contractors expect to have difficulty finding replacement engineers.

61 Drilling, blasting, boring and tunnelling services, geological and mineral experts or specialists, metallurgical experts or specialists, exploration surveying and mapping services, environmental specialists, safety specialists, and site remediation and reclamation services.

5.5 Implications for human resources

In summary, suppliers and contractors have a younger workforce than minerals and metals industry employers.

Currently, retirement is not generally an issue for suppliers and contractors, given that there are fewer workers over the age of 55 than reported by minerals and metals industry employers. Although employee turnover is not considered a significant problem, more than one-third of employees hired in 2004 replaced employees leaving voluntarily from their place of work.

According to some key informants, a few firms poach the most experienced workers from other firms. Interviews also support the view that suppliers and contractors generally have employees with a lower level of experience in mining-specific occupations than employees working for minerals and metals firms. Consequently, fewer experienced employees are available to provide in-house mentoring and training. This situation leads in part to a deficiency in skills attainment by the existing workforce, and supplier and contracting firms report having difficulty hiring workers with adequate skills.

The cost of training is a significant barrier for most suppliers and contractors, especially the smaller firms that operate on a short-term contractual basis with minerals and metals industry employers. With industry employers increasingly outsourcing exploration and production-related activities, the limited supply of qualified personnel, combined with insufficient provision of training or upgrading of skills by suppliers and contractors, could have serious future implications for the industry's human resources.

CHAPTER 6: HUMAN RESOURCE PLANNING, RECRUITMENT AND RETENTION

Given the current and future demand for workers in the Canadian minerals and metals industry, an important element of the research was to assess how the industry plans for human resource needs, and to identify opportunities that would enhance recruitment and retention efforts. The researchers collected information through an employer survey, interviews with human resource and other managers and, to a lesser extent, focus group discussions.

The results presented in this chapter also address specific methods and initiatives to recruit employment equity groups, including women, Aboriginals and immigrants. To provide an employee perspective of "what works" when recruiting people to work in the industry, the chapter also provides information on what attracted current employees to the minerals and metals sector, and how youth perceives the industry. In addition, to provide insight into what could influence recruitment and retention, the researchers explored factors that affect the industry's employee satisfaction.

6.1 Human resource practices

Human resource planning is important in all businesses, and finding employees with the appropriate mix of skills can be expensive and time-consuming. Successful human resource planning entails numerous elements: assessing current human resource and skill requirements; forecasting future needs; implementing attraction, recruitment and retention strategies; and training and professional development. All of these factors are necessary for identifying, attracting and recruiting employees at the appropriate time. Clearly identified career paths and proactive workforce planning are important to retaining the workforce.

The "boom and bust" cycles that characterize the industry's economic environment present some fundamental challenges to human resource planning. Because the need for employees fluctuates with commodity prices, employers tend to take a reactive approach to human resource planning. Employers who participated in the research observed that short-term planning is the industry's main approach to human resources, although it is recognized that this short-term approach is not universal in the industry.

6.1.1 Partnerships Between Industry and Aboriginal Communities

Firms that have a history of aboriginal inclusion in their workforce, such as Cameco Corporation and Areva Group's Cogema Resources Inc. are well aware of the need for long-term human resource planning. Cameco Corporation, for example, has formal relationships with approximately 20 Aboriginal communities in northern Saskatchewan—many of these have been in place for as long as 20 years. Impact Benefit Agreements (IBAs) are examples of the formal agreements made between firms and the Aboriginal communities. The agreements are not always available for public scrutiny but their cornerstones are based on employment capacity building, skills development and sustainability.[62]

62 A list of formal agreements between mining firms and Aboriginal groups is contained in Appendix E.

The match between these firms' human resource requirements and the skills available from the workforce of the local Aboriginal communities is a crucial consideration for these companies when they develop their human resource plans. In essence, Cameco and Areva Cogema work together with the Aboriginal communities and provincial and federal governments to manage the development of their own labour force. Multi-Party Training Agreements have been in place for approximately 13 to 14 years. To ensure development of a trained workforce, these firms typically engage in very long-term planning processes.

6.1.2 Workforce Planning

Survey respondents were asked to indicate the extent to which they plan for various occupational groups. The results are presented in Figure 6.1.

Figure 6.1: Planning Strategy by Occupational Group (2005)

Occupation	Current year	2-3 years	4-5 years	6-10 years
Physical Scientists (n=27)	59.3%	29.6%	7.4%	3.7%
Engineers (n=41)	51.2%	34.1%	9.8%	4.9%
Technologists/ Technicians (n=39)	64.1%	25.6%	10.3%	0.0%
Supervisors (n=44)	54.5%	36.4%	6.8%	2.3%
Skilled Trades (n=39)	51.3%	35.9%	12.8%	0.0%

Source: *Prospecting the Future* Employer Survey

The results suggest that, in general, the majority of workforce planning is for the current year, and seldom extends beyond three years. Information collected in the key informant interviews supports the survey results. For example, a major Ontario employer noted that human resource planning at his operation is "budget-driven" and done annually. Some firms take a three-to five-year overall approach, but review needs yearly.

A British Columbia employer noted that successful human resource planning relies on "early identification of key successors and active development of these individuals well in advance of recruitment of the incumbent." Another key informant remarked that "When you need them the least, you [should] want them the most."

Given the retirement forecast over the next five- and ten-year periods, changing to a more proactive approach to workforce planning should assume a greater priority for mining employers.

6.1.3 Diversity Policies

The research team also used the surveys and key informant interviews to identify issues related to human resource diversity policies to engage specific equity groups, particularly immigrants, women and Aboriginal workers. The findings are highlighted in the following material.

Recruitment of Immigrants

As discussed in Chapter 4, only 0.5% of new immigrants who arrived in Canada in the last five years and are in the labour force are employed in the minerals and metals industry. Many key informants felt that, at present, the industry should not actively recruit immigrants —at least until it is certain that the industry has engaged the Canadian labour force to its maximum potential. Among the survey responses, which reflected the same beliefs, only two respondents indicated that their firm recruited immigrants as part of their human resource planning process.

Challenges associated with introducing workers from other countries included not only language barriers, but recognition of foreign certifications and training. Most informants interviewed noted that recognition of foreign credentials can be a factor if recruiting outside of Canada. In one example, an immigrant mining professional with over 20 years' experience had to wait several years before his credentials were recognized.

Language competency can also be a significant factor for an immigrant's professional certification. Most immigrants choose to settle in large urban centres where there are more community supports and greater cultural diversity. In addition, key informants also noted concerns with respect to cultural differences in terms of adapting to Canadian work sites.

Recruiting Women

Like other industries and occupations, the minerals and metals industry faces significant challenges in attracting women into their respective workforces. Consequently, women are under-represented, with only some 5% in production-related jobs. As noted by Espley, Francis and Castonguay in a recent article, "History has shown that the hardrock mining industry is not a typical workplace for women."[63]

While the post-secondary education system has made significant recruitment efforts to attract women into disciplines traditionally dominated by males, these efforts do not extend themselves into the workforce. A few employers interviewed did note that while the number of women is increasing in some occupations, such as geology, few women work in mines.

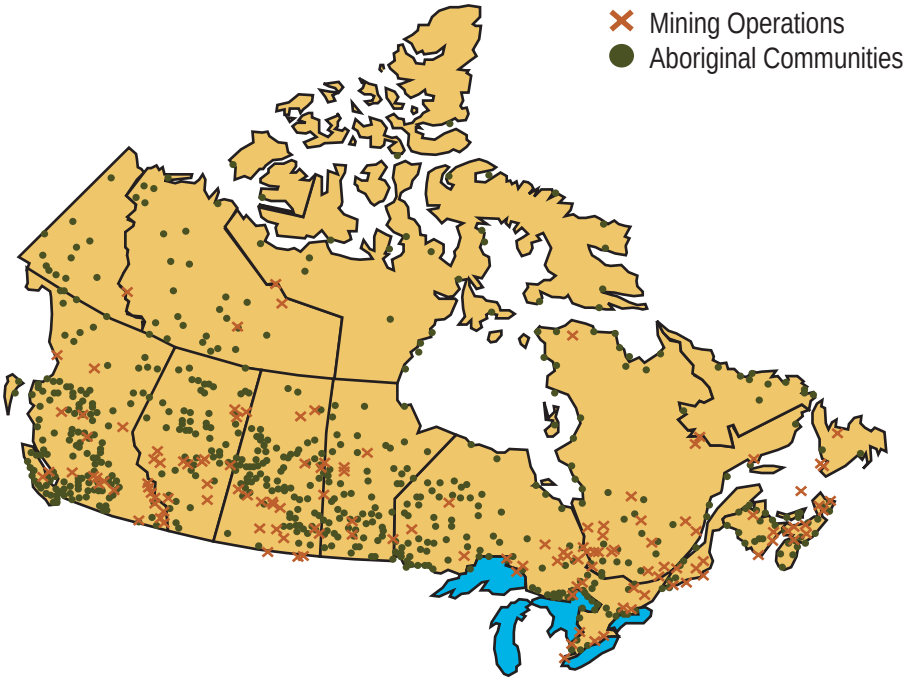
When asked if their firms have any policies in place to recruit women; 14.6% of the survey respondents reported affirmatively. During key-informant interviews, some employers noted that it can be difficult to interest women in the industry. However, the female labour force has begun to change its attitudes towards the minerals and metals industry—a change that some respondents suggested the industry should consider promoting.

63 Espley, Francis and Castonguay. Hardrock Mining and the Evolution of the Roles of Women, p.1. http://laurentian.ca/wise/0286_fullpaper.pdf

The Aboriginal Labour Force

The minerals and metals industry has begun to recognize the Aboriginal labour force as an important human resource, especially for firms with operations located in remote areas of the country. Figure 6.2 shows all Aboriginal communities and mining operations: the dots represent Aboriginal communities, and the crossed shovels, mining operations.

Figure 6.2: Mining Operations and Aboriginal Communities



Source: NRCan, Aboriginal Communities and Minerals and Metals Activities.

Ten (20.8%) of the employers who responded to the survey indicated that their firms use an Aboriginal human resource strategy. Most of these firms have active operations in Saskatchewan, British Columbia and the Northwest Territories.

Hiring members of local Aboriginal communities is a trend in new developments (e.g., Voisey's Bay in Newfoundland and the diamond industry in the Northwest Territories). There are also long-standing relationships between the industry and the Aboriginal communities of northern Saskatchewan (e.g., the Dene Nation) and some First Nations in British Columbia (e.g., the Tahltan Nation). Two of the five case studies included with this report examine the well-established relationships that exist in these communities: one in northern Saskatchewan and one focused on the newly developing relationships at Voisey's Bay.

Mining companies in northern Saskatchewan hire locally and give preference to workers from northern Saskatchewan. For example, Cameco's northern employment strategy has substantially

increased the percentage of northern and Aboriginal employment. Almost 50% of all new hires since 1992 have been people of Aboriginal ancestry. Approximately 450 Aboriginal employees represent 45% of Cameco's site operations workforce. However, there is a severe shortage of skilled workers to fill occupations above the entry- and semi-skilled levels. At present, the local labour force alone cannot meet industry demand. The skills issue is covered in greater depth in Chapter 7.

In northern Saskatchewan, all mineral surface leases require the lessee to prepare and submit annual forecasts of economic opportunities for northern suppliers of goods and services. Lessees must also agree to enter into a Human Resources Development Agreement with Saskatchewan Education to establish guidelines and principles for maximizing employment and training opportunities for northerners. Furthermore, they must agree to submit annual human resource plans that identify recruitment, training and employment practices, project present and future labour and skill requirements, and must also submit quarterly employment statistics.

As part of the case study in northern Saskatchewan, informants with a history of working in industry-Aboriginal partnerships identified many key elements of a successful relationship between the mining establishment and local Aboriginal communities. These elements included:

- Persistence on the part of the firm and a commitment to the Aboriginal communities to develop and maintain these relationships;
- Ensurence that the relationships remain non-politicized;
- A clear division between community leadership and business developed in the community: the business had "to be run by business rules and principles";
- Company willingness to provide benefits back to the community through capacity-building and development of a sustainable workforce and economic environment; and
- Relationships built on the premise of mutual respect and "a sensitivity to culture."

In these types of relationships, it is critical that each partner understands the other and that partnerships be built on beliefs that are agreed to by all parties.

The knowledge base that has been built upon the successes and failures of developing relationships between mining firms and Aboriginal communities is a valuable resource to the minerals and metals industry and provides a critical advantage over other industries that do not have the same experiences. This was recognized at the Aboriginal–Mining Industry Round Table that took place in March, 2004 in Edmonton, Alberta. The meeting provided a forum to share experiences, best practices and lessons learned, as well as identify future goals in the development of relationships between the industry and Aboriginal communities in Canada.

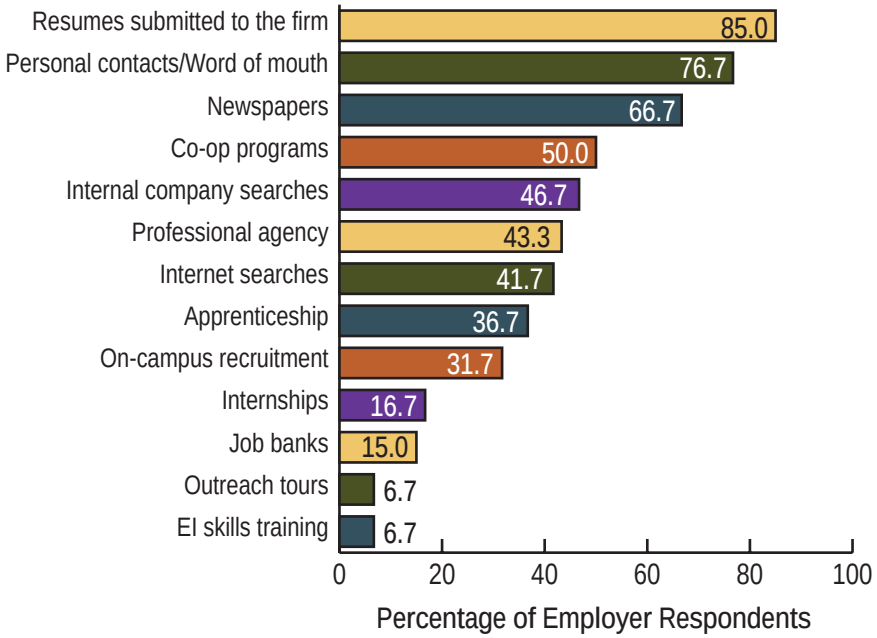
"The [Round Table] underscored the importance of early and ongoing dialogue throughout the mine cycle as vital to developing relationships. When Aboriginal communities are engaged and empowered from the start of the mining process, they are better able to define their involvement and be part of the decision making process. Sustained commitment and leadership by industry senior management is, in all instances, a prerequisite for success, as is strong Aboriginal leadership . . ."[64]

Despite the progress that continues to be made by some firms in working with local Aboriginal communities, a number of representatives from the MMISSSC noted that there are less remote areas in Canada with long-standing operations that have not made any strategic effort towards engaging the local Aboriginal workforce.

6.1.4 Recruitment Practices

The survey asked employers to identify and rate the effectiveness of each of their recruitment strategies. Survey respondents cited the review of résumés submitted to the company as the most common type of recruitment method used (85.0%), followed by personal contacts or word of mouth (76.7%). While these top two methods are passive forms of recruitment, some of this activity may be a secondary effect of other, more-proactive forms of recruitment. Newspaper or trade journal advertisements were also used by many respondents (66.7%). Figure 6.3 summarizes the industry's recruitment methods.

Figure 6.3: Recruitment Methods Used Frequently by Employers (2005)



Source: *Prospecting the Future* Employer Survey (n=56)

64 Mining Association of Canada and Canadian Aboriginal Minerals Association, Aboriginal – Mining Industry Round Table Report, 2004, p. 1.

Respondents were asked to rate the effectiveness of their firms' recruitment practices as "good, average or poor." The most highly rated methods were co-op programs (76.7% of users rated these as good) and apprenticeship programs (72.7% of users rated them as good). However, these methods were used by 50% or less of those surveyed. In contrast, word-of-mouth or personal contacts were cited as popular recruitment methods, although not quite half (47.8%) of the respondents rated this method as effective (the remaining half gave word-of-mouth an average rating. The methods rated least effective were Internet searches and job banks.

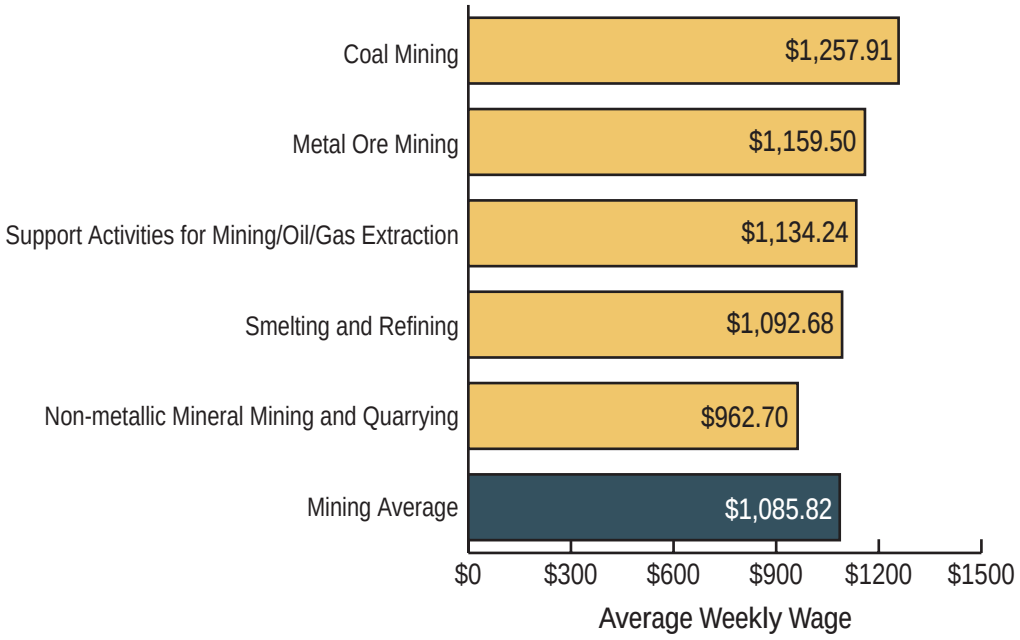
Human resource managers confirmed during interviews that word-of-mouth staff recruitment is a long-standing practice. Similarly, many interviewees noted that "poaching" from other mining firms was another popular way to recruit.

Obviously, the industry's recruitment efforts are somewhat informal and network-based. While these methods may have worked in the past, it might be time for the industry to re-examine these tactics and introduce more structured and organized approaches to recruitment.

6.1.5 Compensation and Benefits

Given that the average weekly wage in the minerals and metals industry is $1,085.82, remuneration and benefits could be an important attraction or recruitment factor. Compensation is highest in coal mining, at $1,257.91 per week, and lowest in non-metallic mineral mining and quarrying activities, at $962.70 per week. Figure 6.4 provides a breakdown of average weekly earnings by key mining activity.

Figure 6.4: Average Weekly Earnings in the Minerals and Metals Industry (2003)

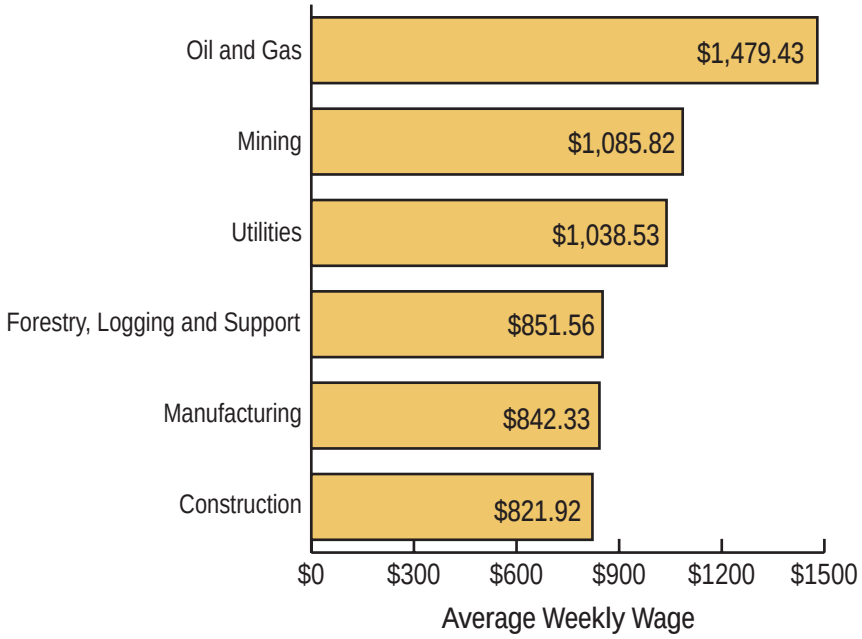


Source: Statistics Canada as reported in *Mining Facts and Figures,* Mining Association of Canada; and Labour Force Survey (LFS) 2003 (for NAICS 2131)

Wages in the minerals and metals industry— especially coal and metal ore mining—are very competitive. Employees in these areas earned considerably more in 2003 than staff in almost all other sectors. As Figure 6.5 illustrates, mining employees earned more than their counterparts in utilities, forestry, manufacturing and construction.

A high percentage of employee survey respondents (93.8%) cited compensation packages as important in their decision to work in the minerals and metals industry. Furthermore, many firms offer their employees production bonuses in addition to their regular wages. Incentive programs, (such as an employee reward or bonus program) were provided by 85.7% of employers in the survey. Such programs were also cited as factors in job satisfaction by almost to two-thirds (60.3%) of the survey respondents.

Figure 6.5: Average Weekly Earnings in the Minerals and Metals Industry and Competing Industrial Sectors (2003)



Source: Statistics Canada as reported in *Mining Facts and Figures* and LFS (for oil and gas, and utilities)

The industry's relatively high average salaries could be related, in part, to long-term employment of many of the industry's employees. Results from the employee survey suggest that (at the time of the survey) an average employee had worked for his or her employer for 10 years, and in the industry for an average 17.5 years. Typically, it could be expected that the "average" salaries reported above would be closer to top earning levels within the occupation, if the worker has a longer period of employment (as is the case in the industry, due to more senior employees).

Despite the competitive wages offered in parts of the minerals and metals industry, oil and gas employees were the highest paid among the occupations considered ($76,930 average annual base salary), followed by employees in coal mining ($70,886), metal ore mining ($59,273) and utilities ($54,004). The study used employer survey data to determine the average annual starting and base salaries by occupational group. Figure 6.6 provides a summary of average salaries by occupational group and average number of hours worked per week.

Figure 6.6: Average Annual Salary and Hours Worked by Occupational Group (2005)

Occupation	Average Starting Annual Salary	Average Base Annual Salary	Average # of Hours Worked/Week
Physical Scientists & Engineers	$53,625	$69,758	42.6
Technologists, Technicians & Related Occupations	$45,323	$54,025	46.2
Skilled Trades	$54,978	$58,632	46.9
Semi-Skilled Occupations	$51,361	$57,527	46.9
Transportation & Material Moving	$51,5055	$56,289	47.8

Source: *Prospecting the Future* Employer Survey n=48. Income data by occupation provided by employers was weighted by the number of employees reported in each occupational category.

In addition to competitive wages, the industry typically offers its employees substantial benefits. Among employers who provided data on benefit packages, 86.5% indicated that they provide non-support staff with health insurance coverage, such as extended health and dental benefits.

Most employers offer stock options (80.6%); reimbursement of costs for educational programs (79.3%); relocation funding (74.3%); and in-house training programs (73.3%). Figure 6.7 details the frequency with which employees are offered various benefits.

Figure 6.7: Percent of Responding Firms Offering Programs and Benefits (2005)

Program/Benefit	<100 Employees (n=23)	100+ Employees (n=16)	Average (n=39)
Health Insurance Coverage	76.2%	100.0%	86.5%
Stock Options/Purchase Plan	78.9%	81.8%	80.6%
Leave/Reimbursement of Educational Costs	66.7%	92.3%	79.3%
Relocation Funding	52.6%	100.0%	74.3%
In-house Training Programs	64.7%	91.7%	73.3%
Parental Leave	37.5%	91.7%	58.6%
Pension Plan	26.3%	100.0%	55.9%
Production Bonus	35.3%	63.6%	48.3%
Lifestyle/Wellness Program	13.3%	53.8%	31.0%
Signing Bonus	0.0%	27.3%	11.1%

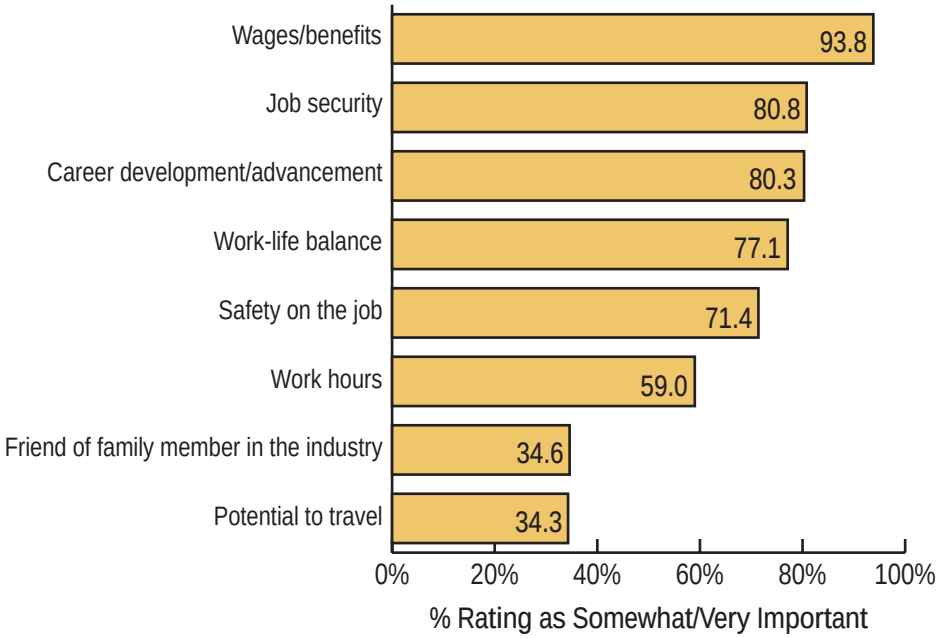
Source: *Prospecting the Future* Employer Survey (n=39)

Firms with fewer than 100 employees are significantly less likely to offer programs and benefits than firms with more employees. Nevertheless, between two-thirds and four-fifths of the smaller firms offer a range of benefits, including health insurance; stock options or purchase-plan benefits; or leave or reimbursement for educational and in-house training programs.

6.1.6 Factors Attracting Workers to the Minerals and Metals industry

Employees were asked to rate the importance of various factors in their decision to work in the industry. The results appear in Figure 6.8.

Figure 6.8: Factors Important to Decision to Work in the Minerals and Metals Industry (2005)



Source: *Prospecting the Future* Employee Survey (n=694)

The survey revealed that for employees, wages and job security are the two most important factors when considering a career in the minerals and metals industry. The least attractive factor was the potential for travel. This finding is interesting when compared to some of the comments made during interviews and in focus groups.

