CANADIAN MINERAL EXPLORATION

HR OUTLOOK

2020

PDAC

PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA

ASSOCIATION CANADIENNE DES PROSPECTEURS ET ENTREPRENEURS

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MINING INDUSTRY HUMAN RESOURCES COUNCIL

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Cover photo – Source: PDAC

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Executive Summary

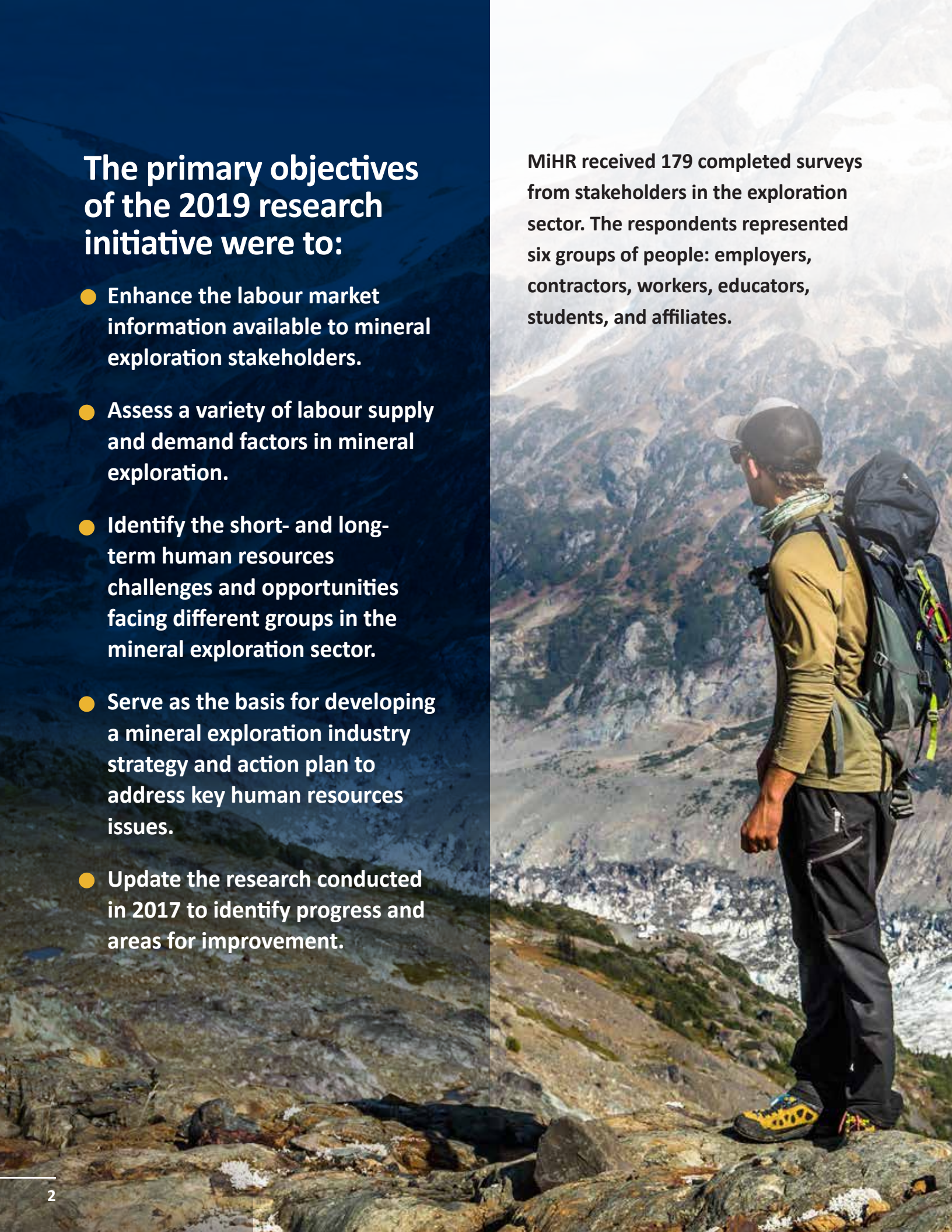
Mineral exploration is the first stage of the mining process and its success requires the collaboration of multiple stakeholders. The Mining Industry Human Resources Council (MiHR) and the Prospectors and Developers Association of Canada (PDAC) have partnered to produce this report on the status of human resources in the Canadian mineral exploration sector. The goal of this research is to help stakeholders identify and understand the human resources and labour market challenges facing the exploration sector.

Unlike other segments of the mining sector, exploration is not covered by a nationally recognized industry classification, nor is there a specific collection of occupations that can be used to define the scope of its labour market. To address the gap in labour market information, MiHR and PDAC developed and deployed the 2019 Canadian Mineral Exploration Survey, a robust research tool that provides a more refined and accurate reflection of the challenges facing Canada's mineral exploration labour market. This work builds on MiHR's research in 2017 that culminated in the publication of the *Canadian Mineral Exploration HR Outlook*.

The primary objectives of the 2019 research initiative were to:

- Enhance the labour market information available to mineral exploration stakeholders.
- Assess a variety of labour supply and demand factors in mineral exploration.
- Identify the short- and long-term human resources challenges and opportunities facing different groups in the mineral exploration sector.
- Serve as the basis for developing a mineral exploration industry strategy and action plan to address key human resources issues.
- Update the research conducted in 2017 to identify progress and areas for improvement.

MiHR received 179 completed surveys from stakeholders in the exploration sector. The respondents represented six groups of people: employers, contractors, workers, educators, students, and affiliates.



KEY FINDINGS

The survey results highlight stakeholders' perceptions and attitudes regarding various aspects of working in the exploration sector. These insights offer a basis for developing and/or refining existing programs to increase worker participation and retention in the mineral exploration labour force.

The study reveals several overarching themes that cut across all six groups associated with mineral exploration:

- The representation of mid-career workers in exploration is lower than in the mining industry.
- There is a higher representation of women and immigrants in exploration than in the mining industry.
- Young people (pre-post-secondary) are unaware about careers in exploration, which needlessly limits the future pool of new labour.
- Exploration contractors have a more negative career outlook compared to the other stakeholder groups.
- Stronger collaboration is needed between industry and educational institutions to better align learning outcomes with the skills requirements of employers.

About MiHR

The Mining Industry Human Resources Council (MiHR) is Canada's knowledge centre for mining labour market information. An independent, non-profit organization, MiHR leads collaboration among mining and exploration companies, organized labour, contractors, educational institutions, industry associations and Indigenous groups to identify opportunities and address the human resource and labour market challenges facing the Canadian minerals and metals sector.

MiHR provides a centralized, trusted and responsive knowledge center for mining labour market trends, intelligence and research. A deep understanding of current labour market trends, valid projections of future needs, and a clear picture of the potential sources of labour to meet these needs, all provide a necessary foundation for proactive, coordinated and cooperative human resources strategies.

Acknowledgements

MiHR partnered with the Prospectors and Developers Association of Canada (PDAC) to develop this research initiative, including the design of the survey questionnaire and its promotion through various channels. MiHR and PDAC are grateful to all the individuals and organizations in the Canadian mineral exploration sector who contributed their valuable time, resources, knowledge and insights to this study and report.

We are particularly indebted to PDAC's Human Resource Development Committee for their hard work, guidance and insights:

- **Krishana Michaud**, PDAC (partner)
- **Lisa McDonald**, PDAC (partner)
- **Laura Clinton**, Mining Matters
- **Karen Rees**, Lake Shore Gold
- **Richard James**, Laurentian University
- **Alexandra Squires**, M.Sc.
- **Christine Petch**, CPETCH Consulting
- **Conrad Dix**, Red Pine Exploration Inc.
- **David Thomas**, RCF Management (Toronto) Inc.
- **Felix Lee**, Independent Economic Geologist
- **Mary Louise Hill**, Lakehead University
- **Tim Dohey**, Newmont Goldcorp

Mineral Exploration: Overview

Source: PDAC

DEFINITION

Mineral exploration is the first stage of the mining cycle. It focuses on the process of gathering information to assess the mineral potential of a given area. Mineral exploration involves identifying a target area that has the potential for mineral endowment. There are five general stages in mineral exploration:

1. **Planning and mineral assessment:** Involves the identification and analysis of potential target areas, using publicly available information from local, provincial and federal governments, as well as information made public by companies that have worked in the area. This work is conducted by geologists and prospectors, among others.

2. **Staking a claim:** Once a target area has been identified, it needs to be staked if it is on Crown land, or the exploration rights to the area need to be purchased from the current claim holder. This work is conducted by geologists, consultants, prospectors, and others.

3. **Reconnaissance:** Involves prospecting, mapping, sampling, and geophysical and geochemical surveying to help identify geological targets indicative of a mineral deposit. This work is conducted by geologists, geochemists, prospectors, geophysicists, and others.

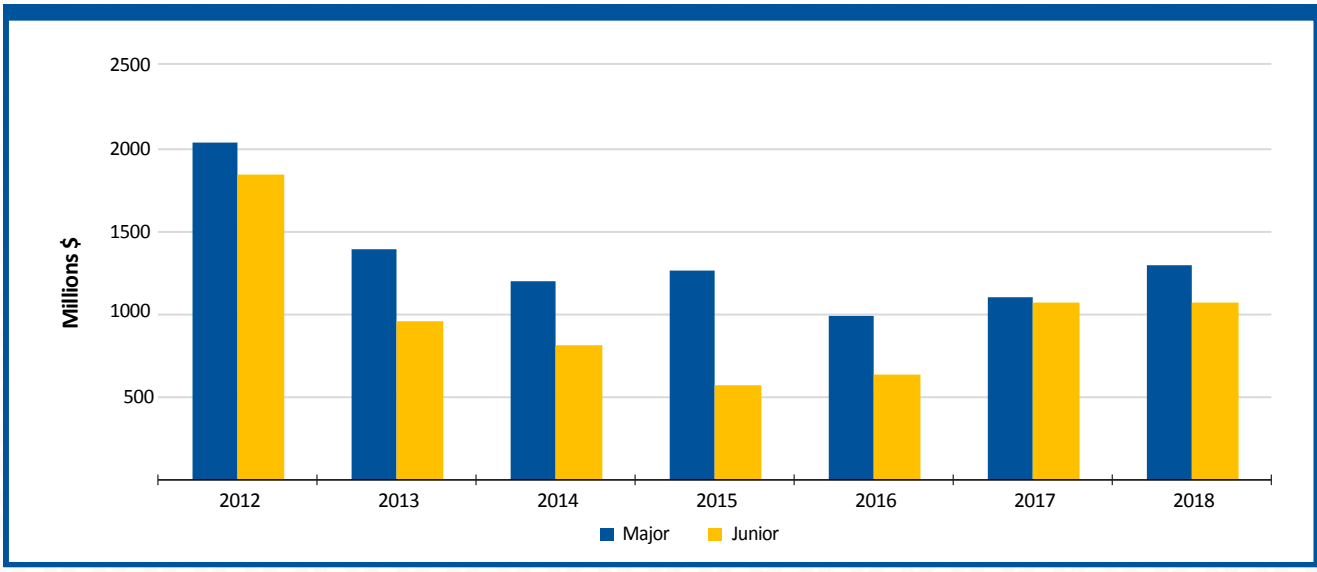
4. **Advanced exploration:** Once the targets have been identified, further work (drilling, trenching, sampling, assaying, etc.) needs to be done to determine the economic viability of the targeted deposit. This work is conducted by geologists, drillers, geotechnical assistants, and others.

5. **Economic evaluation:** Once the size and quality of the ore deposit has been determined (estimation of mineral resources), a feasibility study is conducted to determine whether the deposit is economically viable given the costs of operation, construction, rehabilitation, transport and other costs. This work is done by resource geologists, geological engineers, and others.

SCOPE

The mineral exploration industry consists of many different organizations that come together to discover potential areas for economic mineral resource development. Companies in mineral exploration vary greatly in size, from junior companies consisting of a couple workers, to entire exploration departments of major mining companies. Historically, junior companies had no operating revenues and depended solely on equity financing and investors to cover the cost of exploration, whereas major companies invested heavily in exploration. However, in the past two years (2017–18) the investment gap between juniors and majors has narrowed (Figure 1).

FIGURE 1: Exploration expenditures by junior and major companies, 2012–2018



Source: Natural Resources Canada (Survey of Mineral Exploration), 2019

VOLATILE COMMODITY PRICES AND INVESTMENT

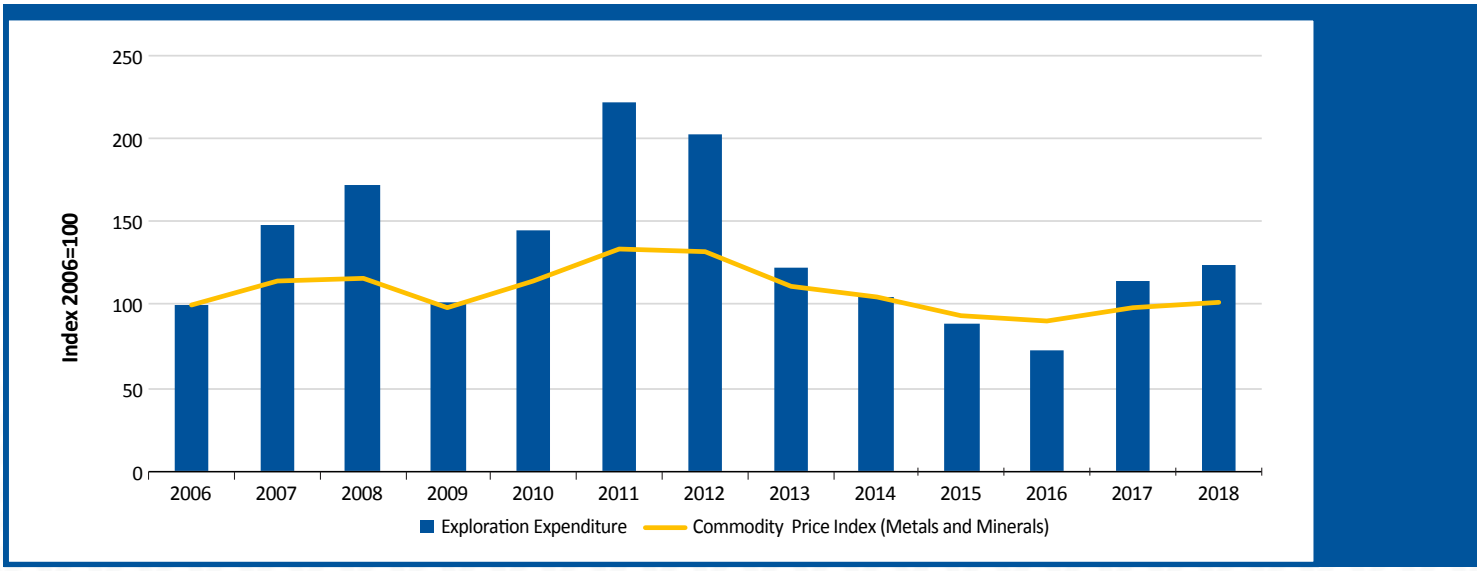
The exploration sector is sensitive to changes in commodity prices - price movement can induce boom and bust periods in the sector. This volatility is a fundamental systemic risk associated with investment in exploration. The sector is largely dependent on investors, with strong investor confidence translating into larger investments and bullish capital markets which fuel growth in the industry.

The first quarter of 2017 witnessed the rebound in commodity prices has contributed to a revitalization of both mining and exploration sectors; this trend continued through 2018–19 (Figure 2).

Variables associated with attracting capital include financial and environmental regulatory frameworks, fiscal policy, infrastructure to deliver goods, and ease of business and government. A robust exploration sector, supportive mining-related industries, skilled labour, politically stable government, and an investor-friendly environment have all contributed to high investment in Canadian mineral exploration (Natural Resources Canada, 2016). S&P Global Market Intelligence ranked Canada one of the world's top destinations for non-ferrous exploration spending in 2019, attracting 14% of worldwide expenditures (Figure 3).


Source: PDAC

FIGURE 2: Growth in mineral exploration expenditure and in Commodity Price Index (Metals and Minerals), 2006–2018

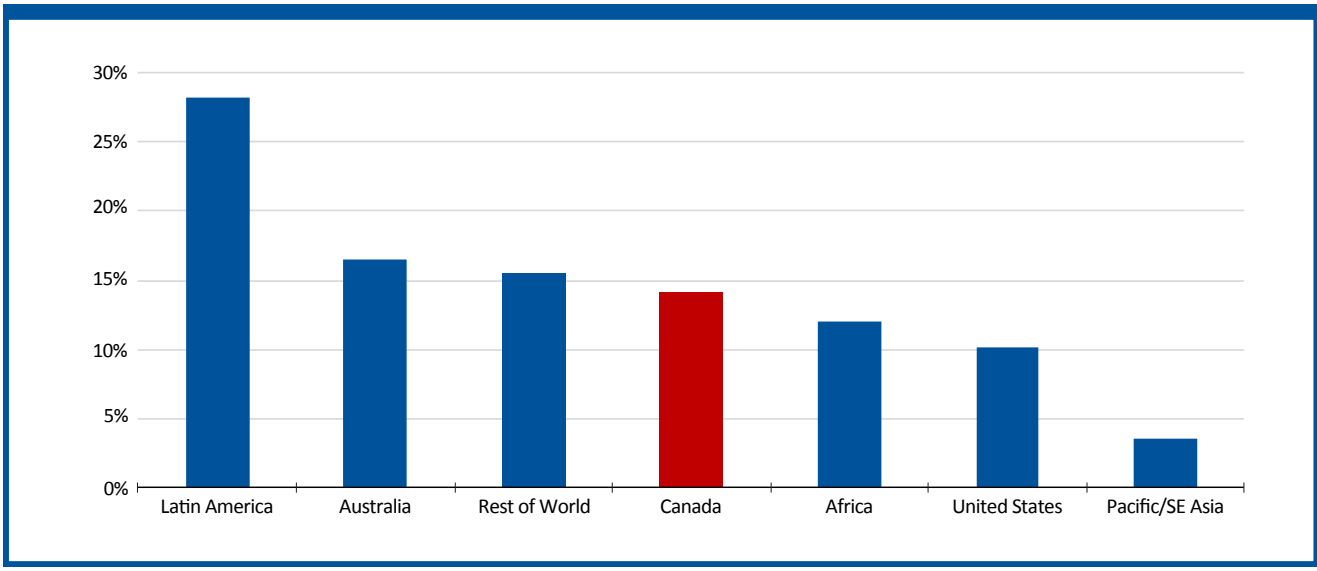


Sources: Bank of Canada, 2019; National Resources Canada (NRCAN), 2019

The Canadian government has demonstrated a commitment to boost growth in the exploration sector. The 2019 federal budget extends the 15% mineral exploration tax credit for another five years, which aids junior exploration companies in raising capital. Layered upon the offering of flow-through shares,[1] this tax credit will play an integral role in attracting investment to the Canadian exploration sector.

