Canadian Mining Labour Market Outlook

2016

MINING INDUSTRY
HUMAN RESOURCES COUNCIL

Canada

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INTRODUCTION

“It is during a downturn that we need to focus on future opportunities, to take steps now to position the sector for success when the cycle turns again, as we know it will.”

Pierre Gratton, President and CEO, The Mining Association of Canada, Keynote address at the Canadian Aboriginal Minerals Association, November 2015

Canada's mining industry has experienced a weak economic climate throughout 2015. During that period, the drop in a number of key commodity prices negatively affected mining activities, which in turn has cooled some of the industry's immediate hiring needs. Recently, however, the industry appears to be entering a recovery phase. Yet, regardless of these significant downturns and anticipated upswings, many of the longer-term problems associated with attracting and retaining a skilled workforce persist. Even a temporary downsizing of the mining workforce may discourage new entrants into the mining labour market. This would exacerbate the labour supply limitations the mining industry has traditionally faced. As the economy recovers and the industry looks to expand production and rebuild its workforce, employers may confront even more challenges in finding the right people, with the right skills, at the right time. Now, more than ever, the mining industry needs to be looking at its future labour market needs and putting in place collaborative strategies to ensure it has a robust, appropriately skilled supply of workers — both now and in the coming decade.

Report overview

In this report, the Mining Industry Human Resources Council (MiHR) expands on its previous forecasting and analysis presented in the 2015 national outlook report for Canada's mining industry (Canadian Mining Industry Employment, Hiring Requirements and Available Talent: 10-year Outlook — 2015). The analysis continues to explore the human resources needs of mining employers and contrasts them with the talent that is expected to become available in the coming decade. This report also places a spotlight on diversity in the mining labour force as it relates to potential opportunities for overcoming some of the industry's labour supply limitations.

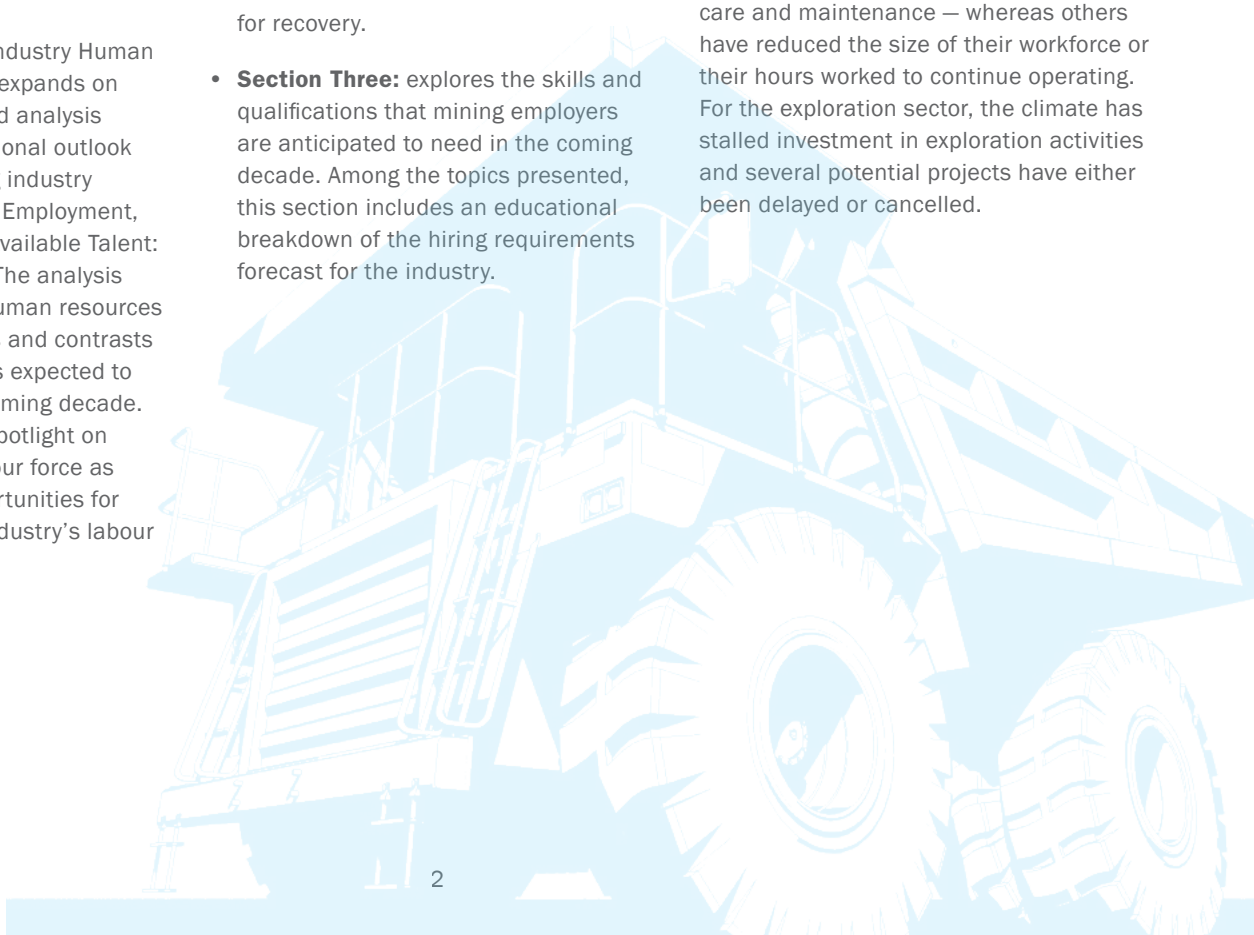
MiHR's 2015 national outlook report provided a forecast of hiring requirements and available talent for the industry and this 2016 report further explores different perspectives on these forecasts. For example, based on the 2015 hiring requirements forecast, this report assesses the qualifications and skill levels required for the positions that will need to be filled — bringing further depth to the forecast, and providing additional quantitative and qualitative information about the hiring challenges facing the industry in the future.

The report is organized in the following way:

- **Section One:** provides an introduction and report overview, in addition to a brief update on the mining industry in Canada.
- **Section Two:** discusses the key factors that affect employment levels and impact the supply and demand for workers in the mining industry. The section revisits the findings from MiHR's 2015 national outlook report and examines the forecasts for employment, hiring requirements, available talent and the gap analysis, in light of the current economic climate and outlook for recovery.
- **Section Three:** explores the skills and qualifications that mining employers are anticipated to need in the coming decade. Among the topics presented, this section includes an educational breakdown of the hiring requirements forecast for the industry.
- **Section Four:** identifies key weaknesses in the mining labour market that undermine the industry's ability to respond to fluctuating labour needs by creating and maintaining a robust talent pipeline; this section also investigates opportunities to strengthen the industry's talent pool, including an in-depth profile of diverse groups in the mining labour force.
- **Section Five:** summarizes the report findings and draws conclusions about the major labour market issues and challenges in Canada's mining industry.

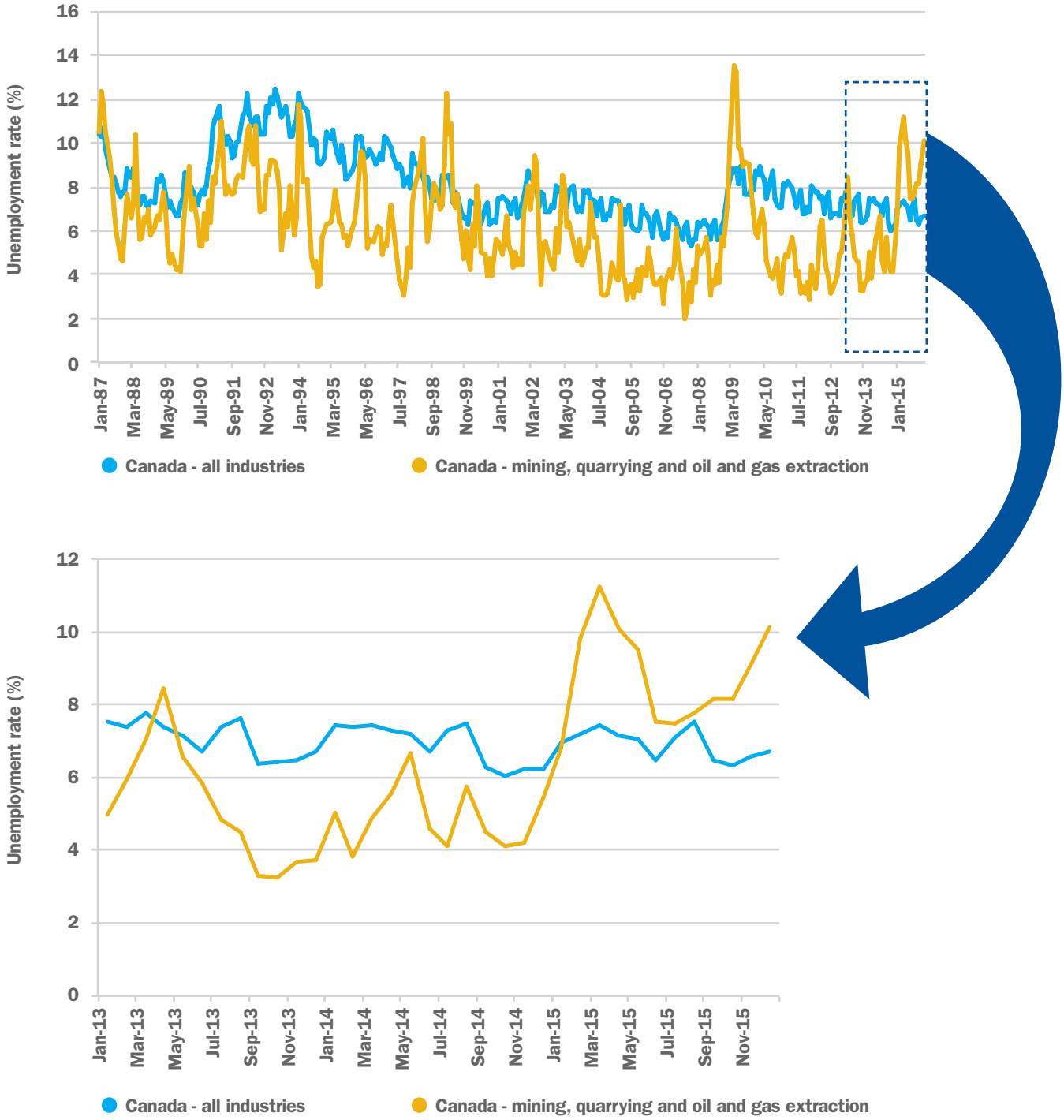
An update on mining in Canada

Canada's mining industry endured an economic downturn that continued throughout 2015. Due to this trend, a number of mining operations faced the decision to continue operating their mine in less than optimal conditions, to scale back production, or to close their operations and lay off workers. Canadian mining operations have adopted a variety of strategies to manage the recent downturn. In late 2015, a number of mines suspended their operations — either permanently, or indefinitely being put on care and maintenance — whereas others have reduced the size of their workforce or their hours worked to continue operating. For the exploration sector, the climate has stalled investment in exploration activities and several potential projects have either been delayed or cancelled.



Unemployment in mining increased significantly in 2015, as shown in Figure 1. The unemployment rate in mining, quarrying, and oil and gas extraction climbed from roughly 4 per cent in November of 2014 to about 10 per cent in December of 2015 — outpacing the unemployment rate in the overall labour force. However, this increase is not a unique event for the industry; as further revealed in Figure 1, the unemployment rate in mining has often endured sharp spikes in unemployment. In the long-term context, unemployment in the mining industry is relatively volatile and is subject to corrections that appear even more dramatic in the short-term view.

Figure 1: Unemployment rate in Canada, all industries and in the mining industry (January 1987-December 2015)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

Many of these developments — mine closures, delayed projects and layoffs — stem from downward trends in prices. Since early 2015, various price forecasts have been adjusted downward to reflect the current economic climate. As shown in Figure 2, up-to-date forecasts of prices for coal, copper and gold have been reduced from previous levels; yet, despite the correction, each revised forecast reveals similar long-term trends that underpin MiHR's employment forecasts to 2025.

Figure 2: Historical and forecasted coal, copper, gold, nickel and iron ore prices (1987-2025)

Figure 2a: Coal

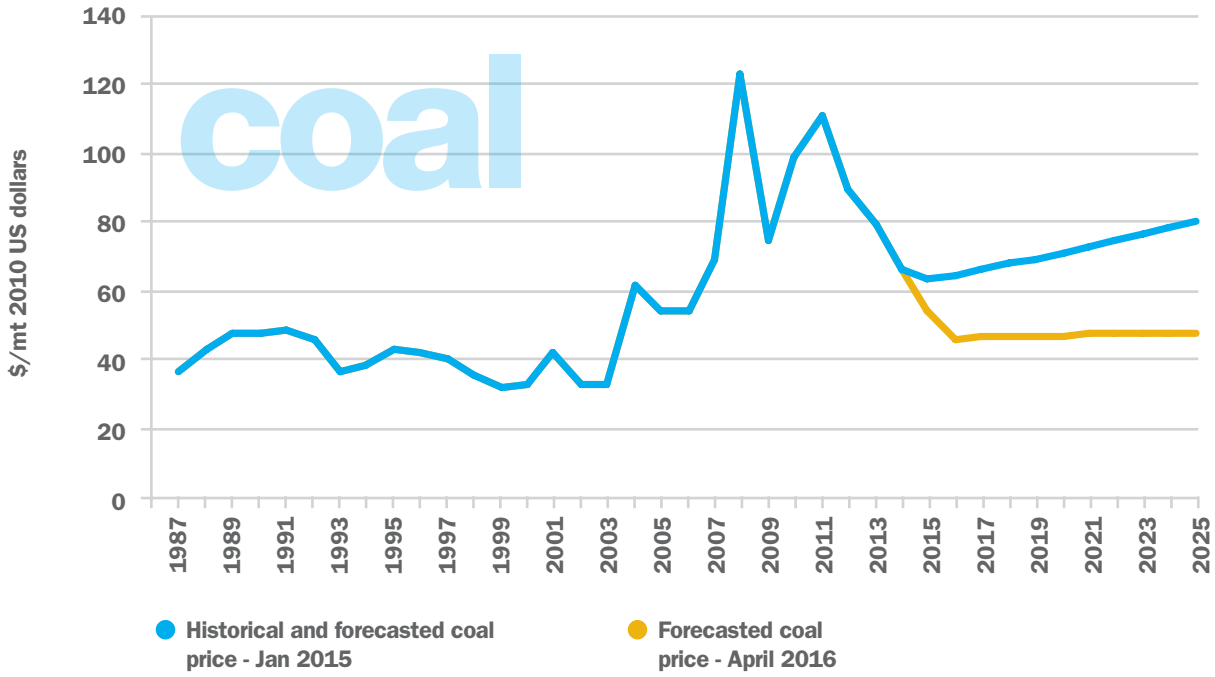
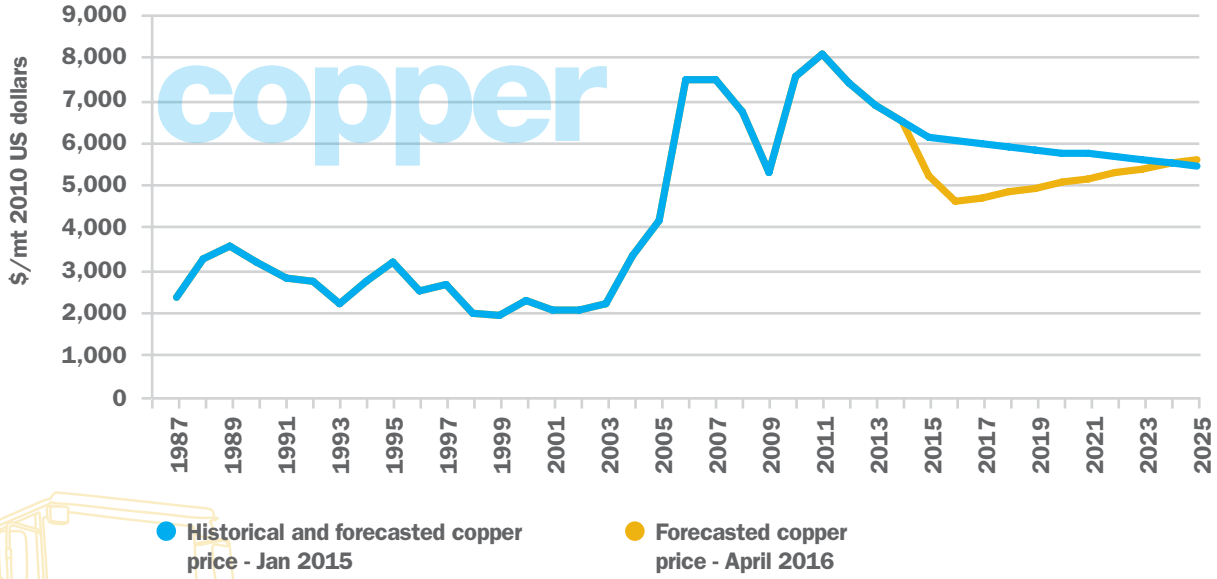