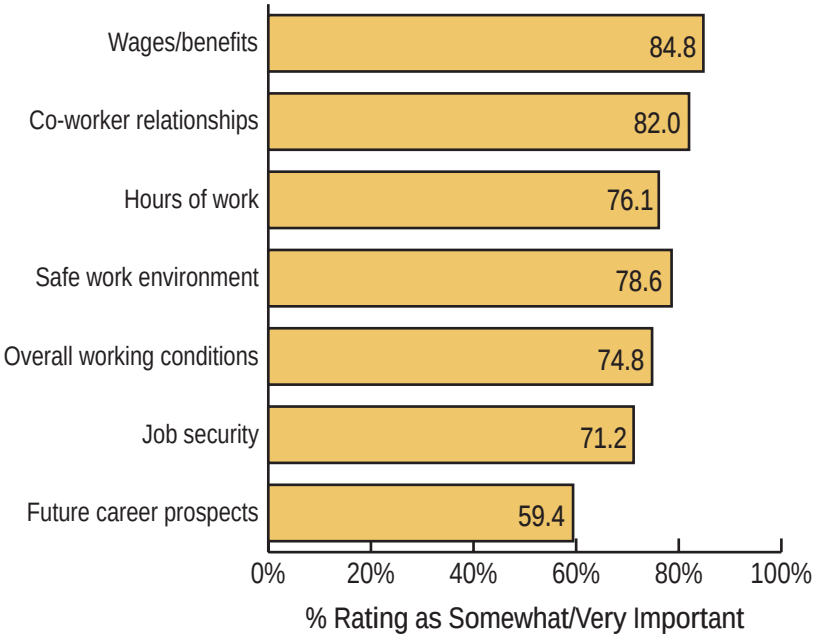
Some employers warned that it could be difficult to recruit people to jobs in Canada, when there were so many more "exotic" places work. Conversely, some focus group participants suggested that the opportunity for travel would be something attractive to them or others contemplating a career in the industry. The disparity suggests a generational difference in attitudes towards the willingness to travel for employment. This explanation is supported, in part, by the low mobility of employees in the workforce reported in Chapter 3.

6.1.7 Retention Strategies

Surveyed firms reported no formal retention strategies beyond offering a competitive compensation and benefits package. Two likely reasons: first, employees tend to stay with an employer for a number of years, and second, in a cyclical industry, employees are often laid off during a downswing in the business cycle. However, retention will become a critical element of human resource planning in the face of growing competition from the oil and gas industry, development of the diamond industry, other mine developments and expansions, and a predicted outflow of experienced workers over the next 10 years due to retirement. Overall, the research results suggest that workers in the minerals and metals industry are generally satisfied with their employment,

which bodes well for retention, since satisfied employees are less likely to leave. Of the employees who completed the survey, less than 10% were dissatisfied with the overall work environment. Figure 6.9 highlights the survey respondents' level of satisfaction with respect to the top seven factors of their employment.

Figure 6.9: Satisfaction with Employment in the Minerals and Metals Industry (2005)



Source: *Prospecting the Future* Employee Survey (n=694)

Given the relatively high compensation earned by industry employees, it is not surprising that wages and benefits received the highest levels of satisfaction. Employees were also satisfied with their work hours. Another interesting finding is that, contrary to the general public's negative perceptions about safety, employees reported relatively high levels of satisfaction with the safety and working conditions of their work environments. In fact, when asked if they would recommend the minerals and metals industry to a friend or relative as a career choice, 72.8% of respondents answered yes. These findings could be promoted to attract more men and women to a career in the industry.

Retention of the population is a different attraction factor for helping companies to ensure sufficient population to staff the minerals sector (although this would be a government initiative). The Québec Mining Association has proposed a review of certain measures designed to retain the population in mining regions. The objective: to address the cyclical nature of the mining industry, its location in outlying regions, its workforce mobility and the need for new workers. Training and tax relief proportional to the remoteness of a given location are among the options being considered.

6.2 Challenges to recruitment and retention

Results from multiple lines of evidence suggest that the industry faces some key challenges to recruiting individuals to the minerals and metals industry. The following section summarizes some of the major issues to be addressed.

6.2.1 Competition for Workers

There is evidence that competition for labour is a serious consideration for the minerals and metals industry in terms of recruitment and, increasingly, retention. Poaching workers occurs at all levels: within the industry between employers; across sectors (particularly oil and gas); and internationally. Most interview participants indicated that the industry's main competitor is the oil and gas industry, which typically pays higher wages and offers better benefit packages. Employers in Ontario also noted that the hydro electricity sector is a major competitor for workers in that province.

It is becoming increasingly important not only to retain people in the industry, but to make Canadian operations as attractive as opportunities in other countries. For example, in a recent interview,[65] Dr. Malcolm Scoble of the University of British Columbia noted that Canadian mining graduates are in such high demand that Canadian companies face fierce competition with firms globally. Undergraduates as well as graduate students are now being actively recruited by companies worldwide.

6.2.2 Awareness and Perceptions of the Industry

Both the public's and young people's limited awareness of, and inaccurate perceptions about the minerals and metals industry are widely recognized by all stakeholders as critical challenges to attracting workers to the industry. As one educator stated: "the minerals industry in general is not present in the daily life of the general public compared to other well-known industries."

As a result, there is a need for marketing tools and a media program (such as the one implemented by the petroleum industry) to generate awareness of, and interest in, the minerals and metals industry. As one educator suggested, marketing tools should be made available to mining program instructors to assist their efforts in raising awareness of the industry as a career option.

When the study's research team consulted young people during a focus group in Vancouver, they found little or no awareness of the minerals and metals industry as a career option. However, they also noted that the only time that mining was mentioned in school was during social studies and that this only mentioned the industry as it was 50 or 60 years ago.

Similarly, other individuals who participated in the research were unanimous that the general public—and youth in particular—were unaware of how the minerals and metals industry has changed. There was general agreement that schools did not expose students to career opportunities in the trades, and generally, employees felt that little attention was paid to work going on in the sector among the general public until there is an accident—whether in Canada or abroad.

65 Vancouver Sun. Metals Boom Puts Premium on UBC Mining Grads. April 20, 2005.

Graduates of mining programs gave mixed reasons for what had attracted them to the industry including travel and general interest in the subject. Employees noted the camaraderie and "fun" associated with the business (which is supported by satisfaction ratings in the employee survey) and stipulated that the industry is attractive to a certain kind of person, one who has to "suit" the industry.

Research participants suggested a number of ways to promote the minerals and metals industry to youth and the general public, including:

- Advertising in electronic/television media to target youth audiences.
- Promoting awareness of the link between consumer products and their reliance on the industry.
- Avoiding the "dark and dirty" stereotypical image—"take the miner out of the mine."
- Promoting the focus on safety in the industry: its good safety record and the high level of safety standards.
- Promoting the sector in schools through career fairs and presentations from younger workers; and providing career-planning courses.
- Being present at university career events, especially in mining-related centres.
- Providing teachers and guidance counsellors with more information about the industry to increase their and their students' awareness.
- Promoting the "health" of the sector (e.g., employment/job inventories) to students even in downturns to maintain interest and enrolments. As noted by one university professor, "Students gauge the health of the minerals sector by their ability to gain employment."

6.2.3 Commuter Operations

In the past, mines had adjoining towns solely to accommodate miners and their families. However, changes in mining and transportation technology, public policy and social and physical standards in town-development have led to the abandonment of the mining town model in favour of commuter mining. No new mining towns have been built in Canada for over two decades.

Commuter mines are operations to which employees travel long distances by car, bus, vessel, or more commonly, by air.[66] When working, employees live at the work site with meals, accommodation, and transportation provided by the employer. Typically, employees are flown into the mine site for from one to four weeks, then flown back out for a similar period of time. While at the site, employees work long hours to make up for the time off outside the operation.

66 Costa, S. Quality of Life in Mine Camp Communities. Improving Workforce Well-being. Doctoral Thesis (on-going)

The benefits and challenges of commuter mining deserve closer attention, particularly now that commuter mining has become the dominant approach to new developments in Canada, and are regarded by many as critical to the future of the Canadian North. Yet one-quarter of employees surveyed regarded traveling to remote locations for work as a negative factor that affected job satisfaction.

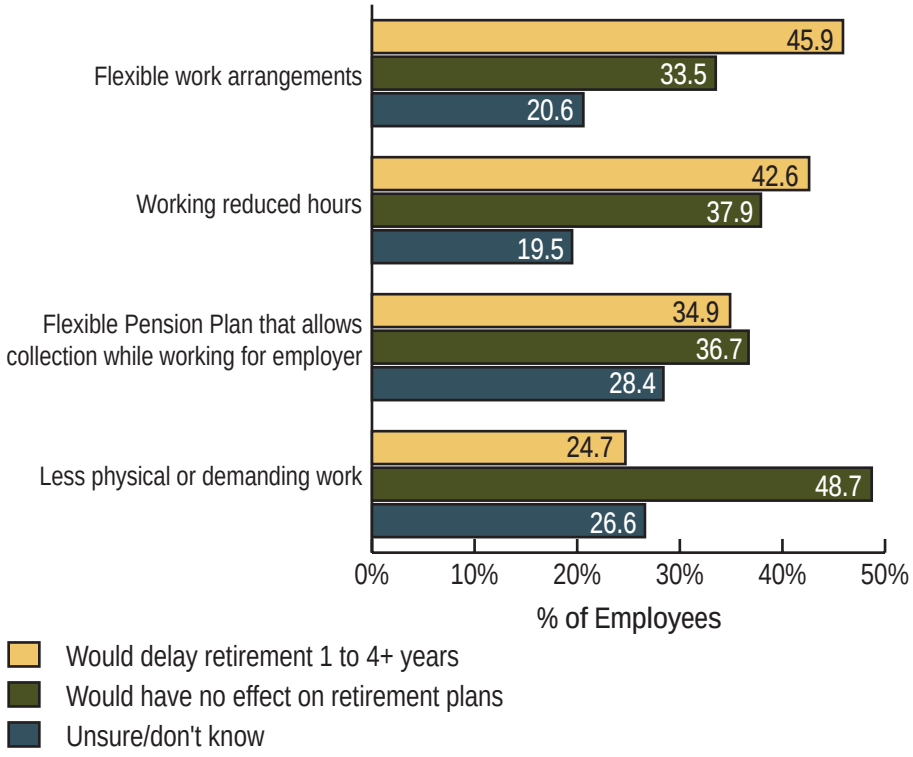
The Barrick Gold Corporation has adopted a unique approach to commuter mining that addresses some of the challenges faced by employees and their families, as well as retention issues associated with commuter mines. The Eskay Creek mine in British Columbia has pioneered a program that makes a counsellor, the Social Development Coordinator, available to employees and their families to help them cope with the issues associated with constant separation and reintroduction. ***Appendix F*** contains a case study about this program.

6.2.4 Potential for Post-retirement Retention

Employees were asked to indicate the extent to which factors would encourage them to remain in the industry beyond retirement eligibility. The rationale was that if skilled and experienced employees remained in the workforce a while longer, their presence could help to ease the transition that an influx of new workers would require. The measure would also mitigate any skill gaps that could emerge or worsen with the departure of the older workforce from the industry.

Figure 6.10 shows that the proportion who would be influenced to work past their eligible retirement date varied from 45.9% if the employer were to offer flexible work arrangements such as job sharing or working a compressed work week, to 24.7% if they were offered less physical or demanding work. Working reduced hours was also a concept supported by 42.6% of respondents as a way to encourage staff to delay their retirement. Interestingly, a high proportion of employees were unsure as to whether such changes would influence their decision to postpone retirement. Analysis of the data also indicates that for a significant proportion of employees (25.9%), none of the identified options would encourage them to remain in the mining workforce beyond eligible retirement.

Figure 6.10: Potential Accommodations – Effect on Retirement Plans (2005)



Source: *Prospecting the Future* Employee Survey (n=694)

Key informants and participants in focus groups noted that it was difficult to encourage production-related employees to work beyond eligible retirement due to the limited financial benefits. In addition, the physical nature of many positions also contributed to the lack of interest in staying on. Research participants did cite some accommodations that could encourage them to remain longer. These incentives included:

- Flexible work arrangements (i.e., summers off, 4-day week or other modified work schedule);
- Elimination of the need to constantly travel to the work site (i.e., not interested in working in fly-in/fly-out operations); and
- Emphasis on training and mentoring activities, versus strictly production-related tasks.

Employees were also asked about how long after eligible retirement they would continue to work in the mining sector. More than three-quarters (76.8%) of decided employees stated that they would not work for their current employer past the date they qualified for retirement. A further 18.0% stated that they would work for their employer for up to five years past the eligible date, and 5.2% would stay six or more years. Figure 6.11 summarizes how long after retirement employees would be willing to work by occupational group and type of operation. Individuals in skilled trades,

transportation/material moving occupations and mining production operations are least likely to continue working. Results also suggest that there could be opportunities to retain some workers for a few years past retirement, especially in the physical science and engineering occupations, as well as in technical occupations.

Figure 6.11: Willingness to Work Past Retirement by Occupation and Operation (2005)

	Will Not Work Past Retirement	Will Work Up To 5 Years	Will Work More Than 6 Years
Occupational Group			
Physical Scientists/Engineers (n=188)	73.4%	21.3%	5.3%
Technologists/Technicians (n=69)	72.5%	20.3%	7.2%
Skilled Trades (n=126)	81.7%	15.1%	3.2%
Semi-Skilled and Mining Occupations (n=131)	77.1%	16.0%	6.9%
Transportation/Material Moving (n=33)	81.8%	15.2%	3.0%
Type of Operation			
Exploration (n=47)	72.3%	21.3%	6.4%
Mining (n=242)	81.0%	14.0%	5.0%
Smelting/Refining (n=186)	72.0%	23.7%	4.3%
Mining and Exploration (n=22)	72.7%	27.3%	0.0%
Mining and Smelting/Refining (n=35)	80.0%	8.6%	11.4%
Survey Average (n=561)	76.8%	18.0%	5.2%

Source: *Prospecting the Future* Employee Survey. Note that individuals who were undecided or had missing information were excluded.

Employees eligible to retire within 10 years were also asked if they would consider working in the mining sector as independent contractors. Only a small proportion (15.5%) replied affirmatively, while 48.6% expressed disinterest in contract work and a further 35.9% were undecided about pursuing contract opportunities.

While the survey results indicate that there is limited opportunity to retain retiring staff past their expected retirement date, employees and managers consulted as part of focus groups described delayed retirement as a "stop-gap" solution. Employers felt that retirees could help to bolster the contractor community for a period of time, but that employers gained only a two-to-three-year employee, rather than a ten-year employee. The general consensus among employees consulted as part of focus groups was that few wanted to work past age 60, largely due to the physical nature of some jobs, and to the marginal increase to income (when pensions are adjusted).

Union representatives interviewed as part of this study believed that, due to potential health risks, the industry should not implement programs to extend employment beyond eligible retirement dates. Programs designed to encourage post-retirement employment would probably generate opposition from unions.

6.3 Human resource implications

The results of the research suggest that human resource planning in the minerals and metals industry tends to be too reactive and budget-driven, and that it lacks a long-term vision of what will be required to meet industry demand in the face of labour shortages and increased competition for workers.

The emerging gap between supply and demand will likely worsen over the next decade. This calls for a change in the corporate mentality from the short-term to the longer-term to meet its human resource needs. In addition, the industry should consider a more united approach to its human resource practices, such as sharing resources among firms rather than stealing from each other to keep employees within the industry, especially during low production times.

Although the industry faces some unique challenges, the research revealed a number of opportunities that the industry could pursue.

- **Increased Public Awareness and Knowledge of the Industry**

  Improve the public's perception of mining with accurate information about the modern industry. Ensure that an accurate description of the industry is presented to youth in their curricula and/or through direct involvement of the industry. For example, the industry could promote its track record and employee satisfaction with workplace safety, as well as its respected position at the global level. Another public message could be focussed on how mining affects Canadians' daily lives. For example, "If it's not grown, it's mined" would underscore the importance of the industry.

- **Capitalize on the Positive Factors of a Career in the Industry**

  Employees noted a number of positive attributes that attracted them to their career choices. Similarly, students graduating from mining programs cited a number of features that attracted them to their field of study. All of these factors could be exploited by the industry as part of a campaign to promote the industry as a career option to youth.

• Increase Labour Force Diversity

According to a study conducted by the Conference Board of Canada, visible minorities will play an increasingly important role in Canada's labour force. The study projects that almost 18.4% of the labour force, or one in five workers, will belong to a visible minority group by 2016.[67] The report recommended that industries create an environment "that welcomes visible minorities and that builds on the skills and talents of an ever-increasingly diverse workforce."[68] It will also be important to attract new Canadians— especially those with skills above entry level—to the labour force.

• Continue Working with Aboriginal Communities

Given the likely development of remote mining operations in close proximity to Aboriginal communities, development of an effective Aboriginal human resource engagement strategy could be of considerable importance to the industry. The strategy could build on the experiences of operations and firms that have developed relationships with the local Aboriginal communities.

• Be Competitive to Attract Workers from Abroad

And finally, as one industry representative pointed out, perhaps the Canadian industry could better promote itself to workers overseas as an "exotic" place to work.

67 The Conference Board of Canada. Making a Visible Difference: The Contribution of Visible Minorities to Canadian Economic Growth. April 2004. P.3
68 ibid.

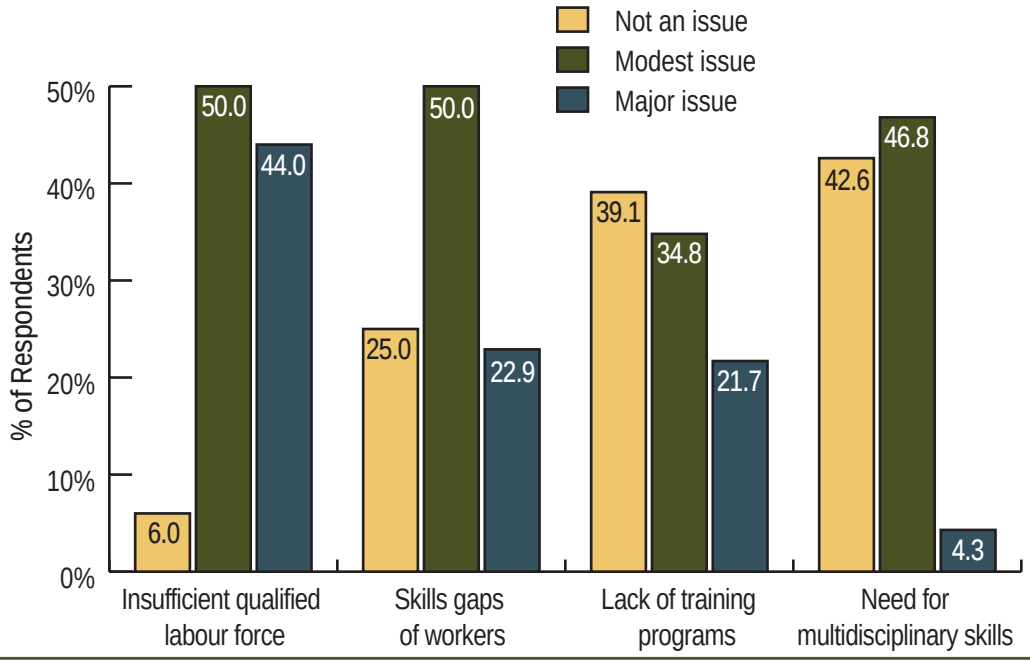
CHAPTER 7: SKILL REQUIREMENTS, EDUCATION AND TRAINING

In addition to identifying the Canadian minerals and metals industry's human resource profile and supply-and-demand gap, the research team also reviewed its skill requirements. The research assessed whether the education and training system was meeting the industry's current and future skill needs, and also asked post-secondary institutions to comment on the issues and challenges that educators face in providing mining and metallurgy programs. The researchers supplemented information from interviews and focus groups with findings from other research sources to provide supplementary and contextual information.

7.1 Industry Skill Needs

Employers were asked about the extent to which the industry's skill needs are being met by current workers and the available labour force. Figure 7.1 highlights their responses.

Figure 7.1: Skill Gap Issues Identified by Employers (2005)



Source: *Prospecting the Future* Employer Survey (n=56)

Respondents identified insufficient preparation and motivation of high school students as two factors that produce gaps in education and training. Specifically, they cited a lack of basic numeracy and literacy skills among high school graduates—a gap that both educators and employers saw as critical—although one that is beyond their respective abilities to control. Industry stakeholders also noted that there is a need to more aggressively support and promote earth sciences at the high school level as a core subject. Currently, few jurisdictions offer earth science as part of the high school curriculum, which hinders student awareness of career options in the industry prior to commencing post-secondary studies.

Figure 7.2 summarizes employers' perceptions of the skill gaps in particular occupational groups.

Figure 7.2: Skill Gaps Experienced by Employees by Occupational Groups (2005)

Occupational Group	% Identifying Skill Gap	Description of Gap (employer comments)
Physical Scientists	9.5%	•writing skills/communication •general people management and leadership •field experience
Engineers	20.9%	•pyromet skills; crushing and mining techniques •general people management •writing skills/communication
Technicians/Technologists	26.2%	•new equipment/continuous up-grading of skills •pyromet skills; crushing and mining techniques •supervisory skills •project management •writing skills/communication
Supervisors	32.5%	•leadership, supervisory and conflict resolution skills •communication •management, project management, business acumen •continuous skill up-grading •technical skills; crushing and mining
Skilled and Semi-skilled Positions	26.8%	•journeyman qualifications •multiple skill sets •ability to multi-task •specific mining techniques •the technology behind the equipment; operating equipment (automation, hydraulic, electromechanical) •continuous skill up-grading

Source: *Prospecting the Future* Employer Survey (n=56)

Employers also identified education gaps in geological and environmental technology, and in radiation and chemistry technology. A few interviewees noted that training has improved in the skilled trades due to the stronger focus on apprenticeship programs. Many employers also noted that soft skills are becoming increasingly important, especially for supervisors and management. Soft skills include communication skills, ethics, socio-environmental issues and cultural awareness. These skills are often poorly developed in recent graduates, and are frequently learned on the job. While professional development courses are available, more courses are needed at the undergraduate and graduate levels.

Employers indicated that the industry also needs mining engineering graduates with better "hard skills" (i.e., practical application of knowledge). Upon graduation, students frequently lack the skill sets that the mining industry requires. In a focus group discussion, some employers pointed out that students are often unprepared for co-op placements, and typically do not go into the field until they have completed their second year of studies. Educators, in contrast, feel that firms seek out individuals with work experience in the sector, but do not give students the opportunity to develop experience by hiring them before they graduate from a mining program.

On the supply side, workers may be hesitant to seek out and pay for training or upgrading of skills when there is an uncertain return on their investment. This is especially relevant to occupational skills specific to mining, due to the cyclical nature of the minerals and metals industry. A number of human resource issues such as family pressures and mobility concerns also come into play when students and employees are considering training options. With the increase in fly-in fly-out mines, many younger workers may choose to leave the industry when the lifestyle no longer suits the needs of the family. These workers may choose not to upgrade their skills beyond a certain level, or choose to pursue training that has a broader application to other industrial sectors with more sedentary employment opportunities.

Another factor affecting the availability of skilled workers in Canada is the current upswing in the minerals and metals industry worldwide. As a result, mining students at Canadian universities are being recruited globally. Companies are investing months of effort in trying to recruit individuals to work in their operations. For example, in 2005 the entire graduating class in mining engineering at UBC received a two-week field trip to Brazil to visit mine sites and research facilities. In addition, undergraduates are being actively recruited for summer work, including first year students who have yet to take a course in mining. UBC mining department head Dr. Malcolm Scoble has pointed out that in 2005, universities across Canada will graduate about 100 mining engineers—one-third fewer than what the industry requires.[69] Of these graduates, some will inevitably accept employment in other jurisdictions.

7.1.1 Skill Requirements and the Northern Workforce

Although some companies have made substantial investments in developing the labour force in northern regions of Canada to participate in the minerals and metals industry, many firms have found that the skills sets do not meet the needs of positions beyond entry-level or semi-skilled occupations. As one survey respondent remarked, the workforce of northern Saskatchewan typically lacks the general skills required to move to a position with greater responsibility. In firms that

69 Vancouver Sun. Metals boom puts premium on UBC mining grads. April 20, 2005.

actively recruit members of northern Aboriginal communities, Aboriginal people may make up 35% or more of the workforce, but account for 80% to 90% of semi-skilled or labourer occupations. In remote operations, employees with higher skill sets are typically imported from elsewhere.

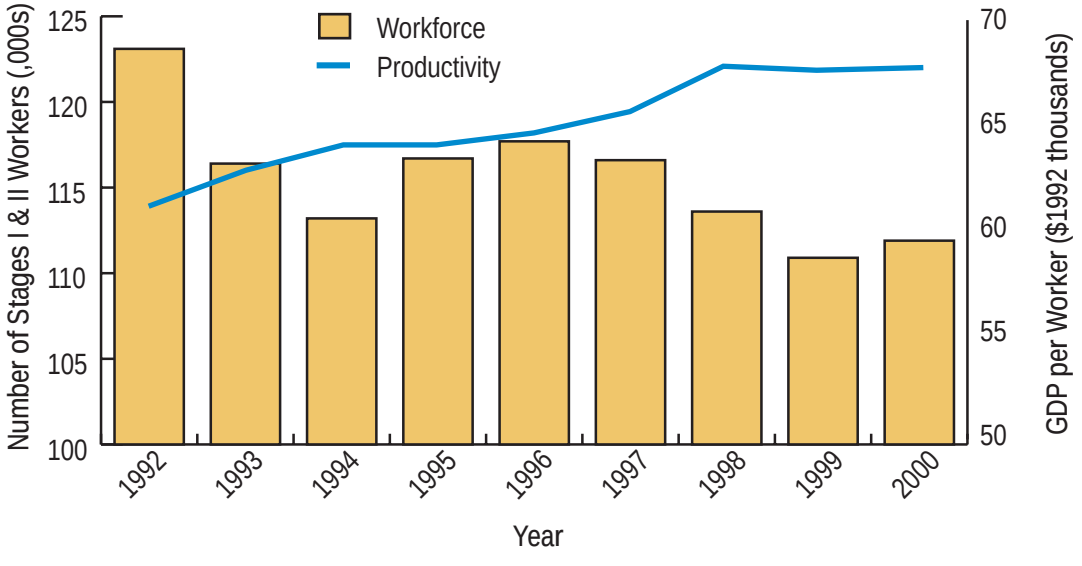
In other words, there is a growing gap between the needs of industry in the north and the skills available in the local labour force. This gap could be addressed through stronger emphasis on community-based or distance learning.

7.1.2 The Impact of Technological Change

The Canadian mining industry has become one of the most dynamic and technologically advanced industries in the world.[70] The technical leap that computerization brought in the 1970s and 1980s had a profound effect on the metal mining industry and its workforce. Since then, the Canadian industry has remained dynamic in terms of innovation and continues to be a leader in research and development.

Increasingly knowledge-based and technology-intensive, the mining industry uses sophisticated and innovative technology to reduce the inherent risks in exploration, to improve the productivity and competitiveness of mining and processing methods, and to enhance environment protection.[71] While the industry's workforce numbers have been declining for many years, productivity has continued to increase. Industry stakeholders indicated that this pattern is mainly attributable to advances in technology and innovation within the industry, as detailed in Figure 7.3.