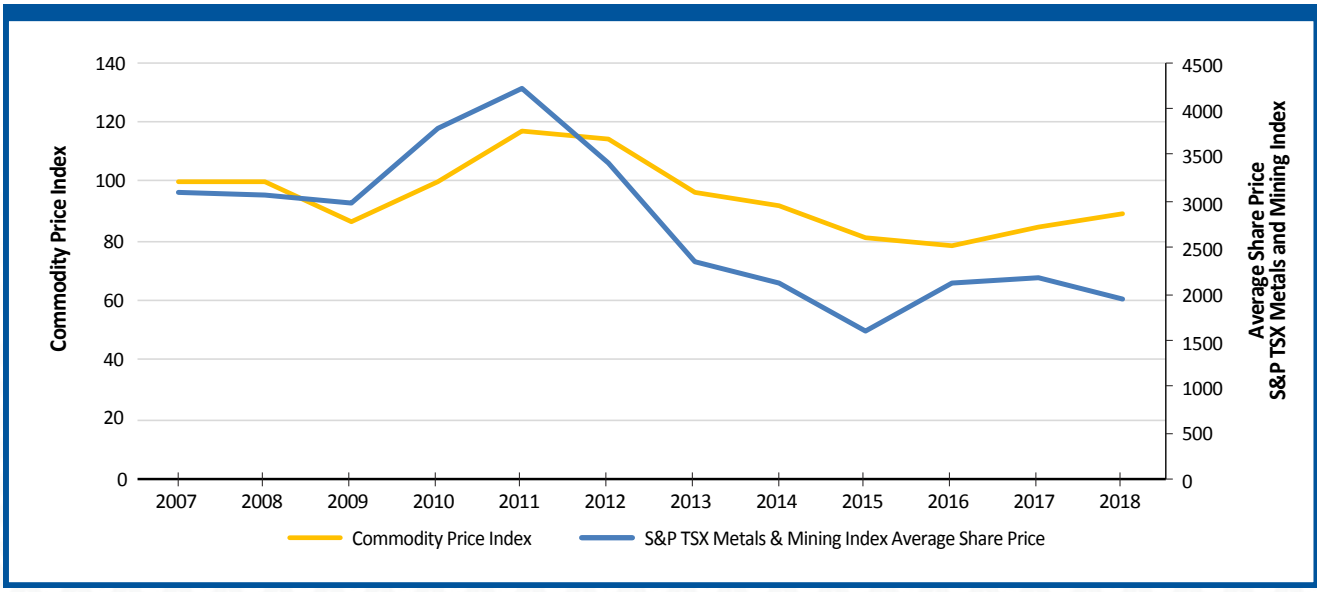
Toronto is the largest financial hub for the global mining industry. As of November 2019, over 1,100 mining companies were listed on the Toronto Stock Exchange (TSX) and Toronto-Venture Exchange (TSX-V). In 2017, 59% of global mining financing was done on the TSX and TSX-V. The ability of exploration companies to raise capital in equity markets is dependent on investor confidence. In 2011, investor confidence was eroded and resulted in a declining average share price for TSX-listed companies that persisted until 2015 (Figure 4).

FIGURE 3: Non-ferrous exploration budgets by region, 2019



Source: S & P Global Market Intelligence 2019

FIGURE 4: Average share price for mining companies listed on the TSX compared to Bank of Canada commodity prices



Sources: TMX Group (2019), Investing.com (2019)

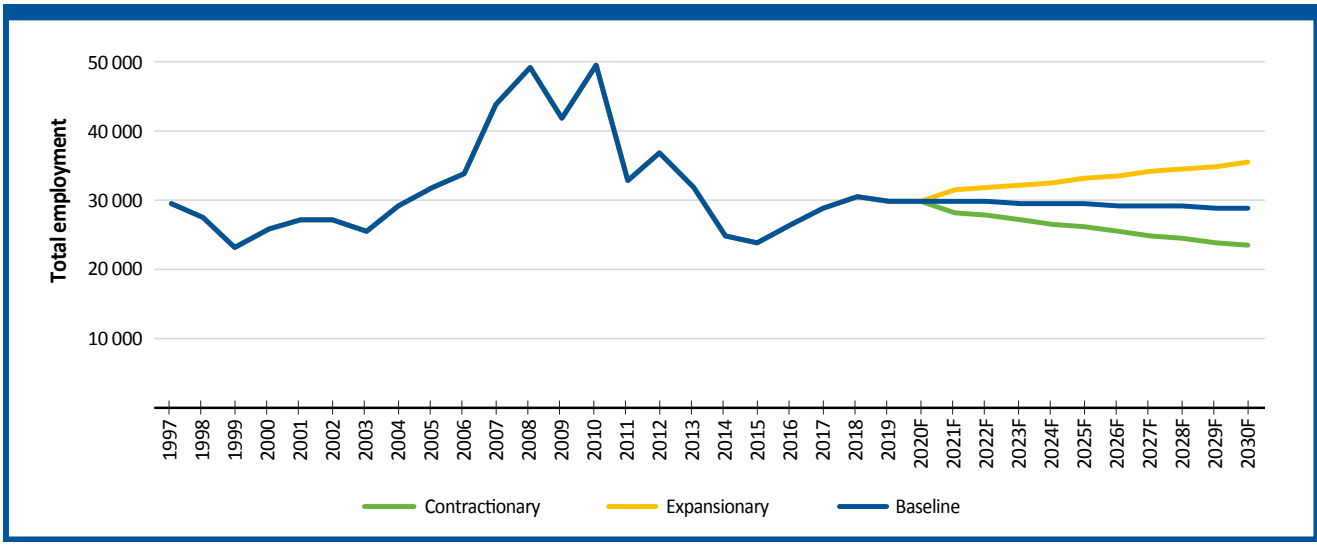
1 Flow-through shares are an incentive provided to individuals who invest in early-stage exploration, allowing resource companies to transfer expenses related to their Canadian exploration activities to investors, who can deduct the expenses in calculating their taxable income.

EMPLOYMENT FORECAST

MiHR estimates that employment in the Canadian exploration sector was close to 30,000 in 2019. MiHR's employment forecast for 2020 to 2030 projects a decrease of roughly 1,100 workers (or 0.3%) under a baseline industry scenario (Figure 5). These are estimated figures because there is no clearly defined North American Industry Classification System (NAICS) code for the mineral exploration sector and few, if any, public LMI sources that report on the sector in isolation. The intent of MiHR's 2019 exploration survey was to better understand the occupations that characterize the industry in its entirety, following up on MiHR's 2017 study. Although the results likely overrepresent professional and technical occupations, they help to illuminate some of the issues affecting all workers in mineral exploration.

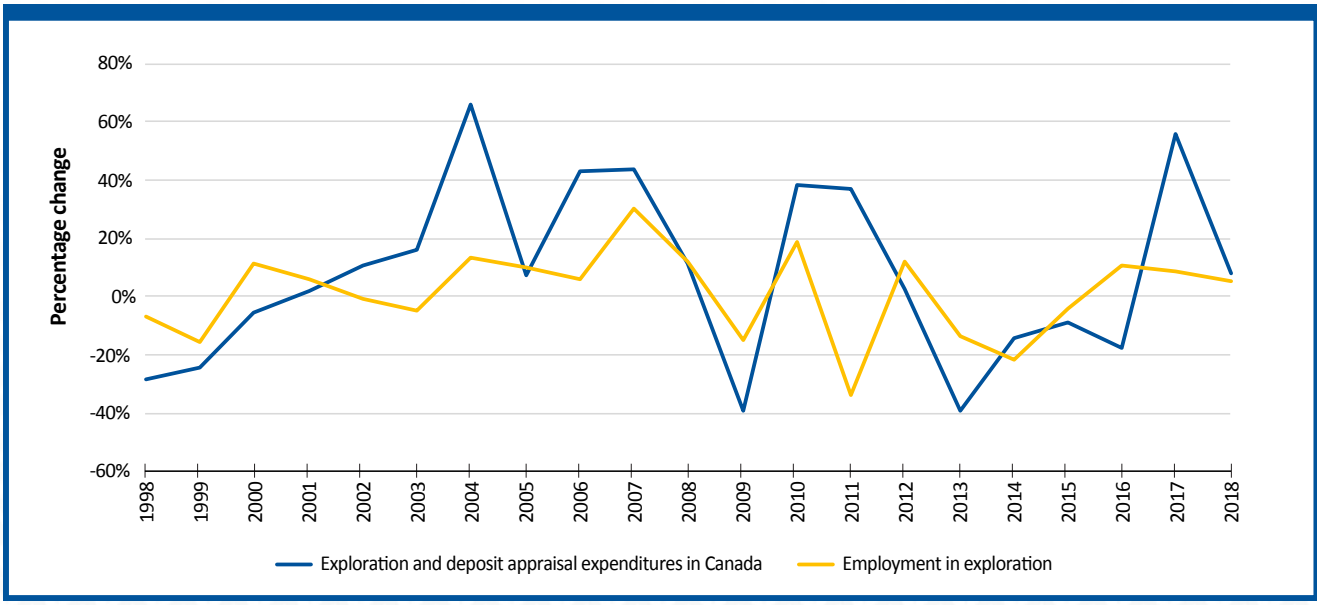
Exploration employment is highly sensitive to fluctuations in commodity prices and exploration spending, highlighting the challenge in maintaining a sustainable exploration workforce during periods of economic uncertainty and highly volatile markets (Figure 6).

FIGURE 5: Historical and forecasted employment in exploration, 1997–2030



Source: Mining Industry Human Resources Council, *Canadian Mining Labour Market 10-Year Outlook 2020*

FIGURE 6: Changes in spending and employment in the exploration sector, 1998–2018



Source: Mining Industry Human Resources Council, *Canadian Mining Labour Market 10-Year Outlook 2020*, Natural Resources Canada, 2019; Statistics Canada, System of National Accounts, 2019

Survey Methodology

A comprehensive online survey was made available to stakeholders in the Canadian mineral exploration sector, including employers, workers, contractors, students, educators and affiliates.

Entitled the 2019 Canadian Mineral Exploration Survey, and made available online from March 3, 2019 to September 30, 2019, the survey was officially launched at the 2019 PDAC convention in Toronto. The survey was available in both English and French.

The sample respondents were required to meet the following criteria:

- Currently or recently (within the last five years) associated with Canada's mineral exploration sector, as an independent contractor, student, affiliate, educator, or employer of people who work in the mineral exploration sector.
- Willing to provide confirmation of informed consent at the start of the survey. (Detailed information was available online for the respondent to review prior to completing the survey.)

Source: PDAC

DATA ANALYSIS

The exploration survey was completed by 179 respondents. All data used in this report were derived from completed survey response data; incomplete data were discarded.

RESPONDENT DEFINITIONS

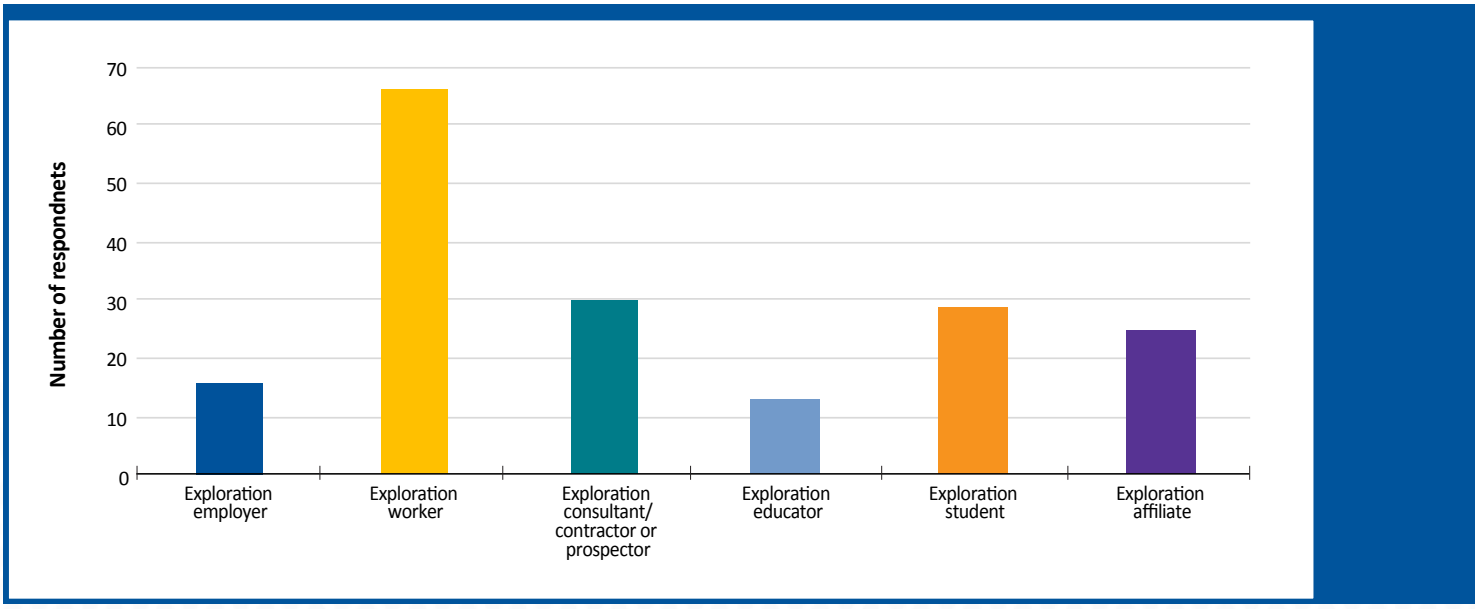
The study focused on six different groups involved in the mineral exploration sector: (1) employers, (2) contractors, (3) workers, (4) educators, (5) students, and (6) affiliates. Respondents were asked to self-identify which of the six groups best described their current (or most recent) position in the mineral exploration sector, as defined below:

1. **Exploration employer:** You are responsible for hiring workers in your organization.
2. **Exploration consultant/contractor or prospector:** You are self-employed and working for a mineral exploration company.
3. **Exploration worker:** You are an employee, have worked as an employee, or are looking to work as an employee for a mineral exploration company.
4. **Exploration student:** You are currently enrolled as a student at a post-secondary institution in a program focused on exploration or mining.
5. **Exploration educator:** You provide post-secondary mineral exploration education and training.
6. **Exploration affiliate:** You work for an organization that is affiliated with the mineral exploration industry but does not conduct primary exploration activities (e.g. an association, laboratory, legal or accounting firm).

OVERVIEW OF SAMPLE

Two thirds (66%) of the survey respondents were exploration workers – they were either employed or looking for work in the mineral exploration sector. Almost one third (30%) of survey respondents were self-employed as consultants, contractors or prospectors working for a mineral exploration company (Figure 7).

FIGURE 7: Distribution of survey respondents by group

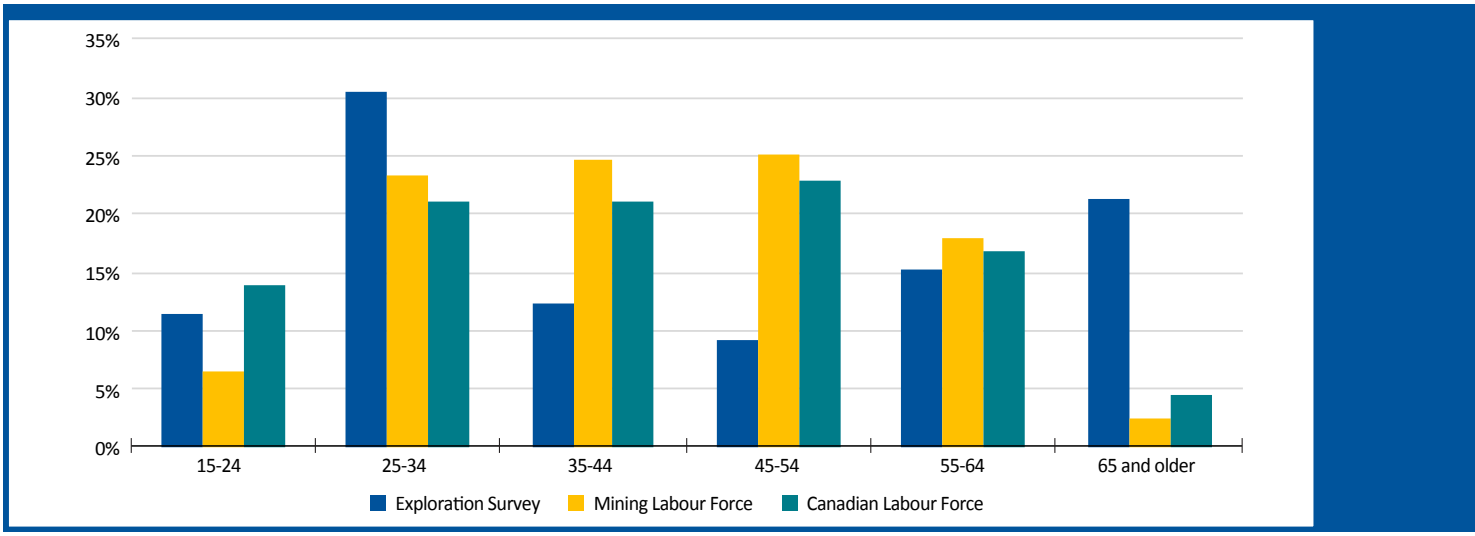


Source: Mining Industry Human Resources Council, Exploration Survey data, 2019

Age distribution

The age distribution data show an overrepresentation of both younger (ages 25 to 34) and older (ages 65 and over) survey respondents and an underrepresentation of middle-age respondents when compared to both the Canadian labour force and the Canadian mining labour force (Figure 8). A large proportion (over 21%) of survey respondents were above the age of 65, which is seven times higher than the average for the mining labour force in Canada. The lower share of mid-career respondents is consistent with findings from the *2017 Canadian Mineral Exploration HR Outlook.*

FIGURE 8: Age distribution of survey respondents compared to the Canadian mining labour force and the Canadian labour force

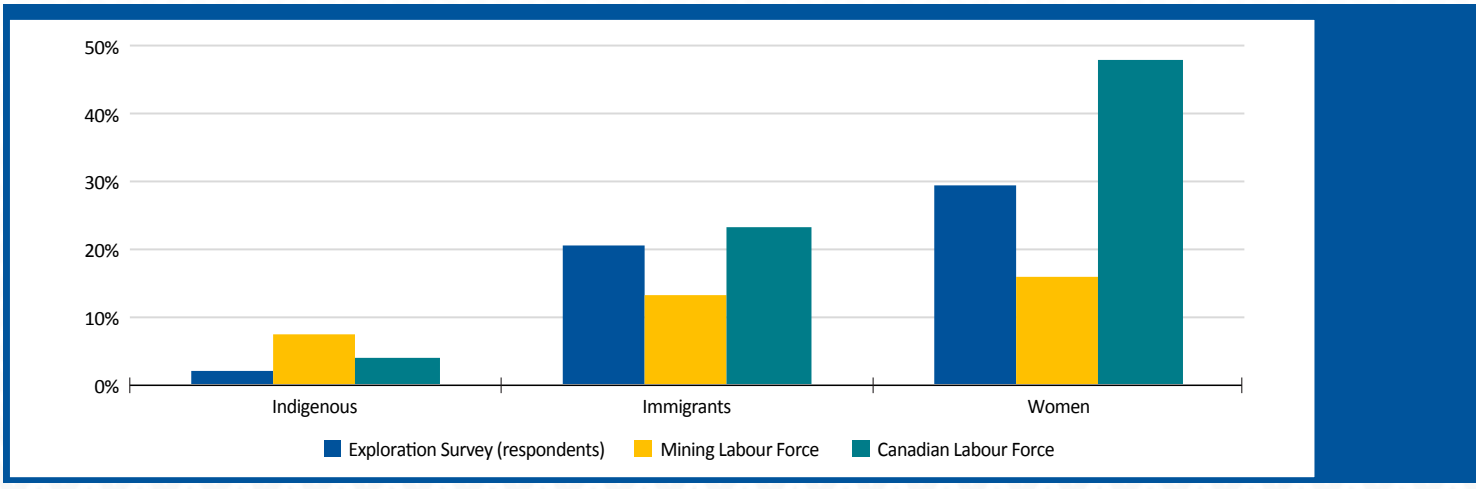


Source: Mining Industry Human Resources Council, Exploration Survey data, 2019; Statistics Canada (2016 Census), 2019

Diversity

Individual respondents from all groups (except employers) were asked to indicate whether they self-identified as part of an underrepresented group (Indigenous, immigrant or woman). The current sample and subsequent reporting rely on a much larger proportion of women and immigrants than are represented in the total mining industry labour force, but the proportion of women and immigrants in the exploration survey sample is still lower than the average for the Canadian labour force (Figure 9). Indigenous representation in this sample is lower than both the Canadian labour force and the mining labour force, which is different than the findings from a similar survey conducted in 2017 where Indigenous representation was similar to the Canadian mining industry labour force.