Figure 2b: Copper



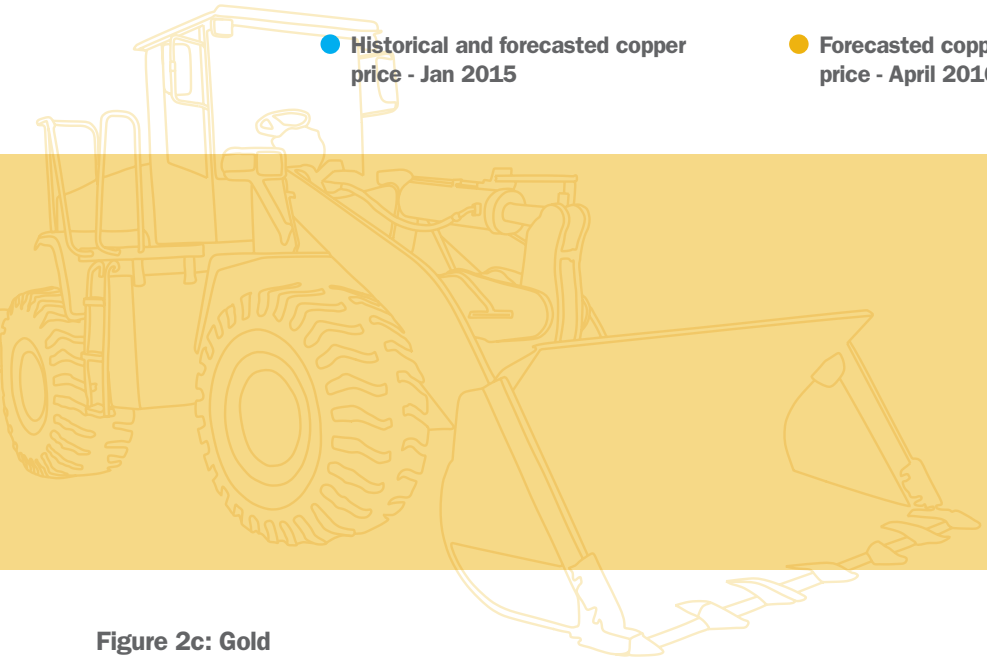


Figure 2c: Gold

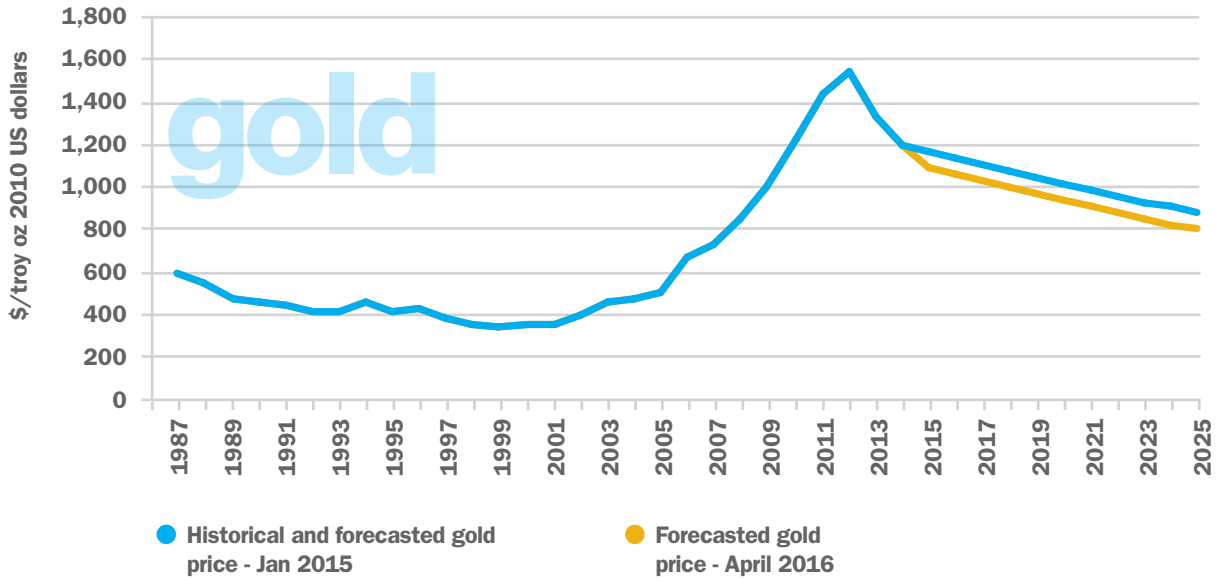


Figure 2d: Nickel

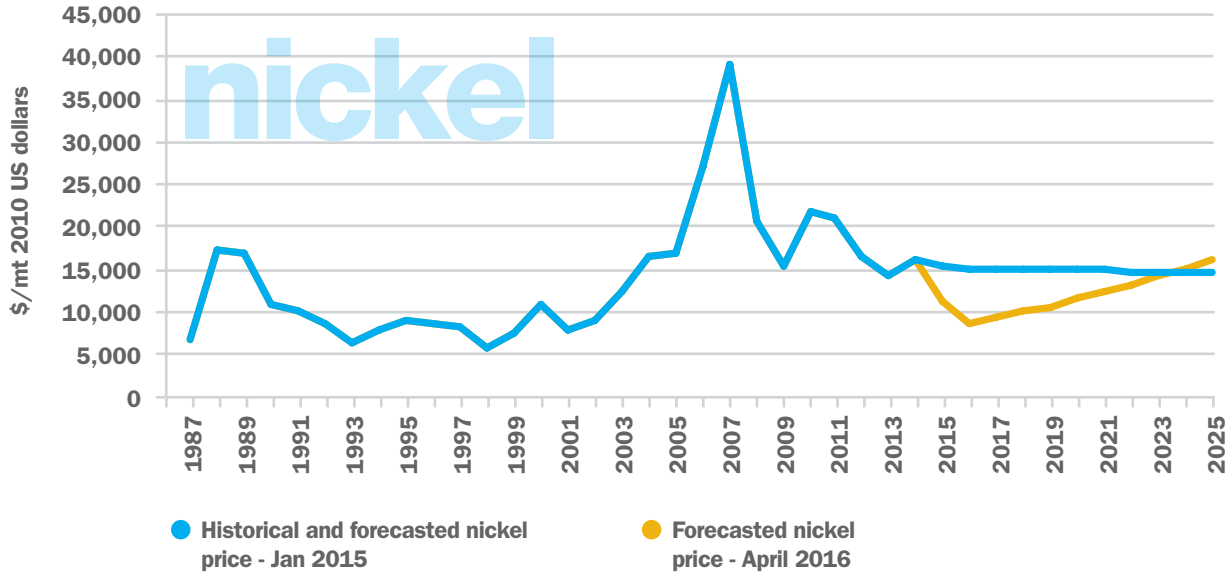
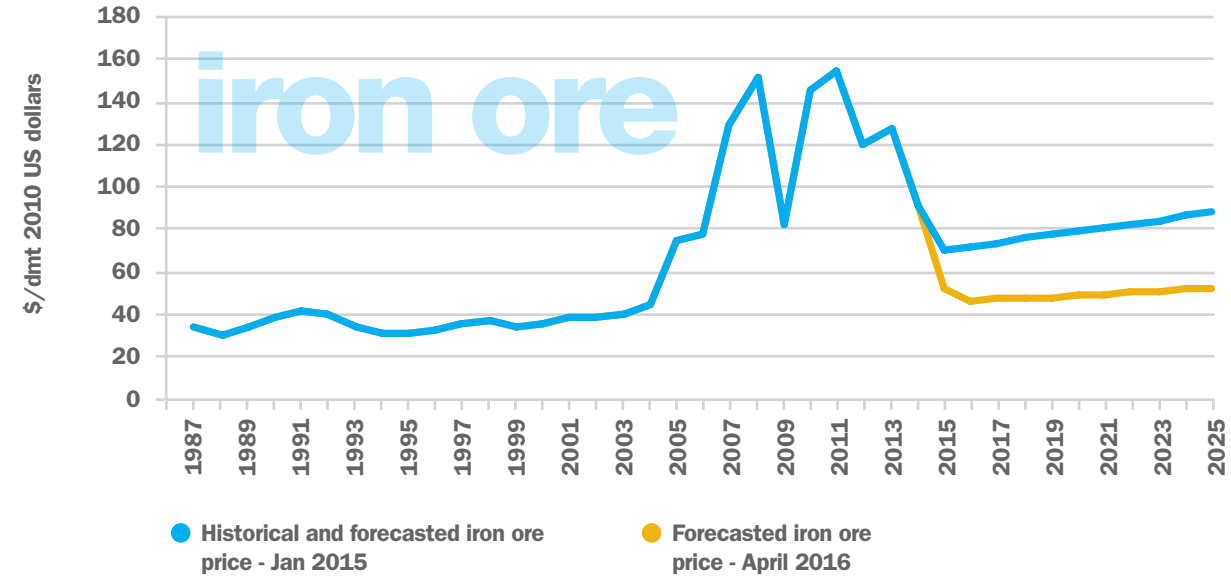


Figure 2e: Iron ore



Source: Mining Industry Human Resources Council, World Bank, 2016

MiHR'S FORECASTING FOR THE MINING INDUSTRY

Labour market forecasting is a central part of MiHR's ongoing research agenda. The forecasts contained in this report provide mining industry stakeholders with insight into the status of their labour market so that they can make informed decisions and formulate HR strategies that will ensure that the industry remains competitive in the long term.

In 2015, MiHR's labour market outlook featured a number of forecasts — including a projection of total employment in the industry, as well as forecasts for hiring requirements, available talent (new entrants to the mining labour force) and an occupational gap analysis. Each of these analyses centred on different aspects of Canada's mining labour market and, in doing so, expanded our understanding of the human resources pressures facing the industry. This section expands upon this understanding by developing additional forecasting perspectives, exploring new ways of interpreting the findings, diagnosing labour market pressures and identifying the mining occupations that are especially vulnerable to those pressures.

Each of MiHR's forecasts considers a variety of factors that collectively shape the characteristics of the industry's labour market. Accordingly, this section also offers a brief discussion of the primary variables used in MiHR's labour market forecasting and describes their expected effect on the mining labour market.

Review of MiHR's labour market forecasts

Employment forecast

At the center of MiHR's labour market analysis for the mining industry is a forecast of total employment over a 10-year horizon. This forecast considers a number of factors impacting mining activities and the optimal size of the workforce that the industry needs to operate competitively.

Specifically, MiHR uses an econometric model to project employment throughout the forecasting period. This model takes into account the historical movements of relevant explanatory variables (such as mineral prices, gross domestic product, labour productivity and other economic variables tied to the size of the workforce) and their observed effect on employment in the industry. Future changes in employment over the next decade are then estimated using various leading forecasts and intelligence for those key explanatory variables. The employment forecasts are generated using three economic scenarios developed to capture the potential volatility in prices and other factors that influence mining sector production and employment. For more information on the important factors that affect employment in the industry, refer to the side bar on mining employment. Each factor is also relevant to MiHR's employment forecasting provided in this report.

Mining Employment

MiHR uses a number of variables to construct its 10-year forecast of employment for the mining industry. These variables regularly include (but are not exclusive to): commodity prices, the capital stock (i.e. the value of machines and equipment), gross domestic product (GDP), the productivity of labour, exchange rates, interest rates and other factors that influence the industry's ongoing activities and employment levels. The specific impacts of these variables are discussed below.

Commodity Prices:

Prices have a significant impact on the viability of mining operations. An increase in price generally translates to greater profits for mining companies, as well as higher returns for investors, particularly in the mineral exploration sector. As such, prices are a catalyst for mining activities.

As prices move above the cost of extraction, newly viable mining projects emerge and existing operations may look to expand their production capacity to capitalize on the higher price; these activities require an expansion of the workforce. Therefore, commodity prices are positively correlated with employment in the industry. This relationship also applies to negative price movements. As prices begin to drop, mining activities tend to slow down, and this in turn may lead to reduced hours of work and/or layoffs. As commodity prices are constantly in flux, the size of the workforce can also change accordingly, although there are often lags between price changes and workforce adjustments. It should be noted that employers may choose to ignore short-term price adjustments in the interests of maintaining production levels and remaining competitive over the long run.

The Canadian mining industry is currently enduring a prolonged period of depressed commodity prices.

Capital Stock:

The stock of capital refers to the fixed assets — the buildings, machinery and equipment — that are used in mining operations. The mining industry naturally uses significant capital inputs in its production process, together with extensive labour inputs (i.e. workers).

Changes to the capital stock can have an ambiguous effect on employment. The addition of capital can increase the need for workers, to the extent that workers are required to interact with it. For example, a new truck requires a driver. On the other hand, with advancements in technology, additional capital can act as a labour substitute. For example, a larger-scale truck reduces the number of drivers needed. Finally, more sophisticated machinery may change the skills requirements for the operator.

In the last decade, mineral extraction operations in Canada have utilized more capital (in value terms) than ever before. A higher ratio of capital dollars for every worker indicates that the industry has become more capital-intensive and that the workforce's interaction with capital has changed; as a result, the recent surge in capital has not necessarily meant a parallel increase to the industry's level of employment.

Gross Domestic Product (GDP):

Gross Domestic Product (GDP) measures the value of goods or services produced over a given period of time. A rise in GDP can be the result of many factors, including an increase in prices (above general inflation) and additional capital or labour inputs (number of workers and hours worked), among other influences. Generally, an increase in GDP corresponds to an increase in production and employment levels. In other words, given that production increases are typically made possible with more workers, changes to GDP provide a gauge on the ongoing adjustments to the industry's employment.

Real GDP in Canada's mining industry has grown in each of the last three decades — even with the significant economic turbulence that suppressed growth in the late 2000's.

Labour Productivity:

Labour productivity describes the value of output that is produced for every input of labour. This measure indicates how labour is being used to produce output over time; it is commonly expressed as real GDP divided by the number of hours worked or the value of output per hour of work. Many factors can influence labour productivity: the skills and composition of the workforce; the arrival of new technologies; and additional capital in the form of larger-scaled machines and equipment. Each of these factors can affect the manner in which workers are utilized and how they interact with the capital inputs in the process. If labour productivity rises, it is not obvious whether the increase was primarily due to an increase in output or a decrease in workers (or hours). As a result, a change in labour productivity does not explicitly suggest a corresponding change in employment.

Labour productivity in Canada's mining industry has increased from previous decades. While the cause of this increase is difficult to quantify — or even specify — the effect echoes a combination of factors, including increased and larger-scaled capital, evolving technologies and even hyper-increases in mineral prices.