Figure 7.3: Employment Versus Productivity – Stages I and II Mining (1992-2002)



Source: Statistics Canada; LFS

70 Global Economics Ltd., Mining Innovation: An overview of Canada's dynamic, technologically advanced mining industry, 2001.
71 The Mining Association of Canada website. Knowledge-Based Industries in the Natural Resource Sector.

Much of the remaining mineral inventories in Canada's traditional mining camps are found at depths exceeding two kilometres. For underground mining of deep ore deposits, geo-mechanical and operational challenges must be overcome. This requires the development of new technologies and new mining strategies. To achieve this goal, research into the development of tele-operated equipment, automated loading and transportation/guidance systems, and robotics technologies has been accelerated in recent years.[72] Developing technologies in the minerals and metals industry include:

- Hydrometallurgical processing;
- Ground imaging and seismic mapping;
- Robotics and remote mining; and
- Biomining[73]

As firms strive to find new ways to access deeper deposits and increase efficiency in mining from lower grade deposits, the industry continues to make important technological advances that reduce costs and increase productivity. Increasingly advanced technology, however, requires a workforce with an evolving set of skills, and access to the appropriate training to maintain proficiency in the workplace.

Currently, the metal-mining workforce's skills appear to have kept pace with the industry's continuous technical advancements. Many interviewees felt that the impact of technological change on the industry has leveled off since the huge advances that occurred 15 to 20 years ago, and did not consider technological change to be a major issue in terms of labour-force skill requirements. Less than 5% of the employers surveyed identified technological change as a major issue, while 45.7% did not consider it to be an issue at all. Close to half (47.8%) considered it to be a modest issue.

However, technological change will become increasingly important for future industry employees. Natural Resources Canada reports that miners with laptops instead of picks, working by remote control, are making tele-mining a reality.[74] By accessing deposits where it was not possible before, tele-mining initiatives may in fact create jobs and will change the kinds of jobs needed by the industry. Mines that would have previously shut down can now exploit deposits at ever-deeper depths, leading to more jobs for those who operate the technology.

Respondents who did see technological change as an issue stressed the need to update safety standards for new or upgraded technologies and pointed out that the minimum educational requirement for the mining workforce is typically set at Grade 12. Technological change also

72 Mirarco website. http://www.mirarco.org/ProjectGRCExcavating.php

73 Biomining is the use of microorganisms to extract metals and minerals from ores in the mining process. Biomining includes two different chemical processes called bioleaching and biooxidation. The bioleaching of copper, and the biooxidation of refractory gold ores are well-established large-scale commercial processes. Biomining is a more environmentally friendly way to extract metals from low-grade ores. Canadian researchers are working on developing biomining technologies optimal for the colder climate in Canada, and are seeking enhanced microbial performance in biomining processes (Government of Canada. BioPortal website. http://www.biobasics.gc.ca/english/view.asp?x=610&all=true#234 ,16 April 2005.)

74 Natural Resources Canada website. http://www.nrcan-rncan.gc.ca/mms/nmw/inno_e.htm

creates a need for individuals with multiple skill sets and interdisciplinary training, which can lead to a re-structuring of jobs and the collapse of job classifications within the workplace. As stated by a union representative, "Technology is driving the skill sets of the workers" and there is a greater integration of trades and technological skills.

The modern equipment used in mining operations requires workers to understand process control and to have the skills to operate remotely controlled equipment.[75] One key informant mentioned that a real problem facing the industry is the number of people who are looking for employment in the industry who come from families with a mining background. Many of these people have less than a high school education, and can no longer meet the minimum hiring standards set out by the industry. Conversely, technologically proficient individuals whose family members have never been employed in the industry are unaware of mining as an opportunity and consequently follow other career paths.

Evidence suggests that skill gaps may start to emerge over the next decade as tele-mining and automation become increasingly important to the viability of Canadian mines. The mining industry is now technologically advanced, and in addition to the required technical skills, needs workers with strong skills in computer technology, productive thinking, information processing, decision-making, critical and creative thinking, interpersonal and social skills, and problem-solving.[76]

7.2 Certification requirements

Certification regulations vary greatly from occupation to occupation. In the professional and technical occupations related to mining and metallurgy, workers must meet provincial requirements in each jurisdiction.

Skilled trades common to other industries (e.g., construction, manufacturing, etc.) require completion of a journeyman apprenticeship program and are generally recognized by the national Red Seal program, which permits inter-provincial mobility.

In contrast, most production mining occupations are not certified trades and therefore do not require credentials or training programs outside of what the industry provides. Respondents believe that the lack of standard credentials or requirements impedes the mobility of these workers between employers. While they see it as impeding mobility within the industry to only a certain degree, between provinces it impedes mobility to a moderate degree, and between industries, to a large degree.

When industry representatives were asked about the importance of certification or credentials for qualifying current and prospective employees, the response was that credentials were generally seen as important for production miners and for specialized positions in other operations.

Many educators and employers felt that mining should become a Red Seal trade, complete with training and apprenticeship programs. National occupational standards are essential if mining

75 Natural Resources Canada. 2002. Natural Resources Skill Colloquium. www.nrcan.gc.ca/dmo/spcb/spri/skills-competence/mms_e.html.
76 Workplace Education Manitoba website. Mining Sector – Basic Skills Needs Assessment. http://www.wem.mb.ca/ES10.htm

occupations are to become Red Seal trades. Respondents felt that occupational standards would improve the industry's image as a career option and improve workers' mobility between provincial jurisdictions.

Ontario and Quebec have legislated training requirements for mining occupations, although the training is not provided by public post-secondary institutions as part of mining programs. Ontario's Common Core training and Quebec's program for mining are modularized programs.

7.2.1 Common Core Requirements in Ontario

In Ontario, basic training for miners has been legislated by the province since the 1978 *Occupational Health and Safety Act and Regulations.* Credentialing is currently administered through the Ontario Ministry of Training, Colleges and Universities. Common Core is a short-term, competency-based modular training program that provides hands-on training and certification.[77] Common Core certification is required by all site employees at operations in Ontario.

The Ontario Ministry of Training, Colleges and Universities develops training standards for, and administers, Common Core programs for the mining industry. While students can take courses toward certification through a number of public and private training institutions, the Ministry is responsible for certifying the trainees. Programs are of varying duration and provide trainees with both on- and off-the-job training. There are seven Common Core programs in Mining:

- Common Core Underground Hard Rock Miner
- Common Core First Line Production Supervisor – Underground Hard Rock Miner
- Common Core for Basic Underground Soft Rock Miner
- Common Core for Basic Underground Diamond Drilling – Helper Level and Specialty
- Common Core for Surface Miner
- Common Core for Basic Underground Hard Rock Mine Service Types
- Common Core for Basic Mill Process Operations – Mineral Ore

The purpose of Common Core Certification Training is to provide a uniform system in which operators acquire essential knowledge of safe working practices in operation jobs.

Various public- and private-sector organizations provide Common Core mine training for companies and individuals who require the standardized modules to work in a mining environment. These include:

77 Government of Ontario, Modular Training Programs, http://www.edu.gov.on.ca/eng/training/apprenticeship/Skills/wrkfrce.html.

- Mines and Aggregates Safety & Health Association (MASHA),
- Northern Centre for Advanced Technology Inc. (NORCAT),
- Georgian College, Orillia Campus,
- 5th Wheel Training Institute,
- Health and Safety Management Group,
- Nelson Aggregate Safety Training Division,
- Utility Safety & Training Consultants, and
- Safety Matters.

Training institutions and employers often partner to provide training. To enroll in a Common Core Program in mining, trainees must be employed by a mining company, and must complete all training modules within one year of the date on which they were hired.[78]

Representatives from industry, organized labour and government have developed a document—"Modular Training Standards for the Surface Miner"—that covers criteria for the training needed to meet competency requirements for employment. The program recognizes three levels of training: basic, common-core training and two levels of credentials. There are three mandatory training modules for production employees. Employees are also required to take an additional training module relevant to their area of work. For example, a loader operator would be required to take the three mandatory modules plus the loader operator module.

Twenty-five training modules have been developed in addition to the three mandatory training modules. Employees who complete the common core training requirements plus a certain number of the remaining modules can receive the first credential level, the *Certificate of Achievement.* The second credential level, the *Certificate of Qualification,* requires completion of the first level and of the training module on explosives and blasting. All training is transferable between employers. The training itself is delivered through a number of different agencies, and includes programs for training the trainers.[79]

One industry stakeholder identified two barriers to common core training. Once training is completed, it must still be registered by the ministry, thereby creating a lag between the time workers complete the training and when they are officially certified. In addition, common core training is mandatory for working in the industry and often students must pay for the required training without any guarantee of continued employment.

78 Ontario Ministry of Education & Ministry of Training, Colleges and Universities website. http://www.edu.gov.on.ca/eng/trining/apprenticeship/Skills/wrkfrce.html

79 Aggregate & Roadbuilding Magazine. APAO seminar addresses safety and operational issues. (19 April 2005).

7.2.2 Quebec

To ensure a uniform approach and guarantee quality of training in Quebec, mining-specific occupations are credentialed through the Commission scolaire L'Or-et-des-Bois. The modules of the Modular Training Program for Mine Workers (known as FMTM – Formation modulaires du travailleurs minier) are being implemented gradually, with five of the seven basic modules now required for underground work. Two more modules have been reviewed and altered and should become mandatory within one year.

Ontario Common Core certification is not recognized in Quebec, although the Ontario government generally recognizes certification from the Quebec programs. However, firms practice "due diligence" to ensure new hires have the requisite skills. Language is also an issue where workers who don't speak French are unable to take the certification courses and tests.

Although the Quebec and Ontario programs are similar, the two provinces do not automatically recognize each other's credentials, so that workers may require province-specific certification. This hampers mobility for workers attempting to find employment in another province. Miners from outside of these two provinces who wish to work in either province must first meet provincial requirements, regardless of their experience elsewhere. During interviews, employers explained that despite the similarities between the programs, mobility of credentials is not as easy as it could be. Most Ontario firms recognize the Quebec program credentials, although they still practice due diligence with any new hires, regardless of their background or credentials.

7.2.3 Occupational Standards in the Northwest Territories

Creating occupational standards in the minerals and metals industry ensures that clear guidelines are in place to inform certification and training programs. New occupations related to the diamond industry in the Northwest Territories provided the impetus for developing three sets of occupational standards for Mineral Processing Technicians: Core Competencies and Gold and Diamond Specializations.[80]

A "designated occupation" is one that is approved by the Minister of Education, Culture and Employment on the recommendation of the Apprenticeship Training and Occupational Certification Board. The occupations have established standards and certification criteria that were set by an industry committee composed of experts from within the industry, including local, national and international subject-matter experts. The occupational standards lay out the knowledge, skills, and personal characteristics required to be considered competent in the occupation. Training is then developed on the basis of these standards.[81] The occupational standards developed for the diamond and gold industries in the Northwest Territories are the subject of a case study that is appended to this report.

80 Government of Canada, Canada/NWT Business Service Centre web site: http://www.cbsc.org/nwt/search/display.cfm?Code=7035&Coll=NT_PROVBIS_E

81 ibid.

7.3 Overview of post-secondary mining programs available in Canada

Public post-secondary education institutions are regionally based across Canada. The list of institutions that offer mining-specific programs was identified in Phase I of the sector study and further refined in this second phase of the research. The final list consisted of 26 post-secondary institutions. As of 2005, nine universities have engineering programs in mining and metallurgy, although these programs are sometimes subsumed within civil, mechanical and environmental engineering departments. The institutions are linked via the Canadian Mining Education Council (CMEC)—"an Initiative to Network Canada's Mining Schools."[82] Universities offering programs specific to the minerals and metals industry are detailed in Figure 7.4.

Figure 7.4: Canadian Universities Delivering Education Specific to the Minerals and Metals Industry (2005)

University	Faculty/Department/School	Program(s)
University of British Columbia	Department of Mining Engineering	Mining Engineering Mining Studies (certificate)
University of Alberta	Department of Civil & Environmental Engineering	Mining Engineering
Laurentian University	School of Engineering	Mining Engineering Extractive Metallurgy
University of Toronto	Faculty of Applied Science and Engineering	Lassonde Mineral Engineering
Queen's University	Department of Mining Engineering	Mining Engineering
McGill University	Department of Mining, Metals and Materials Engineering	Mining Engineering Materials Engineering
École Polytechnique	Département des génies civil, géologique et des mines	Génie des mines
l'Université Laval	Département de génie des mines, de la métallurgie et des matériaux	Génie des mines et de la minéralurgie Génie des matériaux et de la métallurgie
Dalhousie University	Department of Civil & Resource Engineering Department of Processing Engineering & Applied Science	Mining Engineering Metallurgical Engineering

Source: University websites

82 Natural Resources Canada website. www.nrcan.gc.ca/dmo/spcb/spri/skills-competence/conclusion_e.html.

The survey included fourteen colleges, university-colleges, and technical institutes, as well as three community colleges, each offering programs to prepare students for occupations specific to the minerals and metals industry. Examples of certificate, diploma and/or degree programs covered by the survey (based on survey responses) include mining and mineral engineering; mining engineering technology; mining engineering; drilling and blasting technician; geomatics engineering technology; and geological technology.

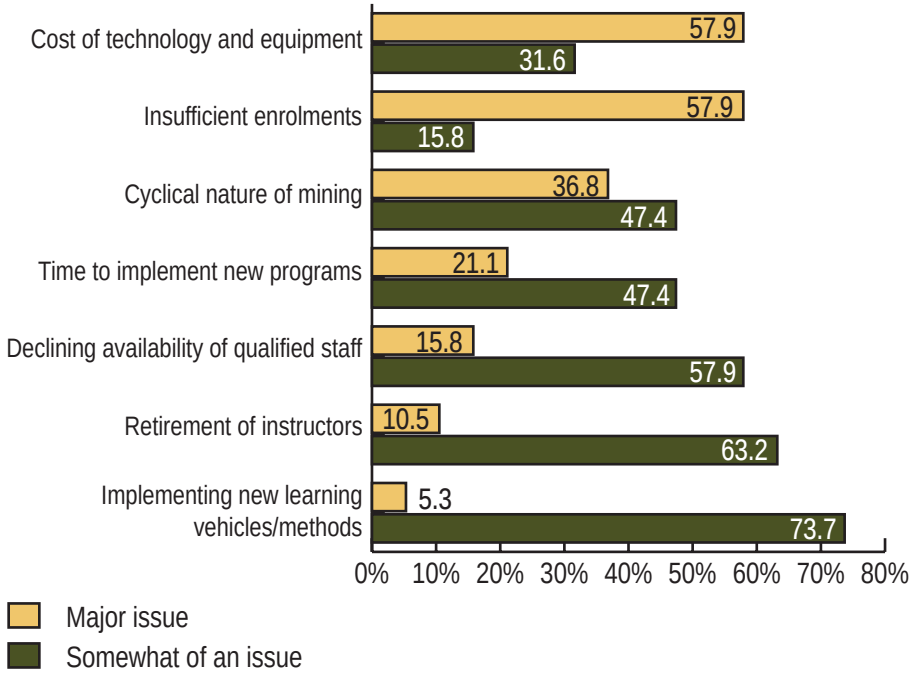
The survey excluded institutions with programs not specific to mining. Almost all Canadian universities have a geology department that produces professionals in exploration and other geoscience occupations, but their graduates do not necessarily pursue careers in the minerals and metals industry. Graduates from computer sciences are also involved in the development of software for computer technologies used in exploration and mine operations. In addition, there is a growing demand within the minerals and metals industry for graduates from environmental science programs at post-secondary institutions, in part to address the environmental and social concerns that have become a global issue for the industry in recent years.

7.4 Meeting industry demand

Respondents identified two main challenges in providing mining-related programs: the high cost of technology and equipment, and low enrolments. Both were identified as a major issue by 57.9% of respondents. As noted by many educators who participated in the research, these two factors combine to create a critical situation for institutions offering mining programs.

The majority (84%) of educators who completed the survey considered the cyclic nature of the industry to be either a major challenge (37%) or somewhat of a challenge (47%). The main challenges to providing mining-related programs are summarized in Figure 7.5.

Figure 7.5: Challenges Faced by PSE Institutions in Providing Mining Programs (2005)



Source: *Prospecting the Future* Education Survey (n=19)

Opinions were mixed when educators were asked whether a lack of industry participation in training programs was an issue. Close to half (47.4%) felt that lack of an industry participation in training programs is somewhat of an issue; but 42% did not consider it an issue at all. Only one institution saw it as a major issue. This is substantiated by the fact that 47% of respondents indicated that the relationship between the minerals and metals industry and their institution was better than the institution's relationship with other industries. Respondents perceived industry support to be strongest for trades, lesser for technician/technological and engineering programs, and least for programs in the physical sciences. However, some educators identified a need to improve collaboration and communication between educational institutions and industry.

The most recent down-cycle in the industry created a situation where many institutions did not have sufficient student enrolment to maintain existing programs. Funding is enrolment-driven, and with declining numbers of students attracted to the programs, it becomes increasingly difficult to maintain the curriculum required to produce effective mining engineering graduates. Most mining programs are small with relatively high costs, prompting administrators to suspend or cut them if they are not producing sufficient numbers of graduates.

For some institutions, this has meant "hiding" or integrating mining programs into other more generic programs, diluting the strength of mining or metallurgy education. Although the programs and courses are still available, they are increasingly being placed within geological, civil and mechanical engineering departments. For example, the Department of Mining and Metallurgical Engineering at Dalhousie University has recently been divided between two departments. Mining

engineering has been placed within the Department of Civil and Resource Engineering, and metallurgical engineering has been placed within the Department of Processing Engineering and Applied Science.[83]

In some cases, metallurgical engineering programs have lost their mining focus and now concentrate more on ceramics or micro-processes within mechanical engineering. As a result, universities are at risk of losing relevancy to the industry, due to their inability to provide graduates with the hard skills the industry needs.[84]

As noted by one interviewee, mining engineering programs are having difficulty maintaining a "critical mass," despite rising enrolment in some institutions. As the focus of education moves away from mining, graduates are less likely to enter the workforce with the skills that the industry will need. Students are also less likely to be aware of the minerals and metals industry as a career option early in their education.

Other challenges that emerged from the qualitative information collected in the survey, and through interviews and focus groups included:

- The difficulty of attracting instructors, because the educational sector cannot compete with salaries offered in the minerals and metals or oil and gas industries; and

- The increased use of consultants by the industry creates fewer opportunities for instructors to work directly with producers. As a result, they do not gain as much practical experience with industry over the course of their teaching careers.

A few interviewees noted that change is slow on the part of both education and industry and that both groups need to improve communication and collaboration.

7.4.1 Addressing Challenges and Gaps

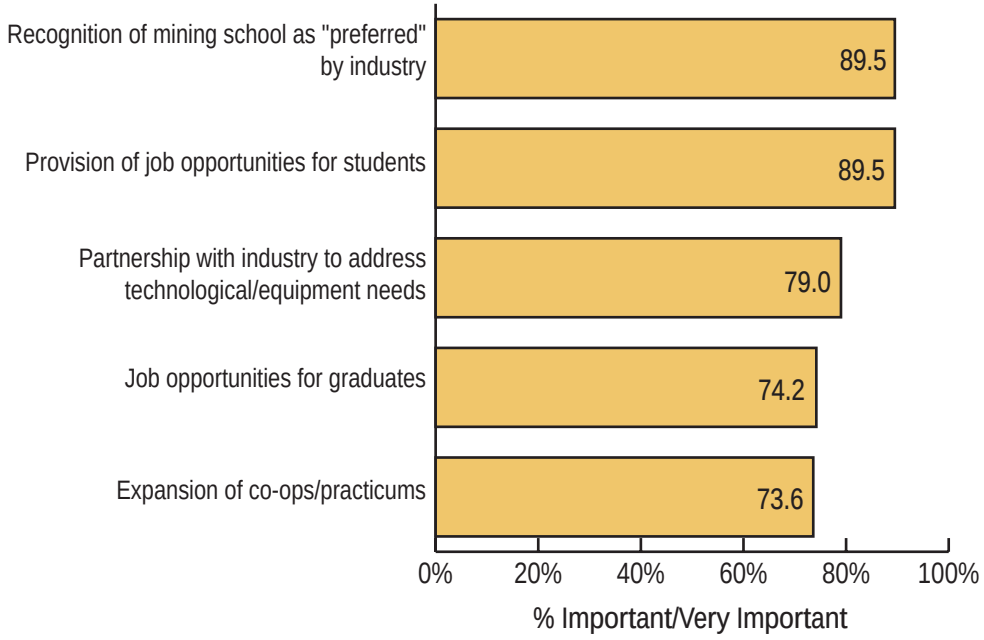
Survey respondents were asked to rate the importance of several factors that help educational institutions meet industry demand. The results appear in Figure 7.6.

Educators cited the need for employers to significantly expand student co-op placements and work-experience opportunities. In essence, they felt that industry needed to ensure that there would be employment opportunities for current students and graduates as a way of ensuring the long-term vitality of mining education programs in Canadian post-secondary institutions.

83 Dalhousie University website. http://miningandmetallurgical.engineering.dal.ca/index.html. (16 April 2005).

84 Educators and employers who participated in the group discussion were interested in tracking whether mining program graduates actually enter the mining industry. This was explored as part of the secondary research through existing research of graduate outcomes and in focus groups.

Figure 7.6: Importance Ratings of Factors to Help Meet Industry Needs (2005)



Source: *Prospecting the Future* Education Survey (n=19)

An important recommendation made by some respondents to the education survey was the need to accurately define and assess the "real" needs of industry so that educators can address these, rather than an idealized "desire" of employers. Several communities of interest identified the need for a concerted and collaborative effort to ensure that a sufficient number of students enter mining education/training programs, and that they receive adequate training for employment in the minerals and metals industry. They suggested collaboration to address a variety of issues at many levels, including between:

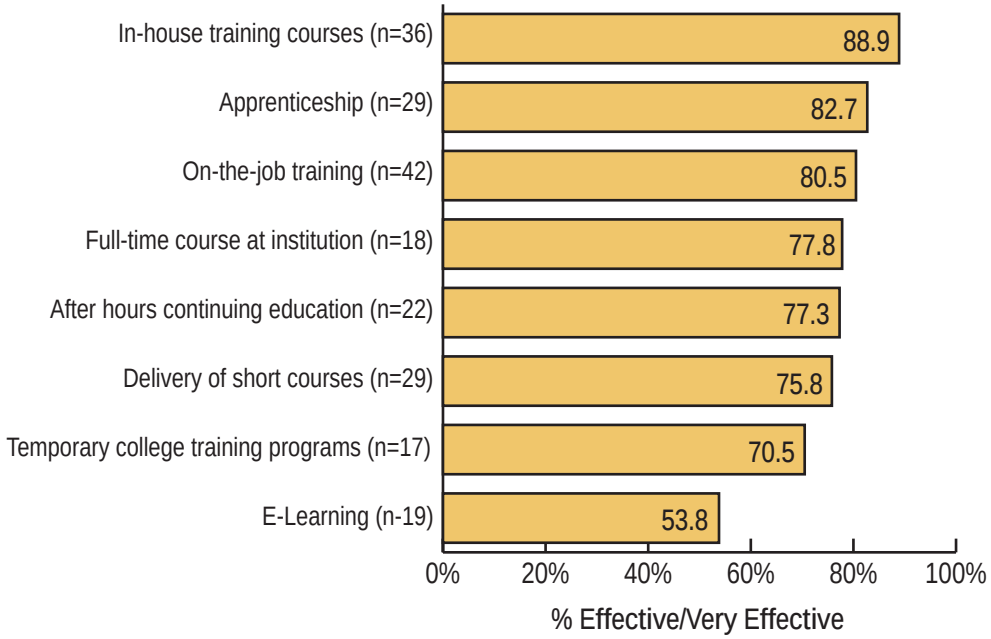
- Adjacent educational institutions, to develop regional solutions to local human resource issues within the industry;
- Industry and educational institutions, to offset the high cost of education related to the minerals and metals industry and the lack of support from regular funding mechanisms (e.g., research grants);
- Educators and other communities of interest (e.g., industry, government, associations, etc.), to develop media/marketing tools that can be used to recruit students into mining-related programs; and
- Employers to provide sufficient and appropriate placement and employment opportunities for students and graduates of mining programs so that students can develop practical experience prior to entering the industry and so that employment opportunities for graduates are assured.

Students in the Quebec focus group mentioned that many companies are not consistent in their practice of summer placements or co-op programs. In leaner years, companies may not hire students in the summer, thereby reinforcing the perceived boom and bust cycles with current or potential students. In addition, students did not feel they were valued by the industry while employed in temporary or placement positions: they mentioned being given menial, repetitive and or short-term tasks, and that they did not have opportunities to practice what they had learned.

7.5 Role of employers in providing training

As identified previously, underground miners and production workers do not currently need to meet national occupational standards or training requirements. However, education and training must still be provided, and the responsibility generally lies with industry. On-the-job training continues to be the most common form of training for mine-production workers; 83% of employer-survey respondents indicated that their firm or operation provided some type of training. As a result, individual employers have historically had a strong training infrastructure, driven in part by the network of health and safety regulations that evolved over the past 60 years. Figure 7.7 summarizes the perceived effectiveness of the various forms of training provided by their respective organizations or operations. Note that only in cases where the type of training was actually used were effectiveness ratings provided.

Figure 7.7: Effectiveness of Type of Training Provided by Employers (2005)



Source: *Prospecting the Future* Employer Survey; NR/DK/NA have been removed

In the survey, one-half (50.6%) of responding employees reported that support for further education is a factor that contributes positively to job satisfaction. In this respect, 79.3% of employers surveyed offer leave to attend programs and courses, or reimburse the educational costs to employees, and 73.3% of employers offer in-house training programs. However, only 40% of employers reported supporting apprenticeship programs. This is interesting, since employers consider apprenticeship to be an effective training mechanism.

According to several key informants, the lower level of support among employers toward apprenticeships is a result of the cyclicality of the industry, the longer-term commitment to apprentices that is required, and the risk of poaching due to the generic applicability of trades to other sectors. Alberta has helped to improve the situation with construction trades related to oil sands development by removing the need for employers to guarantee permanent employment to apprentices.[85] Instead, apprentices receive practical work experience, return to college, and then continue their apprenticeship with another employer – a model closely resembling co-op programs offered through post-secondary degree programs.

Slightly more than one-half (58.6%) of employees surveyed were somewhat satisfied or very satisfied with the extent of the on-the-job training they receive. Approximately one-half (49.6%) of employees responded that they were somewhat satisfied or very satisfied with the level of professional development training in their job. However, there was a measure of dissatisfaction with job training and professional development, as 20.5% and 24.8% of respondents, respectively, reported being either somewhat or very dissatisfied with the amount of training their employer provided.

Employers recognize that, as in most industries, each firm typically provides some type of on-the-job training, so that workers are familiar with the firm's unique procedures and processes. However, the responsibility for developing training to meet broader, more standardized occupational requirements might be better placed with the public educational system or industry sector council.

Several industry representatives pointed out that poaching employees from other firms is a popular recruitment method. This activity can make employers reluctant to invest heavily in certain training programs (particularly apprenticeship programs), since they are concerned that once an employee becomes proficient in their area, they could be "poached" by a competitor organization. While employers acknowledged that it is important to support training, they also recognize that there may be a limited return on such investment, given that not all employees will remain with the initial establishment. Firms in the minerals and metals industry must also be wary of poaching by other industries. For example, many skills are shared with the oil and gas industry, which is a major competitor of the mining labour force.