FIGURE 9: Representation of Indigenous people, immigrants and women in Canadian labour force and mining labour force, compared to exploration survey respondents*



* Survey respondents that were employers are not included.

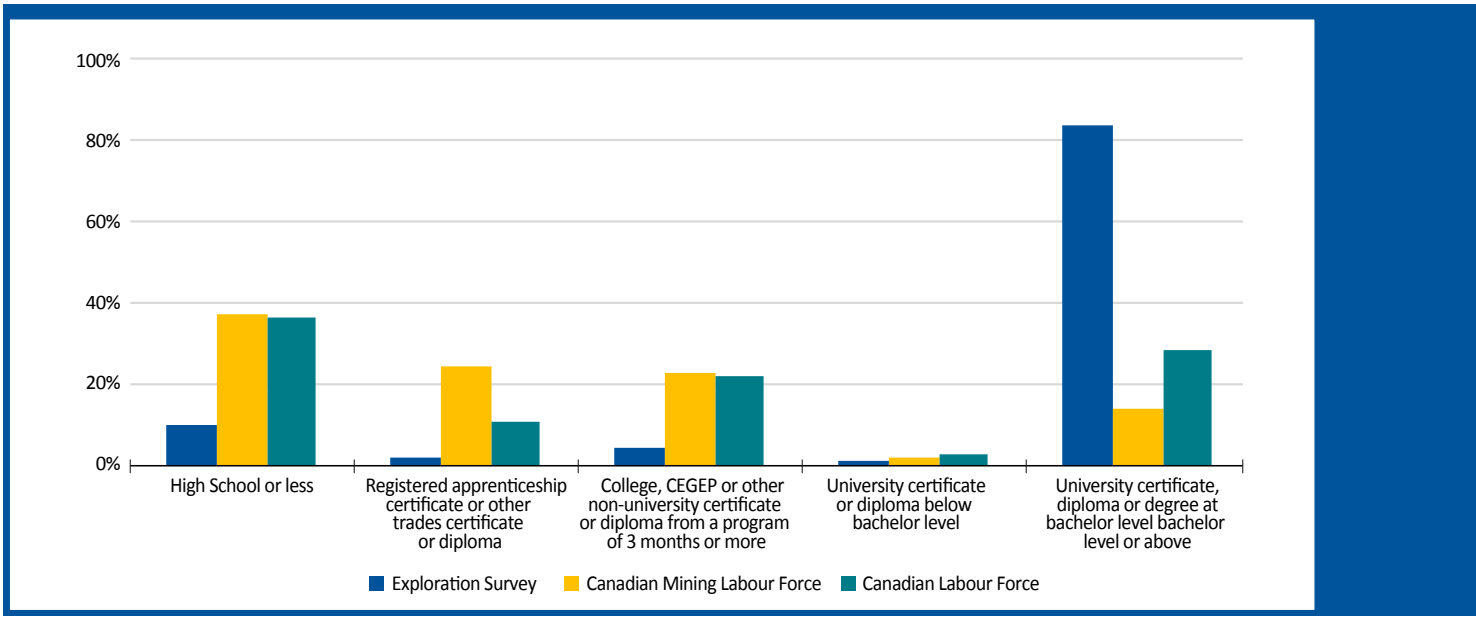
Source: Mining Industry Human Resources Council, Exploration Survey data, 2019; Statistics Canada (2016 Census), 2019

Education

Eighty-three per cent of respondents reported having a bachelor's degree or higher, which is almost six times the rate for the Canadian mining labour force and almost three times the rate for the Canadian labour force (Figure 10). Of this 83%, 42% reported having a graduate degree (31% with a master's and 11% with a doctorate).

The higher share could be attributed to bias in the distribution of the survey through various professional organizations and conferences. However, MiHR and PDAC have previously observed the higher level of education in the exploration industry (2011 and 2017). As well, MiHR's 2016 research indicated that women and immigrants in the mining industry generally have a higher level of education than the overall mining labour force.

FIGURE 10: Education level of surveyed workers and contractors compared to the Canadian labour force and mining labour force



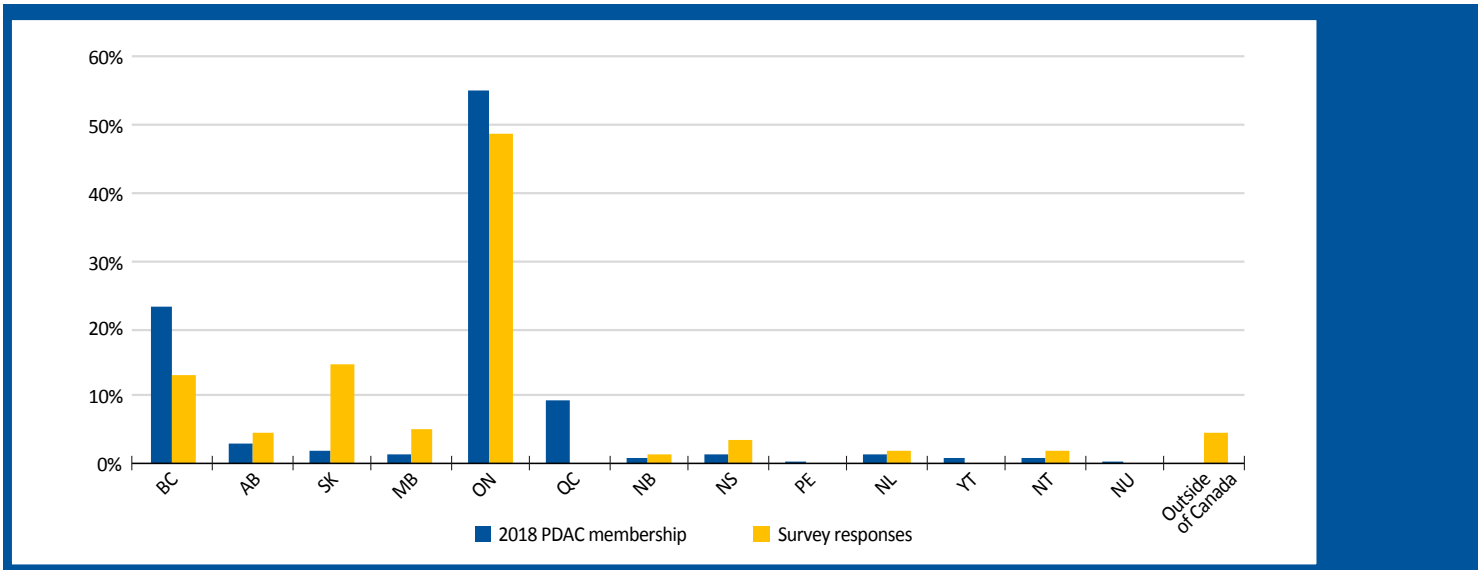
Source: Mining Industry Human Resources Council, Exploration Survey data, 2019; Statistics Canada (2016 Census), 2019

Source: PDAC

Permanent Residence

Just under half of survey respondents (49%) reported that they permanently reside in Ontario (Figure 11). Another 15% reported that they reside in Saskatchewan and 13% reported that their permanent residence is in British Columbia. As expected, survey respondents show a similar geographic distribution to PDAC membership.

FIGURE 11: Permanent residence of survey respondents and PDAC members

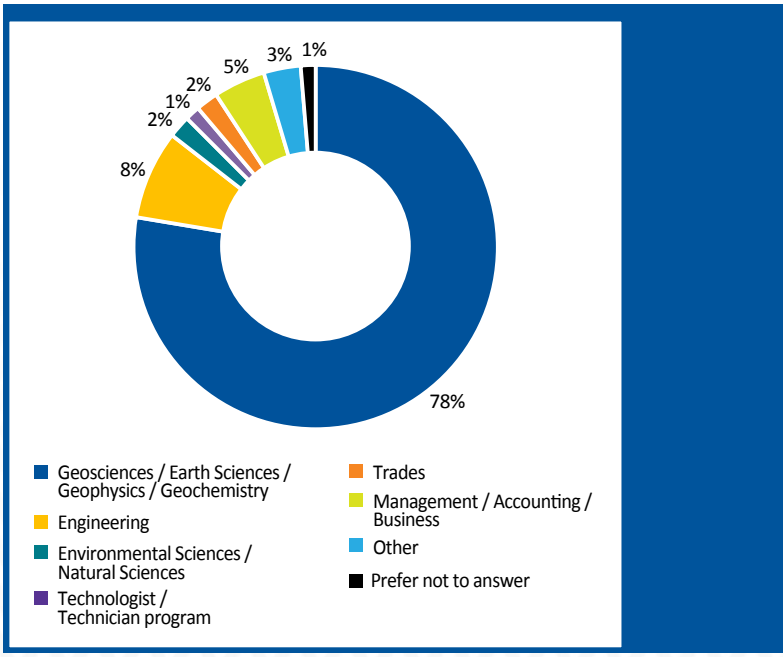


Source: Mining Industry Human Resources Council, Exploration Survey data, 2019; PDAC Annual Report, 2019

Primary Area of Study

Almost 80% of respondents reported that their primary area of study was in the field of geosciences, earth sciences, geophysics or geochemistry (Figure 12). The higher proportion of respondents from these areas of study may reflect the stronger survey penetration in these fields than in other areas of exploration.

FIGURE 12: Primary area of study of the mineral exploration survey respondents



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Respondent Profiles

Source: PDAC

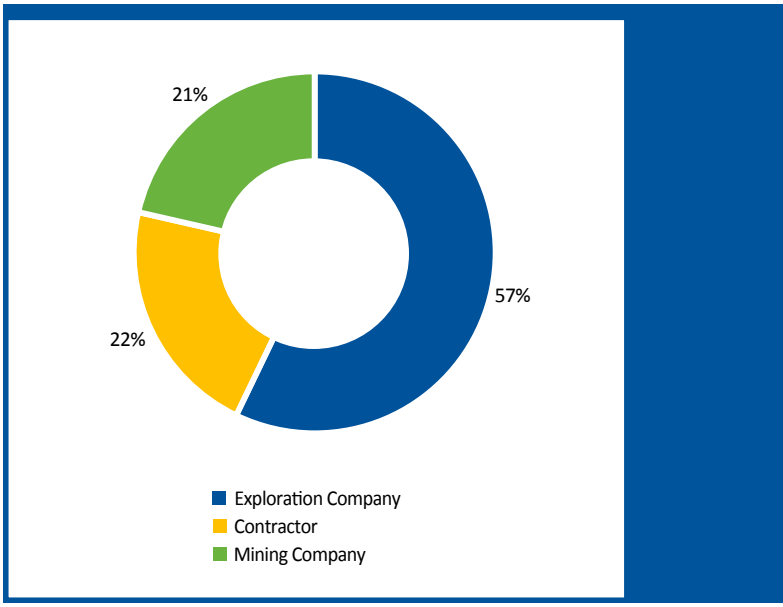
As noted, the study focused on six different groups involved in the mineral exploration sector: (1) employers, (2) contractors, (3) workers, (4) educators, (5) students, and (6) affiliates.

EMPLOYERS

The Canadian mineral exploration industry requires the input of many different organizations. Mineral exploration contractors or consulting firms, exploration companies and mining companies all play a vital role in exploration. A total of 16 employers responded to the survey, of which 57% represented exploration companies (Figure 13).

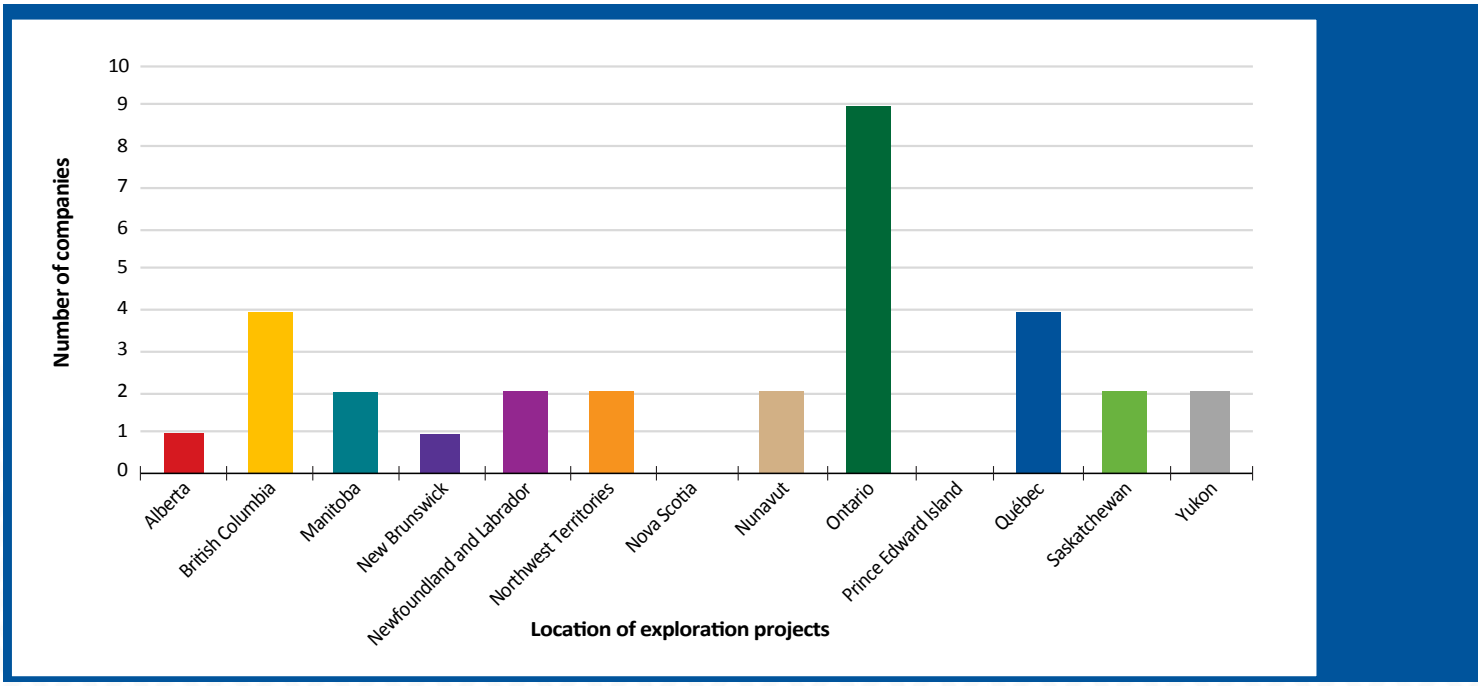
The employers who participated in the survey worked in almost all provinces and territories except for Prince Edward Island, where there are no mineral deposits (Figure 14). The number of employers working in each province is reflective of the investment in exploration companies across Canada. Just over 28% of employers indicated that they have ongoing exploration projects in multiple locations across the country, with Ontario representing the largest mineral exploration market for survey respondents.

FIGURE 13: Respondents by type of organization



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 14: Exploration employers by province/territory of current mineral exploration projects

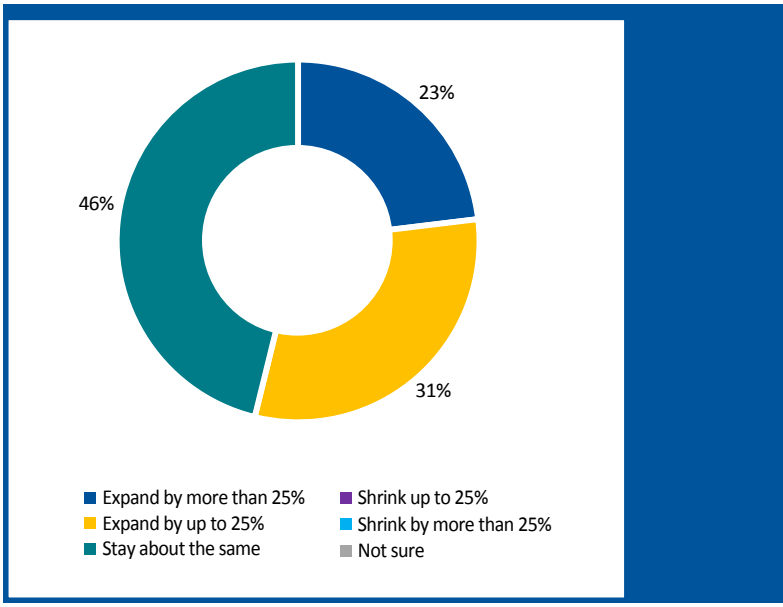


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Changes in commodity prices and exploration expenditures generally move in tandem, but as research from the PWC in 2018 indicates, there is a lag between an increase in commodity prices and increased investment in exploration and mining companies. Given the current optimistic environment associated with recovering commodity prices, it is plausible that the mining and exploration sectors are entering a period of growth, which in turn may trigger an increased demand for mining labour. The 2019 exploration survey attempted to take the pulse of the exploration industry by asking employers questions related to future hiring expectations.