Interest Rates:

Interest rates have an ambiguous effect on employment in the industry. On the one hand, a decrease in interest rates makes it less expensive to borrow money. For a mining enterprise looking to finance its activities, an adjustment to the interest rate can therefore affect the optimal mix of capital and labour inputs the company decides to use in its operations.

Interest rates also provide a barometer of the performance of the overall economy. High interest rates over a long period of time signal that the economy is robust — given that businesses are keen on borrowing to further their endeavours. As a result, a sustained increase in interest rates is, in general, positively correlated with employment growth in the mining industry. Interest rates are determined by a number of factors, notably, the Bank of Canada's monetary policy governing the supply of money in the country.

Currently, interest rates are exceptionally low by historical standards. The low rates coincide with a slower economy, which has, in turn, initiated a reduced cost of borrowing.

Exchange Rate:

Canada's exchange rate denotes the relationship between the Canadian dollar and another foreign currency — most commonly, in terms of US dollars. Canada's resource-based economy is primarily made up of exporters. A depreciation of the Canadian dollar makes exports relatively cheaper for a buyer in another country, thus making Canadian exports more attractive and in-demand. For Canada's mining industry, this could mean a potential increase in the number of workers needed to sustain mining activities. Even for those exporters who receive payment in US dollars, a depreciating Canadian dollar makes their wage bill and other operational costs of production in Canada less expensive in the short term.

The exchange rate in Canada (specifically the Canada-US rate) has fallen significantly over the past couple of years. While this movement is considered favourable to exporting sectors of the economy, including the mining industry, it is still not evident that mining operations will significantly alter their production capacity or levels of employment in response to short-term movements in the exchange rate.

Table 1 summarizes the effects that each of the above-mentioned variables has on employment in Canada's mining industry.

Table 1: Summary of factors impacting employment in Canada's mining industry

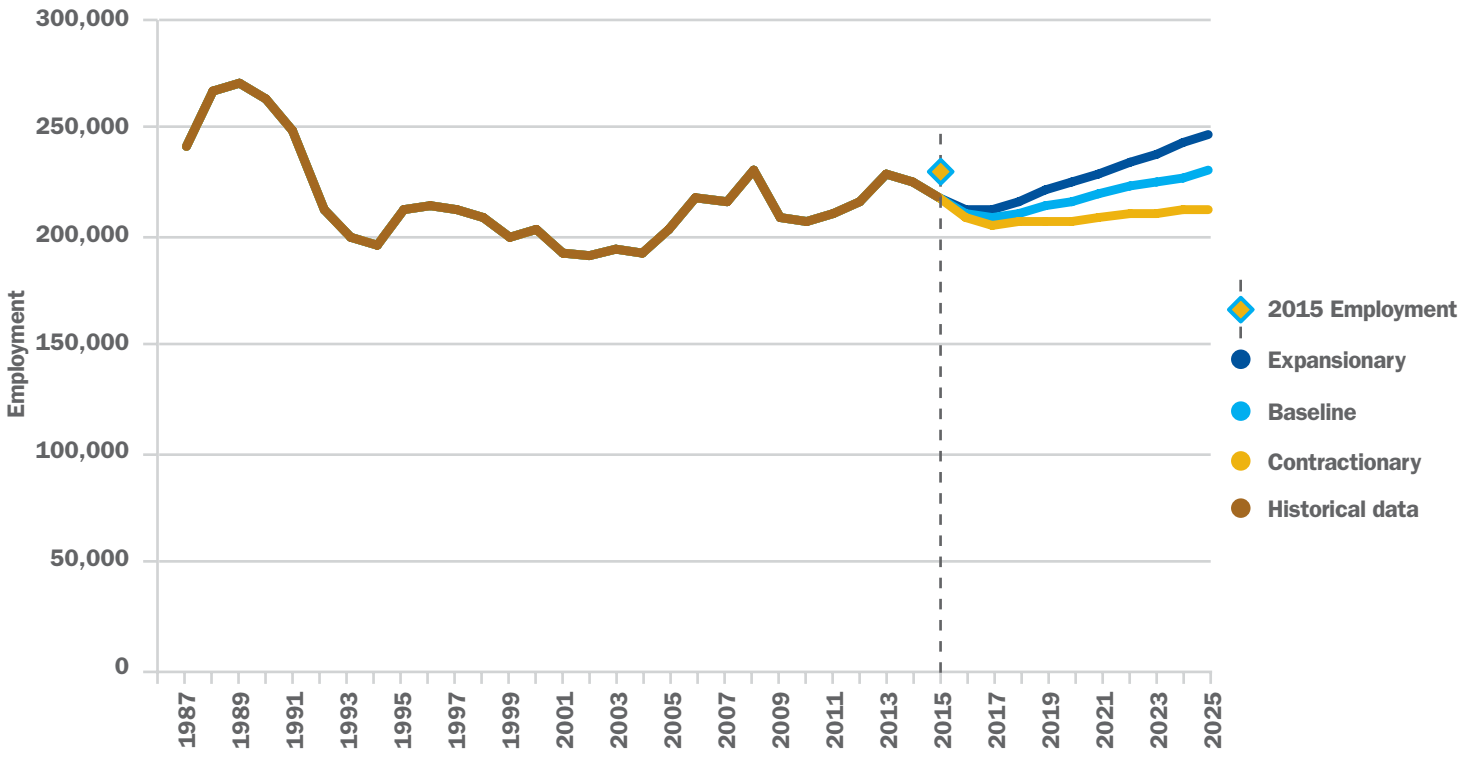
	Production	Exploration Activity	Employment	Current Status
Commodity Prices	A price increase makes production more profitable, leading to an increase in employment. A price decrease has the opposite effect.	A price increase produces a higher return for investors in the mineral exploration sector and increases exploration activities and employment. A price decrease has the opposite effect.	A price increase generally leads to an increase in employment. A price decrease has the opposite effect.	The Canadian mining industry is currently experiencing sharp decreases for a number of key commodity prices.
Capital Stock and Investment	An increase in the capital stock increases production levels and vice versa.	An increase in exploration's capital stock increases exploration activities and vice-versa, though this sector is less capital-intensive than the mineral extraction sector.	An increase in the capital stock has an ambiguous effect: - An increase in employment to the extent that workers are needed to interact with the additional capital. - A decrease in employment to the extent that technological advancements in capital replace the need for labour.	In the last decade, mineral extraction operations in Canada have utilized more capital (in value terms) than ever before.
GDP	Generally, an increase in extraction-related GDP corresponds to an increase in production. A decrease has the opposite effect.	Generally, an increase in exploration-related GDP corresponds to an increase in exploration activities. A decrease has the opposite effect.	Generally, an increase in mining GDP corresponds to an increase in employment. A decrease has the opposite effect.	Real GDP in Canada's mining industry has grown in each of the last three decades — even with the significant economic turbulence that suppressed growth in 2008–2009
Labour Productivity	Assuming that employment remains constant, an increase in labour productivity corresponds to an increase in production. A decrease has the opposite effect.	Assuming that employment remains constant, an increase in labour productivity corresponds to an increase in exploration activity. A decrease has the opposite effect.	A change in labour productivity does not explicitly suggest a corresponding change in employment.	Labour productivity in Canada's mining industry has increased from previous decades.
Interest Rates	An adjustment to interest rates has an ambiguous effect: - To the extent that it makes it more or less expensive to borrow, It can affect the level of production. - High interest rates over a long period of time signal that the economy is robust and that production will be greater.	An adjustment to interest rates has an ambiguous effect: - To the extent that it makes it more or less expensive to borrow, It can affect the level of exploration activities. - High interest rates over a long period of time signal that the economy is robust and that exploration activities will be greater.	An adjustment to interest rates has an ambiguous effect: - To the extent that it makes it more or less expensive to borrow, It can affect the mix of capital and labour inputs an operation uses. - High interest rates over a long period of time signal that the economy is robust and that industry employment will be greater.	Interest rates are exceptionally low by historical standards.
Exchange Rate	A depreciation of the Canadian dollar makes Canadian exports more attractive, potentially leading to an increase in production.	A depreciation of the Canadian dollar makes Canadian exports more attractive. However, exploration is less affected, as it does not export goods to the same degree as the mineral extraction sector.	A depreciation of the Canadian dollar makes Canadian exports more attractive — and for Canada's mining industry — a potential increase in the number of workers needed to sustain mining activities.	The exchange rate in Canada (specifically the Canada-US rate) has fallen significantly over the past couple of years.

Source: Mining Industry Human Resources Council, 2016

Figure 3 outlines MiHR's employment forecast for the mining industry from 2016 to 2025. The graph shows actual employment between 1987 and 2014 and forecasted employment between 2016 and 2025. In 2015, total employment was estimated to be approximately 220,000 workers, but has since been updated to an actual figure of 230,000 — according to the latest Labour Force Survey data available from Statistics Canada. This outcome is somewhat unexpected, given the poor performance of a number of the commodity prices used to explain employment; however, a closer examination shows that job losses in exploration and support services for mining were offset by stronger than expected performance in extraction and milling activities, particularly in Ontario and British Columbia (B.C.). In fact, Ontario's mining industry created an additional 5,300 new jobs in extraction and milling between 2014 and 2015, an increase of 33 per cent. B.C. experienced more modest employment growth, increasing extraction and milling employment by 13 per cent.

Nevertheless, as shown in Figure 2, leading industry forecasters, including the World Bank, have adjusted their outlook for the future prices of many of the commodities mined in Canada. The downward adjustment is a reflection of the weak economic climate in late 2015; for this reason, the analysis in this report focusses on the contractionary scenario for forecasted employment to 2025, represented by the yellow line in Figure 3.

Figure 3: Historical and forecasted mining industry employment (1987-2025)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

Hiring requirements forecasts

In addition to an employment forecast, MiHR also develops a forecast of hiring requirements, which gauges the human resources efforts (i.e. hiring effort) that will be required to ensure the forecasted employment level (shown in Figure 3) is attained over time. MiHR considers two main causes for industry employers to hire or adjust the size of their workforce:

1. Industry expansion or contraction: In a period of increased mining activity, the resulting growth in employment represents the industry's need to hire workers to fill newly created positions; conversely, a contraction represents the need to shed jobs and incumbent workers. The hiring requirements forecast reports net change in employment, or the cumulative adjustments (positive and negative) to the industry's employment over the forecasting period.

2. Replacing exiting workers: Workforce exits are a common reality that all employers must manage. Whether a worker has decided to retire, go back to school or move to another part of the country, their departure creates pressure for employers to replace them. Thus, employers are faced with hiring decisions that do not necessarily result directly from the business cycle but from the choices made by individuals in the workforce.

The hiring requirements model reports replacement requirements, or the cumulative need to replace exiting members of the workforce over the forecasting period. There are two sources of exits that make up replacement requirements in MiHR's model — retirement and non-retirement separation. For each year in the forecast period, MiHR estimates the expected number of retirements, as well as the number of exits that are not related to retirement.[1] For simplicity, MiHR's hiring requirements forecast assumes that employers will choose to replace all workers who leave, rather than substituting more machinery/technology or offering overtime to the remaining employees to make up for those lost through attrition.

Why are hiring requirements important?

Whether a vacancy exists because of a business expansion or because an employer has chosen to replace a worker who leaves, the hiring process is associated with various costs, including advertising, interviewing, selecting, onboarding and training an individual up to the company standards. Furthermore, the process can be time-consuming, especially in tight labour supply situations.

For this reason, MiHR publishes forecasts of hiring requirements that describe the total number of workers that employers will need to hire — either due to industry expansion/contraction or to replace those who leave the industry. As such, hiring requirements signify the cost of making the necessary workforce adjustments; this includes both the costs associated with the hiring process and the cost of ensuring recruits possess the relevant experience, skills and preparedness needed for the job. The forecasts of hiring requirements are reported as cumulative totals over the next decade.

Cumulative hiring requirements forecast

Table 2 presents cumulative hiring requirements as reported for the period of 2016 to 2025. The table provides three forecasted scenarios over a 10-year forecast period. Under the baseline scenario, the mining industry will need to hire almost 106,500 workers over the next decade, based on the current economic climate and forecasted business outlook. This forecast includes the net creation of more than 11,500 new jobs in the industry.

However, in view of the recent downward adjustments in price forecasts used in MiHR's employment forecasting model (Figure 2) and observed increases in unemployment amongst the mining labour force (Figure 1), the contractionary scenario also provides a plausible path for hiring requirements. For the purposes of this section (and where appropriate), MiHR provides an analysis through the lens of the contractionary scenario. To the extent that the baseline or expansionary scenarios may also represent an accurate picture of hiring requirements, the results would be generally amplified above that of the contractionary scenario.

Under the contractionary scenario, total employment in the industry is projected to contract, shedding around 6,300 jobs (on a net basis) over the next 10 years. At the same time, employers would still face a cumulative hiring requirement of 84,100 workers — fueled by the need to replace workers who leave the industry for retirement or other reasons.

Table 2: Cumulative hiring requirements forecasts by scenario (2016-2025)

	Net Change in Employment	Replacement Requirements		Cumulative Hiring Requirements
		Retirement	Non-Retirement	
Contractionary	-6,330	48,600	41,830	84,110
Baseline	11,640	51,030	43,800	106,490
Expansionary	27,740	53,260	45,600	126,590

Source: Mining Industry Human Resources Council, 2015

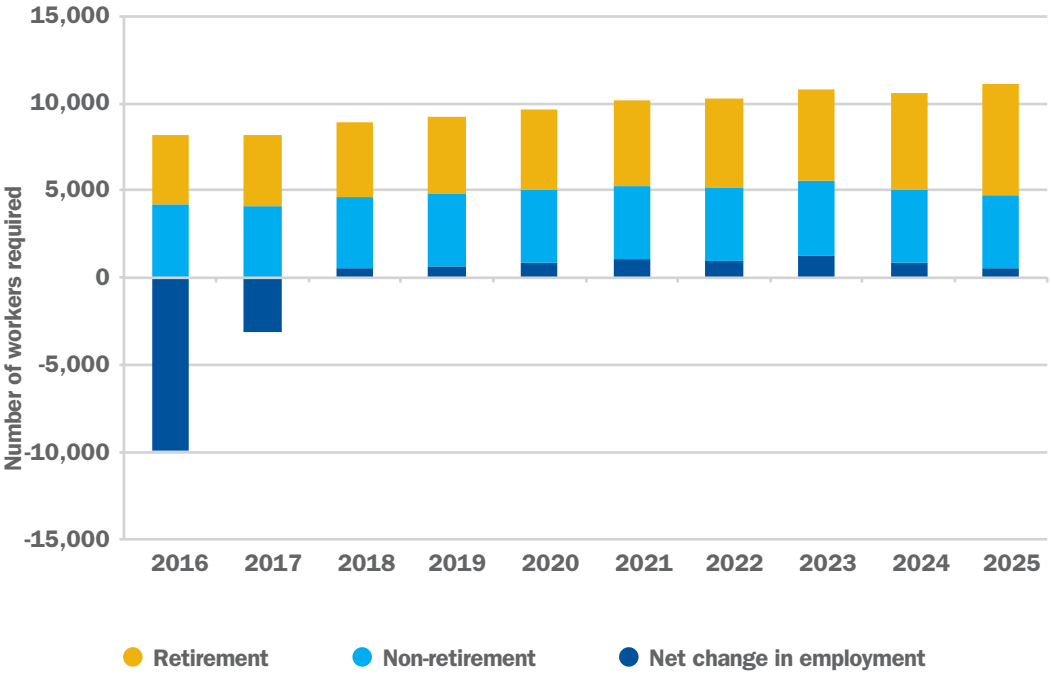
[1] *A more detailed description of the replacement requirements is provided in MiHR's 2015 national outlook report.*

Year-over-year hiring requirements (2016–2025)

Figure 4 shows the year-over-year hiring requirements for the period of 2016–2025, under the contractionary scenario.[2] Both 2016 and 2017 show continued contraction in mining employment, with job losses projected at roughly 9,900 and 3,100, respectively. Subsequently, the industry is expected to create between 500 and 1,300 new jobs per year to the end of 2025.