Another challenge is the considerable on-the-job training required to become job proficient in the industry. Notwithstanding the technical training provided to new hires, employees felt that they required considerable time working in their position before they were truly proficient. As Figure 7.8 illustrates, on average, employees felt that they needed to work approximately 4.5 years on the job before becoming proficient. Some employees responded that they were always learning on the job, and that proficiency could never truly be attained.

85 Natural Resources Canada. 2002. Natural Resources Skill Colloquium. www.nrcan.gc.ca/dmo/spcb/spri/skills-competence/mms_e.html.

Figure 7.8: Employee Estimate of the On-the-Job Experience Required to Become Proficient in their Position (2005)

Major Group	% of employees citing time					Average (years)
	<1 year	1-2 years	3-4 years	5-6 years	>6 years[1]	
Physical Scientists/Engineers (n=202)	0.5%	40.2%	21.8%	21.8%	15.7%	4.6
Technologists/ Technicians (n=70)	1.4%	60.0%	15.7%	17.1%	5.8%	3.1
Skilled Trades (n=121)	1.6%	43.8%	24.8%	15.7%	14.1%	4.2
Semi-skilled and Miners (n=145)	1.4%	44.8%	20.7%	17.9%	15.2%	4.7
Total (n=538)	1.2%	44.8%	21.2%	18.5%	14.3%	4.5

Source: *Prospecting the Future* Employee Survey
Note: The "Other" category is not included as it includes a mix of occupations.
1 Responses up to 40 years to obtain job proficiency were included.

7.6 Partnerships

There has been some progress toward developing collaborative partnerships with educators:

- Industry Advisory Committees (e.g., UBC, Laurentian) require the industry to work together to better communicate their needs to educators.
- UBC includes online courses from EduMine as a component of some courses within its mining engineering program.
- Some companies are reintroducing Engineer-in-Training programs to provide on-the-job training.
- Elk Valley Coal is working in partnership with the College of the Rockies to develop the Discovery Training Centre in Sparwood.[86]
- A number of partnerships and collaborations exist between the local industry and Sudbury post-secondary institutions and research centres.

86 This was originally identified as a potential case study, however, the concept is still under development. It is recommended that the Discovery Training Centre case be re-visited once implemented.

- A unique, community-based training approach begun in 2000 is helping Diavik Diamond Mines Inc. meet its hiring commitments. Training has been conducted in Rae-Edzo, Lutsel K'e, Kugluktuk, Wekweti and Yellowknife, producing over 100 graduates with new skills, largely in the construction trades.

- In northern Saskatchewan, the Multi-Party Training Plan is based on a partnership between mining industry employers, Aboriginal communities, training institutions, and the provincial and federal governments to meet the emerging needs of the minerals and metals industry through training and development of the local labour markets.

- The Québec Mining Association worked with several partners and stakeholders concerned with professional, technical and scientific training programs.

- Aboriginal Skills and Employment Partnership (ASEP).

- Joint Voisey's Bay Employment and Training Authority (JETA).

Although progress has been made in this area, especially between educational institutions and industry/professional associations, much work remains to refine certain processes such as communication and coordinated planning. Fewer than one-half (46%) of the educational institutions surveyed reported existing links between industry and educational institutions, while 57.7% of employers reported that they had not developed links with educational institutions. It is particularly noteworthy that only 40.0% of employers who responded to the survey had a program to take on apprentices, which could serve to limit the number of journeypersons available to the minerals and metals industry in the near future.

7.7 Human Resource Implications

The review of industry needs and the ability of the training and education system to meet these needs has several implications for human resources-planning in the minerals and metals industry.

- **Occupational Standards**

  There are, in fact, two systems of training in operation for the minerals and metals industry – the formal education system, including apprenticeship training, and the industry-based training system. These are two distinct training streams. The evolution of the industry-training stream can be traced to the fact that only some occupations in the minerals and metals industry require certification while, historically, none of the semi-skilled or underground miner occupations have required certification. The situation is beginning to change with the introduction of the Ontario and Quebec programs, the introduction of occupational standards and training in the Northwest Territories and developments in other provinces (e.g., Saskatchewan and Manitoba). In general, though, while the training of production workers has become more formalized, it remains decentralized, with a well-established culture of workers training workers within individual firms. The need for occupational standards is becoming increasingly important given the technological advancements and need to promote mining careers to a wide audience.

- **Training to Address Impending Retirement**

The post-secondary education system and the industry-training system must begin to address the upcoming need to replace skilled workers as they retire from the minerals and metals industry. At present, the system probably does not have the capacity to effectively train new entrants to minimize skill gaps that will emerge when these older works leave the industry.

- **Development of Partnerships to Improve Training Capacity**

Many research participants, both educators and employers, noted the need to further develop and improve collaboration and communication with respect to skill requirements and training needs. Mining programs are restricted by budget limitations imposed by their respective institutions and must demonstrate the need for continued support by maintaining their enrolments. They must attract and recruit more students into mining programs at a rate that will satisfy industry demand, and the students must receive training that will deliver the required skills. But this cannot be the responsibility of the educational system alone, and will require industry's support and involvement. Part of this objective could be addressed by ensuring that students receive practical, hands-on training earlier in their education and that there are sufficient placements (e.g., co-ops, apprenticeships, etc.) to help students obtain this experience. Indeed, employers surveyed consider apprenticeship an effective training mechanism.

- **Further Skills Development of the Aboriginal Labour Force**

Currently, a critical skill gap is emerging for firms that engage the Aboriginal and local workforce in the northern regions of the country. Although the shortage of higher-level skills in these groups has been recognized, individual firms will require the assistance of government and other communities of interest, as well as the local community, to establish a training system that will provide the appropriate level of training to these individuals. One challenge is that most of the required training cannot be accessed locally, forcing individuals to leave their communities. Often, once these individuals leave, they do not return, nor do they enter the minerals and metals industry.

CHAPTER 8: POLICY OPTIONS AND RECOMMENDED STRATEGIES FOR THE CANADIAN MINERALS AND METALS INDUSTRY

8.1 Policy Options

Minerals and metals industry employers, suppliers and contractors, industry associations, unions and government were asked to indicate the perceived importance of several policy options, including:

- Promotion of the minerals and metals industry to youth;
- Strategies for keeping older workers employed in the minerals and metals industry;
- Certification of foreign workers;
- Standardization/certification across Canada of underground and production mining occupations;
- Strategies for recruiting non-traditional workers (e.g. women, Aboriginal people, etc.);
- The use of immigration to meet labour requirements;
- Targeting of the Employment Insurance (EI) system to train workers;
- Development of an industry-funded training centre;
- Developing specific human resource tools for employers (e.g. workbooks with resources for hiring, etc.); and
- Centralized Industry Human Resource Sector Council.

As Figure 8.1 shows, there was general agreement that the sector needed to develop strategies and programs to attract new workers to the mining sector. For example:

- More than 90% of employers and suppliers and contractors rated promote the mining sector to youth as "important" or "very important";
- A high proportion of employers (79.5%) considered it important to keep older workers employed in the mining sector; and
- Three-quarters of employers also felt that it would be "important" or "very important" to expedite processes for the certification of foreign workers and strategies that would promote diversity in the workforce (e.g., by encouraging the participation of women, Aboriginals, visible minorities, etc.)

Figure 8.1 also demonstrates that, while there was a high level of support for policy options associated with strategies to attract and retain workers, employers, suppliers and contractors attached slightly less importance to policy options or strategies associated with training and other human resource policies.

Figure 8.1: Potential Policy Options that Could be Pursued by the Industry (2005)

Policy Option	Not At All or Not Very Important	Important or Very Important
Promotion of the mining sector to youth		
Employers (n=46)	2.2%	97.8%
Suppliers and Contractors (n=36)	5.6%	94.4%
Strategies to keep older workers employed in the mining sector		
Employers (n=44)	20.5%	79.5%
Suppliers and Contractors (n=35)	54.3%	45.7%
Certification of foreign workers		
Employers (n=43)	23.3%	76.7%
Suppliers and Contractors	--	--
Standardization/certification across Canada of mining occupations		
Employers (n=44)	25.0%	75.0%
Suppliers and Contractors	--	--
Strategies for increasing workforce diversity (e.g., women, Aboriginals, etc.)		
Employers (n=43)	25.6%	74.4%
Suppliers and Contractors (n=36)	41.7%	58.3%
Use of immigration to meet labour requirements		
Employers (n=41)	34.1%	65.9%
Suppliers and Contractors (n=33)	36.4%	63.6%
Targeting the Employment Insurance (EI) system to train workers in mining-related occupations		
Employers (n=42)	40.5%	59.5%
Suppliers and Contractors (n=36)	13.9%	86.1%
Development of an industry-funded training centre		
Employers (n=43)	41.9%	58.1%
Suppliers and Contractors (n=36)	30.6%	69.4%
Developing specific human resource tools for employers		
Employers (n=44)	52.3%	47.7%
Suppliers and Contractors (n=35)	34.3%	65.7%
Centralized Industry Human Resource Sector Council		
Employers (n=36)	52.8%	47.2%
Suppliers and Contractors (n=25)	44.0%	56.0%

Note: Sample sizes vary as DK/NR responses were excluded

In addition to information collected by surveying employers, suppliers and contractors, the research team also used key-informant interviews and focus groups to explore various policy options with key stakeholders and target populations. Information specific to each policy option is synthesized in the following section. Policy options are presented in the order of priority identified in the employer survey.

Priority 1. Promotion of the mining sector to youth

Stakeholders viewed industry youth promotion as a key element of a human resource strategy for the mining sector. Employers and stakeholders noted that the industry needed to be more proactive in developing appropriate materials and messages that would encourage youth to consider the mining sector as a career option. Research participants also noted that, to attract youth, the mining sector needed to compete with numerous other industries and sectors. Focus-group research conducted with both youth and employers revealed that there was very little information available to students, teachers, guidance counsellors, parents and librarians regarding employment and career opportunities available in the mining sector. Given the expected need to replace retiring workers, and to accommodate new demand-related production, stakeholders believed that considerable effort should be made to develop strategies and programs to ensure sufficient numbers of youth are available to work in the sector.

Priority 2. Strategies to keep older workers in the industry

While more than three-quarters (79.5%) of employers thought that such strategies were important or very important, this goal was less of a priority among suppliers and contractors (45.7% rated this policy option as "important" or "very important"). A reason for the difference in opinion can likely be attributed to the difference in age structures between the mining sector and suppliers and contractors in the community. For example, the 2001 Census recorded the average age for employees in mining and smelting operations at 42.5 years, while the average age for workers in mine-service occupations was 36.4 years.

Union representatives were generally not supportive of policies or programs designed to retain older workers. Union representatives cited health concerns as a key reason to promote early retirement rather than extend work life for the mining workforce. Similarly, employees were less receptive to strategies designed to encourage employees to continue to work past their eligible retirement date. In fact, almost three-quarters (74.2%) of employees noted that they would not work past their eligible retirement date given existing conditions and policies. In this context, any strategy or policy to encourage older workers to remain in the workforce will require considerable consultation and discussion with organized labour and potential employee candidates.

Priority 3. Certification of foreign-trained workers

Three-quarters of employers (76.7%) were supportive of policies designed to support the certification of foreign-trained workers. Although historical data from the 2001 Census suggests that the mining sector did not hire large numbers of recent immigrants between 1996 and 2001, stakeholders noted that the mining sector was becoming increasingly "globalized," and that competition for workers has resulted in employers recruiting larger numbers of foreign-born

workers. Recognition of foreign credentials and experience was viewed as an important policy option for the sector, because it would allow employers to better evaluate the skills and experiences of foreign-trained workers relative to Canadian requirements.

Priority 4. Standardization and certification across Canada of mining occupations

Three-quarters of employers surveyed were supportive of strategies and policies to provide occupational standards and certification for non-Red Seal trades and other occupations in the mining sector. This strategy is common across many industries in Canada, as sector councils and other organizations develop occupational standards or certification of skills and experience as part of the development of common occupational standards. Human Resources and Skills Development Canada (HRSDC) contributes to the development of occupational standards through the Sectoral Partnerships Initiative by providing funding, technical advice and guidance.[87] This activity was also cited in the Quebec sector study as an action item for the Quebec Sectoral Working Group.[88] The occupational standards and training programs developed in the Northwest Territories are a first step towards certifying mining occupations. Although the NWT have developed standards, these are particular to the gold and diamond sub-sectors and cannot be used to certify workers in other sectors for other commodities.

Priority 5. Strategies for increasing workforce diversity (e.g., women, Aboriginals, visible minorities, etc.)

There was a high level of support for this option among employers (74.4%), although fewer suppliers and contractors (58.3%) supported the option. Research collected as part of this study underscores the relatively limited diversity of the workforce: the mining sector employs relatively low proportions of females and visible minorities. In addition, new Canadians may also possess negative stereotypes of the industry, based on working conditions in their country of origin. In contrast, several organizations have made considerable strides to promote Aboriginal representation in their workforce or to access Aboriginal contractor organizations. During key-informant interviews, respondents noted that the development of formalized agreements between mining companies and local Aboriginal communities were becoming more common.[89]

To enhance the sector's attractiveness to females and visible minorities, youth focus group participants suggested that the industry needed to dispel current stereotypes (e.g., that the industry was "dirty," low-tech and characterized by a poor safety and health record). Youth participants from visible minorities also noted that the sector needed to promote itself as an "inclusive" sector—because the sector is seen as dominated by male Caucasian workers.

Priority 6. Use of immigration to meet labour requirements

Employers, suppliers and contractors held similar opinions regarding the use of immigration to help meet the industry's current and future human resource needs. For example, approximately

87 HRSDC website. http://www.hrsdc.gc.ca/asp/gateway.asp?hr=en/hip/hrp/corporate/nos/occstd.shtml&hs=hzp. (29 April 2005)
88 Quebec Mining Industry Labour Sectoral Working Group – Sector Assessment p. 94.
89 Appendix X provides a list of existing agreements between mining firms and First Nations and other Aboriginal groups. The list may not be exhaustive as these agreements are confidential outside of the parties.

two-thirds of employers (65.9%) and supplier contractors (63.6%) felt that the sector should pursue strategies to increase the number of recent immigrants in Canada's mining sector. Key informants identified several positive or negative issues with respect to the greater use of immigration, such as:

Positive aspects

- Canada is seen as a desirable location. Canada should market itself to mining professionals throughout the world;
- Given the increasing globalization of the industry, inclusion of more foreign-born/or foreign-trained workers would provide Canadian firms with an insight as to operating principles and culture in other jurisdictions; and
- An immigrant workforce was seen to be younger and more open to working in the mining sector.

Negative aspects

- Foreign-born workers often lacked the communication skills required to interact with clients, suppliers and other workers;
- It could be difficult to evaluate the qualifications of foreign-trained workers;

Immigrants could find it difficult to adapt to Canadian work—often cited as a problem for recent immigrants; and

- Union representatives felt that efforts should be made to find employment for the existing Canadian workforce prior to implementing an immigration-based strategy.

Key informants also identified several potential actions that an industry or sector council could undertake to promote the sector to "new Canadians." Suggestions included:

- Lobbying provincial governments to utilize the Provincial Nominee Program to bring in foreign-born workers for specific mining occupations;
- Development of promotional materials for immigrant settlement agencies;
- Targeted promotion of Canada's mining sector and employment opportunities in competitor countries that have existing labour force trained or experienced in mining activities; and
- Working with the federal government to ensure that the point rating criteria for entrance to Canada does not significantly preclude the acceptance of mine workers who may lack formal post-secondary education credentials.

Priority 7. Targeting the Employment Insurance (EI) system to train workers in mining-related occupations

This option was highly supported by suppliers and contractors (86.1% support), although a lower proportion of employers (59.5%) were supportive of this policy option. The difference is likely due to the limited ability of smaller suppliers and contractor firms to meet the skill gaps experienced by these employers. Stakeholders interviewed suggested that it would be appropriate to make use of federal resources to provide specific training for mining occupations. They noted, however, that the industry would need to increase efforts to provide employment case counsellors with information about industry requirements and training opportunities. In addition, many stakeholders pointed out that they had only limited information as to how such programs operated, and how industry could influence the allocation of EI training funds on a regional or industry basis. Some employers interviewed also questioned whether individuals on EI or income assistance could be easily integrated into the mining sector workforce.

Priority 8. Development of an industry-funded training centre

There was modest support for an industry-funded training centre among both employers (58.1%) and supplier/contractors (69.4%). While stakeholders noted that it would be cost-effective to share the cost of industry training among employers, survey participants expressed reservations about how such a centre would be funded or established (e.g., where and for which sub-sectors). The diversity of mining activities and operations could make it difficult to provide a range of training that would be equally useful to all industry members. It was also noted that establishment of such a centre would require greater coordination of industry education and training requirements across employers and unions.

Some stakeholders interviewed pointed out that several other sectors had established an industry-funded training centre to better meet industry needs. The Canadian Automotive Repair and Service Sector and the Construction Sector were cited as possible examples for the mining sector.

Education and government stakeholders felt that such an initiative would be unnecessary if there were better, more effective linkages between industry and regional post-secondary institutions. Educational representatives identified the lack of up-to-date equipment as a limitation to providing specific industry training. Donation of equipment to educational institutions was viewed as a possible mechanism to help ensure that provided training would better align with industry requirements. Although there are existing partnerships between some firms and educational institutions, educators feel there is still a need for greater support and assistance from the industry.

Priority 9. Development of specific human resource tools for employers

Human resource kits for employers would include such components as hiring guides and promotional materials, as well as “best practices” guides related to specific human resource issues. This option was not highly supported by employers (47.7% support), although two-thirds of suppliers and contractor organizations (65.7%) were supportive). In general, large employers felt

that they had adequate materials and expertise in the area of human resources. In contrast, because many of the suppliers and contractor organizations were not large and lacked dedicated human resource staff and materials, they saw initiative as a way to obtain needed assistance.

Priority 10. Centralized Human Resource Sector Council

Although this policy initiative received only modest support from both employers (47.2%) and suppliers and contractors (56.0%), key stakeholders interviewed noted that any human- resource strategy for the mining sector would require an agency or organization to coordinate industry needs and possible strategies. While there are several mining-related industry associations, in discussions with representatives of such agencies, the agency or organization generally did not have a mandate to coordinate human resource planning across sectors or in consultation with other agencies (e.g., unions, government, education and training). In addition, key stakeholders noted that a centralized industry and human resource sector council would be better placed to meet the joint needs of both employers and labour rather than through existing industry or union organizations.

Stakeholders also felt that the sector would have to establish mechanisms to ensure that regional needs and requirements could be appropriately addressed. This approach can be seen in the Quebec sector study, in which a key recommendation includes the establishment of a regional consultative body for the mining sector. The Quebec regional structures would undertake the following activities:[90]

- Evaluation of future needs in terms of labour;
- Recruitment strategy and attraction or push factors;
- Identification of the available labour pool (intra-extra regional);
- Hiring and integration; and
- Workforce retention.

Stakeholders noted that while regional working groups would be beneficial, they would need to have a centralized body or coordinating agency to support the work and requirements of regional human resource groups. In part, these requirements could be supported by a centralized body or coordinating agency through an adjustment program to upgrade the skills of any given workforce, perhaps three to four years in advance of a closure or the downsizing of an operation.

90 Quebec Mining Industry Labour Sectoral Working Group, Sector Assessment, December 2004, p. 51.

8.2 Support for proposed human resource strategies: Summary

Figure 8.2 highlights the level of support for the various policy options identified in consultation with the key stakeholder groups. Support for the policy options have been identified as follows:

High: Almost all respondents and participants believed that the proposed option was important or very important (i.e., approximately three-quarters or more supported the initiative);

Moderate: A majority of respondents and participants were supportive of the option;

Limited: There was limited support for the option or initiative from respondents and participants;

Not Supported: Selected groups did not support some of the proposed initiatives.

As Figure 8.2 shows, strategies associated with attraction and recruitment were generally highly supported by all stakeholder groups. In contrast, strategies associated with training issues received moderate levels of support and strategies associated with specific tools received limited support.

8.3 Policy options: Implications

The research results suggest that there is widespread agreement among many communities of interest regarding policies and initiatives to promote the sector to various target populations. This high level of support suggests that stakeholders anticipate labour shortages as a major issue that the industry could face in the future.

With respect to policy options associated with training certification and other potential human resource strategies, for each strategy there appears to be varying levels of support across the various stakeholder populations. In this context, development of a comprehensive human resource strategy could require further discussion and consultation with selected groups to obtain a better perspective about how potential strategies could be best implemented to meet the needs of the constituents represented by each organization and or association.

Figure 8.2: Support for Policy Options by Stakeholder Groups (2005)

Option	Employers	Suppliers/ Contractors	Industry Associations	Unions	Other Stakeholders
Recruitment/Promotion/Retention					
Promotion of the mining sector to youth	High	High	High	High	High
Strategies for increasing workforce diversity (women, Aboriginals)	High	Moderate	High	Moderate	High
Use of immigration to meet labour requirements	Moderate	Moderate	High	Limited	High
Strategies to keep older workers employed in the mining sector	High	Limited	Moderate	Not Supported	Moderate
Training/Certification Issues					
Certification of foreign workers	High	--	High	Limited	High
Standardization/ certification across Canada of mining occupations	High	--	Moderate	Moderate	High
Use of the EI system to train workers in mining-related occupations	Moderate	High	Moderate	Limited	Moderate
Development of an industry-funded training centre	Moderate	Moderate	Moderate	Moderate	Moderate
Other Strategies					
Developing specific human resource tools for employers	Limited	Moderate	--	--	Moderate
Centralized Industry Human Resource Sector Council	Limited	Moderate	High	Limited	High

CHAPTER 9: STRATEGIES AND ACTION ITEMS

The following recommendations are based on consultations with the MMISSSC, the MITAC project team, and representatives from various communities of interest. They are presented here to address the major issues facing the minerals and metals industry.

Strategies and action items are organized around four primary objectives identified as key to ensuring a sufficient supply of skilled workers to the industry over the next 10 years. The four objectives, which are pivotal to the minerals and metals industry's human resource strategy, are described below.

Objective A: Meet current and projected human resource demand by increasing and making best use of all potential sources of supply.

Objective B: Address existing and expected skill gaps in the industry.

Objective C: Ensure standardization of skills and consistency of training delivery to facilitate recruitment, establish clear educational requirements and increase worker mobility.

Objective D: Ensure that all stakeholders are aware of and understand the critical human resources issues currently facing the minerals and metals industry.

From these four objectives, eleven strategies were developed. Each strategy includes short- and medium- to long-term action items. The time frame for these action items is as follows:

Short Term: Short-term action items or strategies represent activities that can be quickly implemented by identified champion(s) within 12 months.

Medium-to Long-Term: Medium- to long-term strategies reflect actions and activities likely to require further planning, consultation and implementation requirements. It would be expected that such strategies would be implemented within the next 12 to 36 months.

Lead organizations and partners or supports for each action item have also been suggested.[91]

The remainder of this section presents the final recommendations for the minerals and metals industry human resource strategy.

91 Although various communities of interest have been identified as leads and/or partners for the action items, this should not be interpreted to mean that these organizations have signed on to undertake these activities.

Objective A: Meet current and projected human resource demand by increasing and making best use of all potential sources of supply.

The research results suggest that Canada's mining industry will need to hire up to 81,000 new employees to meet current and future demand, as well as to fill positions vacated by retiring workers. To achieve this end, the industry has a clearly identified need to increase the recognition of, and knowledge about, the minerals and metals industry, and the career options it presents. The sector's image has a direct impact on its ability to recruit and retain workers.

Given the close proximity of many mining operations to Aboriginal communities, it is essential that the sector expand efforts to incorporate Aboriginal workers into the mining workforce. In addition, women, visible minorities and recent immigrants are not well represented in the current mining workforce. Given the expected competition for skilled workers across all sectors, the mining sector needs to adopt a pro-active approach to recruiting skilled workers from various labour- supply sources.

The table below lists several strategies that will help ensure that the industry has access to a sufficient labour pool to support current and future operations.

Strategy A1: Promote the minerals and metals industry to youth as a safe, modern, environmentally friendly and technologically advanced career option.

Action Items	Lead(s)	Partners/Support	Timing
1. Prepare an inventory of existing promotional materials and resources on mining	-MITAC	All communities of interest	12 months
2. Develop a targeted marketing strategy to attract youth to the industry	-MITAC		12 months
3. Participate in public presentations and youth oriented activities (e.g., career fairs, in-school presentations, mining in society exhibit, etc.)	-Industry -Industry Associations		Immediate & on-going
4. Develop Career Information Products (e.g. information kits, career booklets, web-based resources) targeted to youth that promote the industry and identify the vast range of career options available	-MITAC	-Industry (funding support) -Canada Career Consortium	12-24 months
5. Appeal to provincial school system/governments to update curricula to reflect the modern mining industry in elementary/high schools	-PMAs	-Educators	36 months

Strategy A2: Develop a national strategy that focuses on engaging, recruiting and retaining Canada's Aboriginal workforce—focusing on sites and operations that neighbour Aboriginal communities.

Action Items	Lead(s)	Partners/Support	Timing
6. Establish partnerships (MOUs) with Aboriginal groups (e.g. The Aboriginal Human Resource Development Council of Canada) to identify best practices with respect to Aboriginal recruitment and retention.	MITAC	AHRDC CAMA	6-12 months
7. Capture best practices in Aboriginal relationships and identify existing employer strategies and programs that enhance Aboriginal participation.	MAC PMAs MITAC	Industry	6-12 months
8. Identify operations that have access to a local Aboriginal population, but have low Aboriginal participation.	MITAC Industry Associations	Industry	6-12 months
9. Work with local AHRDAs to develop comprehensive regional strategies that would enhance Aboriginal participation in the mining sector.	PMAs Industry	AHRDA holders Aboriginal communities	12-24 months
10. Develop Aboriginal recruitment and retention strategies	Industry	Local AHRDA holder	12-36 months
11. Promote "Aboriginal Set-Aside" contracts to Aboriginal suppliers.	PMAs	Aboriginal communities	24-36 months

Strategy A3: Actively target non-traditional groups in promotion and recruitment efforts to expand labour supply sources.

Action Items	Lead(s)	Partners/Support	Timing
12. Develop a strategy to increase the participation of women in the industry (highlight successful mines that have an above-average rate of women participation).	MITAC		12 months
13. Establish partnerships with organizations that promote women in non-traditional roles.	MITAC		24 months
14. Develop a strategy to increase the participation of visible minorities and new Canadians in the industry.	MITAC		12 months
15. Develop a communications and marketing strategy that targets potential mining employees in overseas locations to encourage skilled workers to consider re-locating to Canada.	MITAC Industry Associations		24 months
16. Advocate on behalf of industry to ensure skilled and qualified workers are not denied entry to Canada due to the lack of formal post-secondary education and that individuals with mining-related experience can qualify to work in Canada.	Provincial and federal departments	MAC Provincial Mining Associations (PMAs)	24 months
17. Develop "tool kits" that identify how employers can utilize immigration-based programs to meet workforce shortages (e.g., Provincial Nominee Program, Foreign Worker Program).	Industry Associations	Government	on-going

Objective B: Address existing and expected skill gaps in the industry.