The majority of employers (54%) reported that they anticipate an expansion in the size of their workforce over the next 12 months (Figure 15). Almost one third (31%) stated they expect an increase of up to 25%, and 23% expect an increase of over 25%. These results reflect the general sentiments of employers surveyed and show optimism about the current market conditions. It is interesting to note that none of the employers surveyed indicated that they are anticipating a contraction of their workforce over the next 12 months.

FIGURE 15: Employers' responses to the question, "Over the next 12 months do you anticipate your work force will..."



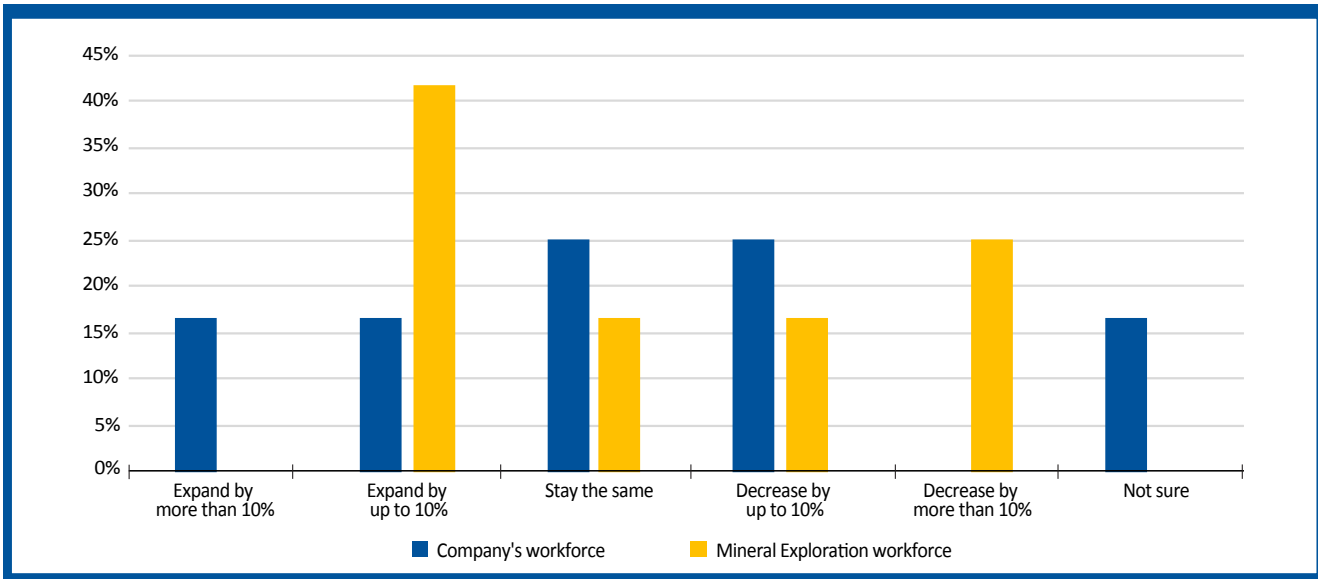
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Source: PDAC

When employers were asked about the future impact of new technologies and innovations on the size of their company's workforce, 33% indicated that they expect their workforce will expand and 25% reported they expect it will stay the same. When asked about the future impact of new technologies and innovations on the overall mineral exploration workforce, 42% of employers reported that they anticipate an expansion of the exploration workforce and 17% indicated they anticipate it will remain the same (Figure 16).

42% of employers anticipate that their workforce will expand due to the impact of new technologies.

FIGURE 16: Employers' responses regarding the potential impact of new technologies on their company workforce and the Canadian mineral exploration workforce

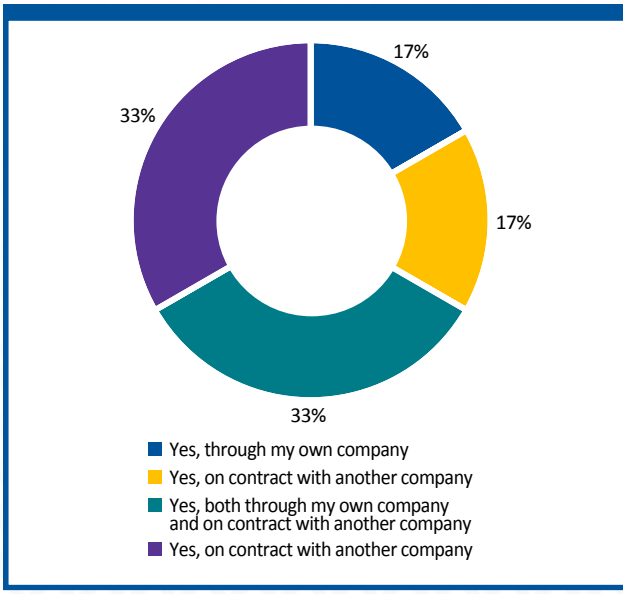


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

CONSULTANTS/CONTRACTORS

A total of 30 exploration consultants/contractors responded to the survey. The work of consulting firms requires a contingent of independent contractors who have specialized skills and are relatively flexible about work arrangements and locations through short-term economic cycles. Almost 17% of contractors surveyed indicated that they are currently work exclusively for other companies. The same share indicated that they are only working on projects generated through their own consulting company. An additional 33% indicated that they are working on their own projects as well as for other companies. Thirty-three per cent of contractors stated that they are not currently working on Canadian mineral exploration projects (Figure 17).

FIGURE 17: Share of contractor respondents currently working on exploration projects by type of company arrangement

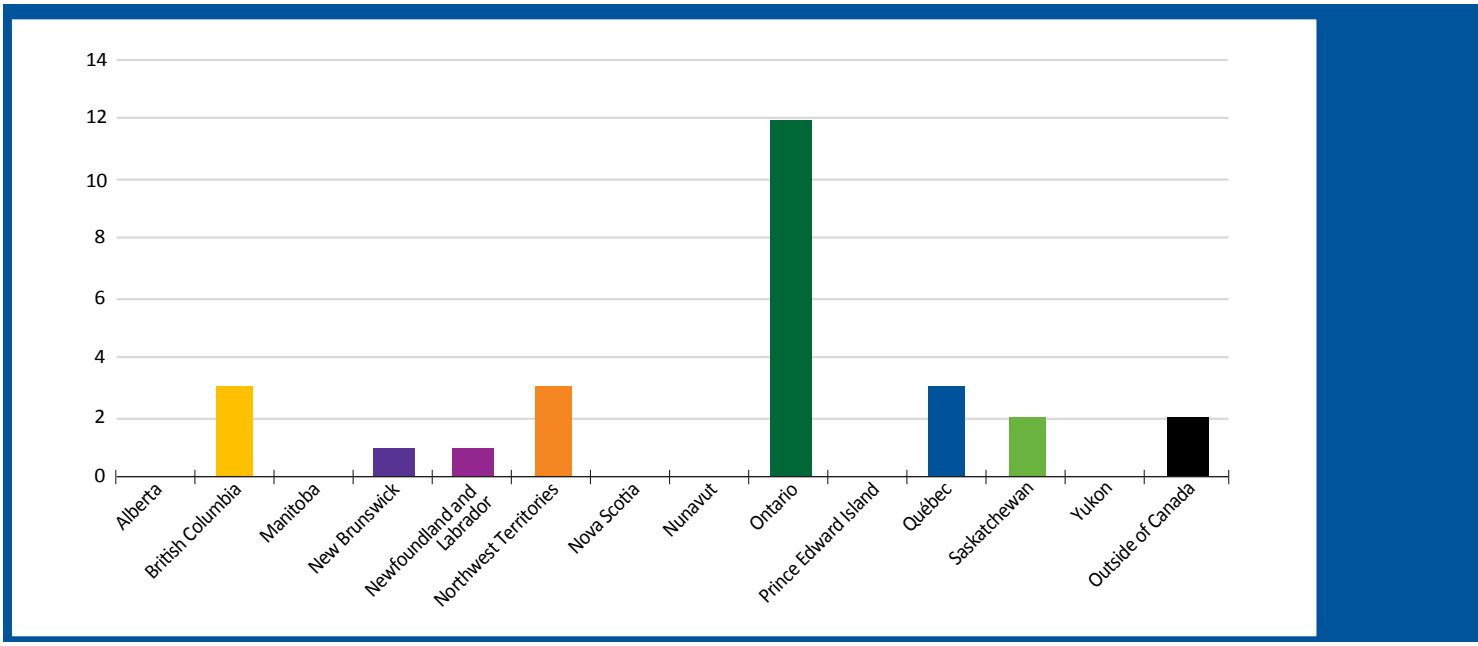


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Most of the exploration contractors reported that they spent most of their work time in Ontario (Figure 18), which likely reflects the high share of survey respondents from Ontario. Interestingly, 7% of contractors indicated that most of their work time was spent on international projects, affirming the globalization of the mineral exploration industry, and helping to explain the high share of immigrants in the exploration sector relative to other sectors in the mining industry.

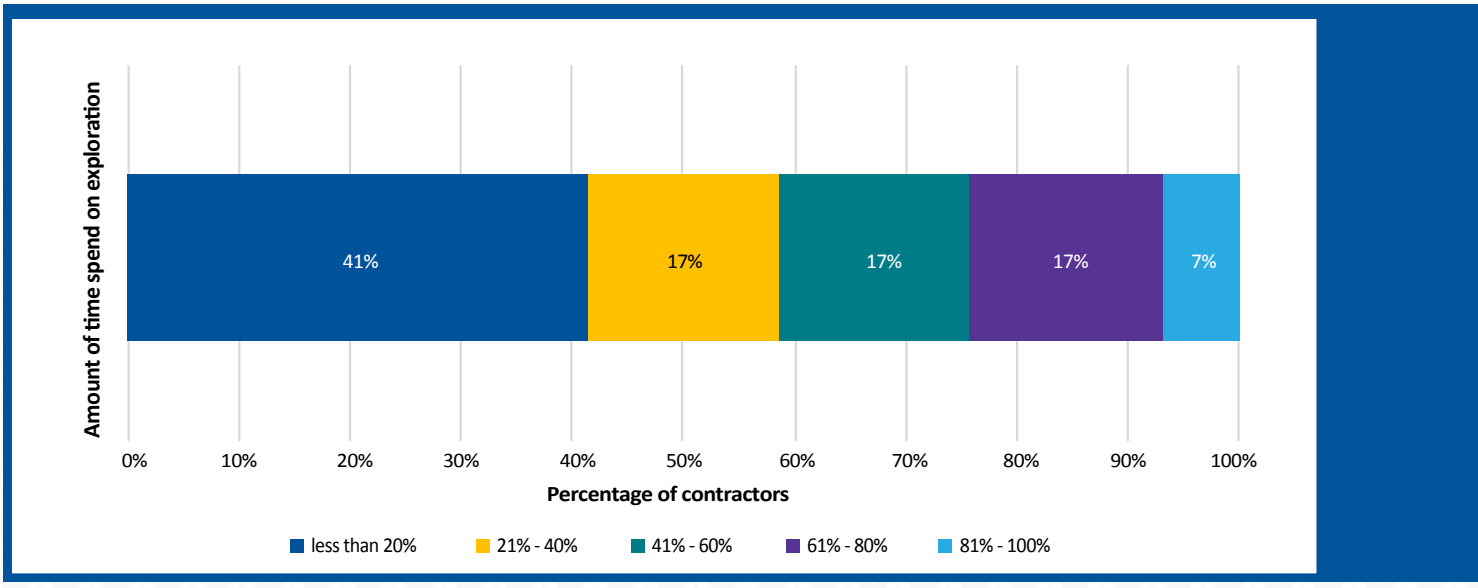
More than half of the surveyed contractors indicated that they spent less than 40% of their time conducting field work over the past 12 months (Figure 19). This finding marks a shift from the 2017 exploration survey, which indicated that contractors and consultants spent most of their time conducting field work. The more recent finding could suggest a shift toward a more digitally-enabled mineral exploration workforce, as more than 70% of the respondents work as geoscientists, which historically has been a predominantly field-based occupation (Figure 20).

FIGURE 18: Location of projects where surveyed contractors reported spending most of their time working



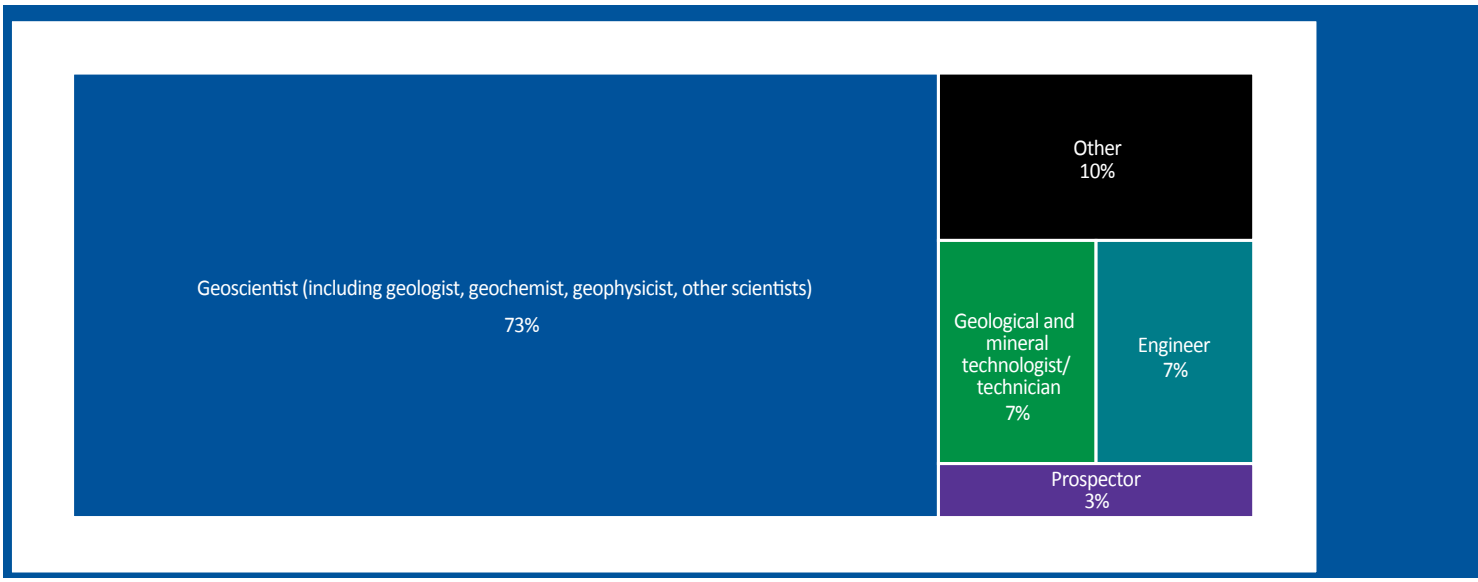
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 19: Amount of time that surveyed contractors reported spending on field work over the past 12 months



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 20: Responses of surveyed contractors to the question, “What best describes your position in your current/most recent mineral exploration job?”



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Forty per cent of the surveyed contractors currently working in exploration reported that they plan to exit the exploration workforce in the next five years, either through retirement or by changing careers (Figure 21). Contractors make up a significant portion of the exploration workforce, at over 18% of those surveyed. Their departure from the industry could result in a significant loss of knowledge and experience that would be difficult to replace, especially given the low share of mid-career workers in mineral exploration.

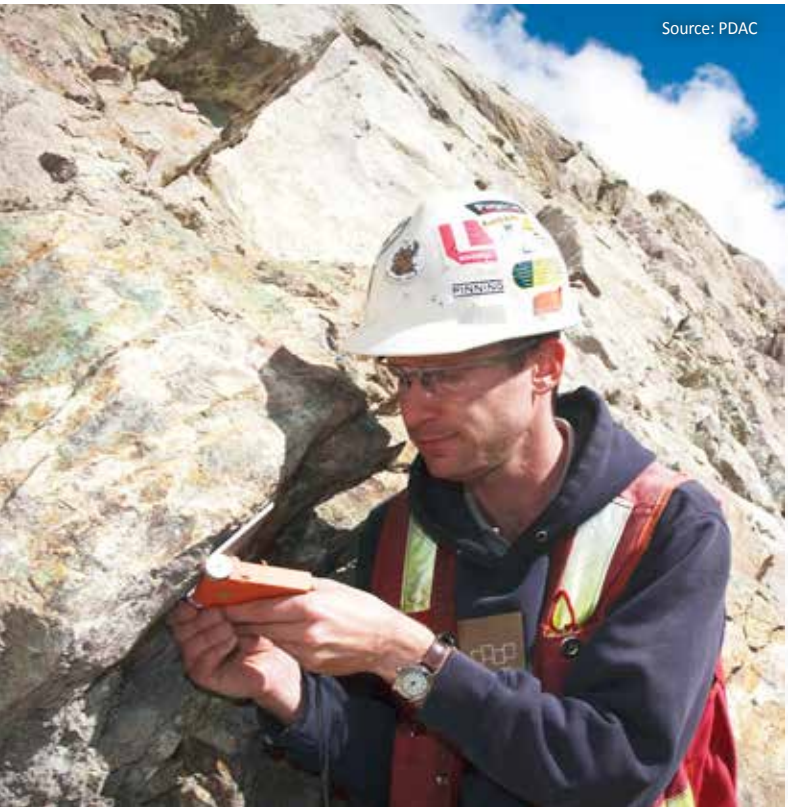
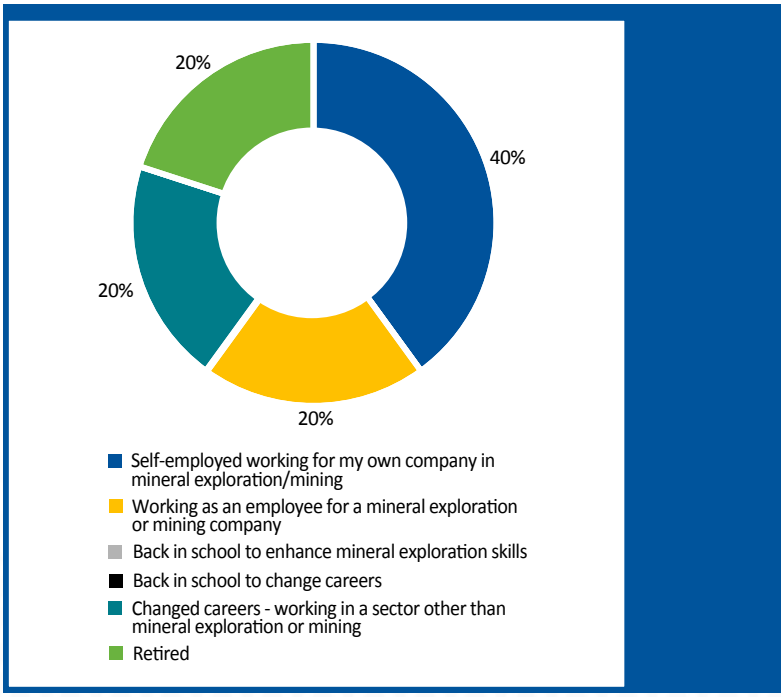