Even though the contractionary scenario projects greater job losses, the overall pattern of the year-by-year hiring requirements is similar to that of the baseline scenario. The forecast also indicates that, even under the contractionary scenario, replacement requirements will continue to drive the volume of new hires facing employers over the next 10 years.

Figure 4: Annual hiring requirements forecast, contractionary scenario (2016-2025)



Source: Mining Industry Human Resources Council, 2016

The average retiring worker takes with them

37 years

of labour force experience - a loss industry must offset

[2]*The baseline scenario for the year-by-year hiring requirements forecast is provided in Figure 52 of MiHR's 2015 national outlook report.*

The experience gap — the challenge of replacing retiring workers

The replacement of retiring workers can be a significant burden for employers. Each retiree takes with them a unique set of skills, talents and knowledge; and those leaving with extensive experience create a void that is difficult to fill, especially in the short term. As such, MiHR's forecast of retirements over the next decade represents a challenging level of replacement requirements for the industry.

To demonstrate the significance of a single retirement for industry, consider that MiHR's retirement model is based on an individual's likely participation in the labour force over the course of their lifespan. Using this framework, MiHR estimates that a person in the mining industry will, on average, accumulate about 37 years of participation in the labour force. Upon retirement, an average person therefore removes this many years of labour force "experience" from the industry.

Therefore, the need to replace about 49,000 workers over the next decade due to retirement[3] can also be expressed as 49,000 workers × 37 years = 1.8 million collective years of labour force experience (or an average of 180,000 per year) — a loss that industry must find a way to offset.

Of course, the industry is continually shuffling within its ranks to optimally address the gaps left by retirees. The most suitable candidates to replace retiring workers are commonly found within the existing base of experienced workers, since they have likely acquired close to the same experience as their predecessors. However, it is not a given that sufficient numbers of upcoming employees will be available to take over the roles and responsibilities of retirees. Moreover, by promoting an existing worker from within, an employer has simply traded one vacant position for another. As a result, the industry must continually introduce new capacity into its workforce — regardless of its ongoing efforts to reposition the current workforce and absorb retirement losses. While this new capacity is not necessarily equal to the 1.8 million collective years noted here, it can be significant — depending on the individuals that are targeted to fill the void. Identifying the logical entry points for new workers can therefore be a challenge, especially if there is pressure to hastily promote junior people too soon or utilize new workers in a way that does not maximize their full potential in the appropriate positions.

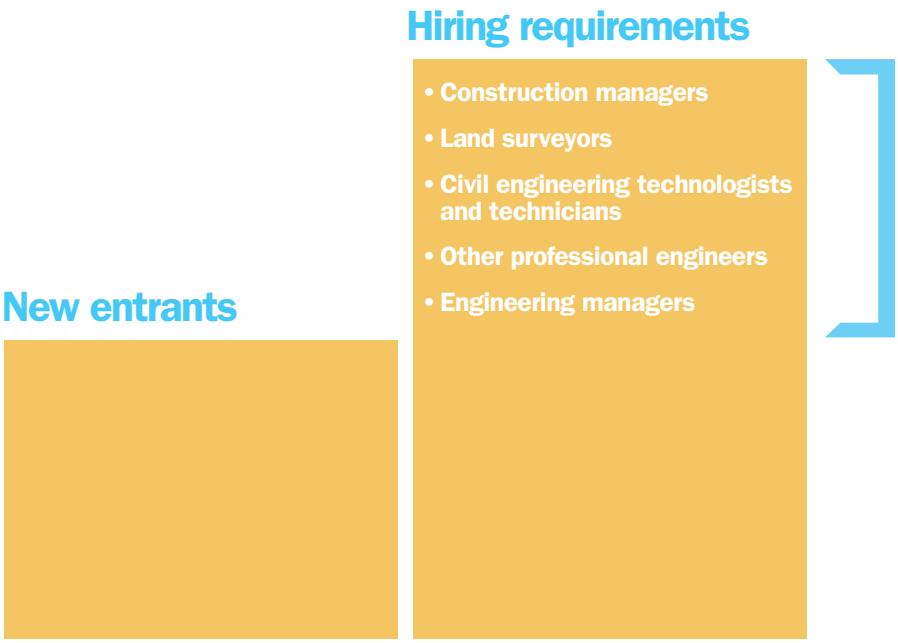
Available talent forecast and occupational gaps

In order to fully understand labour market pressures, the hiring requirements model must be balanced with an estimate of the number of workers expected to become available to fill those positions. For selected occupations, MiHR's available talent forecasts project the total number of new entrants to Canada's labour market.

For each occupation considered, the model estimates the pool of new workers (entrants) that will become available to all industries over the forecast period — and then determines the portion that are likely to enter the mining industry. The model considers new labour market entrants from a variety of sources, including people transitioning from school to the labour market, immigration (both international and interprovincial) and other entry points, such as those returning to work after a leave of absence. The forecast is based on historical performance and does not make any assumptions about future development, such as the introduction of new training programs or changes to immigration policies.[4]

MiHR's available talent forecast is then compared with the hiring requirements forecast to produce a gap analysis for each key occupation. Given that available talent is an occupation-based forecast, the occupation-level hiring requirements forecast is used to provide an appropriate comparison. A particular occupation is said to have a gap, if hiring requirements exceed the expected number of new entrants over the forecast period; in this event, mining employers are expected to struggle to find the workers they are projected to need in the long term. A gap signifies a risk to mining operations, given that a thin labour supply has the potential to derail projects, drive up the cost of finding workers and ultimately undermine an operation's ability to run competitively.

[3]MiHR's hiring requirements forecast for 2015 estimates retirement replacements at roughly 49,000, under the contractionary scenario.
[4]A more detailed description of the available talent model can be found in MiHR's 2015 national outlook report.



The gap between hiring requirements and new entrants is highest in these occupations

As Table 3 shows, even under a contractionary scenario, gaps emerge for certain occupations. The gap between hiring requirements and new entrants is highest in the following occupations: construction managers, land surveyors, civil engineering technologists and technicians, other professional engineers and engineering managers.

Table 3: Key occupational gaps, contractionary scenario (2016-2025)

	Cumulative Hiring Requirements	New Entrants to Mining Labour Force	Gap
Construction managers	355	145	-210
Land surveyors	435	230	-205
Civil engineering technologists and technicians	220	30	-190
Other professional engineers	180	15	-165
Engineering managers	360	205	-155
Land survey technologists and technicians	175	50	-125
Human resources managers	440	315	-125
Mapping and related technologists and technicians	180	60	-120
Biologists and related scientists	135	50	-80
Non-destructive testers and inspection technicians	325	255	-70
Electrical and electronics engineers	395	340	-55
Financial managers	370	315	-55
Mechanical engineering technologists and technicians	335	285	-50
Other trades helpers and labourers	185	140	-45
Construction estimators	75	30	-45
Geological engineers	135	110	-25
Engineering inspectors and regulatory officers	60	35	-25
Biological technologists and technicians	55	35	-20
Inspectors in public and environmental health and occupational health and safety	555	545	-10

Source: Mining Industry Human Resources Council, 2016

Although the 2016 to 2025 forecast found several occupational gaps under the baseline scenario, many of the reported gaps disappear under the contractionary scenario. Note that this outcome does not necessarily suggest that these occupations are without labour market challenges.

For many of the occupations considered, an overall lack of labour supply is the underlying challenge for the industry. While economic conditions — and therefore the demand for workers — are expected to fluctuate over time, labour supply challenges remain relatively consistent throughout the cycles.

> **"During an economic downturn, a thin labour supply is less obvious and tends to be discounted, as workers are less in-demand. Over the long term, industry will need to ensure that the "pipeline" of skilled workers is maintained, to avoid more serious labour market challenges and skills shortages when the market recovers."**

Labour market thinness

A labour market becomes "thicker" as the number of employers and candidates for employment increases. As such, cities generally host thick labour markets, given that they support frequent opportunities for employers and candidates to interact and settle on their preferred employment transactions. In the mining industry, a number of factors undermine the labour market's thickness; the most apparent is the geographic limitations that inhibit industry employers from accessing populated areas. A mining operation cannot choose its location, given the fixed nature of geological deposits. Instead, operations are often located in remote, sparsely populated regions — with too few surrounding competitors to be a draw for prospective employees to move to the region. Therefore, a "thin" labour market — described as having fewer employers and employee candidates in a given space — is more likely to be challenged to match employees with employers.

A thin labour market (and notably, a thin labour supply) is less able to react to and accommodate different phases of the full economic cycle. Nevertheless, during an economic downturn, a thin labour supply is less obvious and tends to be discounted, as workers are less in-demand. Over the long term, industry will need to ensure that the "pipeline" of skilled workers is maintained, to avoid more serious labour market challenges and skills shortages when the market recovers.

Gap sensitivity to changes in labour supply

The forecasts presented in this section are primarily centred on the contractionary scenario: a variation of the forecast that is relatively pessimistic overall, but especially in the short term, and followed by an anticipated recovery over the longer term. Under the contractionary scenario, the short term economic conditions are expected to be more volatile, presenting a risk of exposure for occupations with a thin labour supply or an inherent sensitivity to changes in labour supply.

The impact that a downturn has on labour supply and the inflow of new workers is uncertain, given that individuals may respond to the downturn in a number of ways (e.g. going back to school, changing careers, or moving to another region/industry). However, to the extent that a weak economic climate may have affected industry's access to new workers, reduced enrollments in mining-related programs or generally discouraged workers from the industry, Table 4 provides a picture of how vulnerable an occupation may be to a decrease in available talent.

Table 4 shows key occupations that do not exhibit a gap under the contractionary scenario, but are especially sensitive to changes in supply of new workers. The first column shows the mining industry's share of each occupational talent pool; the second column shows the share that the industry needs to fulfill their hiring requirements; and the third column assigns an index to the sensitivity of the gap between hiring requirements and available talent. A high value for the sensitivity index implies that the occupation is especially sensitive to changes in the supply of new workers. For example, a decrease of less than one per cent in the number of new entrants into the occupation of underground production and development miner would create a shortage of workers, even in a contractionary scenario. Likewise, a drop of almost 10 per cent in the supply of mechanical engineers, mine labourers and supervisors in mineral and metal processing also opens a gap between the incoming supply and the requirements of industry to hire workers. The gap sensitivity index shows the degree to which mining employers are vulnerable to a change in the inflow of new workers in particular occupations, and may help point to some key areas in which mining stakeholders should focus their efforts — especially around informing and influencing decision-making by career seekers.

Table 4: Gap-sensitivity for selected occupations, contractionary scenario (2016-2025)

	Mining's Historical Share of New Entrants (%)	Mining's Required Share (%)	Sensitivity Index
Underground production and development miners	91.0	90.3	100
Industrial instrument technicians and mechanics	11.7	11.0	90
Mine labourers	83.8	76.1	90
Mechanical engineers	2.4	2.1	90
Supervisors, mineral and metal processing	43.2	37.8	90
Supervisors, mining and quarrying	89.6	78.0	80
Machine operators, mineral and metal processing	58.3	49.2	80
Industrial electricians	15.5	12.7	80
Chemists	1.8	1.5	80
Chemical engineers	5.0	4.0	70
Civil engineers	0.6	0.4	70
Drillers and blasters — Surface mining, quarrying and construction	34.1	25.6	70
Construction millwrights and industrial mechanics (except textile)	13.6	10.1	70
Heavy equipment operators (except crane)	15.6	10.9	70
Crane operators	20.7	14.1	60

Source: Mining Industry Human Resources Council, 2016

Gap-intensive occupations: unfilled vacancies

MiHR's occupational analysis identifies occupations that are expected to face significant labour market pressures. However, because the labour market factors for each occupation are unique, each may face a distinct set of challenges. As a result, comparing occupational gaps is difficult, to the extent that each gap is the result of a unique set of circumstances and pressures for that occupation.

What may be a significant labour market gap in one occupation may not be in another. For example, a forecasted gap in a particular occupation may be a substantial burden for mining stakeholders in terms of finding, training and developing workers. Yet, in another occupation, the same size of gap may be relatively easier to overcome depending on the characteristics of that occupation. How can mining stakeholders determine whether an occupation has a significant labour market "gap?"

One way to evaluate occupational gaps is to calculate the share of hiring needs that will remain unsatisfied, according to MiHR's forecasts of new entrants. For example, consider a particular occupation that has a hiring requirement of 1,000 and a gap of 100 workers; accordingly, 10 per cent of the vacant positions cannot be filled, even if all new talent available to mining is hired. The situation is potentially more problematic if the occupation instead has a hiring requirement of 500 workers; in this case, 20 per cent of the hiring needs are not met — a stronger indication that this occupation will experience labour shortages in the coming years. As the proportion of unfulfilled hiring requirements increases, the occupation becomes more gap-intensive. Occupations with the greatest gap intensities represent a higher concern, in terms of employers' ability to fulfill future hiring requirements and stay competitive in the long term.

Figure 5 shows the occupations with the highest gap intensity, based on MiHR's contractionary scenario. Notably, "technicians," "engineers" and "managers" are commonly referenced among the occupations listed in the figure.

Figure 5: Gap-intensive occupations, contractionary scenario (2016-2025)

Source: Mining Industry Human Resources Council, 2016

Sharing talent with other industries

MiHR's gap analysis for occupations allows mining stakeholders to make informed decisions about training and developing new workers for jobs in the industry; however, in reality, not all people that enter into a mining-related occupation will ultimately enter the mining workforce. For all the occupations considered in this report, the mining industry shares a talent pool with other industries. As a result, the degree to which talent is difficult to develop may vary from one occupation to another.

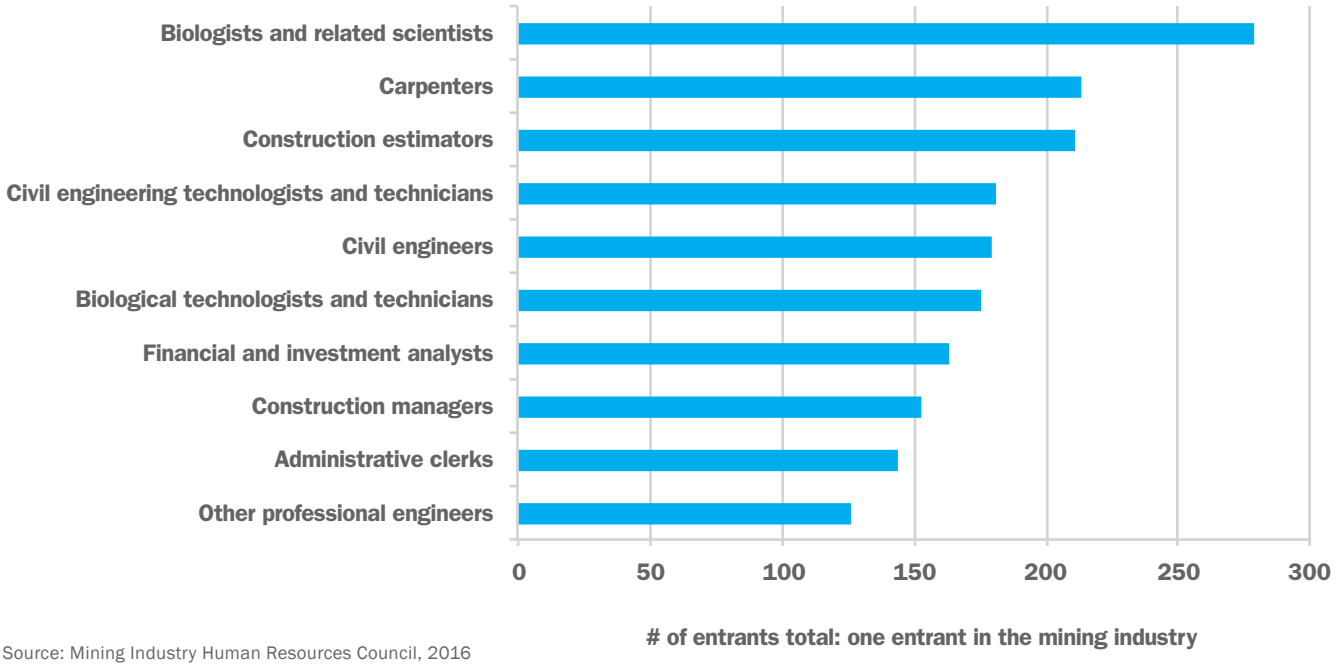
To the extent that the mining industry shares a talent pool with other industries, an effort to erase an occupational gap may actually end up benefiting other industries. For instance, consider that an occupation has a reported gap of 1,000 workers, and the mining industry has historically attracted 80 per cent of workers in that occupation: merely finding and developing 1,000 new workers is not enough to address the gap in the mining workforce, since the industry is expected to attract only 800 workers from this pool (or 80 per cent). In order to address the gap — for the sole interest of the mining industry — at least 1,250 new entrants in the occupation are required — of which the mining industry is expected to capture 1,000 (80 per cent).