Research findings suggest that the industry could lose up to 40% of the existing workforce in the next 10 years due to retirement and early retirement. This significant loss of skills represents a major risk to the sector, especially given that skill gaps currently exist in the workforce. There will be considerable costs associated with the training of new workers. Therefore, recruitment of replacement staff needs to be proactive and must occur before retirements to permit new entrants and existing members of the workforce to become proficient.

Also, given the need to train a large number of new employees to replace retiring workers and meet the skills requirements of employers, post-secondary institutions must have the necessary training capacity.

Finally, organizations need to ensure that existing workers are trained and mentored to move into positions being vacated by retiring employees.

Strategy B1: Mitigate the risk to industry associated with an aging workforce and pending retirements through proactive human resource practices and workforce planning (especially for long-life mines).

Action Items	Lead(s)	Partners/Support	Timing
18. Develop a business case for using longer-term workforce planning practices, including recruitment and retention.	MITAC	Industry Others	6-18 months
19. Develop industry commitment to workforce planning at the corporate, operational, industry and national levels.	PMAs	MAC (to get CEOs on side to mandate a VP-HR team for workforce planning)	Immediate to 6 months

Strategy B2: Develop programs to bring back retired workers and retain older workers to minimize the impact of the workforce exodus and facilitate the capture of knowledge and experience that will be necessary to maintain skill levels within the industry.

Action Items	Lead(s)	Partners/Support	Timing
20. Identify provincial distinctions and potential barriers that could affect retention of retirees.	PMAs	MITAC	Immediate to 6 months
21. Identify and examine specific examples of instances where retention activities have been successful (e.g., Ontario teachers).	MAC (HR committee) PMAs (assign point of contact for each)	MITAC	6-18 months
22. Identify options for retaining older workers in underground mining while minimizing health risks.	Unions Industry		6-12 months
23. Develop and maintain updated lists of recent retirees in case of emergency or extraordinary activities.	Industry		12 months and on-going
24. Develop a system for capturing the knowledge and experience of workers before they retire (e.g. development of training videos, modules, etc.).	MITAC	Employers Labour Unions	24 months
25. Promote re-instating retired workers willing to return to work under flexible working conditions (e.g., part-time).	PMAs	MITAC Employers	12 months and on-going
26. Work with suppliers and contractors to help retirees re-enter the industry.	PMAs	MITAC Industry	12 months and on-going

Strategy B3: Encourage industry to develop mentoring programs to facilitate the transfer of knowledge from older experienced workers to their replacements.

Action Items	Lead(s)	Partners/Support	Timing
27. Identify and catalogue existing mentoring practices in mining or other sectors.	MITAC	Industry Others	6-18 months
28. Promote phased-in retirement (coordinated with new hires), to facilitate knowledge-transfer within firms.		Industry	12-24 months
29. Create a mentorship relationship between experienced or retired workers and PSE faculty who will be replacing the aging teaching infrastructure.	Educators Industry Associations Industry	Workers	24-36 months

Strategy B4: Develop a collaborative, cross-industry strategy for educational preparation, training and educational programs, continuing education and life-long learning, and employer-provided training to facilitate the availability of a skilled labour force.

Action Items	Lead(s)	Partners/Support	Timing
30. Encourage industry to support education and training for mining-related occupations (e.g., co-op placements, apprenticeships).	Industry associations MITAC	Educators	6-24 months
31. Assist educational institutions to obtain or access resources for training (e.g., equipment) and to identify student placement opportunities.	MITAC (help match needs to available resources)		6-12 months on-going
32. Continue to develop the Aboriginal workforce and improve access to essential skills and industry training for rural, remote and Aboriginal populations.	Government AHRDA holders Educators	Industry CAMA MITAC	on-going
33. Share best practices in career development and continuous education to encourage life long learning for the mining workforce	MITAC	Industry	12-24 months

Objective C: Ensure standardization of skills and consistency of training delivery in order to facilitate recruitment, establish clear educational requirements and increase worker mobility.

Although many occupations required by the minerals and metals industry are credentialed, mining-specific occupations typically are not (with the exception of basic common-core training in Ontario and Quebec). The mining workforce will be required to complete increasingly complex tasks in the future. The sector already has a significant proportion of workers (59%) with some post-secondary education and it is expected that, in the future, an even higher proportion of the workforce will require advanced training or further education. In addition, employers and employees highlighted the need to establish a mechanism for clearly identifying required common or core skills for mining-related occupations that would facilitate the development of career paths, maintain occupational and professional standards, ensure the supply of workers with the appropriate skills and enhance worker mobility.

Strategy C1: Present employers and other industry stakeholders with a clear case for the potential benefits of occupational standards, certification and program accreditation.

Action Items	Lead(s)	Partners/Support	Timing
34. Validate study findings and recommendations about occupational standards through consultation with industry stakeholders.	MITAC	MAC Educators Industry trainers Labour organizations Workers	Immediate to 6 months
35. Convene a meeting between representatives of industry, educators and labour to present a business case and list the benefits of occupational standards.	MITAC	MAC Educators and trainers	6-12 months

Strategy C2: Develop and implement occupational standards for key industry occupations.

Action Items	Lead(s)	Partners/Support	Timing
36. Compile and analyze current provincial and territorial occupational standards relevant to the mining industry (e.g. Common Core).	MITAC	PMAs Provincial and territorial ministries and departments (education, training and/or labour departments)	6-12 months
37. Identify barriers to standardization, collaboration and implementation of occupational standards.	MITAC	PMAs Provincial/ territorial ministries/departments (education, training and/or labour departments)	6-12 months
38. Develop and validate nationally accepted occupational standards and essential skills profiles for key industry occupations (non-Red Seal training).	MITAC	PMAs Provincial and territorial ministries and departments (education, training and labour departments)	12-24 months
39. Adjust existing curricula and develop new curricula to meet the national occupational standards.	Association of Canadian Community Colleges of (ACCC)	MITAC provincial and territorial governments	24-36 months
40. Develop and implement a quality-assurance framework to ensure that educational institutions train to national standards through a program-accreditation system.	MITAC	Governments Educators/ trainers Industry Unions	24-36 months
41. Develop a national certification system based on the Occupational Standards for workers who have received their training from an accredited training program.	MITAC	Governments Educators/ trainers Industry Unions	36 months +

Strategy C3: Standardize credentialing of professional occupations within Canada.[92]

Action Items	Lead(s)	Partners/Support	Timing
42. Review provincial professional certification requirements.	MITAC	CCPE CCPG Other professional associations	6-12 months
43. Propose changes to legislation that would allow mining professionals to practice in more than one jurisdiction without requiring specific provincial registration for each province or territory.	PDAC	CCPE CCPG Other professional associations	12-24 months

92 In some cases, there may be opportunities to partner with other industry sectors (e.g., professional engineers).

Objective D: Ensure that all stakeholders are aware of and understand the critical human resources issues currently facing the minerals and metals industry.

Successful implementation of the action items required to meet the objectives set forth in the minerals and metals industry's human resource strategy requires that key industry players understand the importance of human resources to the continued success and competitiveness of Canada's minerals and metals industry.

The challenge is to expand the focus of industry beyond production-specific decision-making to include proactive, strategic human resources planning. As evidenced in the results of the research, the industry is facing considerable competition from other Canadian industries, as well as from the global mining sector. To address these challenges, the industry will need a coordinated effort on the part of all communities of interest.

Strategy D1: Develop and implement a communications strategy that emphasizes the impending human resource crisis facing the minerals and metals industry. The strategy is intended to raise awareness, understanding and collaboration between the industry stakeholders who have an important role to play in overcoming the human resource challenges facing the industry.

Action Items	Lead(s)	Partners/Support	Timing
44. Educate mining company executives and mine managers about the urgency of the industry's human resource situation (e.g., Australia's "story").	PDAC MAC CIM Canadian Labour Congress MITAC		Immediate to 6 months
45. Facilitate communication and coordination of HR planning between corporate and operations management.	MAC MITAC PMAs		6-24 months

APPENDIX A: NOC CODES

NOC 211 Physical Science Professionals

NOC 213 Civil, Mechanical, Electrical and Chemical Engineers

NOC 214 Other Engineers

NOC 221 Technical Occupations in Physical Sciences

NOC 2211 Chemical Technologists and Technicians

NOC 737 Crane Operators, Drillers and Blasters

NOC 823 Underground Miners, Oil and Gas Drillers and Related Workers

NOC 822 Supervisors Mining Oil and Gas

NOC 7311 Construction Millwrights and Industrial Mechanics

NOC 7312 Heavy-Duty Equipment Mechanics

NOC 7242 Industrial Electricians

NOC 921 Supervisors, Processing Occupations

NOC 923 Central Control and Process Operators in Manufacturing and Processing

NOC 941 Machine Operators and Related Workers in Metal and Mineral Products Processing

NOC 841 Mine Service Workers

NOC 742 Heavy Equipment Operators

APPENDIX B: RESEARCH MATRIX

Module 1: The Macroeconomic, Political And Regulatory Environment			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Impact of economic, political and regulatory environments on Canadian Mining Industry Impact of Canadian trade policy, fiscal policy trends and monetary policy Emerging markets/increased investment in under-developed countries and the impact on Canadian Industry Increased social awareness and thrust towards environmental responsibility and its impact on human resources issues	• Analysis of emerging/new markets in Canada and abroad • Assessment of the economic impact of KYOTO ramification in Canada • Macroeconomic analysis (balance of trade, fiscal policy, monetary policy, impact on the national income identity) • Analysis of Canada's taxation system compared to other countries with large mining operations • Analysis of Canada's ability to compete against foreign markets with lower cost structures/taxation Additional Component: • Review and analysis of Canadian immigration policies and trends	• Literature review • Key informant interviews*	

APPENDIX B: RESEARCH MATRIX

MODULE 2: LABOUR SUPPLY			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Current labour shortages by occupation Anticipated labour shortages by occupation (5/10/15 years) Age structure of workforce within firms Expected retirements by occupational group and industry sub-sector over the next 10 years Diversification of the industry's workforce, including present level of diversification and identification of methods to increase diversification	• Identification of the current number of employees and forecasts 5, 10 and 15 years of workforce requirements for production, maintenance, engineering, technical trades and line level supervision • Labour force profile in terms of income, age, gender and education • A determination of the current (past 6 months) job vacancies in key job categories • An analysis of mining education trends, student mid-program attrition, industry departures due to cyclical patterns, impact of lack of student placements, co-ops, etc. Additional Component: • Identification of barriers to participation in the industry • Analysis of cross-sector mobility of members of the workforce	• Employer survey • Forecasting model • Literature review • Focus groups employers new entrants/grads • Key informant interviews • Educator survey • Canadian Occupational Projection System (COPS)	• a non-representative sample of employers would not provide an accurate overview of labour situation in the industry as a whole • limitations to how much we can ask of employers (survey fatigue) • employers may not have data for some variables (e.g., equity groups, age, other)

Note: Key informant interviews include consultation with the various communities of interest and include unions, employers, government, professional associations, industry associations, and special interest groups.

APPENDIX B: RESEARCH MATRIX

MODULE 3: EMPLOYER DEMAND			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Changes in education and skill requirements for entry level employees Current skill or occupation gaps experienced by employers Anticipated skill or occupation gaps in the next 5/10/15 years Time required to fill vacancies Improvements to education and training that would help meet employer demand Diversification of the industry's workforce including present level of diversification and methods to increase diversification	• The identification of the skills, knowledge and abilities needed by occupation • An analysis of the current extent of labour mobility between provinces/territories • An analysis of the current cross trades mobility. As an example: tradespersons with more than one trade; or skills that are transferable to another trade or sector • An analysis of the interrelationships and career mobility between the occupational areas of the mining sector workforce • An analysis and comparison of current and emerging international trends, their impact on the workforce, and, the actions currently being undertaken by the sector and government • The identification and analysis of how new entrants perceive the mining sector as an employment and career opportunity; the assessment will also include examining society's perceptions and acceptance of mining as offering career opportunities • An analysis of trends in mine closures, (shorter mine lifecycles) and industry's ability to relocate and reemploy the labour force through adjustment committees • An analysis of the mobility of those workers affected by mine closures	• Employee consultation • Employer survey • Forecasting model • Key informant interviews • Literature review • Focus groups employers employees youth new entrants/grads • Case studies	• a non-representative sample of employers would not provide an accurate overview of labour situation in the industry as a whole • limitations to how much we can ask of employers (survey fatigue) • employers may not have data for some variables (e.g., equity groups, age, other)

MODULE 4: SUPPLIERS AND CONTRACTORS			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Trends in supplier and contractor firms (e.g., type of service, number, etc.) Labour force profile of supplier and contracting firms Labour force profile of supplier organizations	• Identification of the skills, knowledge and abilities needed by supplier and contractor firms in the short and long term	• Suppliers survey • Forecasting model • Key informant interviews	• a non-representative sample of employers would not provide an accurate overview of labour situation in the industry as a whole

APPENDIX B: RESEARCH MATRIX

MODULE 5: RECRUITMENT AND RETENTION			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Types of human resource plans currently being utilized by firms Elements included in the human resource plans: recruitment, retention and adjustment/displacement Examples of successful human resource practices/strategies in recruitment, retention and adjustment/displacement Descriptions of the various career paths available within the industry Competition for labour supply within the industry, inter-sectorally and internationally	• The identification of occupational shortages and reasons for them, such as difficulties with recruitment, retention, etc. • The assessment of the current recruitment practices and examining the critical challenges of recruitment and retention of experienced, non-experienced workers and women (including the time required to fill vacancies) • Identification/assessment of both successful and unsuccessful recruiting strategies • The assessment of the current compensation and benefits practices of this sector and a comparative analysis of practices to other industrial sectors (e.g., forestry, fisheries, manufacturing, construction, etc.) Additional Component: • Identification of potential issues associated with the retention of older workers • Analysis of cross-sector mobility of members of the workforce	• Employer survey • Career path model • Key informant interviews • Employee consultation • Case studies • Focus groups -all • Literature review	• Need industry engagement to obtain comprehensive overview of the state of human resource planning/management across the industry.

APPENDIX B: RESEARCH MATRIX

MODULE 6: TRAINING AND EDUCATION

Issues	Research Approach	Proposed Data Sources	Research Limitations/Challenges
Present industry-based training infrastructure in large and small operations, including cost of industry-based training, organization and delivery of training and number of employees who receive training Source of trainers in industry, including training of trainers and certification/accreditation of trainers Extent to which coordination and communication among trainers, and duplication of training has been improved Extent to which training is integrated into broader operations and corporate strategy Extent of education and training partnerships, including types of partnership and partners Accessibility of training (public, private and industry-based) Changes in environmental knowledge requirements	• The examination of the sector's use of new learning media/vehicles such as distance education and Computer Based Terminals (CBT), etc. • The identification and assessment of the current and expected training requirements as well as any gaps and opportunities for continuous learning • An analysis of the barriers to training • An analysis of barriers to increasing enrolment in university and college mining programs • An analysis of the current levels and trends in enrolment (including gender breakdown) Additional Components: • Review of student placement levels/ practices • Review of co-op and apprenticeship programs available • Identification of industry participation in student placement, co-op and apprenticeship programs • Analysis of the costs associated with training	• Literature review • Employer survey • Educator survey • Key informant interviews • Focus groups -industry trainers -new/entrants/grads -employees • Case studies	• Heavy reliance on qualitative data • Need educator/trainer engagement to obtain comprehensive overview of training situation in Canada

MODULE 7: TECHNOLOGY

Issues	Research Approach	Proposed Data Sources	Research Limitations/Challenges
Impact of technological change on employer needs Impact of technological change on labour force skill requirements Skill gaps experienced by workers	• An assessment of the current and future role of technology and the implications for the workforce • An assessment of the impact of productivity increases on the workforce numbers	• Focus groups -industry trainers -employers -employees • Employer survey • Key informant interviews • Employee consultation	

APPENDIX B: RESEARCH MATRIX

MODULE 8: ENGAGEMENT/BROADENING SOURCES OF SUPPLY			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Identification of those industry sites in proximity of Aboriginal communities Accessibility of training for Aboriginals (public, private and industry-based) Incorporation of Aboriginal knowledge/culture in education and training programs Extent of Aboriginal involvement in local industry	• A profile of the Aboriginal workforce including age, education, etc. • Identification of existing IBA agreements • Level of involvement of Aboriginal communities in the mining lifecycle • An assessment of the inclusion of women, immigration and other minority groups (not limited to Aboriginals) in the workforce • An assessment of the need of foreign credential / competency recognition to engage immigrant population	• Literature review • Key informant interviews • Aboriginal case studies • Focus groups -employers	• Accessibility of remote locations/ resources required for travel

MODULE 9: INTEGRATED FINDINGS			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Qualitative and quantitative data analysis and synthesis	• Analysis of interrelations between Modules • Analysis of interdependencies between gaps	• Findings from all data sources in all modules	

MODULE 10: RECOMMENDED STRATEGIES			
Issues	**Research Approach**	**Proposed Data Sources**	**Research Limitations/Challenges**
Recommendations to ensure all communities of interest realize the benefits resulting from the research and to ensure the successful future of the entire industry	• Synthesis of key issues facing the minerals and metals industry • Detailed recommendations for solving key issues identified in sector study	• Roundtable • Industry consultation • Employer/Supplier survey • Employee consultation • Key informant interviews • Case studies • Literature review	• Scheduling and recruitment of roundtable participants within project timelines

APPENDIX C: SECTOR STUDY METHODOLOGY

1. Survey of Canadian Minerals and Metals Employers

Minerals and metals employers included companies with mines producing the top 10 minerals and metals in Canada, conducting mineral and metal exploration activities, and/or operating non-ferrous metal smelters and refineries. See ***Appendix C*** for a list of participating minerals and metals firms. Two versions of the survey were developed, one for headquarters and one for sites/operations. The surveys were conducted using a mixed-mode approach (i.e., mail out with telephone follow-up) to enhance the response to the surveys.

Sample Development

Firms had to be identified that fit within the parameters defined for the sector study. A number of sources were used to develop the sample frame for the employer survey. The initial sample of employers in the minerals and metals sector was selected from the 2003/2004 *Canadian & American MineScan* CD-ROM to represent different regions, firm sizes and commodities.[1] This original list of companies with active Canadian mining and smelting/refining operations was up-dated from the 2004/2005 *Canadian & American MineScan* CD-ROM.

In addition to the MineScan directory, the Consultant was provided a temporary account to access the InfoMine database online. Companies with active mining operations in Canada were cross-referenced with the list obtained from the MineScan CD-ROM, which resulted in a further 10 companies with active mining operations in Canada being added to the sample.

There are more than 3,000 aggregate firms across Canada. Therefore, a sample of these firms was selected for the study. Aggregate producers were not listed on the MineScan CD-ROM or in the InfoMine database. The sample of aggregate producers was compiled from a number of sources, as follows:

- Aggregate Producers Association of British Columbia,
- Aggregate Producers Association of Ontario,
- *Aggregates & Roadbuilding* Magazine (annual top 20 producers in Canada, 1998 to 2004), and
- SuperPages directory.

Initially, the sample consisted of 222 employers identified as having active exploration, mining and/or smelting/refining operations in Canada, including the sample of aggregate producers. However, some of the firms were identified as duplicates (e.g., multiple companies having a stake in a single

1 This information was provided by MITAC and used to develop a preliminary list. An up-dated version had been ordered by the Consultant but had not yet been released at the time of initial sample development.

mining operation), or the information acquired from various sources was inaccurate. In particular, a number of exploration companies identified from the InfoMine database were not actively exploring in Canada and did not plan to be actively exploring in Canada within the next year. Thus, the final number of employers (headquarters and sites/operations) in the sample frame was 179. It should be noted that the sample of employers was based on the coverage of target commodities selected for the study.[2]

Survey Administration

A field test of the employer survey revealed the need for a flexible survey distribution strategy. From the field testing activities, it was determined that identifying the appropriate person at the appropriate level (i.e., headquarters versus operations) would be key to collecting accurate data and in ensuring there would be no double-counting of employees, or that employees were not missed. It was determined that distribution of the employer surveys to large national companies would require a preliminary contact call to identify the best way to approach the survey based on the firm's corporate structure. From this point of contact, the appropriate survey packages were distributed to the appropriate people for completion.

During survey administration, a number of strategies were implemented to enhance the response rate of the employer survey:

- continued attempts at telephone follow-up, and telephone or email reminders about completing and returning the survey;
- identification of refusals and review by MITAC of the noted contact persons;
- distribution of a "call to action" letter from the Mining Association of Canada to its member firms reminding them of the importance of participating in the survey; and
- personal contact by members of the MMISSSC to firms to encourage participation.

2. Survey of Suppliers and Contractors

Suppliers and contractors provide a number of services to the minerals and metals industry including:

- professional services (geological, mineral, metallurgical, exploration, environmental, computer, safety and engineering specialists);
- provision of mining and exploration services (drilling, boring, blasting, tunnelling, crane, mineral extraction, material moving, transportation, mineral and metals processing, maintenance, site remediation, etc.);

2 Aggregate, Coal, Copper, Diamonds, Gold, Iron ore, Molybdenum , Nickel, Oil Sands, Potash, Uranium, Zinc.

- education and training services;
- technology equipment supply (robotics, automation, communications, fibre optics, utilities, electricity, etc.); and
- other equipment supply for mining, exploration and smelting/refining operations.

One survey instrument was developed for supply/contracting firms participating in the minerals and metals industry. As with the employer survey, the supplier/contractor survey was conducted using a mixed-mode approach to help maximize response rates.

Sample Development

Similar to the employer sample, secondary sources were used to develop the sample frame for the supplier/contractor survey. Supply/contracting firms were identified through the Canadian Association of Mining Equipment and Services for Export (CAMESE) website. Firms that provided exploration and/or production services were selected. A final sample of 137 supply/contracting firms was selected, representing different types of services provided and different regions. Given the constraints of the study and the wide variety of supplier and contracting firms, it was not possible to determine the full universe.

Survey Administration

Following the field test, full survey administration for suppliers/contractors commenced. Telephone follow-up activities were completed for the supplier/contractor group and attempts were made to contact all firms.

3. Employee Survey

An employee survey was designed to obtain information representative of the industry's workforce as a whole.

Sample Development

The ability to complete an employee survey was dependent on support from employers and from unions where unionized workers are employed. With the cooperation of producers, unions and industry associations, industry employees were invited to participate in the survey. Given the need to accommodate producer requests, employees were provided with a variety of methods to complete the survey. Where applicable, union support or awareness of the research was obtained. It should be noted that as employers could not provide names to the Consultant, it was not possible to complete follow-up activities to increase the survey response rate.

Survey Administration

After field-testing the employee survey instrument, the method of distribution and collection was arranged in consultation with the employers to suit the firm's operations. In addition, representatives from the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), and the Prospectors and Developers Association of Canada (PDAC) distributed an electronic version to their memberships to facilitate response to the survey. Attempts were made to ensure employee representation was obtained from all major commodity groups from all regions of Canada, and from different types of operations and/or mining stages.

4. Education and Training Institution Surveys

To ascertain trends/developments in the training of existing and potential new workers, universities, colleges, and technical institutions that delivered programs applicable to occupations in the minerals and metals industry were surveyed. The survey focused only on mining-specific certificate, diploma and degree programs, such as:

- mining engineering
- geological engineering
- geology
- metallurgy

Sample Development

The 32 institutions identified in Phase I of Prospecting the Future were used as the sample frame for Phase II of the research. Prior to full survey administration, calls were made to the 32 institutions constituting the sample frame to ascertain the correct contact person(s) within each institution prior to mail-out of the survey package. It was determined through the initial contact that 6 of the institutions did not have programs or courses specific to mining education or training. A final sample of 26 institutions and trainers with mining programs and/or courses in Canada was identified that included 9 universities and 17 university-colleges, colleges or technical institutes.

Survey Administration

Field-testing of the education survey was not undertaken due to the small number of institutions and the fact that the survey instrument was closely reviewed and approved by representatives of education from the Steering Committee. Also, similar questionnaires were applied in other sector study research, and questions had been fine-tuned through this research. The education survey was also a mail-out survey with telephone follow-up.

5. Key Stakeholder Interviews

In order to gain a better understanding of the key human resource issues facing the sector, the Consultant completed one-on-one interviews with key stakeholders representing industry, labour, government, education/training, industry associations and other interests. Interviews with key informants representing the communities of interest to this study were necessary to ensure an accurate reflection and understanding of the human resource situation from the industry's perspective. Final versions of the interview guides were reviewed by, and field-tested with members of the Steering Committee.

All efforts were made to accommodate the interviewees in scheduling appointments. Attempts were made to conduct as many interviews as possible in-person and to have the interviews completed by senior research staff of the Consultant. In total, approximately one-third of the interviews were completed in-person.

6. Focus Groups

In order to provide context to the survey findings, the research included 10 focus groups with various target populations across Canada. Focus groups included sessions with employers, employees, graduate students/recent graduates and youth. Focus group participants and their locations are summarized in Exhibit 1 below.

Exhibit 1: Summary of Focus Group Participants, Venues, Scheduled Dates and Facilitators Participants

Participants	Location
Employers (3)	Vancouver, BC Rouyn-Noranda, QC Employers, SK
Employees (2)	Saskatchewan Sudbury
New Entrants/Graduates (3)	Rouyn-Noranda, QC Vancouver Sudbury
Youth (2)	Vancouver Sudbury

7. Case Studies

To further explore unique practices with respect to human resource planning, training, attraction and retention programs or policies, five case studies were selected to provide additional information as to "what works" in terms of successful human resource practices in the minerals and metals industry. Selection of the case study sites was made in consultation with the MMISSSC. The case studies were "miniature" research projects, whereby a number of research techniques were used to obtain multiple lines of evidence.

Aboriginal Case Studies (2)

Two in-depth case studies were completed for regions/operations in Canada where Aboriginal communities have or are developing relationships with mining companies in production in their regions. These studies analyse the challenges and opportunities related to the limited but increasing participation of Aboriginals within the minerals and metals industry. One case study focuses on northern Saskatchewan, where there is a history of successful partnerships between Aboriginal communities and the uranium industry. The second Aboriginal case study focuses on Voisey's Bay, Labrador, which is scheduled to begin production in August 2005. The case study explores the relationship between Inco's Voisey's Bay Nickel Company, the Labrador Inuit Association and the Innu Nation, where successful impact and benefit agreements (IBAs) have been formalized.

Other Case Studies (3)

Three additional case studies were completed. The Sudbury case study explores the relationships between mining employers and the post-secondary education institutions located in the region. In addition, the case study discusses the ongoing development of the Sudbury "mining cluster." A second case study examines Occupational Standards for the mining/mineral processing industry developed by the NWT Department of Education, Culture and Employment. The third case study explores fly-in fly-out operations and a new social support program being implemented by Barrick Gold at the Eskay Creek mine in northern British Columbia.

8. Review of Literature and Secondary Data

A comprehensive review of provincial, national and international information related to the minerals and metals industry was conducted. The research team reviewed a number of national and international sources to identify any "best practices" as potential practical applications to improving the minerals and metals industry human resource situation in Canada. References to programs and literature made during consultation with industry stakeholders were noted and accessed, as well as a number of sources identified independently by members of the research team. Results of the literature and secondary data review activities have been incorporated and referenced in the report, as appropriate.

A bibliographical database developed in Phase I of Prospecting the Future was up-dated as part of Phase II to include other secondary sources identified in the research.