FIGURE 21: Responses of surveyed contractors/consultants on what they see themselves doing in five years



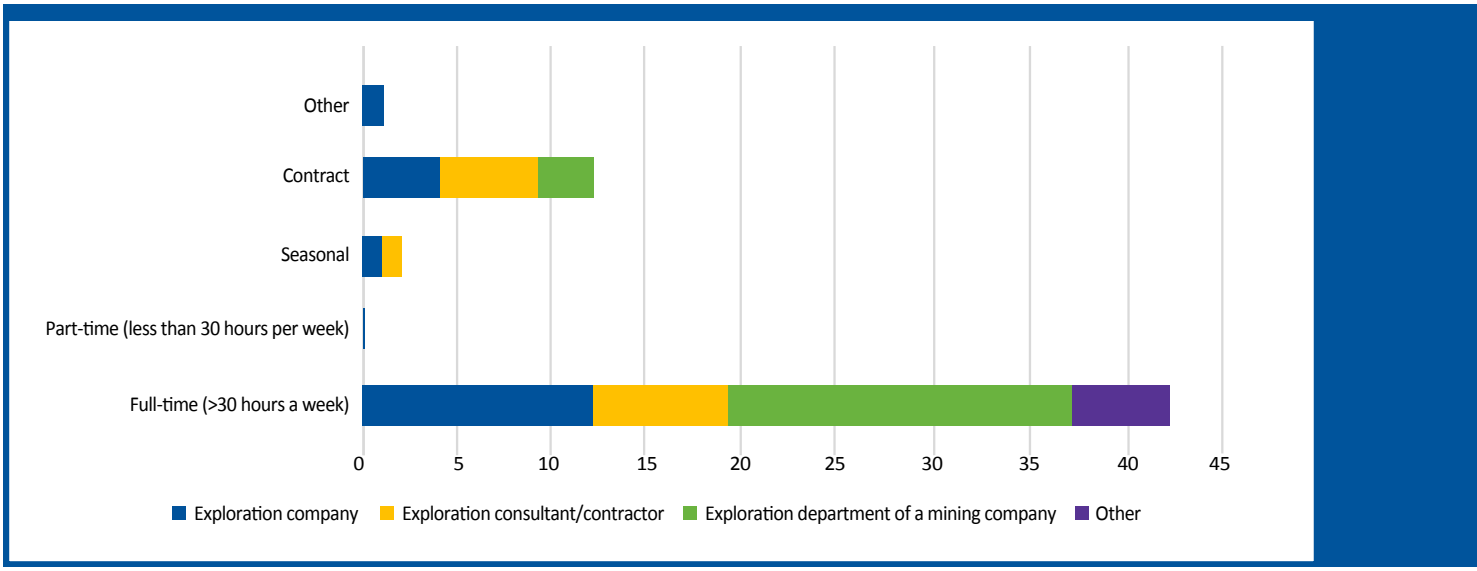
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

WORKERS

Sixty-six survey respondents were workers in mineral exploration, representing 40% of the total number of respondents. Of this group, 78% reported that they currently work in the exploration sector and 22% reported that they have recently worked in the sector. Most of the workers currently employed in the exploration sector are full-time employees, in either an exploration company or the exploration department of a mining company (Figure 22). Contract work is more common with exploration contractors/consultants than full-time work, likely because the awarding of contracts coincides with project timeframes or seasonal exploration programs.

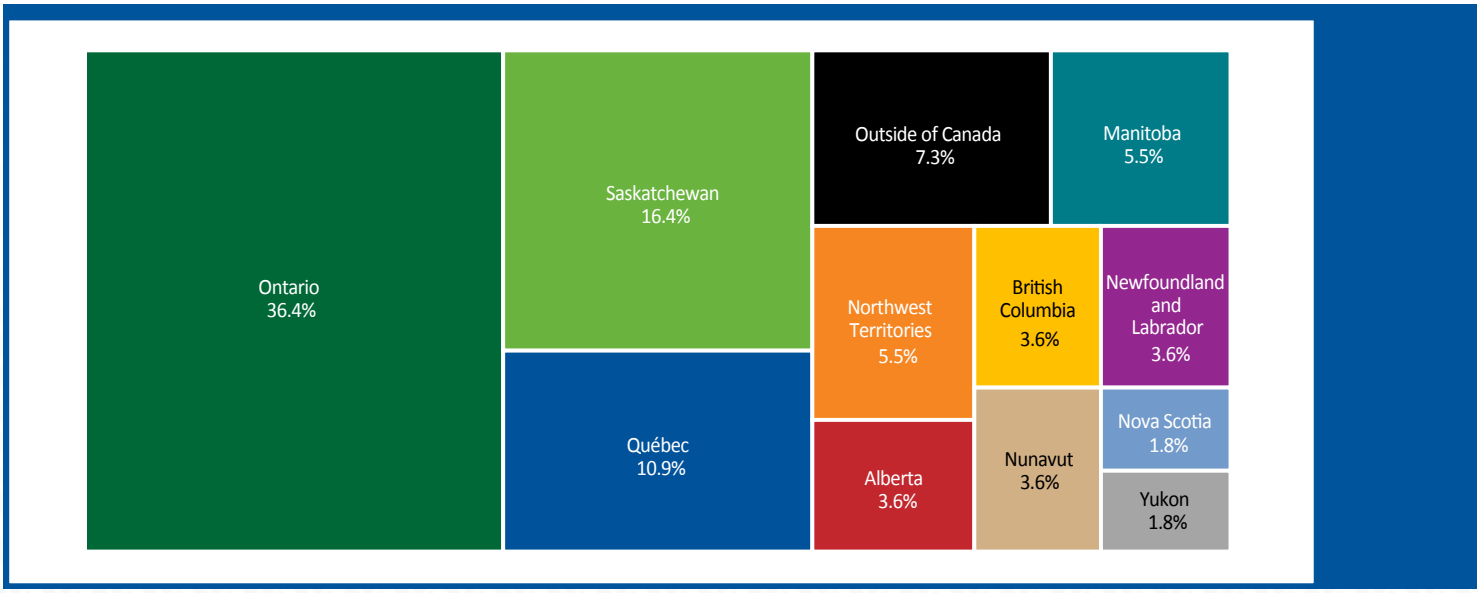
Over half of the mineral exploration work being conducted by respondents reportedly takes place in Ontario and Saskatchewan (Figure 23). Just over 10% of employer respondents indicated that they worked in mineral exploration conducted in Canada's North (Northwest Territories, Yukon and Nunavut), whereas 7% of employer respondents reported working predominantly outside of Canada.

FIGURE 22: Responses of surveyed exploration workers on type of employment arrangement and organization



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 23: Location of work reported by exploration workers

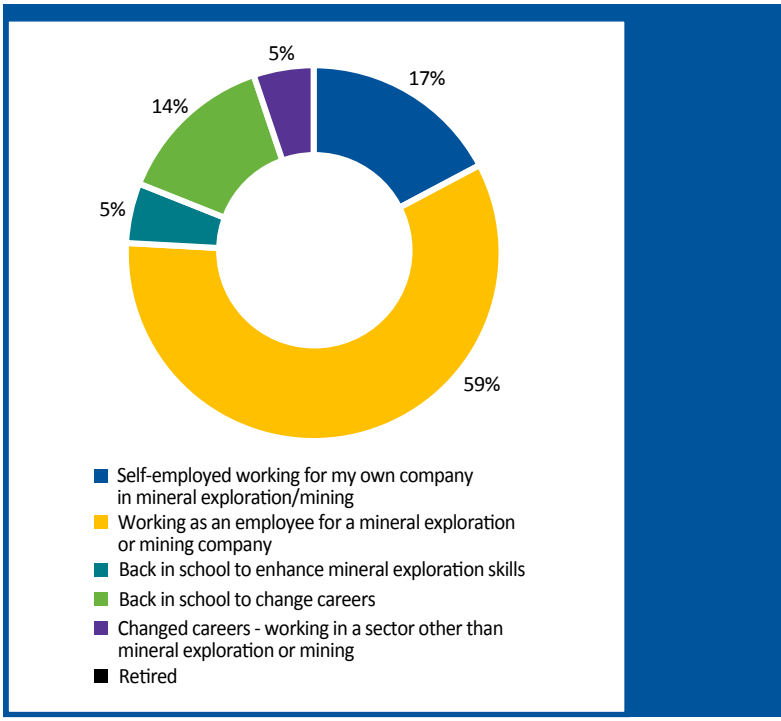


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Eighty-one per cent of the workers surveyed indicated that they plan to remain in either the exploration or mining industry over the next five years (Figure 24). The remaining 19% indicated that they plan on leaving the exploration and mining workforce. Of this share, only 5% indicated that they plan to retire in the next five years, while the remaining 14% reported that they plan to change careers.

The majority of workers surveyed plan to remain in exploration or mining over the next five years.

FIGURE 24: Responses of exploration workers on what they see themselves doing in five years



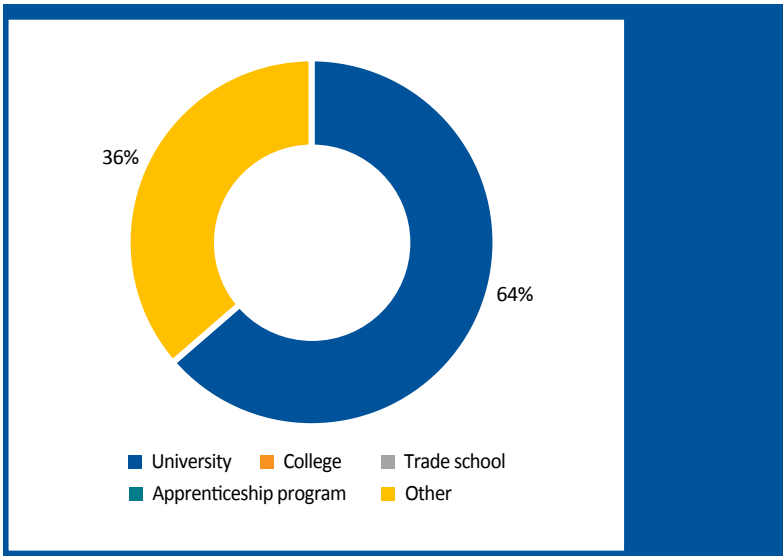
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Source: PDAC

EDUCATORS

Educators provided important insights into the training and development programs available to future exploration workers. A high proportion of these respondents (64%) were university educators, reflective of the high level of education required in the mineral exploration (Figure 25). As with most of the other groups of respondents, the educators were mostly from Ontario. Most of these educators (91%) reported they were professors or instructors (Figure 26).

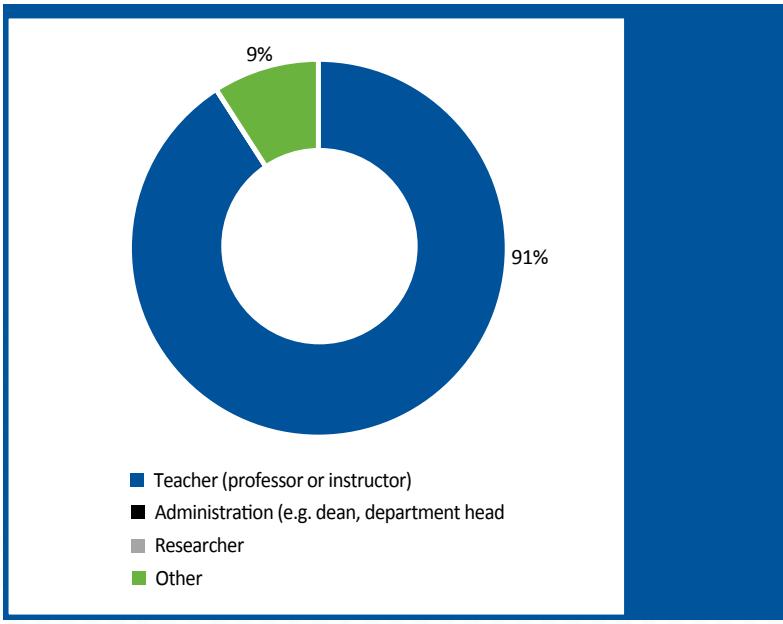
FIGURE 25: Type of educational institution where surveyed educators reported working



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Source: PDAC

FIGURE 26: Role of educators who responded to the mineral exploration survey

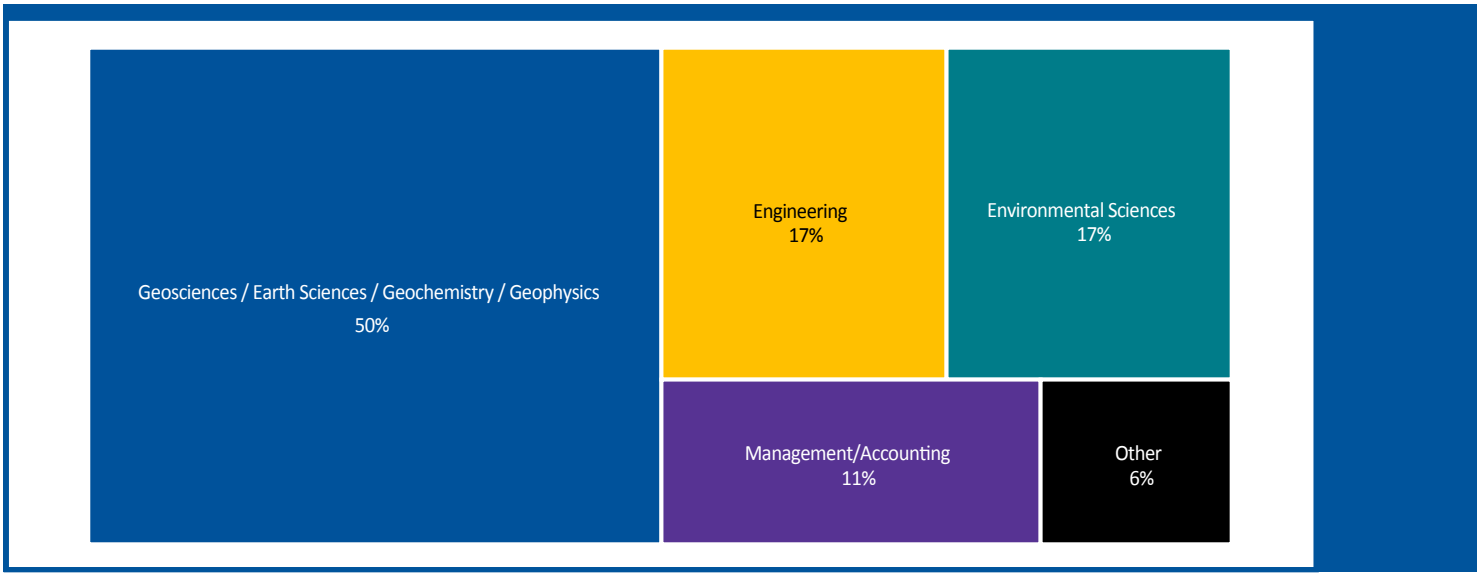


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Half of the educators surveyed reported they provide education programs related to geosciences, earth sciences, geophysics and geochemistry followed by 17% providing engineering-related training and environmental sciences programs (Figure 27). This finding reflects the educational backgrounds reported by respondents from other groups and the types of programs that student respondents are enrolled in (Figure 31). None of the survey educators reported they provided education in trades or technician/technologist programs.

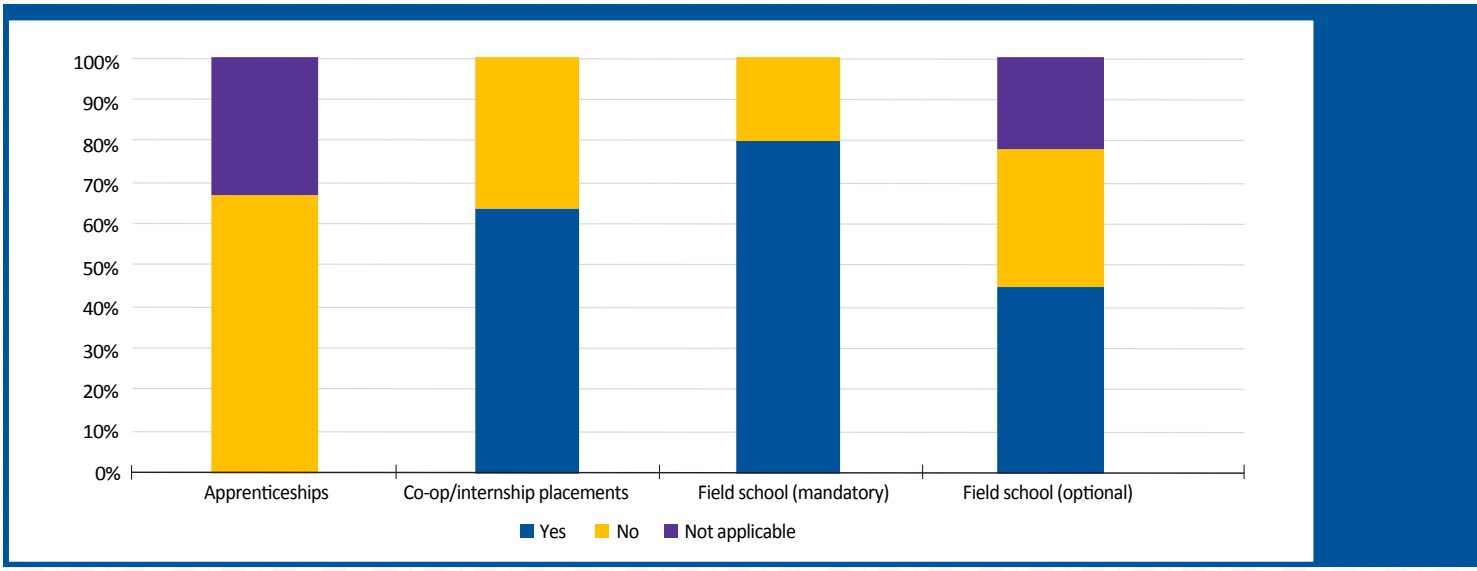
Eighty per cent of educators indicated that their program offers mandatory field courses, and some offer optional field courses to help students better develop their field techniques. More than half of the educators indicated their program offers a co-op/internship program (Figure 28). Just over 30% of students surveyed indicated that they have participated, or will participate, in an internship.