Therefore, a reported gap is not necessarily filled with new entrants on a one-to-one basis. Depending on the mining industry's ability to attract new entrants, each occupational gap reported by MiHR has a "sharing rate" that may compound the need for a larger talent pool. In the previous example, additional new entrants are needed to ensure the mining industry has a large enough talent pool to draw upon.

Figures 6a and 6b present the occupations with the highest and lowest sharing rates — defined as the number of entrants the mining industry will need to ensure that employers will be able to fill all of their future vacancies. For instance, a sharing rate of 10:1 suggests that the industry will need 10 new entrants in that occupation, in order to fill one vacancy. A sizable sharing rate is less favourable for mining stakeholders looking to develop talent specifically for the industry — as it indicates that developing workers for that occupation will be relatively inefficient.

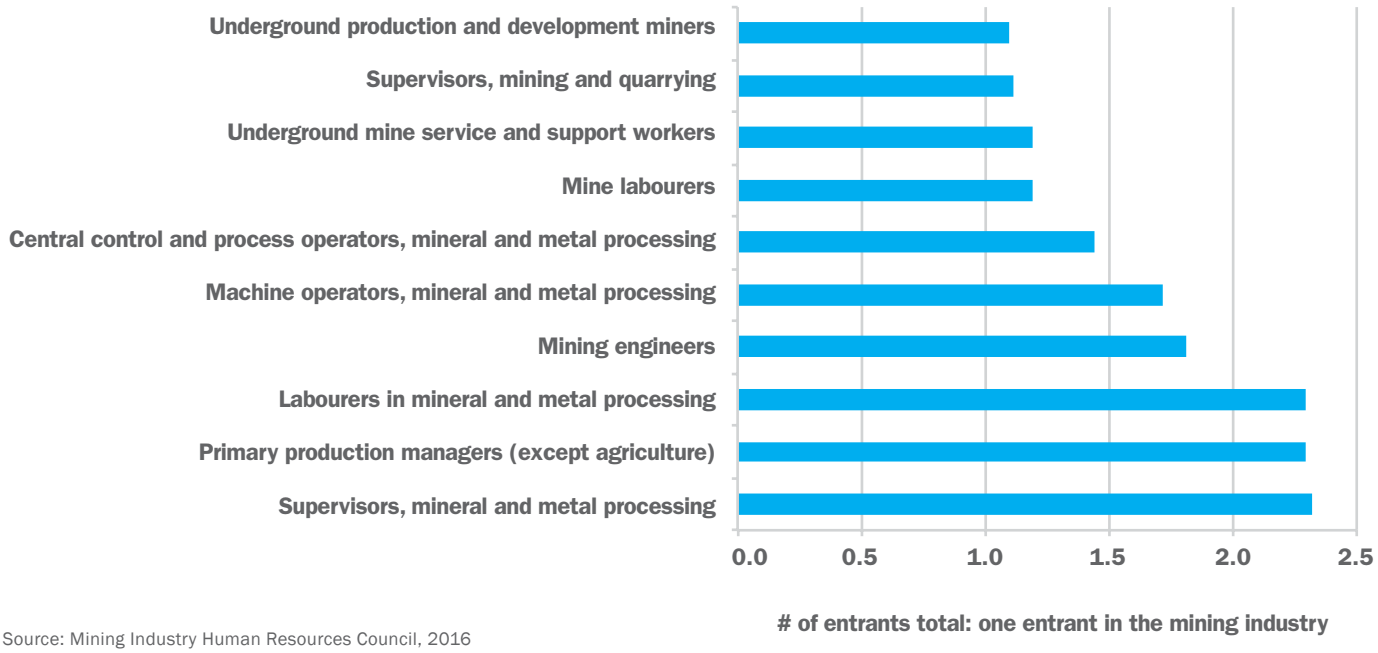
Figure 6: Highest rates and lowest rates of sharing new entrants with other industries (based on historical trends)

Figure 6a: Highest rates



Source: Mining Industry Human Resources Council, 2016

Figure 6b: Lowest rates

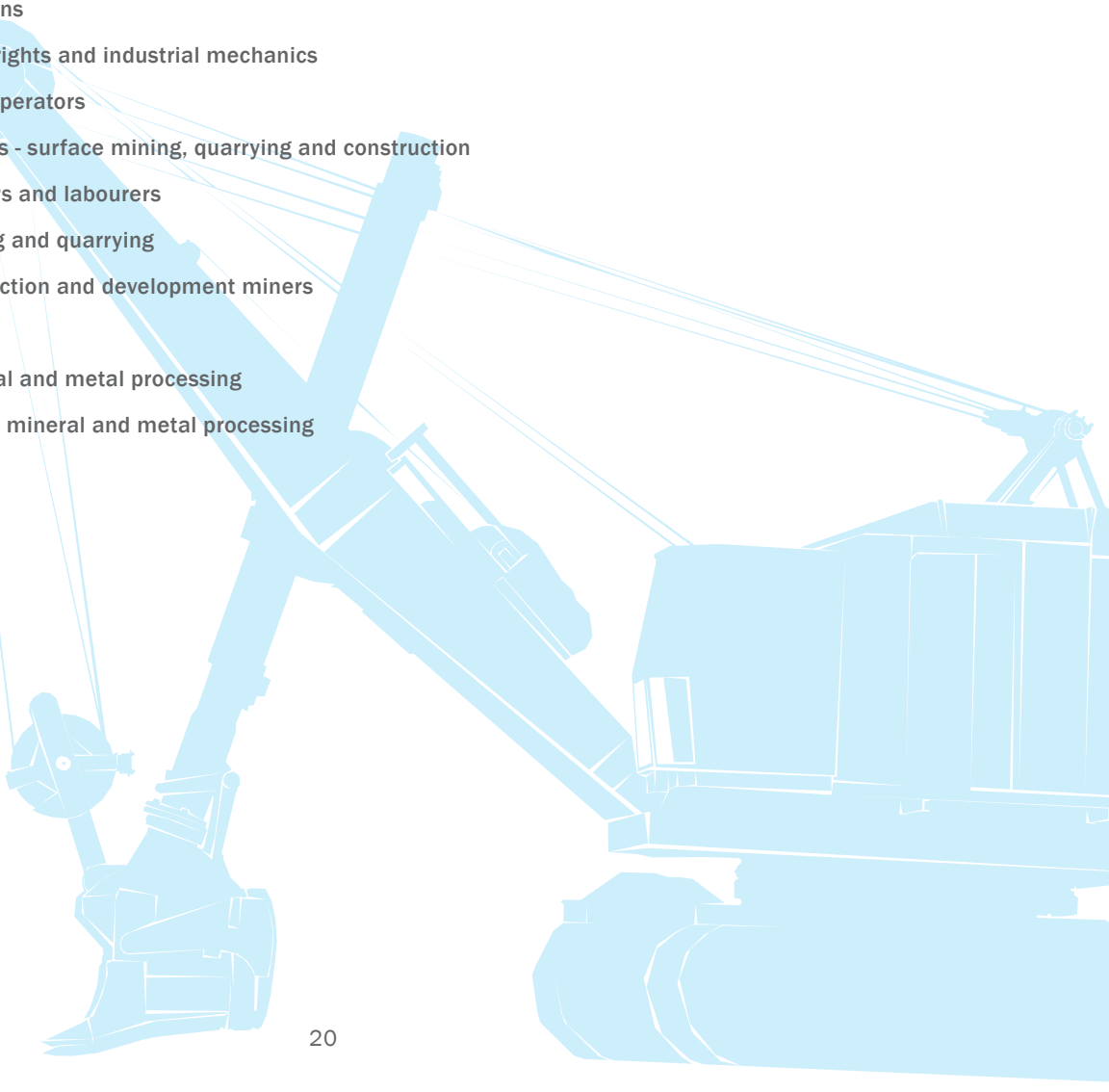


Source: Mining Industry Human Resources Council, 2016

Identifying high-priority occupations for the mining industry

The occupational characteristics covered in this section can also be combined to classify which occupations are especially at risk for certain labour market issues. Examining the gap intensity (the proportion of unfilled hiring requirements) jointly with the industry sharing rate (the number of new entrants for every one entrant in mining industry) reveals which occupations possess both a significant gap and a greater return for the mining industry on training and development. These occupations include:

- Human resources managers
- Engineering managers
- Mechanical engineers
- Chemical engineers
- Geological engineers
- Land surveyors
- Mechanical engineering technologists and technicians
- Land survey technologists and technicians
- Engineering inspectors and regulatory officers
- Inspectors in public and environmental health and occupational health and safety
- Industrial electricians
- Construction millwrights and industrial mechanics
- Heavy equipment operators
- Drillers and blasters - surface mining, quarrying and construction
- Other trades helpers and labourers
- Supervisors, mining and quarrying
- Underground production and development miners
- Mine labourers
- Supervisors, mineral and metal processing
- Machine operators, mineral and metal processing



SKILLS AND QUALIFICATIONS REQUIREMENTS IN MINING

The most recent slowdown in Canada's mining industry occurred in the midst of a changing landscape of technological advancement, regulatory developments, and broadening social expectations and interactions. These factors impact the needs of mining employers.

Over the past decade, the mining industry has become less labour-intensive, as technological advancements have enabled more mechanized work environments and cutting-edge technology has streamlined processes. With these changes, employers have become increasingly reliant on a workforce with a changing breadth and depth of skills and qualifications. A highly skilled and qualified workforce enables employers to remain competitive in complex mining markets and to pursue projects in remote or challenging mining environments.

For the purpose of this report, "qualifications" refer to the level of educational attainment that specific jobs demand, i.e. university or college certificate, apprenticeship or trades certificate, or high-school diploma. "Skills" refer to an ability to perform a task or function that is typically gathered through experience.

Why look at skills and qualifications?

Examining mining's hiring requirements in light of their associated qualifications and skills allows a detailed discussion on the key characteristics of the mining workforce of the future. The qualifications and skills lens more closely examines the type of workers the mining sector will require; this lens goes beyond numbers and titles, to provide more information on the qualitative aspects of hiring requirements over the next decade.

This analysis provides information on the levels of education and types of skills training that the mining industry will require from future workers. This analysis is especially relevant in leaner times, when roles and responsibilities may be more fluid. In the current mining environment, job functions that were traditionally performed by a number of workers in a particular occupation may now be performed by one person with a wider breadth of knowledge and skills.

In addition, looking at skills and qualifications creates a more robust profile of hiring requirements, while also highlighting occupational frictions in the job market. A profile of mining engineers in MiHR's 2015 national labour market outlook showed that even though this occupation does not exhibit a numerical occupational gap and can draw from a healthy supply of mining engineering graduates, employers continue to report challenges with finding, hiring and retaining mining engineers. In part, this is because a hiring employer isn't looking for simply "a mining engineer" — they are looking for a mining engineer with a very specific set of skills and qualifications.

What skills and qualifications will mining employers need over the coming decade?

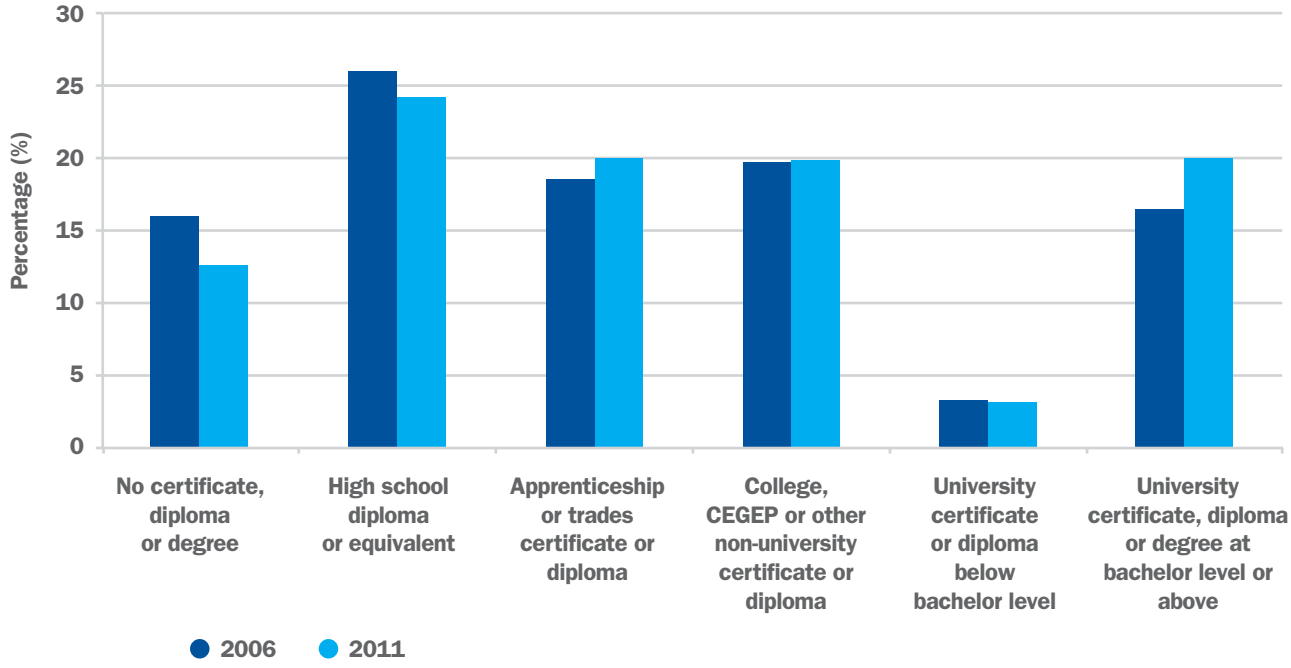
MiHR's hiring requirements forecast provides information on the size of employers' needs and this section aims to build on that foundation, by examining the set of skills, education, qualifications and qualities the mining industry is expected to require over the next decade. The analysis takes a deeper look at hiring needs, by characterizing the types of workers and skills that will be necessary to ensure the industry remains competitive.

Educational attainment forecast

The mining workforce is made up of people with a wide range of educational backgrounds and qualifications. This report considers six educational categories of people employed in the mining industry in Canada. The mining industry's educational profile is distinct from other industries and reflects the specific needs of mining-sector employers. Compared to the overall labour force in Canada, the mining labour force tends to employ a larger share of people with (1) no post-secondary certificate and (2) an apprentice/trades certificate; conversely, the mining labour force exhibits a relatively modest share of people with a university degree.