9. Summary of Coverage

Survey responses were received from all regions, for small, medium and large operations/firms, for most commodities, for all types of mining activities of interest to the research and for union/non-union operations. Exhibit 2 provides a summary of the regional representation of survey completions for active mines, smelting/refining operations and exploration sites.

Exhibit 2: Number of Active Minerals and Metals Industry Sites Reported by Region

	Atlantic	QC	ON	MB	SK	AB	BC	Terr	TOTAL
Active Mines	5	8	33	6	15	13	26	1	107
Smelters/ Refineries[1]	1	3	4	1	0	0	1	0	10
Refineries[2]	1	1	2	0	2	0	4	0	10
Exploration Sites	14	5	31	6	59	0	23	10	148
Pelletizing, Port, Railway & Ore Handling	0	1	0	0	0	0	0	0	1
TOTAL	21	18	70	13	76	13	54	11	276

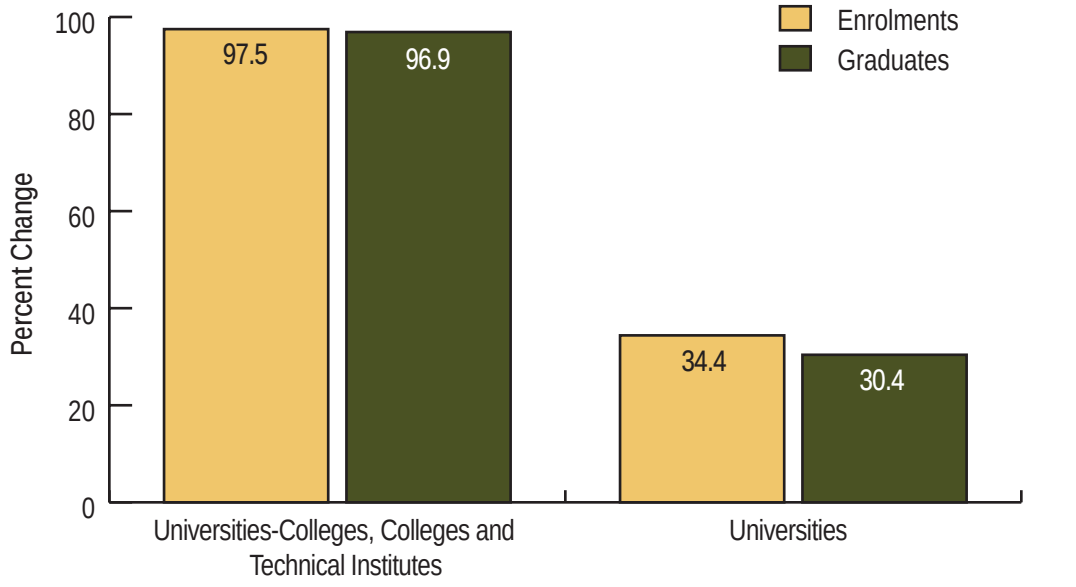
Source: Employer survey responses (n=48)

1 Operations include only nonferrous smelting and refining.

2 Excludes survey responses for refineries listed by aggregate, coal and diamond producers, and refineries associated with smelters in survey responses.

There was a higher response to the education survey from university-colleges, colleges and technical institutes than from universities providing minerals and metals industry-related programs, as detailed in Exhibit 3. Overall, survey responses accounted for 97.5% of the estimated number of students enrolled in university-colleges, colleges and technical institutes, and 96.9% of the estimated number of graduates for the 2004-05 academic year. In comparison, coverage of estimated enrolments (34.4%) and graduates (30.4%) in university programs and courses in the current calendar year was much lower.

Exhibit 3: Education/Training Coverage Percent of Estimated Student Enrolment and Graduates (2004-2005)



n=5 universities, 14 university-colleges, colleges and technical institutes responding to the education survey.

In total, 14 of 17 university-colleges, colleges and technical institutes participated in the survey, in contrast to 5 of 9 universities. Indeed, some universities with the greatest number of minerals and metals industry-related programs and courses were non-participants.

APPENDIX D: PARTICIPATING MINERALS AND METALS FIRMS

1. Altius Mineral Corporation
2. Areva Cogema Resource Inc
3. Ash Grove Cement
4. Azure Resources Corporation
5. Band Ore Resources Ltd.
6. Barrick Gold Corp
7. Breakwater Resources Ltd.
8. Cambior Inc.
9. Cameco Corporation
10. Canadian Gold Hunter Corp.
11. Claude Resources Inc.
12. Conrad Brother Ltd.
13. Doublestar Resources Ltd.
14. Elk Valley Coal Corp.
15. FNX Mining Company Inc.
16. Foran Mining Corp
17. GLR Resources Inc.
18. Harold Sutherland Construction Ltd.
19. Huckleberry Mine Ltd.
20. Hudson Bay Mining and Smelting Company
21. Imperial Metals Corporation
22. Inco Ltd.
23. Inmet Mining Corp.
24. Inmet Mining Corp., Troilus Division
25. Iron Ore Company of Canada
26. Jaguar Nickel Inc.
27. Kemess Mine Ltd.
28. Lafarge Canada Inc. AC&A Western Region
29. Luscar Ltd.
30. Merit Mining Corporation
31. Miramar Mining Corporation
32. Moncton Crushed Stone
33. Nelson Aggregate Company
34. Newmont Canada Ltd.
35. Noranda/Falconbridge
36. North American Palladium
37. Northgate Mineral Corporation
38. Potash Corporation of Saskatchewan Inc.
39. Quebec Cartier Mining
40. Queenston Mining Inc.
41. Quinsam Coal Corp. (Hillsborough Resources Ltd.)
42. St. Andrew Goldfields Ltd.
43. Tahera Diamond Corporation
44. Teck Cominco Ltd.
45. Teck Cominco Metals Ltd.
46. Terra Nova Industries Ltd.
47. Texada Quarrying Ltd.
48. Thunderstone Quarries Ltd.

APPENDIX E: ABORIGINAL AGREEMENTS

Existing Impact and Benefit Agreements

Project	Prov./Terr.	First Nation	Mining Company
Ulu Project	Nunavut	Kitikmeot Inuit Association	Echo Bay Mines Ltd.
Raglan Nickel	Quebec	Nunavik Makivik Corp.	Falconbridge Ltd.
Mount Nansen Mine (has been shut down and abandoned)	Yukon	Little Salmon/Carmacks Nation	BYG Natural Resources
Voisey's Bay	Nfld & Lab.	Labrador Inuit Association	Inco Ltd.
Voisey's Bay	Nfld & Lab.	Innu Nation	Inco Ltd.
Troilus Mine	Quebec	Cree Nation	INMET
Ekati Diamond Mine	NWT	North Slave Metis Association	BHP Billiton Inc.
Ekati Diamond Mine	NWT	Kitikmeot Inuit Association with the Inuit of Kugluktuk	BHP Billiton Inc.
Ekati Diamond Mine	NWT	Akaitcho Treaty 8 Council	BHP Billiton Inc.
Ekati Diamond Mine	NWT	Dogrib Treaty 11 Council	BHP Billiton Inc.
Eskay Creek Mine	BC	Tahltan Nation	Barrick Gold Corp.
	Alberta	Fort McKay First Nation	Syncrude
Musselwhite	Ontario	Windigo Nation.	Placer Dome Inc.
Musselwhite	Ontario	Cat Lake Nation	Placer Dome Inc.
Musselwhite	Ontario	Shibogama Nation	Placer Dome Inc.
Musselwhite	Ontario	North Caribou Lake Nation	Placer Dome Inc.
Musselwhite	Ontario	Kingfisher Nation	Placer Dome Inc.
Musselwhite	Ontario	Wuunnumin Lake First Nation	Placer Dome Inc.
Brewery Creek	Yukon	Tr'on dek Hwech'in First Nation	Viceroy Resources Corp.
Diavik	NWT	Yellowknives Dene First Nation	Rio Tinto/Diavik Diamond Mines Inc.
Diavik	NWT	Dogrib Treaty 11 Council	Rio Tinto/Diavik Diamond Mines Inc.
Diavik	NWT	North Slave Metis Alliance	Rio Tinto/Diavik Diamond Mines Inc.
Diavik	NWT	Kitikmeot Inuit Association	Rio Tinto/Diavik Diamond Mines Inc.
Diavik	NWT	Lutsel K'e Dene Band	Rio Tinto/Diavik Diamond Mines Inc.
Meliadine	Nunavut	Nunavut Tungavik Corp.	WMC/Cumberland/Comaplex
Meliadine	Nunavut	Kivalliq Inuit Association	WMC/Cumberland/Comaplex
Kudz Ze Kayah	Yukon	Ross River Dene	Cominco
Mudjatik/Thyssen	SK	Dene, Woodland Cree, Metis	Cameco Corporation
Jericho Diamond Mine	Nunavut	Kitikmeot Inuit Association	Tahera Diamond Corp.

Sources: Prospectors and Developers Association website: www.pdac.ca/pdac/publications/papers/2001/pdf/Wolfe(T-19).pdf
Canadian Arctic Resources Committee website: www.carc.org/pubs/v25no4/2.htm

APPENDIX E: ABORIGINAL AGREEMENTS

Cameco Corporation, Cigar Lake Mining Corporations, and COGEMA entered into an **Impact Management Agreement (IMA)** with the communities of the Athabasca Region in the far north of the province in 1999. The IMA is a community-company agreement, which addresses many of the communication, environmental, social, and economic issues raised by communities during the hearings.[1]

1 Parsons, G.F. and R. Barsi. 2001. Large Mines and the Community: Socioeconomic and Environmental Effects in Latin America, Canada, and Spain; Chapter 7. Uranium Mining in Northern Saskatchewan: A Public-Private Transition (Part 6). IDRC/World Bank http://web.idrc.ca/en/ev-28039-201-1-DO_TOPIC.html.

APPENDIX F: CASE STUDIES

Eskay Creek Mine: Commuter Mines and Social Support Case Study

Overview

This case study examines commuter mining and its associated challenges in the context of Eskay Creek Mine's innovative social development program that helps workers and their families manage these challenges.

The Eskay Creek Mine is an underground, high-grade gold and silver mine that produces 320,784 ounces of gold and 15.5 million ounces of silver each year,[1] making it the world's fifth largest producer of silver. Opened in 1995, Eskay Creek currently produces both high-grade shipping ore and lower grade milling ore and continues to be a highly profitable operation.[2] It is a major employer in the region and has a policy to hire local people whenever possible.[3] In 2003, it employed 144 company employees and 201 contractor employees.

The Eskay Creek Mine has been owned by the Barrick Gold Corporation since 2001. Barrick Gold is a leading international gold company with mines and development projects in Canada, the United States, Australia, Peru, Chile, Argentina and Tanzania. Since its beginning in May 1983, Barrick has become one of the world's largest gold producers. Eskay Creek is one of Barrick's three Canadian mines and its only one in British Columbia. In addition to its mining activities in the region, Barrick Gold Corporation spends more than $1.5 million each year exploring the area for other deposits. It plans to close Eskay Creek in 2008 if no new ore reserves are found.[4]

Eskay Creek is located in a very remote part of northwestern British Columbia and has no adjoining townsite. Unlike many remote mining sites, however, there is road access to Eskay Creek. Nonetheless, the small population of the area and the mine's remoteness means that many workers must fly in and fly out. Fly-in-fly-out mines, also known as commuter mines, present unique challenges for workers and their families not normally associated with more conventional mines.

Mining and forestry operations are the main employers in the region. The population of the surrounding communities, including First Nations

1 Mineral Resources Education Program of British Columbia website, Eskay Creek. http://www.minerals.ca/files/bc_mine_information/000127.php (04 April 2005).
2 Teuton Resources Corporation website. http://www.teuton.com/pf-pr-mar162004.htm (05 April 2005).
3 Mineral Resources Education Program of British Columbia website, Eskay Creek. http://www.minerals.ca/files/bc_mine_information/000127.php (04 April 2005).
4 Ibid.

reserves, is 1,930,[5] about 0.05% of the provincial population of 4,196,383.[6] The closest community is Stewart, B.C., approximately 80 kilometers to the south. The town of Stewart was established in 1898 when 68 prospectors came looking for precious metals deposits. Although rumours that the area was another Klondike proved unfounded, the attention led to increased mining activity and exploration.[7] The Stewart-Eskay Creek region first became prominent in 1918, when high-grade gold and silver were discovered at the Premier Mine. In the 1960s, several large copper deposits were also discovered but were not developed at that time. In 1988, high-grade gold and silver deposits were discovered at Eskay Creek, setting off a gold rush of explorers looking for similar ore bodies. However, as no comparable finds were made and gold prices fell through the 1990s, mining companies withdrew from the area.[8]

Economic Base

Currently, metal mining provides approximately 2,500 direct jobs in the region and pays among the highest average industrial wages in British Columbia. It also supports numerous indirect jobs and industries throughout the province. Mineral exploration and mining activities provide important economic and geographic diversification by supporting both regional and small communities and infrastructure. In the last five years, the metals sector has contributed between $25 million and $50 million in direct taxes to the provincial government and approximately $30 million to municipal governments annually.[9] Eskay Creek is an important part of the minerals and metals industry in British Columbia.

The Eskay Creek Mine is located on traditional First Nations territory. The mine has established several service contracts with the Tahltan National Development Corporation (TNDC) for road maintenance and catering services.[10] Jerry Asp, Chief of the Tahltan First Nation since 2002, founded TNDC in 1985 to take advantage of construction opportunities in the local minerals and metals industry.[11] The mine supports economic and education programs for the Tahltan Nation through employment, apprenticeships, and contributions to local community improvement projects.[12] Barrick Gold fostered the joint venture between the Tahltan First Nation and Domco caterers to provide camp services at Eskay Creek. Following their initial three-year contract, the Tahltan First Nations formed their own catering company in 1999, Spatsizi Remote Services Corporation, which now provides the camp services and uses Domco to assist with management services.[13]

Local Labour Force

In 2002, there were 5,000 registered Tahltan people; of these, 1,000 lived full-time in this traditional First Nations territory while the rest were spread across British Columbia and the Yukon. The Tahltan people have a long history of mining in the area. The Cassiar Mine was the first major mine

5 Northern Lights College website. http://www.nlc.bc.ca/deaselake/index.html.
6 BC Stats Population and Demographics website. http://www.bcstats.gov.bc.ca/data/pop/popstart.htm.
7 Stewart and Hyder International Chamber of Commerce website. http://www.stewart-hyder.com/stewart.html (05 April 2005).
8 Resources World Magazine.
9 Province of British Columbia, British Columbia Mining Plan 2004.
10 International Institute for Sustainable Development.
11 Vini Vidi Vici: Tahltan Chief Conquers Mining Industry. Interview with Chief Jerry Asper.
12 Barrick Gold Corporation. Responsibility: Environment, Health, Safety and Social Responsibility Report 2002.
13 Natural Resources Canada website. Barrick Gold. http://www.nrcan.gc.ca/mms/sociprac/barrick-e.ht (04 April 2005).

in the region to employ significant numbers of Tahltan people.[14] A significant number now work in mining or mining-related activities in the region, many through the Barrick Gold Corporation at Eskay Creek. More than a third of the mine's workforce is Tahltan, employed either directly or through a variety of service contracts made between the TNDC and Barrick Gold.

Commuter Mines

Historically, small towns or communities were built around mining operations. Today, however, governments and industry avoid developing communities solely to accommodate miners and their families during the life of the mine. In fact, no new mining towns have been built in Canada for over two decades. This is because of the expense and because of changes in mining and transportation technology, public policy and social and physical standards in town development. Instead, the mining town model has been displaced by commuter mining. Commuter mines are operations to which employees travel long distances by car, bus, vessel or, more commonly, by air.[15] A sparse local population and remoteness of a mine site often necessitates the fly-in-fly-out system. The first mine in Canada to fully adopt the fly-in fly-out system was the Asbestos Hill mine in Quebec, which operated from 1972 to 1983.

The commuting associated with fly-in-fly-out operations is distinctly different from the regular commuting associated with work because employees stay on site for one to four weeks at a time depending on the operation. The intermittent nature of the work in a commuter mine is similar to the work in offshore oil and gas extraction, deep ocean fishing, forestry and some military work.[16]

Commuter mines present many benefits and challenges to the industry, communities, employees and their families. However, little is currently known about the economic, social, psychological and physical impacts of commuter mines on individuals and communities, or the implications for the mining industry, overall.

For industry, a major advantage of commuter mines is reduced start-up and shut down costs because the town-building phase has been eliminated. Commuter mines are easier and cheaper to open, close and re-open. Higher long-term expenses, however, may result from costly transportation schemes and from elevated costs of quality accommodation and food preparation.

For First Nation's communities, commuter mines have allowed them to participate in the minerals and metals workforce to a far greater extent than in the past. However, the social and health impacts of long-distance commuting on employees are not yet fully understood. [17]

Employees at commuter mines enjoy relatively high incomes, extended periods of time off, and greater choice of where to live. On the other hand, they must deal with frequent partings and reunions with their families, extended shifts, compressed schedules and periods of isolation.[18]

14 International Institute for Sustainable Development.
15 Costa, Silvana.
16 Ibid.
17 Ibid.
18 Ibid.

Research in the oil and gas industry, which also uses commuter operations, suggests that times of parting and reunion can be extremely stressful for many families. The spouses of workers who are away regularly are prone to mood and behavioural changes as stresses develop related to parenting, role definitions and the use of the leave time and money. As most mining employees are traditionally men, women carry the bulk of responsibility for childcare and community life while their partners are away working.[19] Research has also shown that for many women, the demands of adjusting to an "intermittent" husband and attending to the needs and demands of the spouse while he is at home can be very stressful.[20]

In addition, with the exception of a small branch of North Light's College in Dease Lake, all higher education has to be done distant from the region. As a result, when employees with diplomas or advanced degrees are needed, they generally have to be brought in from outside the area.

Like many other newer operations in Canada, Eskay Creek is a commuter mine. When working, Eskay Creek employees live at the work site and the employer provides meals, accommodation and transportation. When they are not working, many Eskay Creek employees live in the northern B.C. communities of Stewart, Smithers, Terrace and Dease Lake. Other employees commute from the southern part of the province as well as from various regions across Canada, some from as far away as Newfoundland. Most employees at Eskay Creek work for two weeks and then have two weeks off. Underground miners work ten hours a day for four weeks and then take two weeks off. While at the mine, other employees and contractors work for twelve hours a day, seven days a week. Each employee at the mine has a private room with a telephone and cable television and most workers eat their meals in a dining hall. Amenities include a weight room, sauna, games room and small store.[21] As one employer noted, the food in the mining camp is an especially important element of recruitment and retention for fly-in fly-out operations.

The Social Development Program

Barrick Gold has a number of programs to attract, develop and retain "exceptional employees." These include competitive wages and benefits, extensive education and training opportunities, and policies that discourage discrimination, harassment and other human rights violations.[22] The company also routinely conducts "social effects assessments" of its projects to ensure they contribute to local communities and promote a healthy, satisfied, skilled and stable workforce.[23]

To address many of the challenges associated with commuter operations, Barrick Gold hired a Social Development Coordinator in 2004 to help employees and their families deal with issues when one spouse or partner works in a camp environment and the other is left at home. According to Neil Jones, Human Resources Superintendent at Eskay Creek, re-entry into the family situation after extended absences can be challenging for both workers and their families. While most employees work on a two-week in two-week out rotation, some are at the camp for as long as four-weeks at a stretch. Adjusting to life at home after being away for so long can be challenging, as

19 Ibid.
20 Ibid.
21 Ibid.
22 Ibid.
23 Barrick Gold Corporation website. Social Responsibility Programs & Performance. http://www.barrick.com/index.aspx?usesid=-1&sid=122 (03 April 2005).

can returning to the worksite after a couple of weeks. In the meantime, Jones explains, life for the family continues.

The Social Development Coordinator works from the mine camp, providing counselling services to the workers at the mine and also helping the workers' families with tasks that might otherwise cause the worker to have to leave the mine. According to Jones, the Social Development Coordinator's role involves diverse activities ranging from assisting the wife of a worker when she has a car accident and insurance claims to deal with to providing one-on-one counselling to a distressed worker who is having difficulty balancing work and family life while employed in a commuter mine setting.

It has been argued that First Nations people can better tolerate being away from home because their traditional activities require that men be absent over specific periods.[24] In a January 2004 interview, however, Jones argued that these issues can be even more challenging in the Tahltan community because they may compound pre-existing social issues. As a result, Jones revealed Barrick Gold intends to appoint a Social Development Coordinator of Tahltan ancestry.

Barrick Gold hopes the efforts of the Social Development Coordinator will also help it retain employees because they and their families will be happier and healthier.

The benefits and challenges of commuter mining in the minerals and metals sector deserve closer attention, particularly as commuter mining has become the dominant approach to new developments in Canada and are regarded by many as critical to the future of Canada's North. Barrick Gold is attempting to address some of the challenges faced by employees and their families by pioneering a program that makes a Social Development Coordinator available to employees and their families in order to help them cope with the issues of regular separation and re-unification. It is worth investigating the impact of the Social Development Program further to see if introducing similar programs into other commuter operations would be viable.

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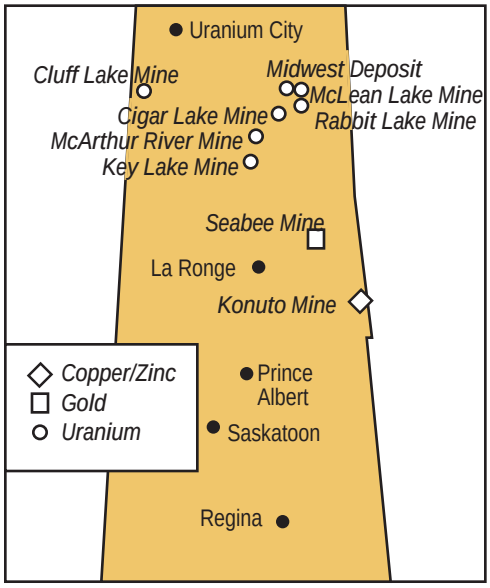
Northern Saskatchewan Case Study Focus: Aboriginal Relationship with Industry

Overview

This case study examines the minerals and mining industry in northern Saskatchewan and its relationship with the region's Aboriginal peoples.

Northern Saskatchewan is home to the world's largest and richest resources of uranium and accounts for more than 30% of global production.[25] Uranium is mined in the Athabasca sandstone basin west of Wollaston Lake.[26] Uranium mining has become a leading economic activity, led by two companies: Cameco and Areva Cogema. Rich uranium reserves have driven the development of advanced automated mining technologies, including remote-controlled underground mining equipment at the McArthur River uranium mine.

Gold, copper and zinc are also currently mined in northern Saskatchewan. The Flin Flon Greenstone Belt in Manitoba is one of the richest base metal areas in Canada. The Flin Flon zinc–copper deposit extends into Saskatchewan, where new deposits are being discovered and developed.[27] In addition, several new projects are exploring the potential for mining limestone, graphite and rare earth elements in northern Saskatchewan.[28]



Source: Northern Saskatchewan Regional Training Needs Assessment Report 2004–2005.

The northern region of Saskatchewan encompasses nearly 300,000 square kilometers. The population is sparse, primarily of Aboriginal (First Nations and Métis) ancestry, and lives in small communities. Mining activities there take place in an area traditionally occupied by First Nations people. Given the high proportion of Aboriginal people and the remoteness of communities, the region has unique demographic characteristics that have implications for the minerals and metals industry.

25 Saskatchewan Industry and Resources website. Minerals: Mining and Exploration – Abundance and Untapped Potential. http://www.ir.gov.sk.ca/adx/asp/adxGetMedia.asp?DocID=4299,3087,2936,Documents&MediaID=8131&Filename=Minerals.pdf (08 March 2005).

26 Natural Resources Canada. Saskatchewan Mining Facts. http://mmsd1.mms.nrcan.gc.ca/mmsd/facts/canFact_e.asp?regionId=7.

27 Saskatchewan Industry and Resources website. Minerals: Mining and Exploration – Abundance and Untapped Potential. http://www.ir.gov.sk.ca/adx/asp/adxGetMedia.asp?DocID=4299,3087,2936,Documents&MediaID=8131&Filename=Minerals.pdf (08 March 2005).

28 Currently, there are few rare earth deposits in the world. Rare earth elements are used in expanding technologies such as magnetics, electric and electric-hybrid automobiles, fuel cells and computers.

Economic Base

Northern Saskatchewan has been producing uranium for over 50 years. Currently, 30% of the world's supply of uranium comes from three mines: the McClean Lake and McArthur River uranium projects, which began production in 1999-2000, and the Cigar Lake mine, scheduled to begin production this year.[29] McArthur and Cigar Lake uranium ore bodies are the largest and richest in the world. Other metals are also economically important. The Seabee gold mine has produced over 600,000 ounces of gold since 1991. The Konuto Mine has been producing copper and zinc since 1999. Two companies are in the process of raising funds to proceed to production: Kristo Gold at the old Anglo Rouyn mine near La Ronge, and GLR Resources at the old Goldfields mine on Lake Athabasca.

Mineral exploration activity has accelerated in recent years, as prices for uranium, gold, copper, and silver and other mineral and metals commodities have increased. An estimated $41.4 million will be spent on mineral exploration in Saskatchewan in 2004, most of it in northern uranium and gold exploration.

The increase in exploration is due in part to Saskatchewan's six-year, $12.6 million Mineral Exploration Incentives program. This initiative is designed to stimulate exploration and development of new mines, with most of the activity taking place in northern Saskatchewan. It includes Prospectors and Corporation Exploration Incentives that support grassroots exploration. At present, most exploration activity is focused on expanding current mines, revisiting old mines, or delineating advanced exploration projects. Some noteworthy projects include:

- The Hoidas rare earth mineralization is currently being explored, including the construction of a pilot plant.

- Junior exploration companies active in the LaRonge Gold Belt include Claude Resources, which will continue exploration around its Seabee mine. Golden Band Resources continues to explore in the area of the old Jolu and Komis mines.

There is a diverse set of supply chain industries that complement the mining industry in northern Saskatchewan.[30] Mining companies have committed to increasing business opportunities for these contractors and suppliers. Since 1991, northern contractors have earned $1.4 billion from northern mining operations for goods and services.

Mining will continue to play a large role in the northern Saskatchewan economy for the next decade. Recovering markets for uranium, gold and base metal are driving exploration activity. If the Cigar Lake mine proceeds to production, there will be a marked increase in employment opportunities beginning in 2006.

29 Natural Resource Canada website. http://mmsd1.mms.nrcan.gc.ca/mmsd/facts/canFact_e.asp?regionId=7 (04 March 2005).
30 Saskatchewan Industry and Resources website. Minerals: Mining and Exploration – Abundance and Untapped Potential. http://www.ir.gov.sk.ca/adx/asp/adxGetMedia.asp?DocID=4299,3087,2936,Documents&MediaID=8131&Filename=Minerals.pdf (08 March 2005).