FIGURE 27: The type of mineral exploration training and education provided by surveyed educators



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 28: Work-integrated learning offered at educational institutions of surveyed educators



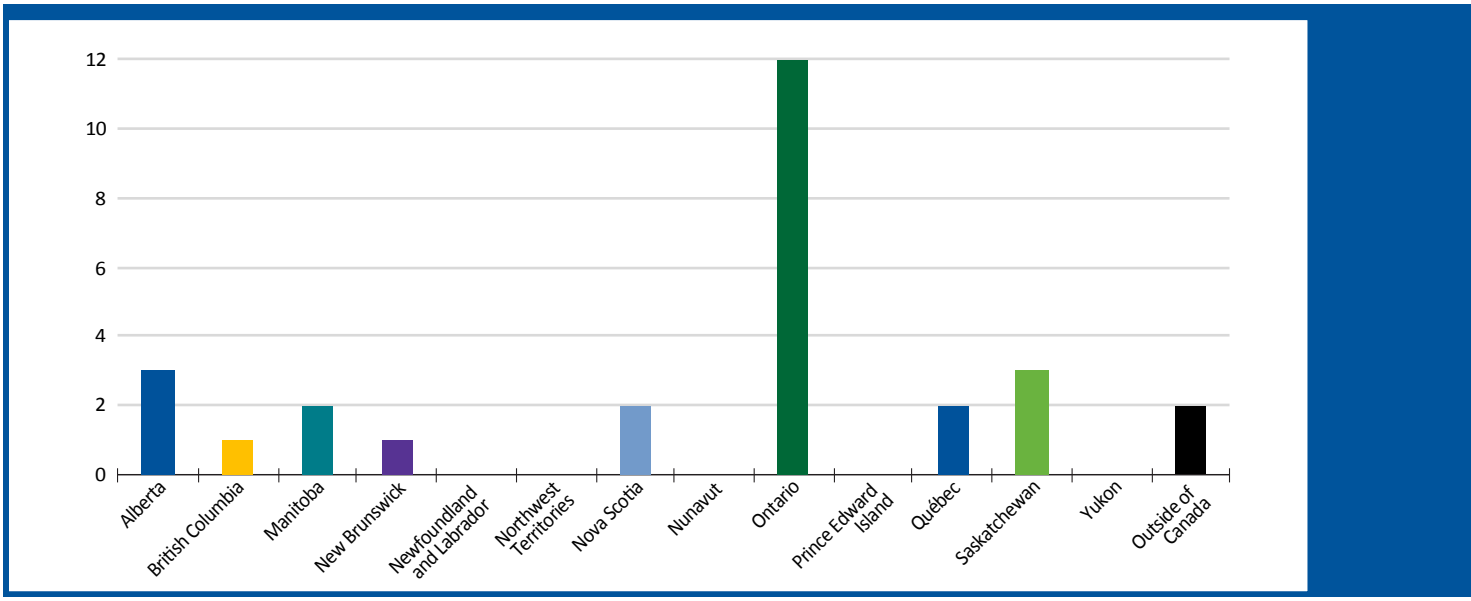
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

STUDENTS

Twenty-nine students, all of whom were attending a university, responded to the exploration survey. The high representation of university students is reflective of the higher level of education required in the mineral exploration industry. As noted, 83% of all the respondents reported having at least a bachelor's degree (Figure 10). The majority of student respondents were attending a university located in Ontario (Figure 29).

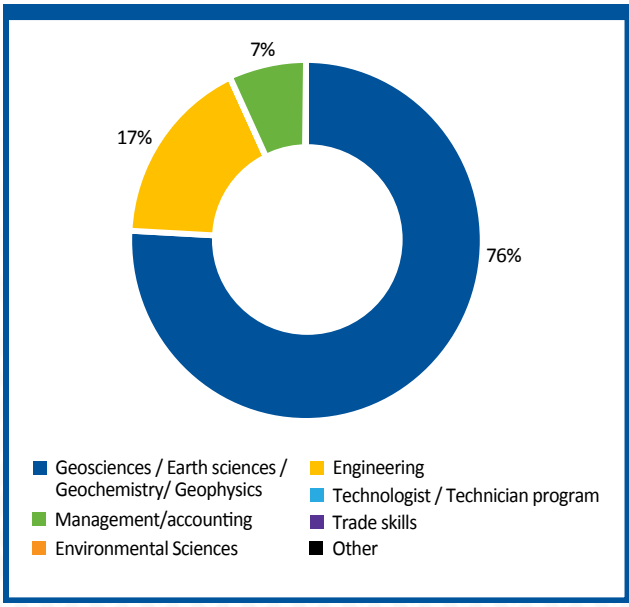
About three quarters of the students (76%) that responded to the mineral exploration survey were enrolled in geosciences, earth sciences, geophysics and geochemistry programs (Figure 30). All the students who participated in the survey indicated they were pursuing a bachelor's degree or higher, a finding which also corresponds to the high level of education observed in the responses from other groups (Figure 31).

FIGURE 29: Location of university that surveyed students are attending



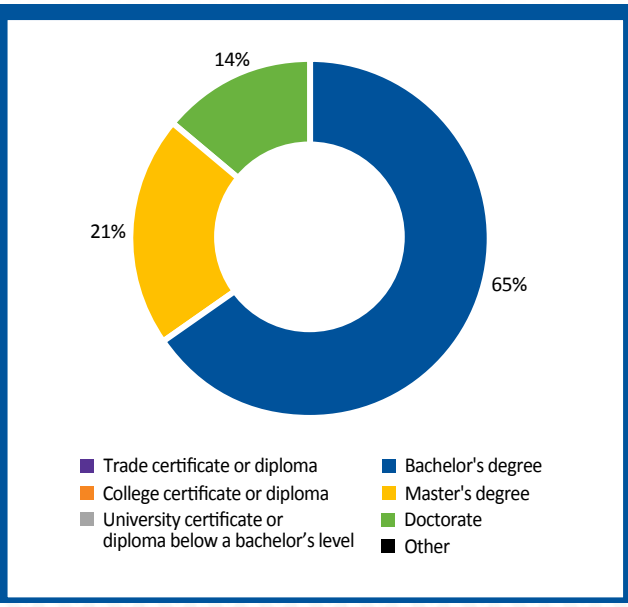
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 30: Program of study reported by students that responded to the survey



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 31: Post-secondary credential being pursued, as reported by surveyed students

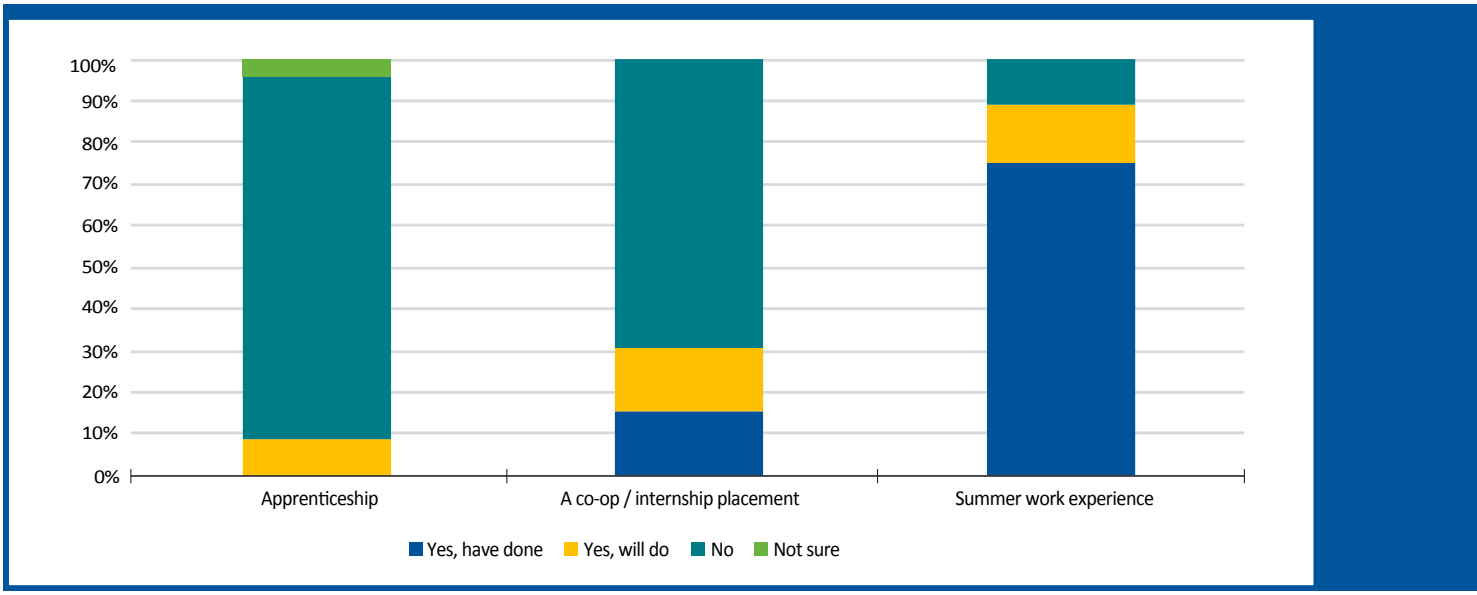


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

The exploration survey asked students whether they had participated in work-integrated learning related to their program of study. More than 86% of students surveyed indicated they will not complete an apprenticeship as part of their program and almost 70% reported they will not complete a co-op or internship placement. Approximately 75% of respondents indicated they have already completed or will complete some form of summer work experience, suggesting that summer work experience is the most common way that students in mineral exploration gain experience during their studies.

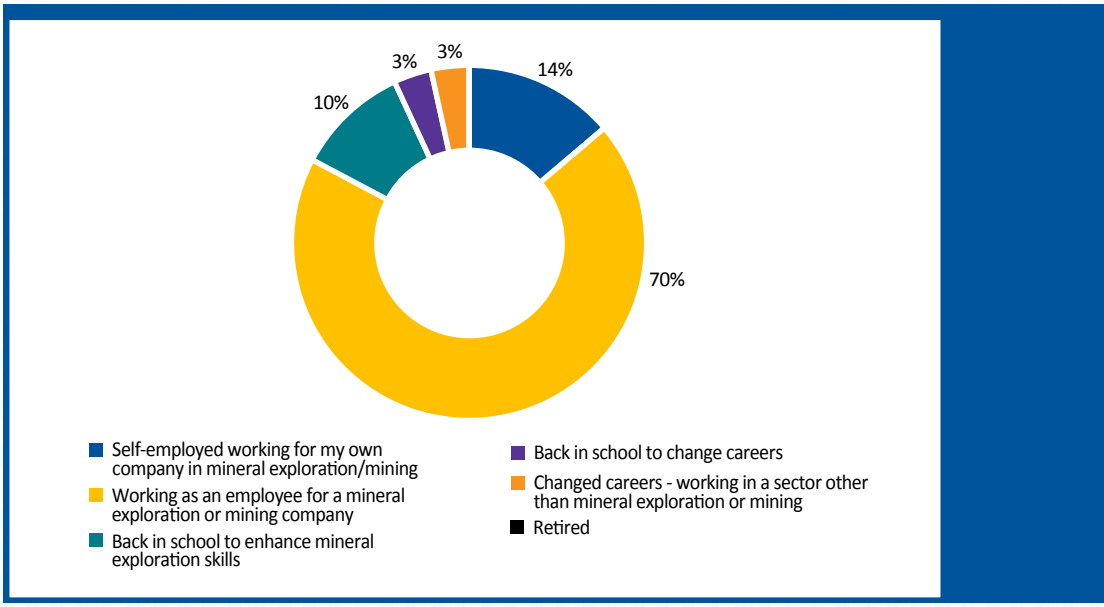
When asked about what they see themselves doing in five years, 69% of the students surveyed indicated they would likely be working as an employee for a mineral exploration or mining company. Over 90% of respondents reported they intend to remain in the mining or mineral exploration industry. Interestingly, 6% of the surveyed students indicated that they plan on leaving or will have left the industry to pursue a career in another sector within the next five years (Figure 33).

FIGURE 32: Work-integrated learning related to programs in which surveyed students are enrolled



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 33: Responses from students on what they see themselves doing in five years



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

AFFILIATES

Affiliates comprise the second smallest group of respondents, at 14% of the total survey sample. They spend on average 41% of their time working on mineral exploration projects in a range of organizations, from mineral exploration associations to government associations to laboratories and financial institutions (Figure 34). The largest share of surveyed affiliates (60%) reported working in "other" areas, highlighting the breadth of organizations involved in the mineral exploration sector (Figure 35).

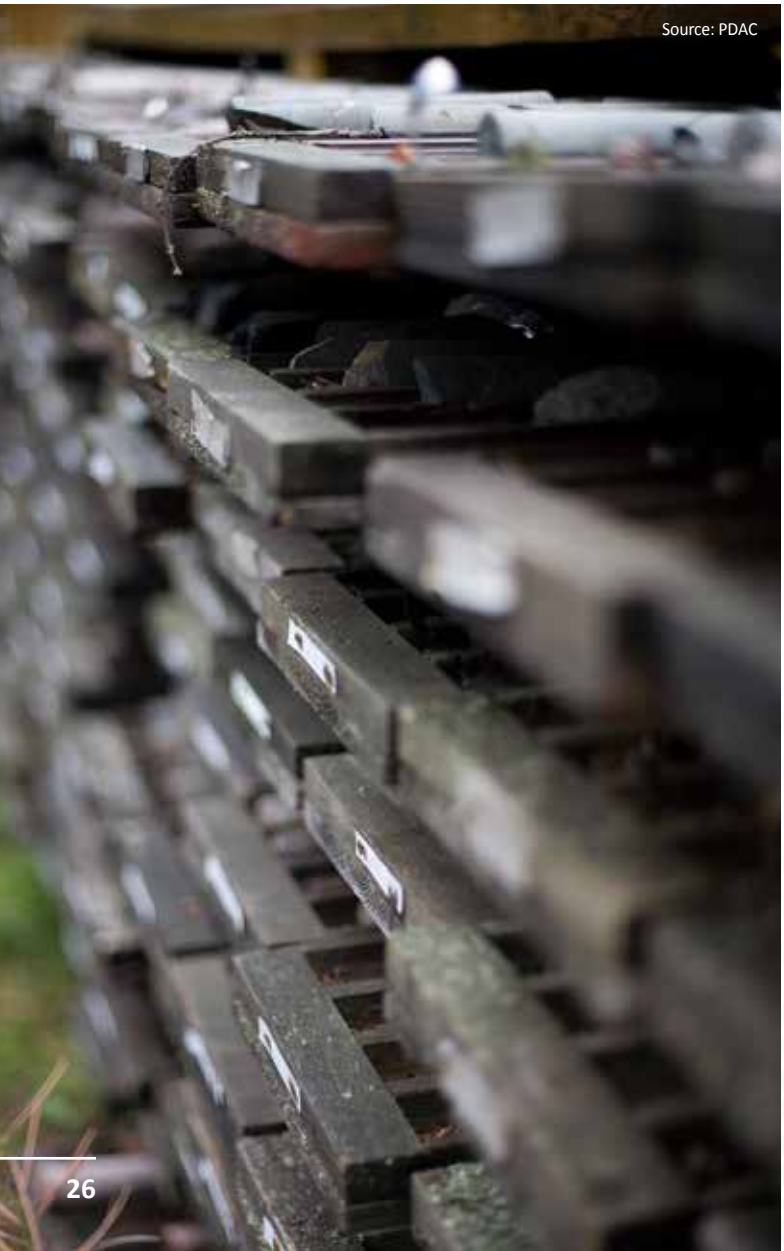
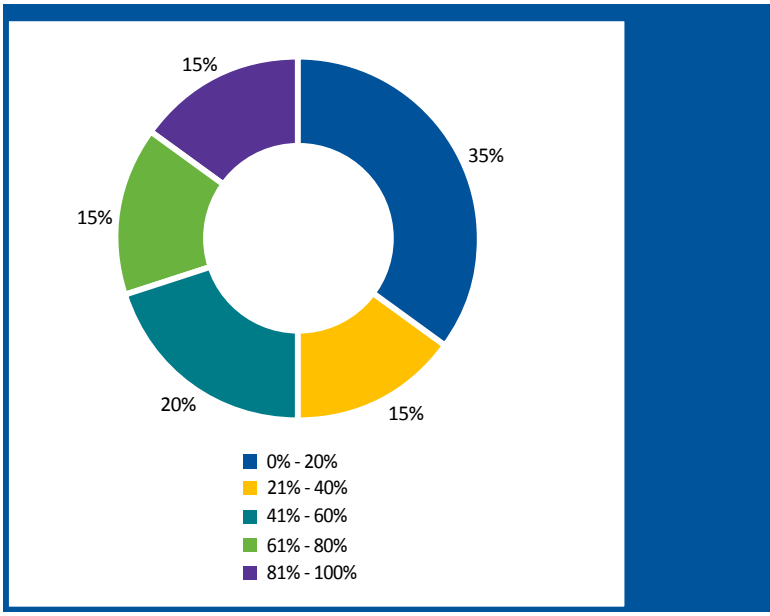
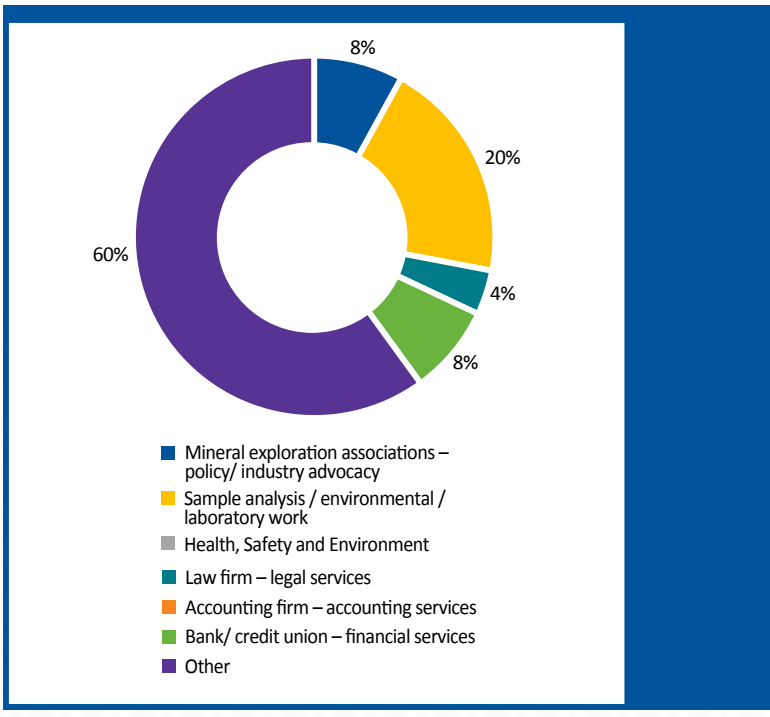


FIGURE 34: Percentage of time that affiliates reported working in the exploration industry or on exploration projects



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 35: Organizations/roles reported by surveyed exploration affiliates