However, over time, the educational requirements of the industry have shifted in favour of higher levels of educational attainment. Figure 7 highlights the changes in educational attainment in Canada's mining labour force between the Census years 2006 and 2011. The figure shows that there has been a significant decrease in the proportion of the mining labour force that holds no certificate degree or diploma, and a marginal decrease in the proportion with a secondary diploma. On the other hand, the mining industry is employing a significantly larger proportion of university-educated people, with a notable increase in those who hold trades certificates.

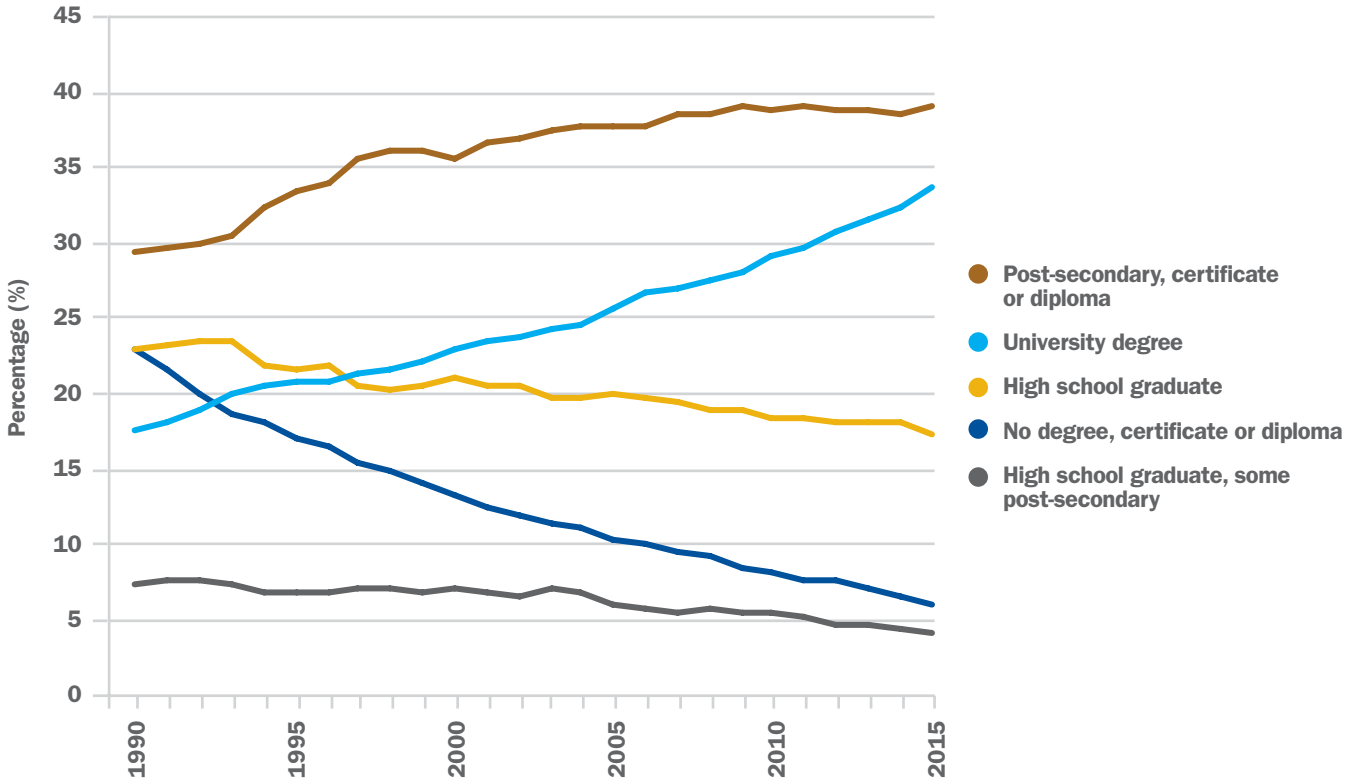
Figure 7: Change in proportion of the mining labour force by educational attainment, between 2006 and 2011



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

The shift toward university education requirements is comparable to trends in Canada's overall workforce. As shown in Figure 8, the educational structure of Canada's workforce has also shifted over the last three decades — with an increasing emphasis on those with a post-secondary diploma[5] or a university degree. Conversely, the number without a certificate has decreased over time, as more Canadians are investing in education than in previous years.

Figure 8: Percentage of educational attainment in Canada's overall workforce, ages 25 and over (1990–2015)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

Given that the educational structure of the mining labour force has shifted, this report provides an educational breakdown of the hiring requirements forecast — to expand on what mining employers are expected to be seeking in terms of educational attainment to fill future hiring requirements.

Table 5 compares MiHR's hiring requirements forecast by educational attainment, for 2011 to 2020 and for 2016 to 2025. The table shows a decrease in the number of workers with no certificate or high school diploma and an increased focus on advanced education levels — with university graduates making up an increased proportion of hiring requirements — almost 30 per cent above previous levels.

[5]Note that, in this figure, the category for post-secondary certificate or diploma includes certificates from vocational school, apprenticeship training, community college, Collège d'Enseignement Général et Professionnel (CEGEP), school of nursing and certificates below a Bachelor's degree obtained at a university.

Table 5: Hiring requirements forecast by educational attainment, baseline scenario (2011-2020 forecast vs. 2016-2025 forecast)

	Hiring Requirements Forecast (2011–2020)	Hiring Requirements Forecast (2016–2025)	Per cent Change (%)
No certificate, diploma or degree	16,000	13,415	-16
High school diploma or equivalent	25,925	25,815	0
Apprenticeship or trades certificate or diploma	18,535	21,360	15
College, CEGEP or other non-university certificate or diploma	19,775	21,205	7
University certificate or diploma below Bachelor level	3,220	3,380	5
University certificate, diploma or degree at Bachelor level or above	16,535	21,315	29
Total	**99,990**	**106,490**	**7**

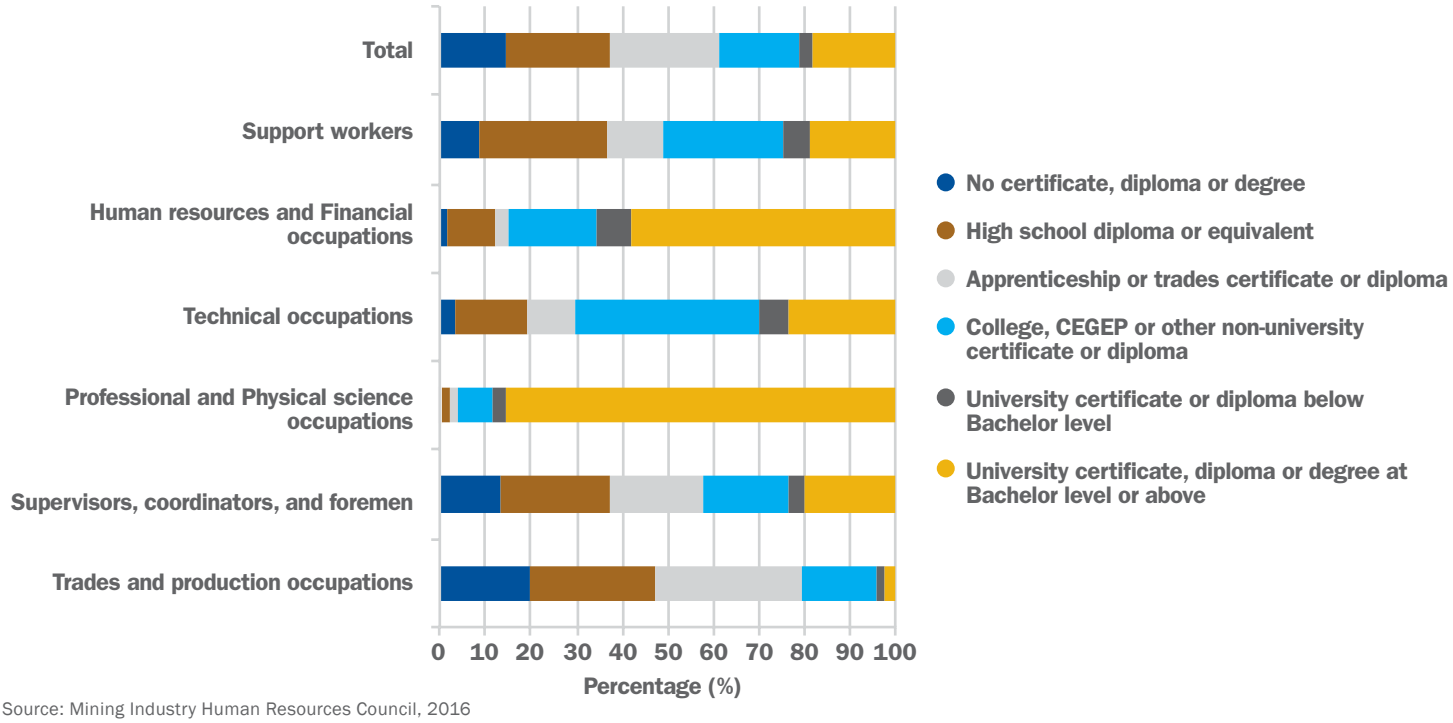
Source: Mining Industry Human Resources Council, 2016

It is important to note that the trends presented in Table 5 are the product of two distinct factors. The first factor is the trend towards higher educational requirements, and the diminished reliance on those with no certificate and high school graduates. The second influence is the increase in the number of workers to be hired under the two forecasts, which grew by 7 per cent.

Figure 9 shows the educational breakdown for the occupational hiring requirements forecast for 2016–2025. For each broad occupational category, the figure illustrates the educational makeup of hiring requirements. Each occupation has unique education requirements that can shape the strategies for addressing hiring needs.

For instance, a strategy to address these hiring requirements in professional and physical sciences occupations may effectively focus on recruitment from universities, given the prominent share of university graduates in these occupations.

Figure 9: Educational breakdown of hiring requirements for broad occupational categories (2016-2025)



Source: Mining Industry Human Resources Council, 2016

Occupational structure of the mining workforce: changes over time

Rapid changes in employment levels, as well as shifts in the occupational composition of the workforce over time, may suggest that some occupations are more highly sensitive to periods of growth — leading to rapid job creation and increased vulnerability to sudden downswings, when production levels slow and layoffs occur. This section examines changes in the occupational distribution of employment in the mining industry over the last two decades and compares the impact of changes in total employment on selected mining occupations.

Volatility in commodity prices, technological advances and fluctuating economic conditions impact not only total employment in the mining industry, but also have an effect on the occupational structure of the workforce. For example, the introduction of a new technology may eliminate jobs in one occupation, while creating jobs in another. Furthermore, a sudden upswing in prices may drive intensive research and development efforts and faster introduction of new and more sophisticated technologies, in addition to increases in employment. MiHR's 2015 labour market outlook reported that mining has become a more capital-intensive industry, with a greater reliance on machinery and technology. These advancements have likely resulted in changes to the occupational structure of the mining workforce.

Driverless haul trucks — the impact of technological advances on future skills requirements

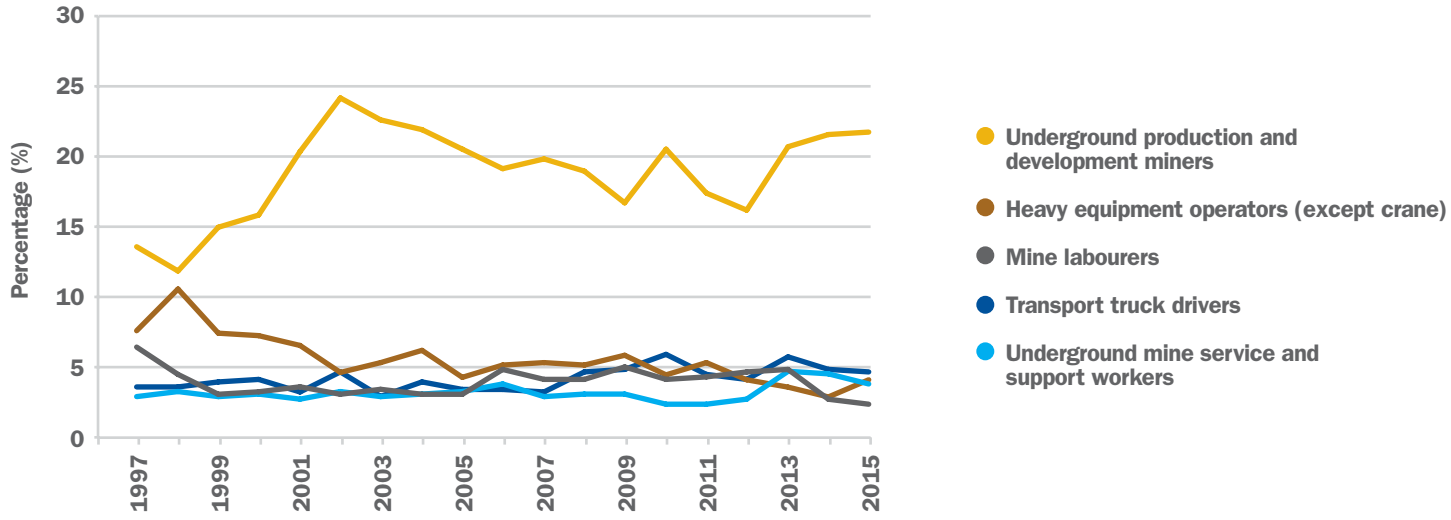
The introduction of new technologies can increase employment in certain occupations, and decrease employment in others. Advancements in haul trucks provide an example of how changes to the size and types of machines and equipment can permanently shift the occupational structure of a workforce.

Larger-scaled trucks in the mining industry provide a more efficient way to move ore on the mine site — requiring fewer trips and drivers for the same production levels. A move towards the use of "driverless" or autonomous haul trucks also diminishes the number of operators required, while at the same time creating new skills requirements for employees, to both operate and maintain these vehicles. In this example, the shift to a new technology not only impacts the number of workers required, but the skill sets that are necessary and, potentially, changes in the occupational mix of the workforce at that mine. As the mining industry continues to become more capital-intensive — with companies adopting new technologies to expand their operational capacity — there will be a need to assess the new skills sets required to ensure new technology is implemented efficiently and to maximize the return on investment. These evolving needs will help to inform the skills and qualifications requirements of the mining workforce of the future.

Figure 10 highlights changes in the occupational share of selected frontline production occupations as a proportion of total employment in the occupational category.

The data reported in this section covers the category of "mining extraction and milling activities" (NAICS 212), from 1997 to 2015.