Demographic Profile

The population of northern Saskatchewan grew 21.1% between 1991 and 2001 but only 3.5% between 1996 and 2001. According to Census 2001, there are 32,029 people living in northern Saskatchewan, representing 3.3% of the provincial population of 978,933. This figure is expected to grow by 38% by 2015. Approximately 58% of these people live in 35 small communities, and 42% live in reserve communities belonging to 12 First Nations. La Ronge is northern Saskatchewan's largest community: over 3,500 people reside in the town itself, about 2,000 people live on the adjacent First Nations lands of the Lac La Ronge Indian Band, and 1,000 people live in the bordering settlement of Air Ronge.[31]

Most residents of northern Saskatchewan (83.6%) are of Aboriginal heritage, primarily Cree and Dene First Nations (50%) and Métis (30%). In fact, 23% of Saskatchewan's Aboriginals reside in the northern half of the province. Between 1996 and 2001, the Aboriginal population grew by 6.3% in northern Saskatchewan, by 17% in the province and by 22.2% across Canada. During the next 15 years, this population will continue to grow, although it is beginning to follow the provincial aging trend as indicated by fewer students entering elementary schools.

In 2001, almost half the people of northern Saskatchewan (47%) were under 20 years of age. This was a much higher proportion than the rest of Canada. Table 1 compares the age distribution of people living in northern Saskatchewan, Saskatchewan and Canada.

Table 1: Age Distribution - 2001

Age Group	Percentage Age Distribution[1]		
	Northern Saskatchewan	Saskatchewan	Canada
Under 20	47.0	29.2	24.6
20–34	21.5	18.5	20.8
35–44	13.1	15.3	16.1
45–54	8.8	13.4	15.0
55–64	5.1	8.6	10.6
Over 65	4.6	15.1	13.1
Total	100.1	100.1	100.2

Source: *Statistics Canada* 2001 Census
1 Numbers may not add up to 100% due to rounding.

31 Northern Saskatchewan Heritage Site website. http://www.kayas.ca/communities/laronge/laronge.html (16 February 2005).

As Table 2 shows, people in northern Saskatchewan aged 20 and older had educational attainment significantly below both the Ontario and Canadian averages in 2001. On the other hand, a slightly higher percentage of the population had obtained a trades certificate than the Canadian average. Only the two major centres in northern Saskatchewan, Air Ronge/La Ronge and Creighton/Denare Beach, had education levels similar to the provincial average.

Table 2: Percent of Population 20 Years and Older by Highest Educational Attainment (2001)

Highest Level of Educational Attainment	Percentage of Population[1]		
	Northern Saskatchewan	Saskatchewan	Canada
Less than high school	48.5	35.2	27.9
High school diploma and/or some post-secondary	18.7	22.0	27.3
Trades certificate or diploma	14.0	13.9	11.8
College certificate or diploma	12.3	16.6	16.2
Bachelor's degree or higher	6.5	12.3	16.9
Total	100.0	100.0	100.1

Source: *Statistics Canada* 2001 Census
1 Numbers may not add up to 100% due to rounding.

Working-age residents of northern Saskatchewan who graduated with a certificate, diploma or degree from a trade school, college or university rose from 15% in 1981 to 33% in 2001 (2001 Census). For the most part, this was because more people earned a high school education; the number of people with less than a high school graduation certificate fell from 71% to 48% over the same period.

School enrollment in northern Saskatchewan increased by 35% between 1989 and 2004. Five provincial schools were transferred to First Nations systems since 1991. Since then, enrollment in First Nations schools has increased by 103%, while that in public provincial schools increased by only 1%.

Over the last decade, the number of students achieving their Grade 12 diploma increased by 164% across northern Saskatchewan. A total of 269 people graduated from Grade 12 in 2003, up from 102 in 1994. The number of graduates from provincially funded schools and institutes increased by 114%, while the number of graduates from federally funded schools and institutes increased by 316%.

The unemployment rate across northern Saskatchewan is 24%, four times the provincial rate. Unemployment is highest among those aged 15 to 24, at 12.6% provincially and 38.4% in northern Saskatchewan. The labour force participation rate is relatively low; 54% of the working-age population is working or actively looking for work, compared with 68% for Saskatchewan as a whole. In addition, only 33% of youths in northern Saskatchewan are in the labour force, compared with 66% provincially.

Over the last decade, no significant gains were made in lowering the unemployment rate or increasing the employment rate in northern Saskatchewan's workforce. Between 1991 and 2001, there was a small gain of 1% made in participation rates. Employment has increased in all sectors in the north except in three: mining, government and transportation. Clearly, the minerals and metals industry in Saskatchewan will need to take action to improve the participation rate of northern Saskatchewan residents in its workforce.

Minerals and Metals Industry Labour Force

Between 1991 and 2001, mining employment in the northern region fell 24%. In 1991, there were 755 people employed in mining in the region, comprising 10% of the labour force. This number fell to 660 by 1996, or 7%, and 575 by 2001, or just 6%.

Since the co-operative, training-to-employment Multi-Party Training Plan began 10 years ago, the proportion of northern mining company employees has grown in all skill categories, particularly in supervisory, trades and technical levels. By 2003, the workforce in the north had increased by 200 people, and 40% of northern employees were working in higher skills categories, up from 34% in 1992.

More than 1,200 people from northern Saskatchewan are directly or indirectly employed in the mining sector, filling 53% of the total 2,300 jobs. This number can be broken down as follows:

- Mining companies and their long-term contractors employ about 1,650 workers on site, of whom 850 are from the northern region.
- Hudson Bay Mining and Smelting in Flin Flon, Manitoba, provides employment for about 300 workers from Creighton and Denare Beach in northern Saskatchewan.
- Other contractors such as trucking, air transportation, and short-term/construction contractors employ another 350 workers, of whom about 100 are from the north.

Only two populated centres have high participation and low unemployment comparable with the rest of the province: Air Ronge/La Ronge and Creighton/Denare Beach. People there have higher educational attainment than other northern communities and greater employment opportunities from mining, hospitals and government.

The Mineral Sector Steering Committee estimates that employment by mining companies will increase slightly in 2006 and remain fairly constant over the next decade. This is based on Cigar Lake mine proceeding to production. The majority of projected employment opportunities will be in trades, mill operation, equipment operation and underground mining.

Education and Training Infrastructure

Provincially funded training programs and career and employment services in northern Saskatchewan are planned and delivered by Northlands College, Saskatchewan Learning and Community Resources and Employment. The Northern Labour Market Committee, a partnership

of industry, governments and economic development, training and community agencies, provides a forum to discuss emerging local labour trends and training requirements.

The Mineral Sector Steering Committee works with Northlands College and other institutions to plan and deliver programs under the Multi-Party Training Plan. The Multi-Party Training Plan is a partnership between the northern mining industry, the provincial and federal governments, and Métis and First Nations organizations. It prepares northerners for a range of jobs in new and expanding mining developments in the north. New employers can receive employee-training grants of up to $5,000 per employee to a maximum of $150,000 per company.[32]

The Multi-Party Training Plan began its third 5-year phase in July 2003. This phase focuses on trades and professional careers, and ways to increase the number of high school students obtaining math and science credits. Industry involvement in Northlands College ensures that programming is tied directly to employment opportunities in mining through Multi-Party Training Plan III.

The Saskatchewan Institute of Applied Science and Technology (SIAST) offers programs across campuses throughout the province. In partnership with industry, it provides tailored apprenticeship training for 28 trades through the industry-led Saskatchewan Apprenticeship and Trade Certification Commission. The University of Saskatchewan and the University of Regina both deliver comprehensive engineering, sciences and computer science specialties. Saskatchewan's universities awarded almost 1,100 Science and Engineering degrees in 2003.

Northern trades workers often face barriers to advancing in their trade because of a lack of academic prerequisites or a shortage of employment opportunities in which to gain trade time. The challenge facing northern agencies is to make youths aware of the job opportunities in trades and to create innovative ways of delivering trades training that links it to employment. Although in the past two decades significantly more people have graduated from high school or earned post-secondary certification, diplomas or degrees, educational attainment continues to be well below provincial levels.

Cameco and Areva Cogema provide over $30,000 each year to the Athabasca school awards program to promote education in schools in northern Saskatchewan. They provide over $50,000 annually in scholarships to assist northern students in post-secondary studies.

Research

The Saskatchewan Research Council (SRC) operates three specialized laboratories to provide rapid and confidential mineral exploration services. It is also working on several projects at various levels of First Nations and Tribal Councils and with the Federation of Saskatchewan Indian Nations (FSIN). For example:[33]

32 Saskatchewan Industry and Resources website. Minerals: Mining and Exploration – Abundance and Untapped Potential. http://www.ir.gov.sk.ca/adx/asp/adxGetMedia.asp?DocID=4299,3087,2936,Documents&MediaID=8131&Filename=Minerals.pdf (08 March 2005).

33 Saskatchewan Research Council (SRC) website. Aboriginal Partnerships. http://www.src.sk.ca/html/partnering/aboriginal/index.cfm (08 March 2005).

- The SRC signed a Memorandum of Understanding with FSIN in September 2004 to establish a co-operative relationship that will encourage the development of projects with First Nations in Saskatchewan.

- The SRC hired an Aboriginal Business Development Coordinator to investigate Technical Development and Applications (TDAs) for Aboriginal communities and to provide cross-cultural awareness training to SRC staff.

Human Resources Planning and Strategies for Recruitment and Retention

Mining companies in northern Saskatchewan have committed to hire locally and give preference to workers from the region. Both Areva Cogema and Cameco have negotiated agreements with their unions that override seniority to give preference to northern workers for apprenticeship positions. Currently, all entry-level positions at mines are targeted at people from the northern region. However, while most job opportunities in the minerals and metals industry require post-secondary training in supervisory, administration, technical and trades categories, there is a severe shortage of skilled workers to fill these jobs above the semi-skilled level. In other words, the local labour force cannot meet industry demand. In this respect, Cameco is pushing for a minimum Grade 12 education for recruitment to stress the importance of education and encourage students to stay in school.

Areva Cogema, Cameco and Claude Resources are partners in the Multi-Party Training Plan. They are working together to focus northern recruitment efforts, particularly in the following positions:

- supervisory — warehouse manager, mine and mill;

- administration — warehouse, clerical;

- professional/technical — nurses and technicians in areas of radiation/environmental, chemical laboratory, geological, surveying;

- trades — power engineers, instrumentation technicians, plumbers, industrial mechanics, heavy duty mechanics; and

- mill operators.

The mining companies provide air transportation for their workers, making it possible for workers from across the north to work at the mines. In 2001, 11% of employed workers in northern Saskatchewan worked at mines in northern Saskatchewan and Flin Flon. The fly-in-fly-out approach helps to recruit the local Aboriginal population who wish to maintain ancestral traditions of hunting and trapping. Respect for culture and tradition is an important aspect of northern Saskatchewan operations.

In northern Saskatchewan, more than a dozen companies are exploring for uranium, gold and other metals. Each exploration project creates seasonal employment for six or more northerners. However, owners of the dozen small exploration companies based in northern Saskatchewan have been in the industry for 20 to 30 years and most are over 50 years of age.

To address current and anticipated shortages in the skilled trades, Cameco implemented a long-term strategy in 2002 to employ and train 60 new apprentices by 2010. In 2004, it employed 5 new first-year apprentices and 20 apprentices at levels 2 and 3, almost all from northern Saskatchewan.

The majority of employment opportunities will be in trades, mill operation, equipment operation and underground mining. Most such opportunities now require post-secondary training in professional, technical and trades categories. Because of safety concerns and technological advancements in mining, companies are demanding higher education levels even of entry-level workers.

Cameco's northern employment strategy has resulted in a very substantial increase in the percentages of northern and Aboriginal employment. Almost 50% of all new hires since 1992 have been people of Aboriginal ancestry. Approximately 450 Aboriginal employees represent 45% of Cameco's site operations workforce. Northern people employed in Cameco's mining operations earn approximately $20 million in salaries and wages every year.

Cameco has undertaken other initiatives involving the Aboriginal communities, including:

- Spearheading a comprehensive impact management agreement with Aboriginal communities, including an environmental protection agreement that guarantees compensation should they suffer any loss as a result of emissions from a uranium mine. The program also provides assurances that uranium mining will not in any way limit the ability of Aboriginal people to continue to live off the land and pursue their traditional lifestyle. [34]

- The appointment of the Chief of Saskatchewan's largest First Nation to the Cameco board of directors, which brings the First Nations' perspective directly to the highest level of the company.

Site-Specific Issues and Observations

Looming retirements in the trades underscores the need for long-term workforce planning; otherwise, the industry could face a labour gap in the next 10 years. Ideally, northern residents will be trained to fill these higher level and training-intensive jobs.

The mines operate under a "northern preference" strategy, which has created employment and contracting opportunities in the minerals industry for local residents and businesses. The majority of employment opportunities will be in trades (power engineer, instrumentation technician, industrial and heavy-duty mechanic), mill operation, equipment operation and underground mining.

34 Natural Resources Canada website. http://www.nrcan.gc.ca/mms/sociprac/cameco_e.htm (04 March 2005).

The key issues facing the minerals and metals industry in northern Saskatchewan include the following:

- Fewer youths are active in the labour force and youths have a higher rate of unemployment.
- A high proportion of working-age people have not joined the workforce; for those who have, employment opportunities are more often part-time or seasonal, and unemployment is high.
- The demand for skilled trade workers is expected to continue to increase as more trades people are required for several upcoming construction projects.

Technical job opportunities include engineer, nurse, chemical laboratory technician, and geological, radiation and environmental technician. However, the local labour market is unable to meet the skill requirements of the minerals and metals industry.

Other obstacles to attracting and retaining a skilled workforce in the exploration sector is the seasonality and winter work schedule. Much of the workforce and owner/managers are older, and fewer youth are attracted to the industry. In addition, the booming oil and gas industry in Alberta and southern Saskatchewan and the mineral exploration industry in British Columbia have attracted geologists away from mineral exploration in Saskatchewan.

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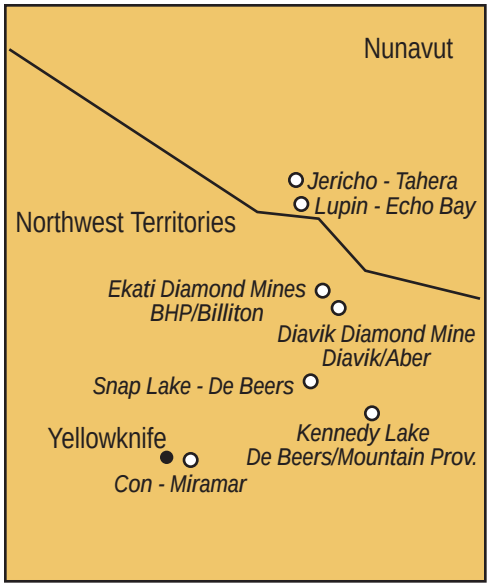
Northwest Territories Case Study Occupational Standards in the Mining/ Mineral Processing Industry

Overview

This case study examines occupational standards in the mineral and metals industry in the Northwest Territories (NWT). It also explores the feasibility of developing national occupational standards and certification programs for the entire mineral and metals industry.

The NWT Department of Education, Culture and Employment has developed a number of occupational standards for various occupations within the mining and mineral processing industry. These standards set out the knowledge and skills necessary to be deemed competent in a given occupation. They are a first for the industry in Canada. In addition, two mineral certifications are now available to students through a territorial government administered process: Mineral Processing – Diamond Specialization and Mineral Processing – Gold Specialization. The development of these occupational standards and certifications was originally championed by BHP Billiton, owner of the Ekati mine, Canada's first diamond mine.[35]



Mining in the Northwest Territories

The population of the Northwest Territories is composed of people from diverse backgrounds. Approximately one half of the population is First Nations, representing six distinct First Nations groups.[36] Between 1991 and 2000, the population increased by 13%, from 36,044 to 40,907.[37] In the late 1990s, 6.3% of people were employed in mining, compared with 1.2% for the rest of Canada. The communities most involved with mining are all situated in the North Slave Region of the territory. Mineral extraction has played a large part in the development of the Northwest Territories and continues to be a key economic driver.[38]

Canada's first diamond mine was opened on October 14, 1998,[39] by the BHP Billiton Group, the world's largest diversified resources company.[40] The Ekati Diamond Mine is located approximately

35 Canadian Arctic Diamonds website. http://www.canadianarcticdiamond.com/02_Certification/certification.html.
36 Northwest Territories and Nunavut Chamber of Mines.
37 Ibid.
38 Ibid.
39 Northwest Territories and Nunavut Chamber of Mines.
40 Ekati Diamond Mine website. http://ekati.bhpbilliton.com/.

300 kilometres northeast of Yellowknife and 200 kilometres south of the Arctic Circle.[41] It currently produces 4% of the world's diamond production by weight and 6% by value.[42] It employs over 600 people[43] and is a leading employer of local people. Before the mine opened, approximately 60% of workers in the Northwest Territories mining industry were northern residents and only 10% of these were First Nations people. Today, 75% of employees are northern residents and the number of First Nations employees continues to increase. In 2001, 638 indigenous First Nations employees worked to support the operation of the Ekati mine, representing approximately 30% of the operations-based workforce.[44]

Although the metal mining industry in the Northwest Territories has created employment, and will continue to do so, many northern residents simply do not have the skills and/or formal education needed for many of these jobs.[45] Developing occupational standards and corresponding training programs to help workers achieve these standards is an important step in addressing this problem.[46]

Occupational Standards: Mining and Mineral Processing Industry

Spurred by new occupations related to the diamond industry, the NWT Department of Education, Culture and Employment has worked with the mining and mineral industry to develop appropriate occupational standards. Occupational standards lay out the knowledge, skills and personal characteristics required to be considered competent in a particular job. Three sets of occupational standards have been developed for Mineral Processing Technicians: Core Competencies, Gold Specializations and Diamond Specializations.[47] Standards have also been developed for many other designated occupations. A designated occupation is one that is approved by the Minister of Education, Culture and Employment upon the recommendation of the Apprenticeship Training and Occupational Certification Board. The occupations are tied to established standards and certification criteria set by a committee of industry experts, including local, national and international subject matter experts. Occupational certification allows a person to become a qualified practitioner of a designated occupation. The certification process is based on the occupational standards for that occupation.

Training is developed based on the occupational standards.[48] The standards ensure that clear guidelines are in place to inform the certification and training programs. They also increase accountability in the delivery of the training programs, including on-the-job training and industry-recognized certification. As a result, the NWT mining industry has implemented a range of training initiatives in co-operation with several partners: the Department of Education, Culture and Employment, Aurora College, Human Resources and Skills Development Canada (HRSDC), and Indian and Northern Affairs Canada (INAC). These programs include pre-employment training, apprenticeships, workplace literacy and academic scholarships.[49]

41 BHP Billiton website. http://ekati.bhpbilliton.com/.
42 Ibid.
43 Ibid.
44 NWT and Nunavut Chamber of Mines.
45 http://siksik.learnnet.nt.ca/06%20careerEmploy/06_18%20Labour_Force/EXECUTIV.HTM.
46 Ibid.
47 Government of Canada, Canada/NWT Business Service Centre web site. http://www.cbsc.org/nwt/search/display.cfm?Code=7035&Coll=NT_PROVBIS_E.
48 Ibid.
49 Northwest Territories Department of Education, Culture and Employment website. http://www.ece.gov.nt.ca.

Not only do occupational standards help create employment for residents of the Northwest Territories, they also help address the challenges associated with employing skilled workers from other countries. Skilled workers are brought in through HRSDC's Temporary Foreign Worker Program.[50] However, this approach is more suited to some industries than others, and some workers may lack many of the skills needed to succeed in the Canadian mining industry. In addition, differences in mining processes, labour practices, government-mandated costs, benefits packages and languages may all present challenges.[51] Obstacles surrounding the recognition of foreign credentials pose further barriers to employing foreign workers. The recognition of foreign skills and credentials can be made easier through the implementation of occupational profiles or standards.

Occupational standards have benefited the mineral and metals processing industry in the Northwest Territories; however, much work remains to be done if such standards are to be implemented across Canada.

NWT Mineral Certifications: Gold or Diamond Processing Specializations

The skills required to operate the complex technology used in today's mines has necessitated the development of certification programs for the mining trade in the Northwest Territories. Two mineral processing technical careers — gold processing and diamond processing — have been certified though a process administered by the territorial government. Occupational standards were established in these areas because of a need for skilled, trained workers. In order to meet labour demands in the future, young people in the Northwest Territories are being encouraged to consider these occupations when thinking about a career. These occupations, and corresponding certification programs, offer young northerners the opportunity to enter the workforce, learn new skills, earn a good salary and obtain valuable work experience in an industry expected to demand qualified workers in the foreseeable future.[52]

The technical certification was intended to encompass both diamond and gold mining but vast differences between the two industries soon made clear the need for separate specializations. BHP Billiton originally championed the occupational certification. Following this, the Lupin mine in Nunavut was approached to help develop standards for the gold specialization.[53] The certification program, the first of its kind in Canada and perhaps in the world,[54] requires that mineral processors meet high standards of skills and knowledge. The Government of the Northwest Territories has recommended that Canada establish a National Centre of Excellence in Skills Training under the federal government's Innovation Strategy. This centre would include training in the latest technologies and provide a place for further research and development.[55]

The new certification process ensures an adequate framework to enable workers to become qualified and certified. The process is similar to an apprenticeship program but differs in several ways, including training location, delivery methods, wages and monitoring. Apprenticeships are

50 Natural Resources Canada.
51 Ibid.
52 Government of Canada, Canada/NWT Business Service Centre.
53 New certification for mining trades. http://www.nnsl.com/ops/Mining_03/jun27_03min5.html.
54 Canadian Arctic Diamonds web site. http://www.canadianarcticdiamond.com/02_Certification/certification.html.
55 Natural Resources Canada.

regulated by government, whereas the occupational certification process regulated by industry. Most of the requisite skills and experience for certification are acquired through on-the-job training, work experience, performance reviews and written exams. As with many trades, occupational certification provides a measure of workers' qualifications to do a particular job. Generally, a worker must be employed in the mining industry for three to four years to become a fully competent mineral processing technician.[56] Once a candidate has completed all steps required for certification, formal recognition of this accomplishment is made and a Certificate of Competency is awarded. The certificate is recognized throughout the Northwest Territories as an achievement of competency for that occupation. [57]

Currently, the Northwest Territories is the only jurisdiction in Canada that sets occupational standards for the metal mining industry. However, the feasibility of developing national occupational standards and certification programs for the entire mineral and metals industry should be explored. Key industry stakeholders have suggested that nationally recognized occupational standards would not only ensure that training was more in keeping with actual industry requirements but would also improve the image of the minerals and metals industry as a career option and allow industry workers to move more freely between provincial jurisdictions.

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56 Ibid.
57 Ibid.

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Sudbury Case Study Focus: Education/Training and Relationship with Industry

Overview

This case study examines the mining industry in Sudbury and its well-developed infrastructure for mining-related education, training and research.

Sudbury is one of Canada's few long-lived mining sites, with mining operations dating back more than 100 years. The mining industry got its start in the area in 1883, when ore with high levels of copper sulphites were discovered. The formation is one of the most productive mining sites in the world and is generally thought to be the result of a meteorite impact.[58] The major commodities mined in the area are nickel, copper, gold, silver, platinum group metals and cobalt.

Sudbury is Canada's leading mining community and is considered one the world's four great mining "city-states."[59] It is the only city in the world with 15 producing mines within city limits. With known reserves, the industry is predicted to continue for another 100 years,[60] although the rate of production, and hence level of employment, will eventually decline as ore-bodies are exhausted.

The "Sudbury Mining Supply and Services Cluster" is the largest integrated mining cluster in the world. In addition to the two major mining employers, Inco and Falconbridge, the network is made up of the Canadian Mining Industry Research Organization (CAMIRO), the Canadian Construction and Mining division of Atlas Copco, the Mining Innovation, Rehabilitation, and Applied Research Corporation (MIRARCO), the Northern Centre for Advanced Technology (NORCAT), the Sudbury Neutrino Observatory and almost 300 mining and supply services companies. The financial cluster for the global mining industry is in Toronto.[61]

Three post-secondary institutions in Sudbury offer mining-specific education programs: Laurentian University, Cambrian College and Collège Boréal. These institutions collaborate with industry, government and other training, research and service organizations to advance common goals for the region.

Economic Base

58 The Mining Supply and Services Cluster, Sudbury (Canada). http://inord.laurentian.ca/11_03/Robinson_Woodsworth.htm.
59 Ibid.
60 Sudbury: Found Locally website. http://sudbury.foundlocally.com/Local/Info-CityHistoryRailwayMiningBoom.htm.
61 Greater Sudbury Development Corporation website. http://www.sudbury.ca/index.cfm?app=gsdc&lang=en&ct=806&items=&sr=&cntid=1958.

Sudbury serves as a base for geology and exploration, as well as huge smelting operations. Exploration for nickel, copper and palladium group metals in the Sudbury Basin has increased in recent years: there was more exploration activity in and around the basin in 2002 than in the rest of Ontario. The combined value of historic production and present reserves and resources from the Sudbury Basin, in today's dollars, exceeds CDN$366 billion. The current GDP for Greater Sudbury in total is approximately CDN$6.8 billion.

Regional factors relative to Sudbury's economy include:

- the potential sale of Noranda-Falconbridge;
- the massive exploration program currently under way;
- development of Sudbury as an International Centre for Mining Innovation; and
- the possible relocation of the headquarters of the Geological Survey of Canada from Ottawa to Sudbury.[62]

The expanding Sudbury population as well as its increasing economic diversity bodes well for the region in terms of surviving as a self-sustaining community. As one interviewee noted, however, successful resource towns typically need to grow to a population greater than 200,000 to maintain themselves once the natural resource becomes exhausted. It will be important, therefore, that Sudbury continue to experience a certain level of population growth and establish a strong economic base in sustainable activities. Having said that, there are sufficient reserves to sustain mining for at least another 100 years.

Demographic Profile

As a northern community traditionally linked to natural resources, Sudbury's population over the last three decades has mirrored the cyclical nature of the minerals and metals industry. After peaking in the early 1970s at 169,580 (1971 Census), the population dropped to 152,470 by 1986, mainly due to downsizing in the mining sector. This negatively affected the local economy and led to an out-migration of people. The population then increased to 164,049 in 1996 but fell in the late 1990s, due in part to persistent low commodity prices. By 2001, the population had fallen to 155,220.[63] The latest population data (2003) show another upswing, this time reaching 160,113.[64] Table 1 shows the City of Greater Sudbury's population by sex cohort and major age group in 2001.

There are relatively fewer people younger than 35 and relatively more older than 50 in the Sudbury

62 Northern Ontario Business website. Mining R&D Centre of Excellence Vital. http://www.northernontariobusiness.com/regional/Sudbury/headlines.asp?437id145-pn=&view=30431. (28 February 2005).
63 The City of Greater Sudbury website.
64 Ontario Ministry of Finance (2004). Demographic Trends: Population Estimates for Census Subdivisions.

Table 1: Population of the City of Greater Sudbury, Ontario and Canada by Sex Cohort and Age Group - 2001

Age Group	Population by Sex Cohort			Percentage Age Distribution		
Under 20	19,900	19,335	39,235	25.3%	26.3%	24.6%
20-34	13,980	14,490	28,470	18.3%	20.0%	20.7%
35-49	18,310	19,915	38,225	24.6%	24.7%	24.2%
50-64	13,890	13,910	27,800	17.9%	16.1%	17.6%
Over 65	9,270	12,230	21,500	13.9%	13.0%	13.0%
Total	75,350	79,880	155,220	100.0%	100.0%	100.1%

Source: *Statistics Canada* 2001 Census

area than the rest of Ontario and Canada. This older demographic could have serious implications for the minerals and metals industry workforce.