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

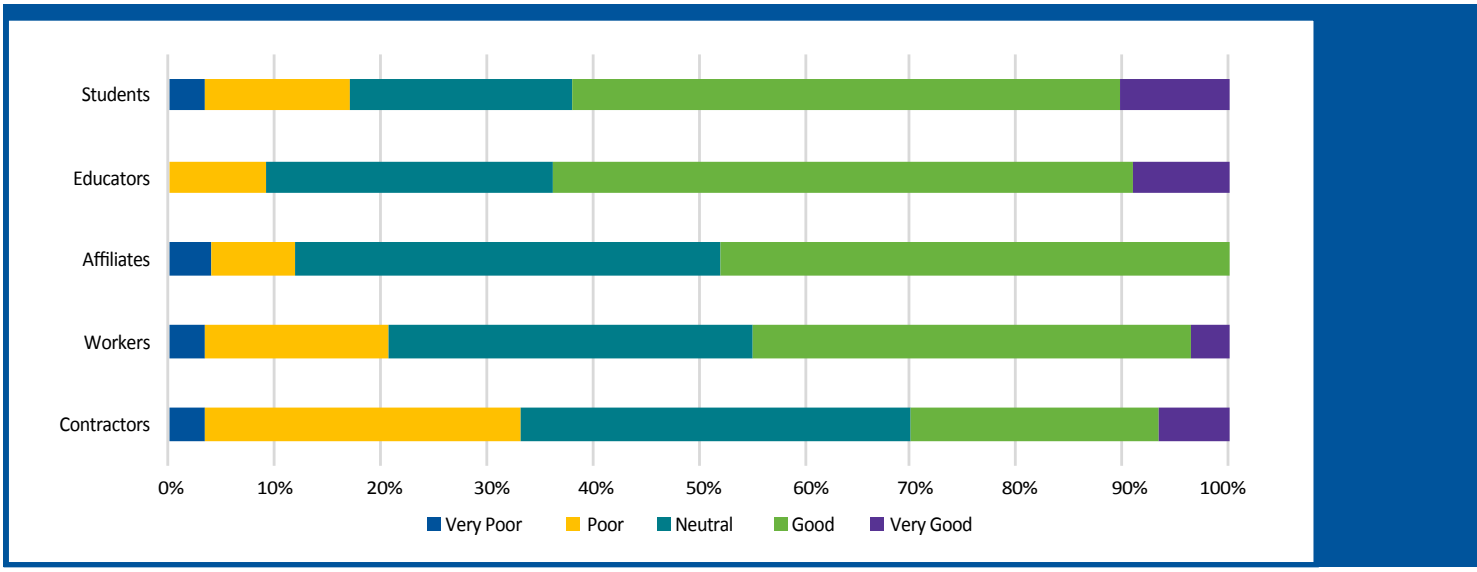
Key Themes

CAREER OUTLOOK IS POSITIVE

Respondents were asked to rank their career outlook in the Canadian mineral exploration sector over the next five years on a scale of 1 to 5, with 1 being "very poor" and 5 being "very good" (Figure 36). The majority of respondents (42%) indicated that their career outlook was "good", followed by 33% of respondents that indicated a "neutral" career outlook, suggesting that they think that the career outlook in exploration will either stay the same or improve marginally. Compared to 2017, the results signal a more positive outlook. Forty-seven per cent of those surveyed in 2019 ranked the outlook for careers in mineral exploration as good or very good, compared to 35% in 2017. Responses from the contractors indicate that this group have the least positive career outlook of any of the groups surveyed, with one third of surveyed contractors indicating that the five-year outlook for careers in exploration is "poor" or "very poor".

Source: PDAC

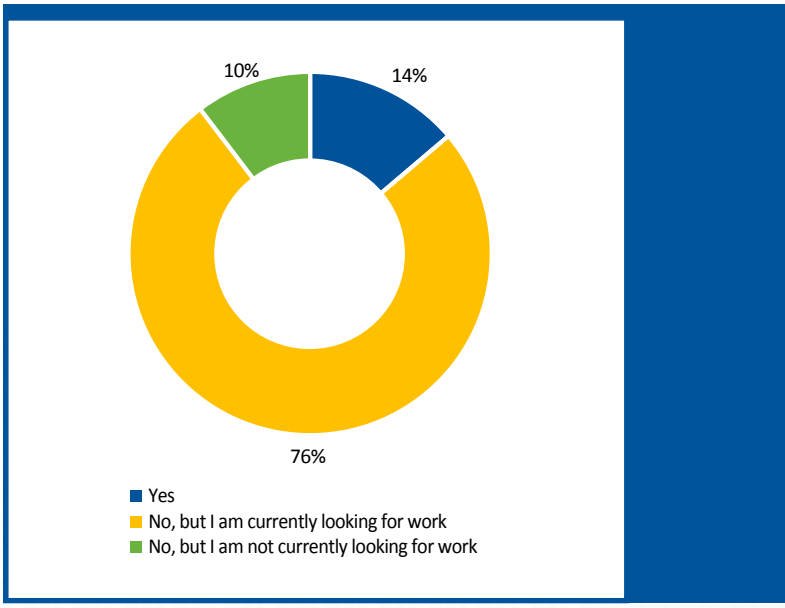
FIGURE 36: Rating for five-year career outlook in the mineral exploration sector, by category of respondent



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Seventeen per cent of students reported they have either a poor or very poor career outlook in mineral exploration. One possible explanation for this is that over 75% of students indicated they do not have an employment arrangement in place for when they graduate from their current program and are actively looking for work (Figure 37). A lack of employment opportunities for graduates could significantly impact the career outlook for all students, current and future, in exploration and mining-related programs, as they witness the struggles of their colleagues to find employment following graduation.

FIGURE 37: Students' responses to the survey question, "Do you have employment arranged for after you graduate from this program?"



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

POSITIVE AND LESS POSITIVE ASPECTS OF EXPLORATION WORK

The 2019 mineral exploration survey asked four of the groups (workers, students, educators and consultants) to rate 16 aspects of working in the mineral exploration industry (Figure 36). Workers and contractors were asked to indicate which aspects they disliked or liked, whereas students and educators were asked to indicate which aspects either discouraged or encouraged people to pursue a career in the mineral exploration industry.

Although all four groups expressed slightly different views on each aspect of working in the mineral exploration sector, several common themes were observed across all four groups. As an example, the respondents noted that most people in the exploration industry like working independently, conducting fieldwork, and applying their skills and knowledge. They also enjoy the thrill of discovery and the technical challenges associated with exploration. The aspects that received negative opinions include work-life balance, job security, and the cyclical nature of the exploration industry.

Contractors had different opinions from students on some aspects of working in the mineral exploration sector, including flexibility in scheduling, ongoing training and learning, professional development, and opportunities for career advancement. Students were more likely to have positive views on these aspects compared to consultants. Overall, students and educators seemed to have a more positive outlook on most aspects of the mineral exploration industry compared to the other groups, such as workers and contractors (Figure 38).

Source: PDAC

FIGURE 38: Aspects of working in mineral exploration, ranking by respondent group

Source: Mining Industry Human Resources Council, Exploration Survey, 2019

(CONTINUED) FIGURE 38: Aspects of working in mineral exploration, ranking by respondent group

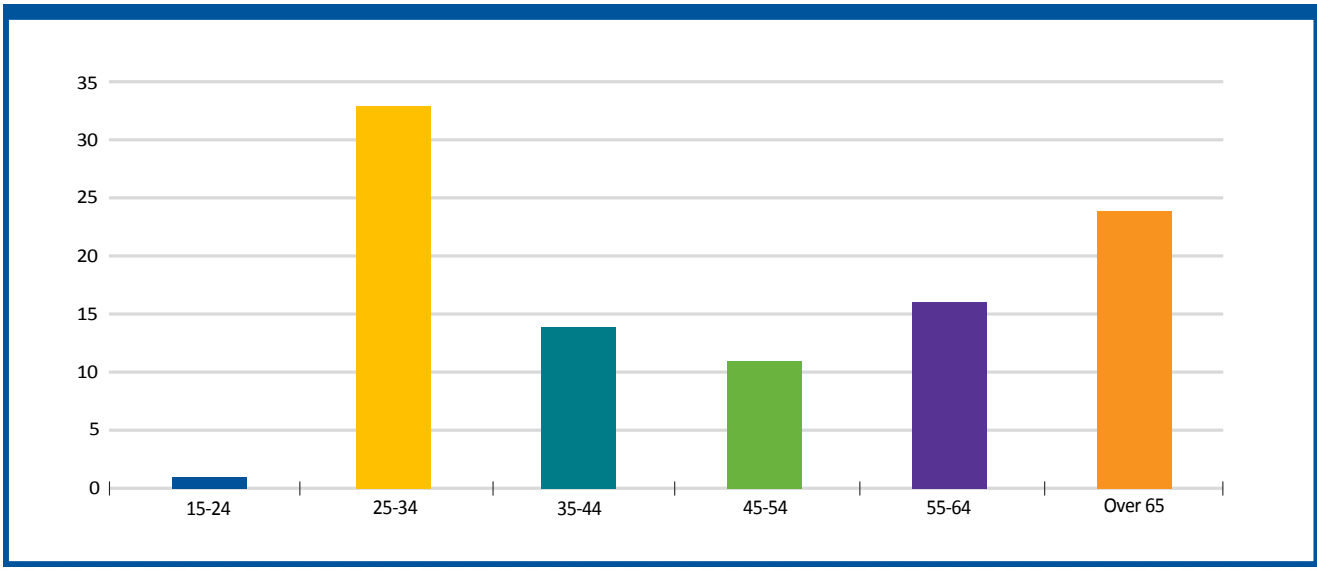
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

LOW REPRESENTATION OF MID-CAREER WORKERS

As discussed, survey respondents have a lower share of mid-career (ages 35 to 54) representation when compared to both the Canadian labour force and the Canadian mining labour force (Figure 8). This underrepresentation is observed for affiliates, workers, and consultants (students and educators are not included), highlighting concerns about the sustainability of the sector's future workforce. The underrepresentation of mid-career workers is not reflected in the mining extraction labour force, and therefore may be a challenge uniquely associated with mineral exploration (Figure 39).

The lack of mid-career workers highlights concern about the sustainability of the exploration sector's workforce.

FIGURE 39: Age distribution as reported by surveyed workers, affiliates and contractors in the exploration sector*



*Responses from both the student group and the education group are not included.
Source: Mining Industry Human Resources Council, Exploration Survey, 2019

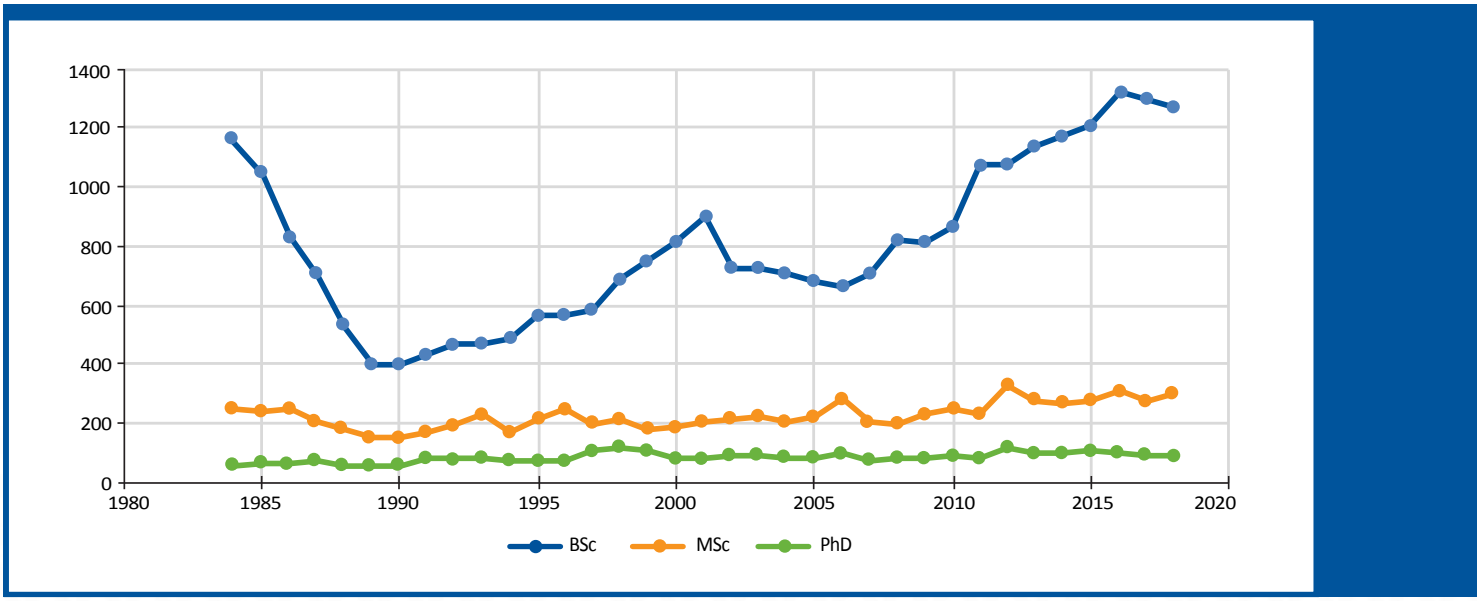

Source: PDAC

The exploration industry heavily relies on geoscientists, as borne out by the high share of survey respondents (78%) who reported that their primary area of study was in the geosciences, earth sciences, geophysics, or geochemistry fields (Figure 12). The current underrepresentation of mid-career labour in the exploration sector may have evolved over several decades. Enrollments in the geosciences plummeted in the late 1980s and early 1990s, likely the result of poor employment prospects and lack of job security that was incentivizing geoscientists and other exploration labour to find work in other industries (Figure 40). The loss of this pool of labour has likely been propagated over time, resulting in a lower share of mid-career workers in exploration relative to other segments of the mining labour force.

Moreover, the 2019 survey respondents cited several negative aspects associated with working in the exploration industry, including job insecurity, industry cyclicity, employment that is highly sensitive to market volatility, and work-life balance.

Source: PDAC

FIGURE 40: Geoscience enrolment in Canada, 1984 to 2018



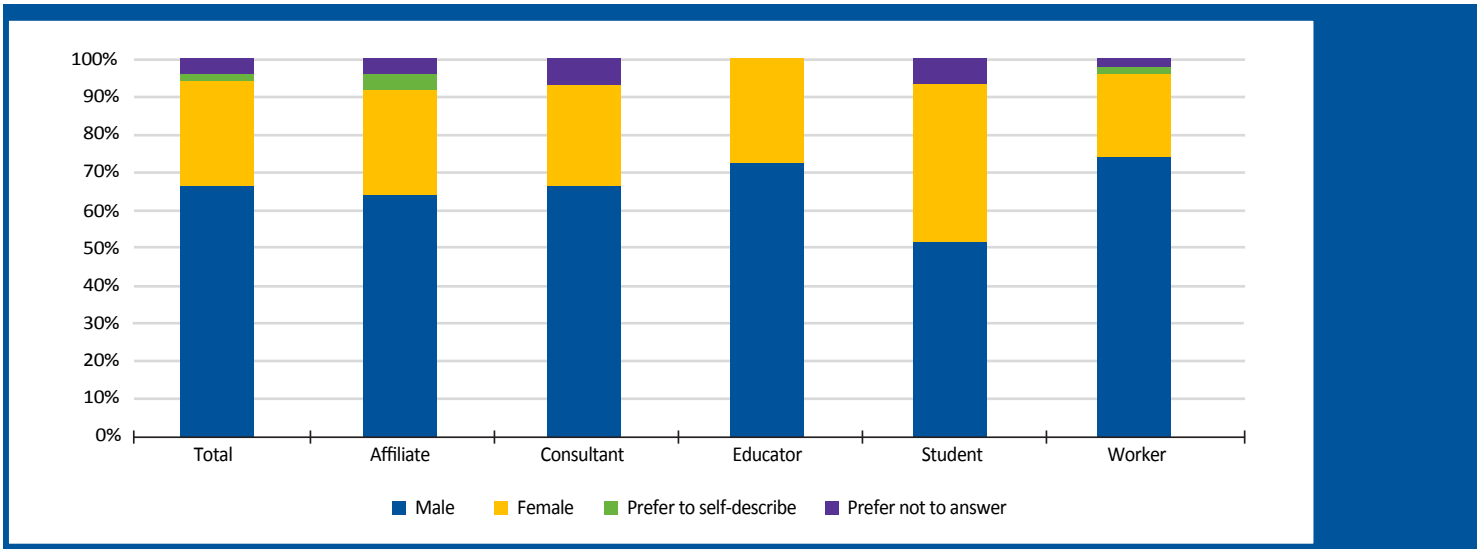
Source: Council of Chairs of Canadian Earth Science Departments, 2019

HIGH REPRESENTATION OF WOMEN

Enabling diversity in the workforce has become a prominent strategy to address skill shortages in an increasingly competitive market for talent, requiring the increased participation, recruitment and retention of underrepresented groups, including women. Thirty per cent of survey respondents were female, which is double the labour force participation rate of women in the mining industry (15%). This higher response rate is reflected in all the categories of respondents (Figure 41). The lowest proportion of women who responded to the survey were workers, at 22%, whereas the highest proportion of respondents (41%) were students.

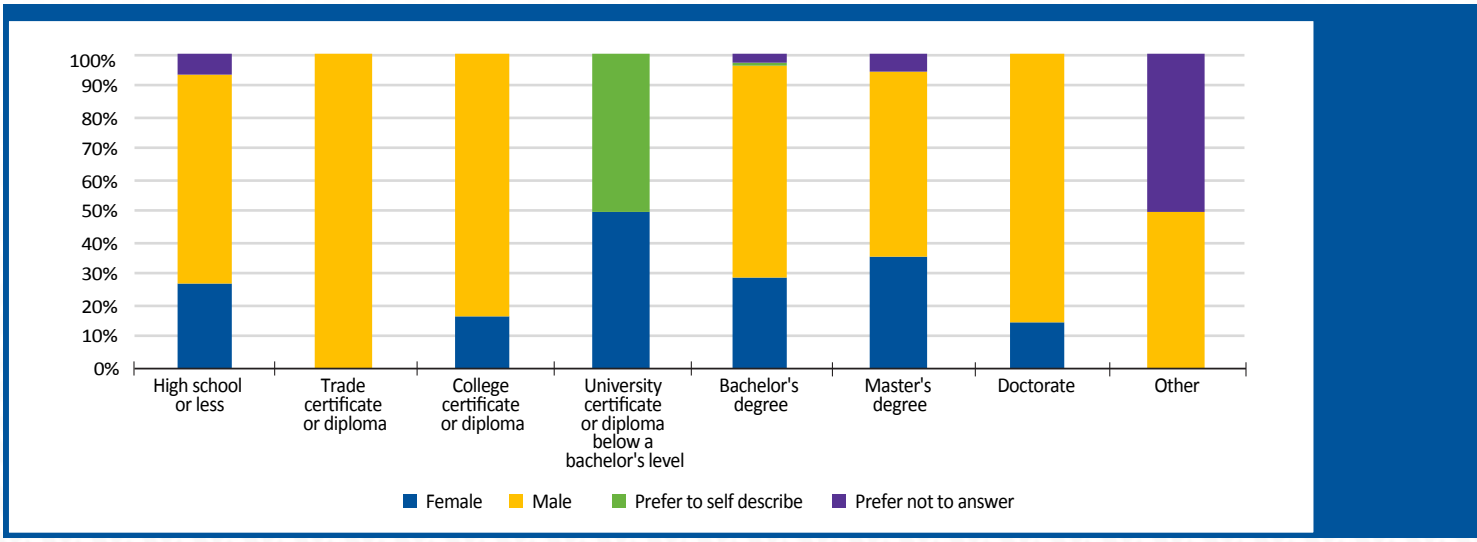
This higher representation of women is interpreted to be an accurate reflection of the Canadian mineral exploration industry based on the nature of the occupations that it encompasses. The skills required to work in exploration are highly technical and most jobs require a minimum of an undergraduate degree. Eighty-four per cent of the female respondents indicated that they have at least a bachelor's degree, and 37% indicated that they have a graduate degree (master's or doctorate), reflecting the high educational and technical demands of the exploration sector (Figure 42).