Figure 10: Occupational share of selected production occupations in extraction and milling activities (1997-2015)

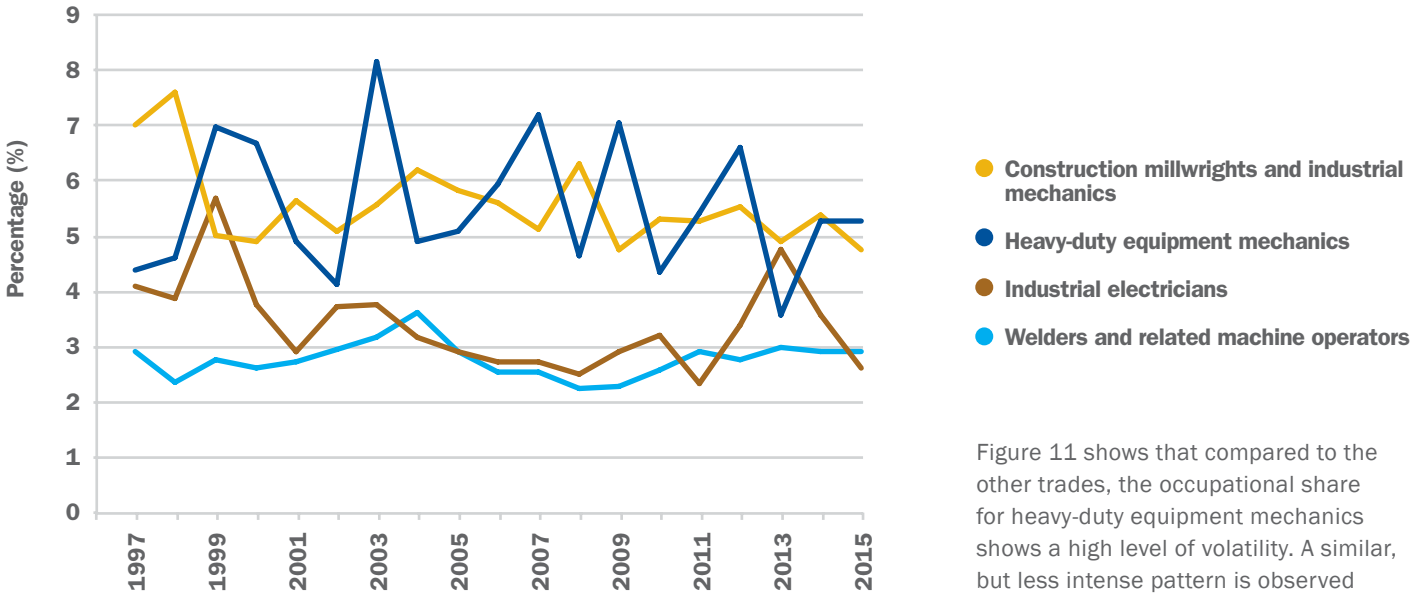


Source: Mining Industry Human Resource Council, Statistics Canada, 2016

Figure 10 shows that between 1997 and 2015, the occupational shares of truck drivers, heavy equipment operators and underground mine service and support workers remained relatively constant, whereas the occupational share for underground production and development miners increased sharply and has fluctuated more significantly over the period. The occupational share for underground production and development miners increased from 13.5 per cent of the total extraction workforce in 1997 to over 21 per cent in 2015.

Figure 11 examines changes in the occupational shares for selected trades in extraction and milling activities between 1997 and 2015.

Figure 11: Occupational share of selected trades in extraction and milling activities (1997-2015)



Source: Mining Industry Human Resource Council, Statistics Canada, 2016

Figure 11 shows that compared to the other trades, the occupational share for heavy-duty equipment mechanics shows a high level of volatility. A similar, but less intense pattern is observed for construction millwrights and industrial mechanics.

LABOUR SUPPLY - OPPORTUNITIES AND CHALLENGES

This section examines the challenges and opportunities relating to labour supply. The section explores issues around the impact of disabilities on the mining workforce and the supply of skilled workers. It also examines areas in which mining may be underperforming, and points to the opportunities where stakeholders can better align the labour force with the specific needs of employers. Diverse workers represent one of the greatest challenges and opportunities to strengthen the industry's labour supply. This section focusses on groups that are either under-represented or underutilized in the mining industry.

Exploring disability and the mining workforce

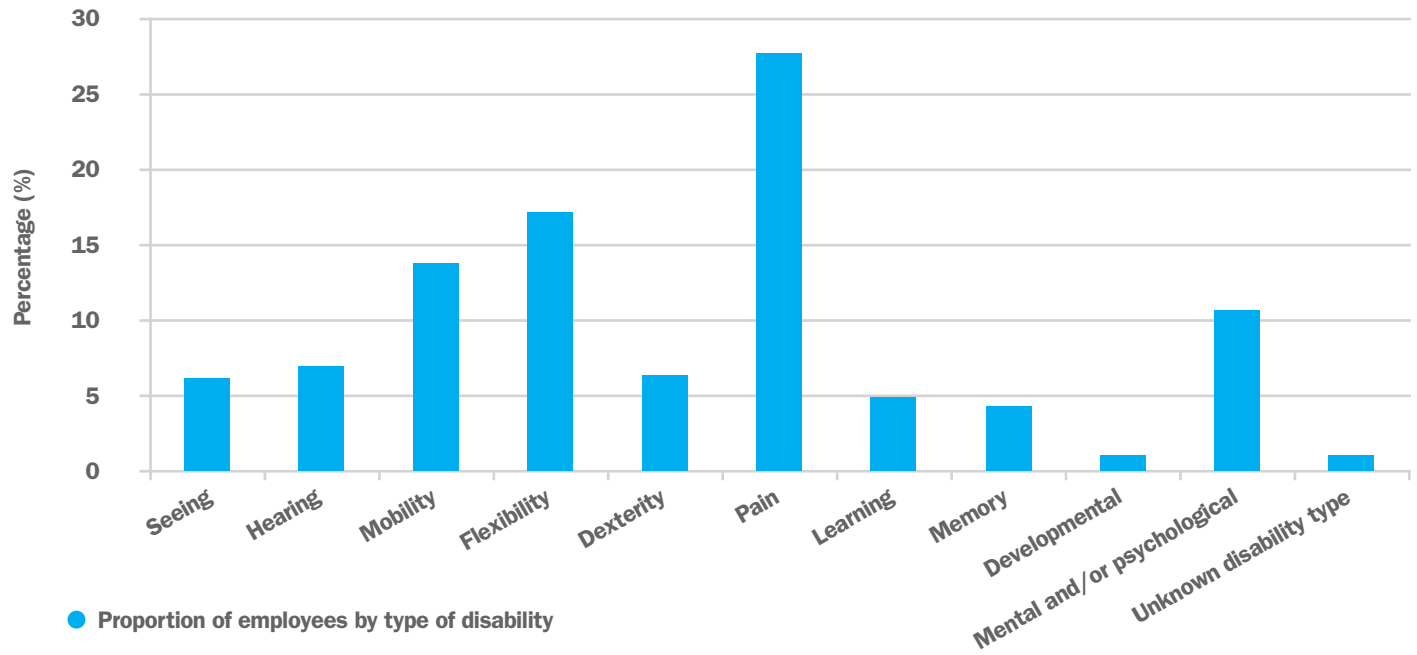
MiHR's hiring requirements are generated by two labour market forces: 1) the demand for workers that comes from industry growth; and 2) the need to replace workers who leave the industry, either for retirement or for other reasons. The second types of factors are actually supply-side issues, in the sense that they represent hiring requirements that are generated through circumstances and decisions made by incumbent workers, rather than through the creation of new jobs. In Section 2, as in past reports, MiHR has explored some of the issues and challenges surrounding retirement decisions. This section provides some additional insight into other possible pressures — using disabilities in the workforce as an example. It will explore the potential impact of disabilities in the workforce on the supply of experienced and skilled workers in the industry.

There are significant numbers of persons with a disability currently employed in Canadian workplaces. According to Statistics Canada's *Canadian Survey on Disability* (CSD), in 2012, almost 3.8 million adult Canadians reported some form of disability that posed a hindrance in their daily activities. This represents 13.7 per cent of the total adult population.

Defining disability

Data from the CSD (see Figure 12) indicate that over 28 per cent of the disabled individuals in the Canadian workforce reported disabilities related to pain. Other disabilities identified by employed individuals were flexibility (17 per cent), mobility (14 per cent), mental and/or psychological (11 per cent) and hearing (7 per cent). Only one per cent of the individuals who were both employed and disabled reported a developmental disability.

Figure 12: Prevalence of disability by type in the Canadian workforce, all industries (2012)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

The aging workforce in Canada, and specifically within the mining industry, underlines the importance of considering disability as a facet of workforce management. Data from the 2012 CSD indicate that the prevalence of disability increases with age. MiHR has been reporting on the trends related to Canada's aging mining workforce for nearly a decade — taking the perspective that the industry will need to replace these workers. Almost 43 per cent of the workforce in mining is between the ages of 45 and 64. According to the CSD data, employees across all sectors of the economy within this age group report the highest incidence of disability (35 per cent of workers in the 45–54 year old age cohort and 30 per cent of the 55-64 year old age cohort).

This trend may point to an emerging set of challenges related to the physiological changes associated with aging, including lower muscle strength, age-related macular degeneration, less efficient neuromuscular coordination, etc. These are important in the mining industry, especially when the occupational requirements and standards gradually become more than an individual can undertake; in such cases, employers are likely to see an increase in job-related stress, lower productivity, and potentially, higher rates of disability leave or early retirement.[1]

CSD data also shows that the types of disability experienced by an individual also vary with age. In the age group of 15 to 24, the second-most common disability reported after pain (30 per cent) was "mental or psychological" (16 per cent), followed by mobility and flexibility (11 per cent). However, in older age groups (45–54 and 55–64), flexibility and pain are the most commonly reported disabilities — with each reported by approximately 19 per cent of Canadian workers. Mining employers will need to consider the impact this may be having in their workplace, and how they will accommodate their older workers who have age-related disabilities, so they may plan for efficient succession and allow sufficient time for the transfer of skills and knowledge.

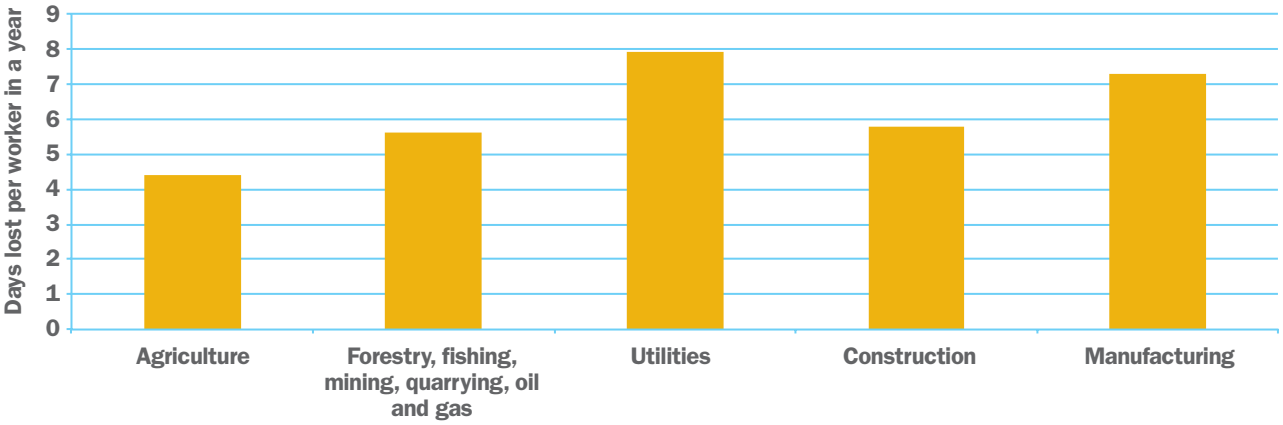
[1] *http://apps.who.int/iris/bitstream/10665/36979/1/WHO_TRS_835.pdf*

Mental illness is one form of disability that has received heightened focus and attention in recent years. The Mental Health Commission of Canada's website states that "One in five people in Canada will experience a mental health problem or illness in any given year…".[2] Employers are required to accommodate employees who are experiencing mental illness, as with any other aspect of disability. Often, mental illness is an invisible disability; this means that many workers are not taking leaves of absence or seeking other available support to return to mental wellness — for fear of stigma. However, this type of disability may be even more pressing for mining employers to consider, as some aspects of mining may lead to increased stress and mental health challenges, including: the remote nature of mining, especially at fly-in, fly-out (FIFO) operations; the long periods away from daylight experienced in underground environments; the cyclical nature of employment; and shift work and long shifts, among others. These contributing factors along with the stigma associated with mental illness may combine to present a significant safety risk.

While there is not currently a significant body of research on mental illness and its impact in the mining workforce, a study of one Ontario mining employer suggested that approximately one quarter of all disability claims are related to mental health problems.[3]

Disabilities and disability claims have a real financial impact in the workplace — both in terms of the direct costs of insurance and disability claims, as well as the indirect costs of productivity losses. Mental health problems and illnesses account for approximately 30 per cent of short- and long-term disabilities claims and are rated one of the top three drivers of such claims by more than 80 per cent of Canadian employers.[4] In 2012, forestry, fishing, mining, quarrying, and the oil and gas sectors lost an average of 5.6 days per worker per year due to illness or disability, as shown in Figure 13.

Figure 13: Days lost per worker in a year through illness or disability by selected industries (2012)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

Overlaying this with an examination of productivity losses due to illness or disability in occupations that are essential to mining operations, provides more data to emphasize the potential costs of disability to Canada's mining industry. In 2012, individuals employed as trades helpers, construction labourers and related occupations lost an average of 10.5 days per year per worker, and transport and heavy equipment operation and related maintenance occupations lost, on average, 9.6 days per year per worker. The New South Wales Minerals Council in Australia estimates that an average mine with 170 employees faces lowered productivity costs due to mental illness of $300,000 to $400,000 (AUD) annually.[5] The financial impact of the productivity losses related to disabilities is significant to the Canadian economy — and the cost of disability to Canada's mining sector should be considered. Understanding the drivers of disability and exploring ways to help workers with a disability return to being productively employed will have a positive impact on the bottom line.

[2]*Seehttp://www.mentalhealthcommission.ca/English/focus-areas/mental-health-matters*
[3]*https://laurentian.ca/news/vale-united-steelworkers-and-crosh-kick-groundbreaking-new-study-mining-and-mental-health*
[4]*See report Investing in Mental Health (www.mentalhealthcommission.ca)*
[5]*See report Blueprint for mental health and wellbeing (www.himh.org.au)*

Why are all potential sources of labour important?

There are a number of factors that ensure the mining industry will continually be challenged to access the right workers at the right time. For instance, certain overall demographic trends continue to erode the potential labour supply for mining (as well as for other industries); these include the steady decline in the population in younger age groups and the migration of people to urban centres of the country.

The industry's labour supply is also undermined through its own inherent circumstances. Mining operations frequently have little choice but to operate in a thin labour market, drawing on sparse or distant populations. Also, the perception of the industry, including the nature of the work, may also be a persistent deterrent among certain groups that have traditionally demonstrated they are less willing to participate in the mining labour force.

These labour supply factors are unlikely to change in the near future, and some are intrinsic to the mining industry. This section emphasizes the importance of identifying and fostering all potential sources of labour — with the aim of countering the factors that work against ensuring access to a sufficient supply of labour to support competitiveness and growth. MiHR's analysis shows that the available talent is not sufficient to address all the scenarios forecasted and that certain occupations are more vulnerable to either a surge in hiring requirements or a decline in available talent. In other words, a healthy labour supply should be able to accommodate all projected scenarios and cycles, not just the contractionary scenario or down cycles.