The local Aboriginal population could provide a critical component of the industry's labour force. Aboriginal people make up 4.6% of Greater Sudbury's population, a larger proportion than the rest of Ontario and Canada (2001 Census). Table 2 compares the populations of Greater Sudbury, Ontario and Canada by ethnic group.

Table 2: Percent of Population By Ethnic Group (2001)

Ethnic Group	Percentage of Population		
	Greater Sudbury	Ontario	Canada
Aboriginal	4.6	1.7	3.3
Other Visible Minority	19.1	19.1	13.4
Rest of Population	76.3	79.2	83.3
Total	100.0	100.0	100.0

Source: *Statistics Canada* 2001 Census

As Table 3 shows, people in Greater Sudbury aged 20 and older had educational attainment below both the Ontario and Canadian averages in 2001. On the other hand, a higher percentage had obtained a trades certificate or diploma.[65]

65 The City of Greater Sudbury website.

Table 3: Percent of Population 20 Years and Older by Highest Educational Attainment (2001)

Highest Level of Educational Attainment	Percentage of Population[1]		
	Greater Sudbury	Ontario	Canada
Less than high school	30.1	25.6	27.9
High School diploma	13.9	14.2	13.9
Trades certificate or diploma	13.5	10.2	11.8
Some college	7.5	6.6	6.4
College certificate or diploma	17.8	17.1	16.2
Some university	5.2	7.1	7.0
Bachelor's degree or higher	12.0	19.2	16.9
Total	100.0	100.0	100.1

Source: *Statistics Canada* 2001 Census
1 Numbers may not add up to 100% due to rounding.

Industry trainers and firm representatives in Sudbury have suggested that these lower education levels were because Inco and Falconbridge, until recently, did not require all their mining and smelting employees to be high school graduates. Therefore, individuals could enter the workforce and obtain a relatively high paying job without completing high school. However, as technologies became more complex and industry health and safety standards more strict, both firms now require all employees to have at least a Grade 12 education. In addition, the Ontario government has legislated that mining workers in Ontario receive Common Core training and certification.

According to the latest labour force survey figures (January 2005), the greater Sudbury Census metropolitan area has a seasonally adjusted unemployment rate of 7.8%, higher than the rest of Ontario (6.8%) and Canada (7.1%). The employment rate is 61.3%.[66] The slightly higher unemployment rate in Sudbury could reflect the high unemployment among Sudbury's Aboriginal population (19.7% in 2001). It is important to note, however, that the labour force participation rate for Sudbury's Aboriginals (60.0%) was comparable with that of the region overall.[67] This suggest that employers may be underutilizing this segment of the population.

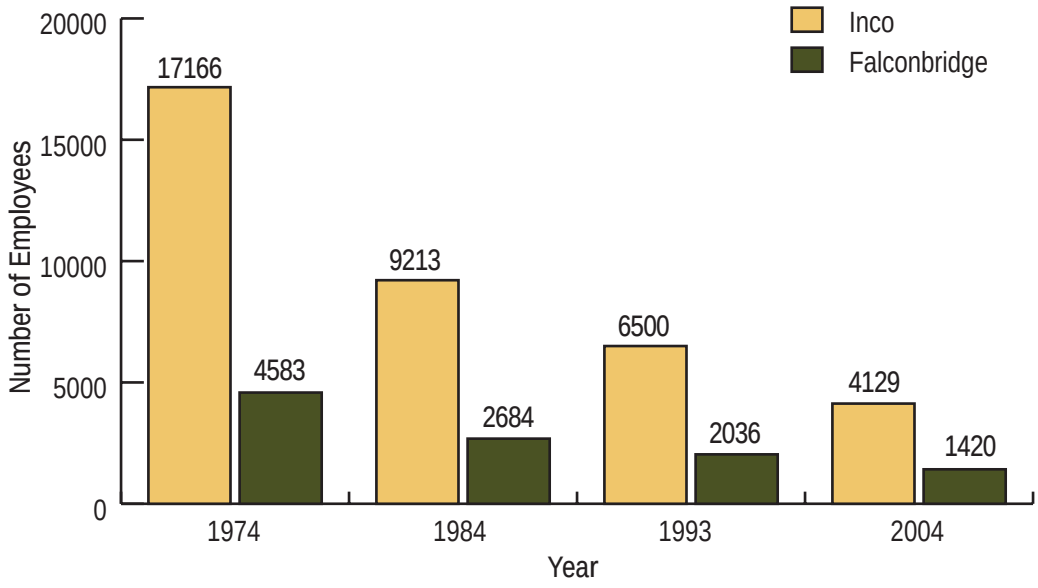
The Minerals and Metals Industry Labour Force

Most of Ontario's mining and smelting employment is in the nickel, copper and zinc corridor that comprises Inco and Falconbridge mines and smelters in the Sudbury area and Falconbridge's Kidd Creek Mines in Timmins. In 1971, Inco and Falconbridge dominated the local labour force, employing over 25,000 workers. Over the next three decades, employment in this sector fell significantly. A number of reasons explain this: new mining technologies increased productivity;

66 The City of Greater Sudbury website.
67 M. Mendelson. 2004. Aboriginal People in Canada's Labour Market: Work and Unemployment, Today and Tomorrow. The Caledon Institute of Social Policy.

improved training created a more skilled workforce; bonus plans encouraged employees to remain; and non-value added work was eliminated. According to the 2001 Census, there were 4,830 people directly employed in mining in Sudbury, representing 6.2% of the total labour force. In 2004, the combined total employment of Inco and Falconbridge Sudbury operations was 5,549, an overall decline of 74% in the mining labour force since 1974, as detailed in Chart 1-1.[68]

Chart 1-1:Inco Ltd and Falconbridge Ltd. Sudbury Operations Employment (1974-2004)



Sources: Inco Ltd. and Falconbridge Ltd.

Despite fewer mining jobs, the demand for products, services and technological advancement fuelled the development of a mining services cluster. By 2001, employment in the mining supply and services sector totalled 8,500.[69] The Greater Sudbury mining cluster is the biggest of its kind in Canada and it has been growing jobs for Sudbury at an annual rate of 10% over the last five years.

There are also a significant number of people involved in exploration, which is one of the major forms of research in the mining industry. It is estimated that over 700 people are engaged in mining-related research in the region.

Most employees in the Sudbury minerals and metals industry are from the region. Local employers face a current shortage of the more generalist types of trades and an emerging shortage in production occupations. Within the next 30 months, this labour shortage will likely be severe. Up to 5,000 replacement workers will be needed in such key occupations as heavy-duty equipment operators, millwrights, welders and transport drivers.[70] Retirement is a key factor in the labour

68 The City of Greater Sudbury website. http://www.city.greatersudbury.on.ca/content/keyfacts/documents/Mining%5Femployment%5FFeb05%2Epdf.
69 The Mining Supply and Services Cluster, Sudbury (Canada). http://inord.laurentian.ca/11_03/Robinson_Woodsworth.htm.
70 Northern Ontario Business website. Labour Expert Working to Close 'Incredible' Gap. www.northernontariobusiness.com/regional/Sudbury/ (18 February 2005).

shortage: in the next three to five years, one third of Inco's Ontario division workforce will be eligible to retire; in the past year, close to 200 Falconbridge employees were eligible to retire. Employees with 30 years of service are retiring as early as age 48 with a full pension.[71]

Education and Training Infrastructure

Like many cities of similar size, Sudbury has a solid educational infrastructure, consisting of:

- 23 Kindergarten to Grade 8 schools (public, separate and private), not including surrounding communities;
- 8 high schools (public, separate and private), plus 6 more in surrounding communities;
- 2 colleges: Cambrian College and Collège Boréal; and
- 2 universities: Laurentian University and the University of Sudbury (a liberal arts Catholic university).

Sudbury is the only mining community in Canada to host a research university. In addition, due to the strong focus on the minerals and metals industry, there are other unique aspects to the education and training available in the Greater Sudbury region. The various mining-related education and training facilities and their respective offerings are described below.

Laurentian University

Founded in 1960, Laurentian University is a relatively new university.[72] It offers undergraduate programs in engineering and Ph.D.s in Geology and Natural Resource Engineering. Survey data has not yet been received from Laurentian University. However, a report on the status of Canadian university programs in mining engineering shows that in 2000, Laurentian had 21 B.Sc. graduates in mining engineering, higher than the five-year average of 10 B.Sc. graduates per year. Although no data for the number of M.Sc. and Ph.D. graduates were available, there were six (6) and zero (0) students enrolled, respectively, in mining engineering at the graduate level for the 1999/2000 academic year.[73]

Laurentian University has appointed a Vice-President to advance the "mining initiative" and has made mining and mining-related research a major focus. Research institutes, facilities and centres at the university include:

- MIRARCO and associated centres;
- Centre for Mining and Mineral Exploration Research (CIMMER);

71 Sudbury Mining Solutions website. www.sudburyminingsolutions.com/skills.asp?20id4-pn=&view=570.
72 Sudbury: Found Locally website. http://sudbury.foundlocally.com/Local/Info-CityHistoryRailwayMiningBoom.htm.
73 Archibald, J.F. 2001. The Status of Canadian University Programs in Mining Engineering. Department of Mining Engineering. Queen's University, Kingston, Ontario, Canada.

- Mineral Exploration Research Centre (MERC);
- Laurentian University Mining Automation Laboratory (LUMAL);
- Elliot Lake Research Field Station (ELRFS); and
- Telerobotics and Automation Research Centre (TRAC).

Laurentian University is involved in various types of industry partnerships. For example, LUMAL is supported by the Department of Mines Technology of Inco Ltd. at Copper Cliff, Ontario. Another example, Inco and Falconbridge have representatives on the Board of Directors at MIRARCO.

Cambrian College

Cambrian College delivers Mining Engineering Technology, Geological Engineering Technology and Mining Engineering Technician programs as well as other mining-related diploma and certificate programs. It offers one-year trades certificates, two-year trades diplomas, and diplomas in engineering technology and as an engineering technician. According to surveys, there are 496 students enrolled in mining-related programs and courses in the current academic year. Of these, 459 could graduate within their registered program this year. However, students have the option of continuing on from a one-year certificate program to two-year technician or three-year technology diploma programs. In 2002/03, more than 150 students graduated with certificates or diplomas from mining-related programs.

The College is also home to NORCAT, which offers safety training and entry-level training required by employees in the minerals and metals sector in Ontario. NORCAT provides Common Core mine training for companies and individuals who require the standardized Common Core modules to work in a mining environment. In co-operation with Ontario mining companies, NORCAT has developed a Common Contractor Orientation Program.[74] SkyTech at Cambrian College sponsors apprenticeship co-op placements for heavy equipment, industrial maintenance mechanic and industrial electrician students.[75]

Partnerships with Inco and Falconbridge have expanded opportunities for students and graduates through specialized training programs and co-op work placement initiatives. Some high level technology diploma programs have been designed in conjunction with Inco. For example, Inco recently donated equipment, software and training materials valued at $1.3 million.[76]

Collège Boréal

Collège Boréal is a francophone institution that offers training and apprenticeship programs for occupations related to the minerals and metals industry. It partners with sector organizations to place students for job training. Collège Boréal has created a combined Mining and Civil Engineering program to address student concerns about the cyclical nature of the mining industry.

74 Northern Centre for Advanced Technology (NORCAT) website. http://www.norcat.org/ocgct.htm.
75 Cambrian College SkyTech website. http://homepages.cambrianc.on.ca/skytech/coop_placements.htm.
76 Cambrian College website. http://www.cambrianc.on.ca/_About_Cambrian/partnerships.htm.

The College expects to have 17 graduates this year, 19 graduates in two years and 20 graduates in five years. Enrollments are expected to increase from 31 students in the present school year to 35 in the next five years. It should be noted, however, that enrollment in the program is reportedly growing more slowly than other programs at the College.

On March 25, 2004, the Centre for Industrial and Commercial Subcontracting of Ontario (STICO) was inaugurated at Collège Boréal's main campus in Sudbury. STICO will aid in the global management of suppliers and subcontractors in Ontario, including those involved in the minerals and metals industry, through a virtual business network.[77]

Skilled Trades

In response to the current shortage of experienced trades people and anticipated retirement trends, concerted efforts are under way in Sudbury to encourage youth to enter into trades training related to minerals and metals. The Ontario Youth Apprenticeship Program (OYAP) places high school seniors into the workplace to learn a skilled trade. The Rainbow District School Board has also initiated an outreach program designed to identify potential candidates for apprenticeship program placements.[78]

Industry-based Training

Both Falconbridge and Inco offer training for other workforce development programs or courses to employees. Trainers are typically recruited internally. With new equipment, the firms frequently enlist the vendor to help develop the training program and/or deliver the training. A "train-the-trainer" approach is applied whereby one or two individuals receive specialized training and pass their knowledge on to the other trainers.

At Inco, most of the underground and surface training is legislated by the Ontario government as part of the Common Core Program. About 20% of the training is delivered through computer-based training or by instructors in a classroom while 80% is delivered "hands on" in the field, mostly one-on-one (or one-on-two). Inco has numerous programs to develop the skill and talent pool of its employees. Most are organized and delivered internally, but specialty programs are delivered by external professionals brought to the Sudbury operations. Most of the hourly rate training is covered by the collective agreement with employees. Inco also offers the Underground Mining Common Core program to post-secondary students in Sudbury. Inco provides a four-week Ontario Common Core training course to mining technology and engineering students at Cambrian College, Collège Boréal and Laurentian University, free of charge.

Similarly, Falconbridge has an internal training department that completes most of the training, and uses external trainers for specialty areas. It has one central training program, and the rest are site-specific. The courses are organized and delivered by modules in the classroom and on the job, and include the Ontario Common Core programs. Computer-Based Terminal (CBT) learning is tied to performance objectives. In addition, Falconbridge offers distance job-related learning courses, such as the renewal of First Aid qualifications. It has also implemented a tuition assistance program.

77 STICO Centre website. http://www.stico.ca/www/index.asp?lang=en.
78 Ulrichson, H. (December, 2004). Schools, industry unite to promote trades. www.sudburyminingsolutions.com.

Both companies employ a "due diligence" approach in their hiring processes to ensure that Common Core standards, at a minimum, are met. Inco has both management and union representative on various provincial committees that review training. Falconbridge has registered its training through the Ontario Ministry of Training, Colleges and Universities and often works with the Ministry to promote this training to other companies in Ontario.

Research

There is significant research capacity in the Sudbury region. Mining research occurs at Cambrian College, the federal CanMet Labs, Inco, Falconbridge and the Ontario Geological Survey (OGS) at Laurentian University. With the OGS, Laurentian University boasts one of the best analytical facilities for mining in North America.

The not-for-profit CAMIRO is run by the mining industry to manage collaborative mining research. CAMIRO initiates and manages applied collaborative research to improve the technology and reduce the costs of exploration, project development, mining and processing of mineral deposits.

MIRARCO, founded in 1998, is a not-for-profit applied research and technical service organization formed through collaboration between Laurentian University and the private and public sectors. MIRARCO customizes applied research teams from several mining and environmental centres, including:

- Geomechanics Research Centre (GRC);
- Centre for Environmental Monitoring (CEM);
- Centre for Mining Technology (CMT);
- MIRARCO's Mining Exploratorium Program; and
- Centre for Integrated Monitoring Technology (CIMTEC).

MIRARCO offers short professional development courses on demand, including:

- Valuing and Managing Mining Projects with Real Options;
- Ventilation and Heat Management in Deep Mines;
- Advanced Aqueous Electrometallurgy;
- Applied Geostatistics for Ore Reserve Estimation;
- Tunnelling and Brittle Failure of Excavations in Highly Stressed, Rockbursting Ground;

- Slope Stability in Rock and Soil: Slope Failure Mechanisms, Monitoring and Stability Analysis; and

- MAP 3D Workshop.

MIRARCO markets its products and services to the minerals and metals industry across Canada.

HR Planning and Strategies for Recruitment and Retention

The mining firms in Sudbury do not specifically recruit certain demographic groups, although one interviewee noted that there are now more women in the field than in the past. Given the older labour force, however, companies might consider more actively recruiting specific groups such as women or Aboriginals. That is, companies will have to work to maximize the use of the existing local labour force and promote mining careers to *everyone* in the region.

During interviews with representatives from Sudbury employers and labour representatives, it became evident that both consider human resource planning to be an important aspect of the two- and five-year business planning process at the operational level. Succession planning is a key aspect to the human resource strategies of Sudbury-based mining and smelting operations. "Annual demonstrative studies" of the workforce are undertaken, and both human resource managers and union representatives have clear knowledge of upcoming retirements in the various occupational groups and company's or industry's replacement needs. Managers at the operational level are well aware that retirement will have a large effect on the local minerals and metals industry. Interviewees also noted that human resource planning in the minerals and metals sector must strategize in terms of industry competition for the labour force.

Retention strategies are less well developed as their main purpose is to keep employees from seeking employment with competing firms. According to industry and labour representatives, employees in the Sudbury region typically do not leave the minerals and metals industry for a career in another sector. The two most likely reasons for leaving the industry were noted as "winning the lottery" and poor health. This situation could be somewhat unique to Sudbury, as the area has such a long and steady history of mining and is considered somewhat of a "Mecca for mining."

Site-Specific Issues and Observations

Within the Sudbury area, all industry stakeholders are working together to advance the sector by actively developing and promoting the region as a national and global leader in the minerals and metals industry at a number of levels.

However, there are still challenges to be met. For example, there are significant mining engineering programs at universities in the more southern parts of Ontario (such as University of Toronto and Queen's University) that were established before there were universities in Northern Ontario. Even in Sudbury, where mining is a cornerstone to the historical development of the region, postsecondary institutions are beginning to "hide" the mining and metallurgical programs within

the broader, more generalist programs, such as Civil Engineering. The continued development of Northern Ontario depends significantly on moving the research and high-tech jobs related to mining, and other resource industries such as forestry, into the North.[79]

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Appendix: Sudbury Mines

Whistle Mine	Base metals (Nickel, Copper, Gold, Silver)
McCreedy West Mine	Base metals (Nickel, Copper, Gold, Silver)
Onaping Mine (closed)	Base metals (Nickel, Copper, Platinum, Group Metals, Cobalt)
Fraser Mine	Base metals (Nickel, Copper, Platinum, Group Metals, Cobalt)
McCreedy East Mine	Base metals (Nickel, Copper)
Lower Coleman Mine	Base metals (Nickel, Copper, Gold, Silver)
Crean Hill Mine	Base metals (Nickel, Copper, Gold, Silver)
Lockerby Mine (closed)	Base metals (Nickel, Copper, Gold, Silver)
Creighton Mine	Base metals (Nickel, Copper, Gold, Silver)
Copper Cliff South Mine	Base metals (Nickel, Copper, Gold, Silver)
Copper Cliff North Mine	Base metals (Nickel, Copper, Gold, Silver)
Frood Mine	Base metals (Nickel, Copper, Gold, Silver)
Stobie Mine	Base metals (Nickel, Copper, Gold, Silver)
Little Stobie Mine	Base metals (Nickel, Copper, Gold, Silver)
Lindsley Mine	Base metals (Nickel, Copper, Platinum Group Metals, Cobalt)
Street Township Mine	Industrial minerals (Almandine (garnet))
Craig Mine	Base metals (Nickel, Copper)

The Innu Nation and Inco's Voisey's Bay Nickel Company Case Study

Overview

This case study examines the efforts of Voisey's Bay Nickel Company and the local Aboriginal population to define mutually beneficial relationships for the development and operation of the Voisey's Bay mine in Labrador.

The Voisey's Bay deposit is one of the richest nickel-copper-cobalt finds in the world.[80] It is particularly significant because its most productive ores are close to the surface, making mining relatively inexpensive. In addition, deeper deposits offer the possibility for continued mineral development over several decades. The Voisey's Bay Project involves the construction of concentrator and processing facilities and is forecasted to bring a total investment of approximately CDN$3 billion to Newfoundland and Labrador over the estimated 30-year life of the project.[81] The Voisey's Bay Nickel Company is owned and operated by Inco, one of the world's leading nickel producers.

Voisey's Bay is located on the northern coast of Labrador, about 330 kilometers northwest of Happy Valley-Goose Bay and 35 kilometers south of the town of Nain. The project is on land claimed by the region's approximately 1,500 Innu and 5,000 Inuit, and is located 79 kilometers northwest of the Innu community of Utshimassits, in the heart of Innu territory.

Source: Voisey's Bay Nickel Company Ltd. website.

The discovery of this rich nickel deposit in 1993[82] kicked off an exploration boom that left its stamp on this traditional Innu and Inuit territory. In 1995 alone, over 250,000 claims were staked in the region, significantly changing the landscape.[83] This, along with development of the project, has raised the issue of land ownership and instilled fears among the Innu and Inuit people about the negative effects of exploration, construction and future ore extraction at Voisey's Bay.[84]

Throughout the history of the project, the local Aboriginal people have not always agreed with Inco or the provincial government about the Voisey's Bay development. Some view it as another threat to their traditional lifestyle.[85] According to Chief Katie Rich of the Utshimassit Innu Band

80 Economic Development Voisey's Bay Project.
81 Voisey's Bay Nickel Company Ltd. website.
82 Science North website.
83 Mining Watch website.
84 Arctic Circle website.
85 Ibid.

Council, the news of the discovery at Voisey's Bay was met with much concern:

> The exploration programs, not only in the Voisey's Bay area, but also throughout much of the Innu lands, have proceeded without the consent of the Innu people… and the rapid pace has given rise to concerns, fears, and deep resentment among the Innu.[86]

According to Larry Innes, Environment Advisor for the Innu Nation, it is particularly significant that in 1993, just before the discovery of the deposit, former premier Clyde Wells offered the Inuit a 10,360 km^2 parcel of land that included Voisey's Bay. The Inuit did not accept the offer, feeling the package was smaller than land-claims settlements other indigenous groups had made across the country. The offer was still technically on the table when the discovery was made but the land around Voisey's Bay was soon taken off the table.[87]

Despite these concerns, the Voisey's Bay Nickel Company was eventually able to negotiate Impact and Benefit Agreements (IBAs) with the Labrador Inuit Association and the Innu Nation in 2002.[88] Clearly, these Aboriginal communities will play a key role in the Voisey's Bay operation.

Development of Impact and Benefit Agreements

Impact and Benefits Agreements are formal, written agreements between companies and Aboriginal groups that help manage the predicted impacts associated with an industrial development and secure economic benefits for communities neighbouring that development. Because of the potential for social, cultural and environmental impacts on local communities, IBAs have become common when Canadian mining companies seek to open mines on traditional Aboriginal lands.[89]

The Voisey's Bay IBAs provide for specific business, employment and training opportunities for members of the Innu Nation and the Labrador Inuit.[90] However, they were negotiated, finalized and ultimately signed only after a long and somewhat rocky road. For example, in early 1997, the Innu Nation and Labrador Innuit requested a full environmental assessment be undertaken on the proposed development and that they be included in the process to ensure its credibility.[91] They argued that a project of this nature required proper planning and Aboriginal consent, and they made it clear that their approval would be contingent upon establishing Land Rights Agreement and an IBA.

Since finalizing the Agreements, the Voisey's Bay Nickel Company has recruited a workforce composed of over 30% Aboriginal people; it has been involved with a number of initiatives including working in partnership with local Aboriginal groups and the federal government to establish the Joint Voisey's Bay Employment and Training Authority; and it has awarded contracts valued at approximately CDN$290 million to a number of Aboriginal companies.[92]

86 Ibid.
87 Innu people forum list.
88 Inco 2003 Social Responsibility Report
89 Voisey's Bay Nickel Company Ltd. website.
90 Ibid.
91 Mining Watch website.
92 Inco 2003 Social Responsibility Report.

Employment at Voisey's Bay

For the people of Newfoundland and Labrador, Voisey's Bay represents the possibility of long-awaited relief from high unemployment,[93] which in March 2005 stood at 16.8%,[94] more than double the Canadian average of 6.9%.[95] The last decade in the province has been marked by a population decline due to high out-migration, sparked by the collapse of the fisheries and a declining birth rate. Nonetheless, the current economic outlook is positive.[96] The province's economic growth is projected to stem primarily from consumer spending and the construction, operation and related activities of the Voisey's Bay Project and Husky Energy's White Rose offshore oil project.[97]

The Voisey's Bay mine is expected to ramp up to full operation in August 2005. Inco estimates that the construction of the mine and concentrator at Voisey's Bay will create approximately 1,550 person-years of employment between 2002 and 2005 while the design, engineering and construction activities related to the hydrometallurgical processing demonstration facility in Argentia will generate approximately 340 person-years. It further estimates that the construction of the commercial scale processing facility will generate approximately 3,000 person-years of employment from 2009 to 2011.[98] Most employment during the construction phase will be provided by contractors, whereas most of those who work during the operation of the mine will be employees of the Voisey's Bay Nickel Company.[99]

The Voisey's Bay site is governed by a special project agreement requiring all on-site construction trades people to be members of unions but giving Labrador's Innu and Inuit workers preference for employment opportunities, as per the IBAs. It also recognizes the Voisey's Bay Nickel Company's commitment to give qualified workers from Labrador priority for employment opportunities related to the mine and concentrator project in Labrador.[100]

The federal government's Aboriginal Skills and Employment Partnership (ASEP) program is a five-year, $85 million initiative aimed at developing the skills of Canada's Aboriginal workforce and promoting maximum employment for Aboriginal people on major economic developments across Canada. Providing Aboriginal people with the skills needed to participate in economic opportunities such as mining, oil and gas, and hydro development projects will lead to lasting benefits for Aboriginal communities, families and individuals. As a pilot project for the ASEP program, Human Resources and Skills Development Canada (HRSDC) has helped develop the partnership between the Voisey's Bay Nickel Company, the Innu Nation, the Labrador Inuit Association, the Labrador Métis Nation and the Province of Newfoundland and Labrador. This partnership will implement programs and services that prepare Aboriginal people for long-term jobs associated with the Voisey's Bay Project.[101]

93 Heathcote, I.
94 Newfoundland and Labrador Statistics Agency website.
95 Statistics Canada website.
96 Newfoundland and Labrador Government website.
97 Ibid.
98 Ibid.
99 Voisey's Bay Nickel Company website.
100 Ibid.
101 Treasury Board of Canada Secretariat.

The Voisey's Bay Nickel Company has also developed partnership agreements with all levels of government and Memorial University covering research, human resources training, development principles and local benefits. One of the most complex of these is a 2002 agreement with the Resource Development Council (RDC), an organization encompassing 17 trade unions. Under this agreement, the RDC agreed to waive the usual requirement that contractors rely exclusively on union workers to give appropriately qualified non-unionized Innu, Inuit and other Labradorians priority for on-site jobs over union members.[102]

In 2003, the Voisey's Bay Nickel Company developed a comprehensive plan articulating its guiding vision, values and philosophy regarding human resources. This plan will ensure a smooth transition from the construction to the commissioning phase of the Voisey's Bay project.[103] Employment opportunities in the mine itself and in support roles will bring greatly needed jobs to a province with the highest unemployment rate in Canada since the collapse of the Atlantic cod fishery in the early 1990s. Many will be filled by skilled workers from other parts of Newfoundland and the rest of Canada. Thanks to the collaboration of the Innu Nation, Labrador Inuit Association and the Voisey's Bay Nickel Company, however, many of these jobs will also be set aside worker Innu and Inuit workers.

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