FIGURE 41: Gender of respondents by group category



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

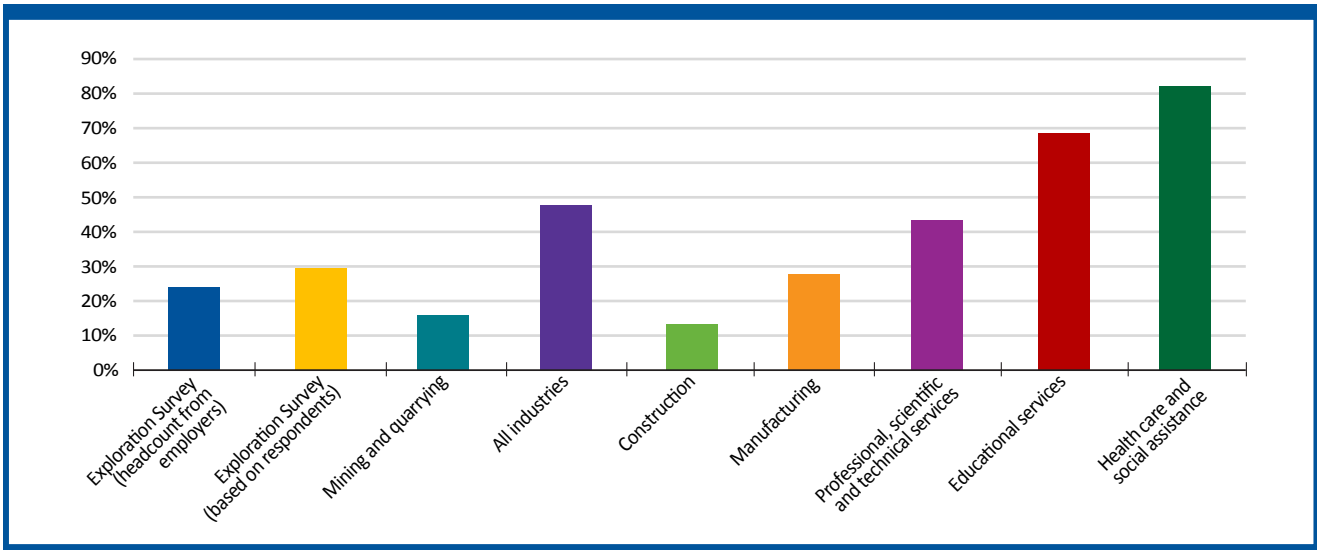
FIGURE 42: Respondents' highest level of education by gender



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

The employer responses also suggest that female representation is much higher in mineral exploration than in the mining industry. Data based on employers' self-reported headcount of employees at their organizations indicates a female representation rate of 24%, which is much higher than Statistics Canada's rate for the mining and quarrying sector (15%), and further indicates that the survey respondents are a representative sample for Canada's mineral exploration industry (Figure 43). Although the rate of female representation is lower than the rate for the total Canadian labour force across all industries, it is much higher in mineral exploration than in other heavy industries such as mining and quarrying and construction.

FIGURE 43: Representation of women in the labour force, exploration and other industries (2018)



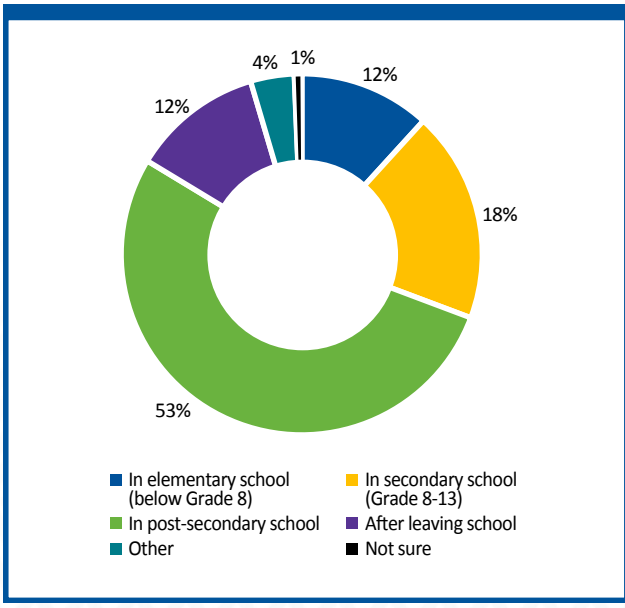
Source: Mining Industry Human Resources Council, Exploration Survey, 2019; Statistics Canada (Labour Force Survey), 2019

BUILDING AWARENESS OF EXPLORATION CAREERS

Changes in hiring requirements inevitably arise – whether from the need to create new positions or to replace workers who are leaving. The mining and exploration industries must ensure there is a robust supply of talent entering mining- and exploration-related education and training programs. Promoting career awareness at the elementary- and middle-school levels is essential preparation. By high school, many students are considering various career paths. Students who are unaware of the career opportunities in mining and exploration inevitably go on to pursue more familiar career options.

Over half of respondents (53%) indicated they did not learn about careers in exploration until their post-secondary education, and 12% reported only learning about these careers after they had left school (Figure 44). This shows that those who currently work in the industry were unaware of the career opportunities in mining and exploration when they graduated from high school. Lack of career awareness ultimately hinders the sector's capacity to increase its labour supply.

FIGURE 44: When respondents first learned about careers in exploration



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

STRENGTHENING COLLABORATION BETWEEN INDUSTRY AND EDUCATION

Educators in mineral exploration suggested that better coordination is needed between the industry and educational institutions. The vast majority indicated that participation in field courses and summer work experience were important or very important for students (Figure 45). However, they also indicated that it was difficult or extremely difficult to convince industry to provide these opportunities for students (Figure 46). Apprenticeships were ranked less important than field courses or summer work experience, but could reflect the respondent composition, which overwhelmingly works in university environments where apprenticeships are seldom offered.

While work-integrated learning (WIL) programs can vary widely by post-secondary institution, the value of a WIL is indisputable as Figure 45 illustrates. Increasingly post-secondary institutions in alignment with governments signalling strengthened educational outcomes are making WIL's mandatory as part of the requirements necessary to graduate.

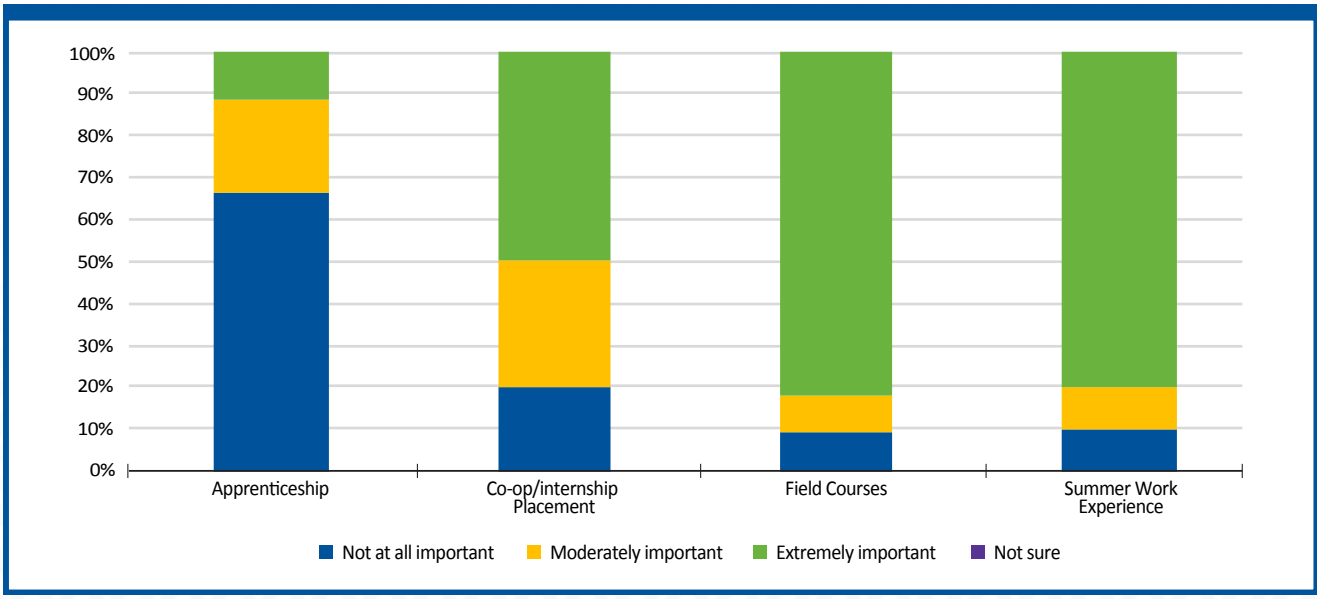
However, as Figure 46 demonstrates, engaging industry to offer WIL's to mineral exploration students has not been easy. For example, over 85% of educators responded that it was difficult or very difficult to obtain industry support for co-ops or internship placements.

This trend is troubling - older workers are leaving the sector and STEM occupations are becoming more prevalent with the adoption of new technology. It can also take anywhere from two to five years to train a skilled worker for the mineral exploration industry. Given this, where are companies going to find the next generation of mining talent?

Historically, geoscience programs in Canada have not provided many co-op opportunities to students, unlike numerous other post-secondary programs. To help address the lack of co-op opportunities, the Government of Canada provided MiHR with funding support through its Student Work Placement Program to create approximately 750 new WIL placements. The Gearing Up program provides a wage subsidy to employers to help cover a portion (up to 70%) of the costs associated with creating new WIL opportunities (co-ops) for post-secondary students. This work experience will help the students be better positioned to secure employment in the mineral exploration sector upon graduation.

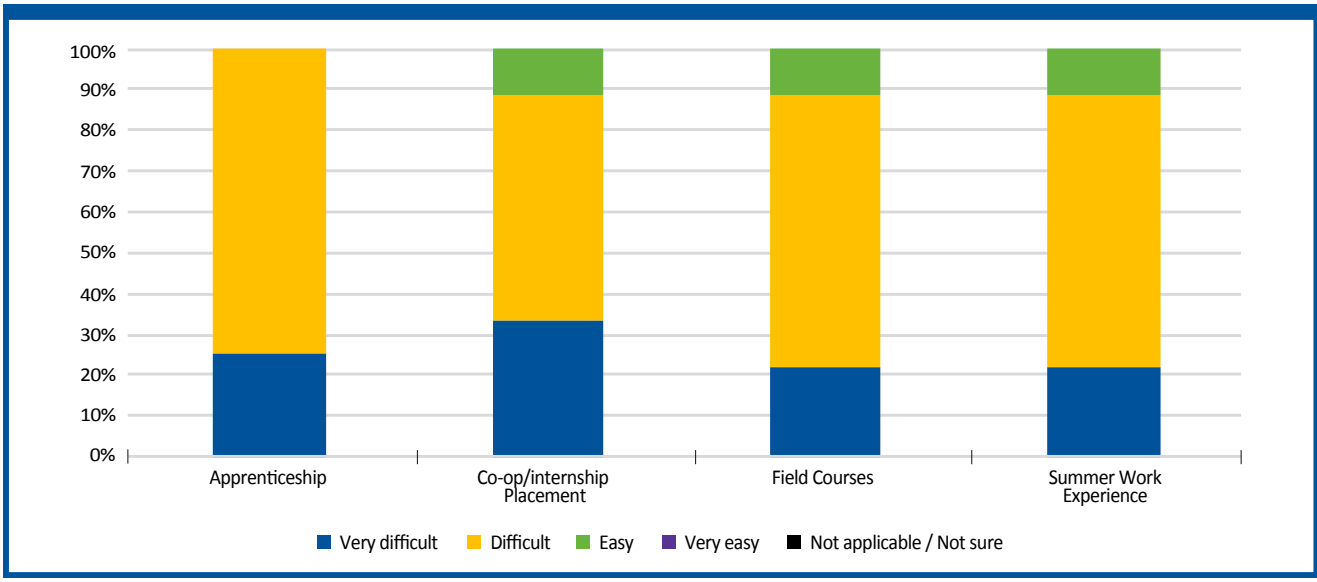
Please visit mihr.ca for more information about Gearing Up.

FIGURE 45: Educators' responses on student participation in work-integrated learning (WIL), by type and importance



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

FIGURE 46: Educators' responses on the ease of getting industry to offer WIL to students

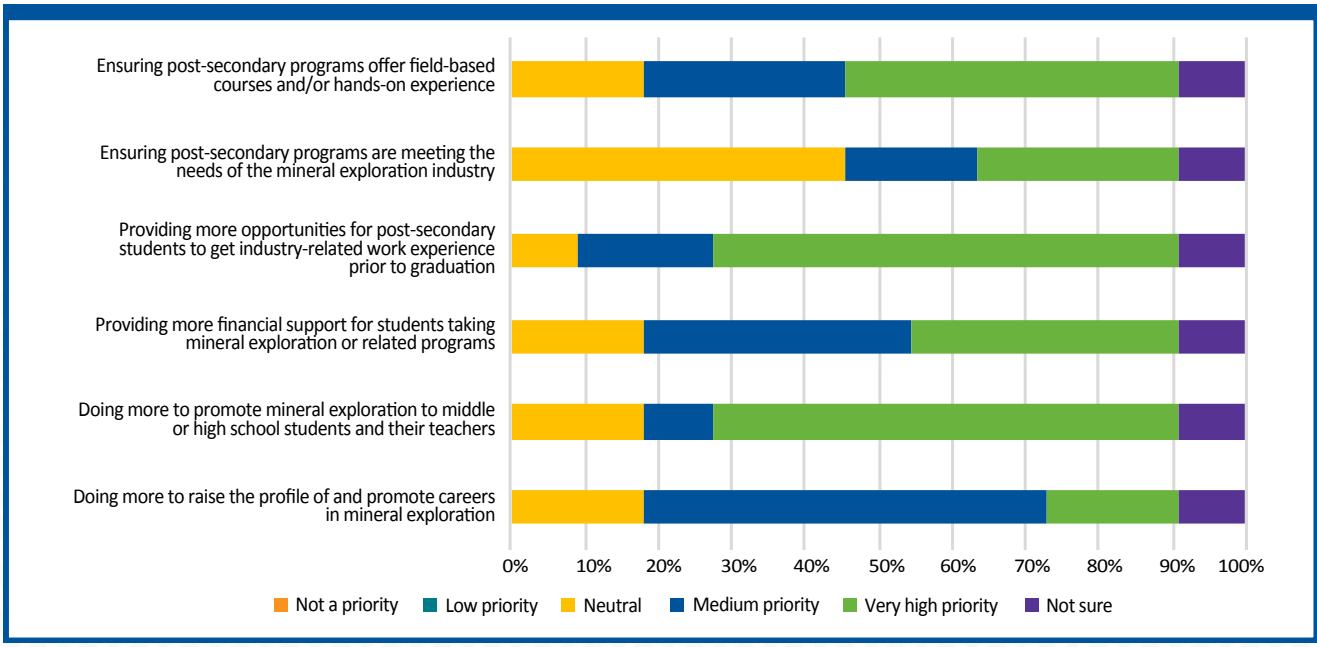


Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Most educators and students (80%) who responded to the survey indicated that a field-based course is part of their program curriculum. Field school is a good starting point to gain practical experience, but it does not necessarily meet the field work requirements of employers. Industry and educational institutions need to collaborate more closely to ensure that student learning outcomes better align with employers' needs. Meaningful, targeted collaboration initiatives will help to ensure that students graduate from their post-secondary education with the required field experience and skills.

Over 70% of educators who responded to the survey indicated that offering field-based courses and hands-on experience to students should be a high priority for programs related to mineral exploration. However, the largest share of educator respondents indicated that a high or very high priority should be put on providing additional opportunities for post-secondary students to acquire industry-related work experience prior to graduation (Figure 47).

FIGURE 47: Responses from educators when asked to prioritize the human resources needs of the mining exploration sector



Source: Mining Industry Human Resources Council, Exploration Survey, 2019

Conclusion

The key observations in this report are derived from respondents' insights into the poorly understood and highly volatile mineral exploration industry.

The survey sample comprised of a representative profile of the exploration labour force, including educators, employers, workers, students, affiliates, and contractors. Their responses were vital to our understanding of the key aspects of the exploration industry that contribute to the sector's labour market challenges. Some of these challenges are systemic and cannot be mitigated – the exploration industry will always be cyclical, as it is closely tied to commodity prices, the volatility of the stock market, and a company's ability to finance. However, this survey has identified key areas for improvement that could help to strengthen the sector's supply of labour. These include: meaningful collaboration between industry and educational institutions to strengthen alignment between industry needs and mining-related programs of study, the creation of new work-integrated learning (co-ops) opportunities for students and targeted initiatives to improve young people's (pre-post-secondary) awareness about careers in the exploration sector.

The survey results also indicate some of the uniquely positive aspects of the mineral exploration industry, such as the much higher representation of women and immigrants in exploration compared to the mining industry. The study also showed that working in the mineral exploration industry in Canada can be very satisfying, full of people who enjoy field work and the thrill of discovery.

All mining stakeholders – employers, governments, educators, associations, and others – have a vested interest in optimizing the supply of labour, for today and tomorrow. The data collected from this survey will help MiHR and PDAC to strengthen their knowledge of the specific labour market challenges in mineral exploration in Canada. As the industry continues to evolve, the availability of accurate, timely, and relevant data will become all the more critical to stakeholders' understanding of the sector's labour market issues, enabling them to respond more effectively through targeted human resources development and planning initiatives. In the face of ongoing shifts in Canada's labour market, follow-up research on the exploration sector should be conducted on a regular basis.

Source: Callinex Mines Inc.

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Source: PDAC

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