The talent pipeline

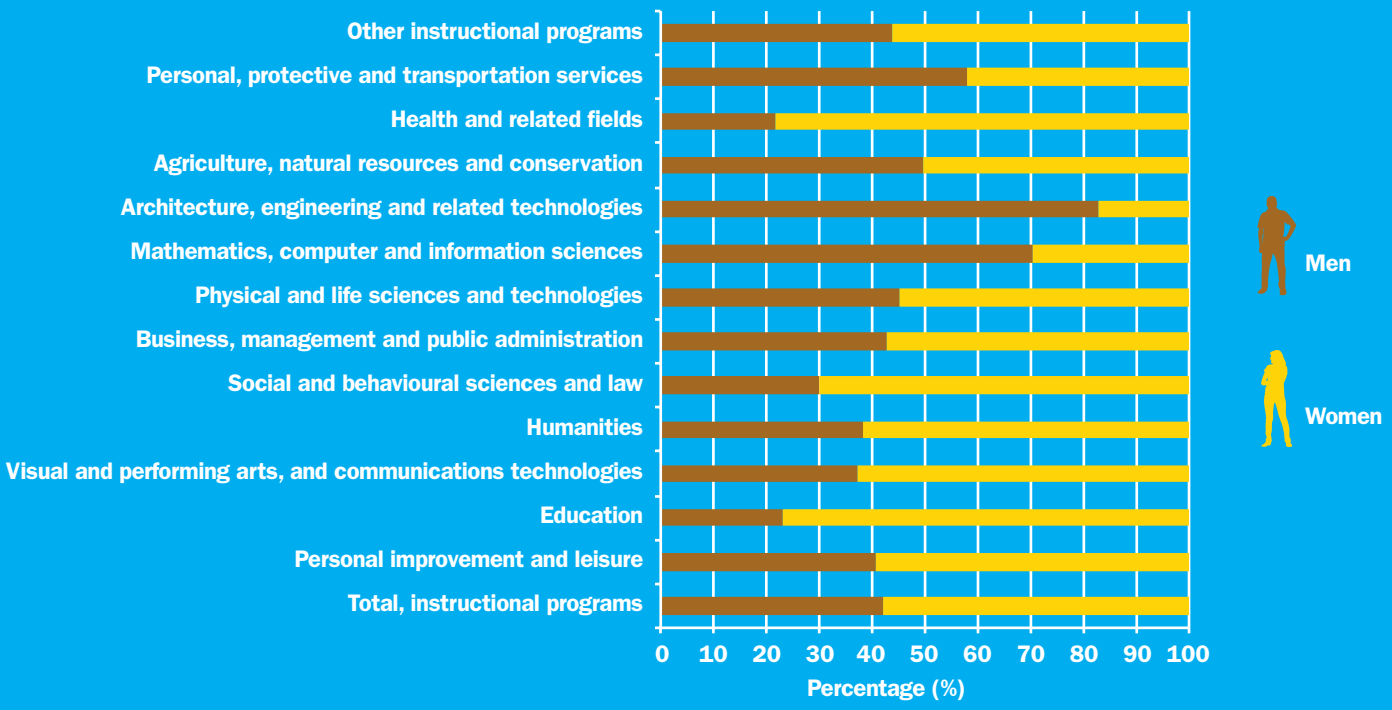
As discussed in Section 2, mining employers need a continuous flow of individuals through the talent pipeline to ensure they have a sufficient labour pool of skilled and qualified workers from which to draw to fulfill their hiring requirements. As hiring requirements arise — whether from the creation of new positions or from the need to replace workers who leave — the mining industry must ensure that there is a robust pool of individuals entering mining-related education and training programs, and eventually entering the mining labour market. During market contractions, there will be increased pressures for job seekers and students to pursue training and careers outside of the sector; therefore, it is critical that the mining industry remains engaged with students and job seekers — to ensure that when the inevitable upswing occurs, there is a sufficient talent pool to draw from. Regardless of the stage within the business cycle, the need to secure future sources of qualified and skilled workers by understanding all potential sources must remain top-of-mind for mining employers.

A closer look at gender and education outcomes

From 1999 to 2013, the total number of post-secondary graduates in Canada increased by 87 per cent. During this time, the proportion of female and male graduates remained relatively constant at about 58 per cent and 42 per cent, respectively. Despite the overall proportional representation, there is a significant difference in the types of post-secondary programs pursued by men and women.

As illustrated in Figure 14, the graduation data from the Post-secondary Student Information System (PSIS), a national survey by Statistics Canada, indicate that "health and related fields" and "education" tend to attract a larger proportion of women compared to men. In contrast, "mathematics, computer science and information science" and "architecture, engineering and related technologies" programs have a higher concentration of men. In 2013, 83 per cent of the students that graduated from "architecture, engineering and related technologies" programs were men and only 17 per cent were women.

Figure 14: Proportion of men and women graduating from post-secondary degree programs (2013)



Source: Mining Industry Human Resources Council, 2016; Statistics Canada (PSIS), 2013

The gender impact on the talent pipeline

The general educational preferences and outcomes of men and women greatly impact gender diversity and representation in the talent pipeline. If young women do not see themselves reflected in STEM (science, technology, engineering and math) occupations or in senior leadership in mining, or if women are discouraged or disengaged at a young age from pursuing science or math, these factors will have an impact on the education and career decisions that individuals make. In order to address the under-representation of women in the mining sector, the industry must look at solutions that go beyond simply addressing workforce barriers and connect earlier in the talent pipeline. Reaching out to students and communities to build awareness about careers in the sector — and connecting with women as they make decisions about education and skills attainment — will support the development of a more gender-diverse talent pipeline.

Diversity

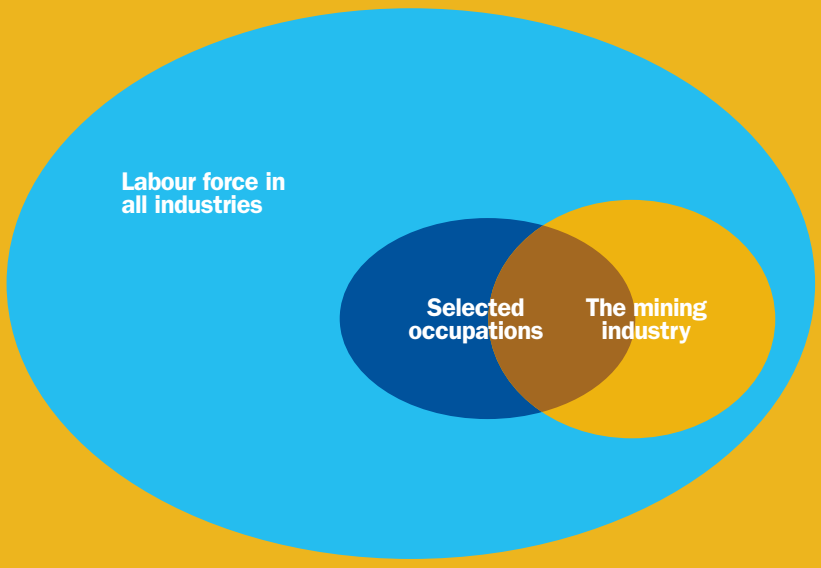
The importance of a strong and robust talent pipeline means that diversity will continue to be a priority for mining organizations in Canada. An apparent shortfall or mismatch in diversity in a workforce can point to missed opportunities, and even a malfunctioning labour market, especially if an under-represented group has the necessary skills and experience that would benefit the industry. MiHR examines three groups that are relevant to diversity in the mining industry: Aboriginal peoples, women and immigrants. These groups are examined because their presence in the mining labour force has traditionally tended to not match the overall labour force or the population in general. This mismatch may indicate that each group faces potential challenges to industry participation, including systemic barriers.

In this report, the analysis on diversity principally examines the extent to which each diverse group is represented in the mining labour force, and how that compares to the labour force in other industries and overall. Given that there are a number of ways to divide up the labour force, there are also several ways to describe how a diverse group is represented in the labour force — depending on the frame of reference. Figure 15 illustrates the possible division of the labour force for the purpose of this analysis. The diagram highlights the following subsets of the labour force:

- Labour force in all industries
- Labour force in selected occupations in all industries
- Labour force in the mining industry
- Labour force in selected occupations in the mining industry

This section reports on the representation of diversity groups for each of these categories, and in certain cases, for individual occupations.

Figure 15: Representation in the labour force



Source: Mining Industry Human Resources Council, 2016

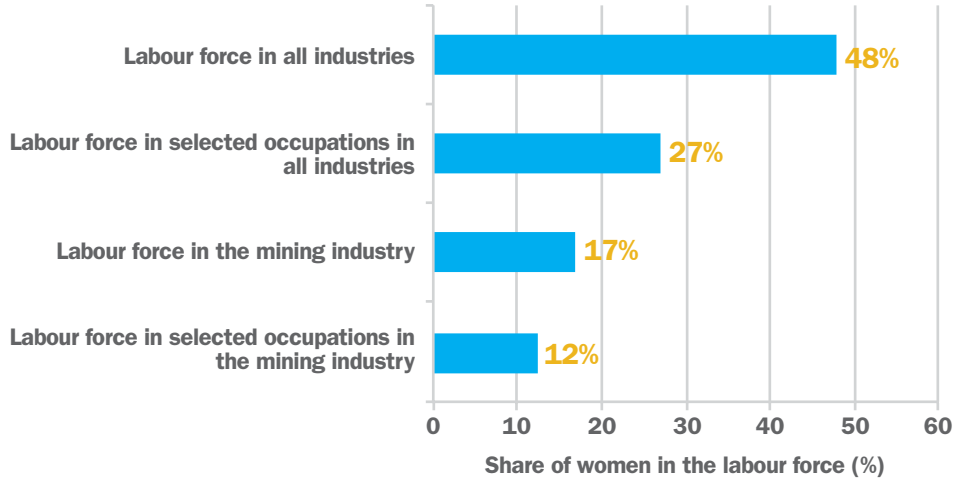
Women

According to the 2011 Census, women make up about 17 per cent of the Canadian mining labour force, compared to 48 per cent representation in the overall labour force. Based on these proportions and on MiHR's estimates of total employment for the industry, roughly 38,600 women worked in the mining industry in 2015.[6]

roughly **38,600** women worked in the mining industry in 2015.

As illustrated in Figure 16, women account for only 27 per cent of workers in the occupations tracked by MiHR across all industries. In other words, women are not as well represented in these occupations as they are in the overall labour force. However, when we look at the representation of women in these occupations within the mining sector, the proportion of women is even smaller, at only 12 per cent. This indicates that not only are women less likely to work in the occupations that best define the sector, the women that do work in these occupations are not proportionately choosing mining as a sector of choice. In other words, the mining sector is not getting a comparative share of women within these occupations.

Figure 16: Representation of women in the labour force (2011)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

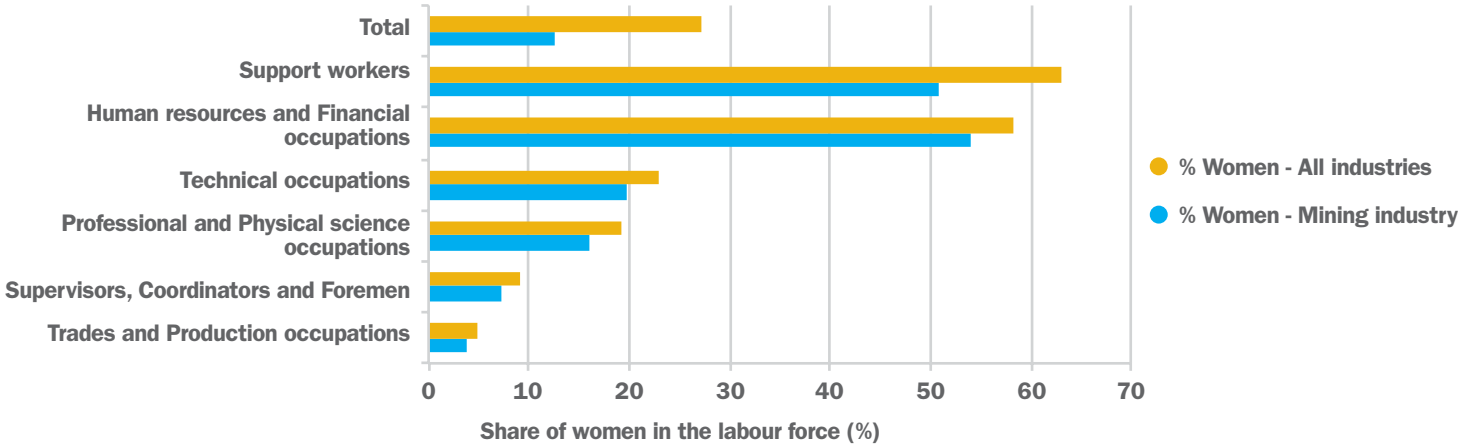
Drilling down to occupations

Figure 17 compares the representation of women in broad occupational categories in mining, with their representation in all industries. Gender disparity in workforce representation is prevalent across occupational categories in the mining sector. As shown in Figure 17, in the mining industry, women are under-represented in occupational categories that are more traditionally associated with a higher proportion of women (e.g. human resources professions). Similarly, even in occupations that traditionally have low female representation, such as STEM-related professions, Figure 17 shows that the mining industry is still not attracting a representative proportion of women into the professional and physical sciences occupations, when compared to all industries.

Interestingly, the share of women in trades and production occupations is relatively small, regardless of whether the focus is on the mining industry or all industries. This would suggest that the underperformance shown in these occupations extends beyond mining and that other industries also struggle to attract women into these areas.

[6]*Note: This may overstate employment of women in mining, given that unemployment rates among women in mining is relatively high compared to men.*

Figure 17: Representation of women in all industries and in mining, by broad occupational category (2011)

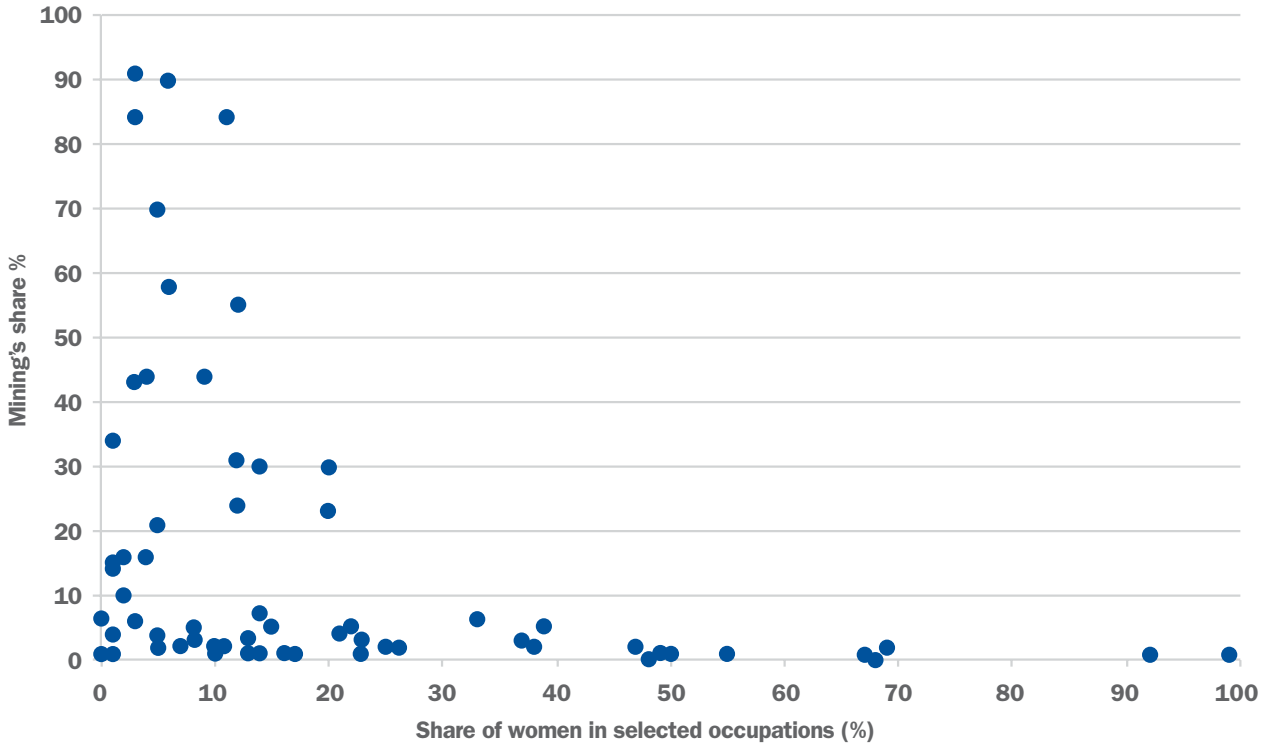


Source: Mining Industry Human Resources Council, Statistics Canada, 2016

An occupational analysis of the mining labour force shows that women frequently make up less than 20 per cent of workers in most of the 70 occupations tracked by MiHR. For the occupations considered, Figure 18 compares the percentage of women and mining's traditional share of new entrants; the latter measure serves as a gauge for how specific an occupation is to the mining industry.

The figure shows a distinct pattern: there is a lack of occupations observed to have both a high proportion of women and that are highly specific to mining. That is, as an occupation becomes more specific to the mining industry, there is a general tendency for that occupation to show less representation among women. For example, mining's share of available talent in the occupation of underground miner is 91 per cent and yet, within this occupation, women represent only 3 per cent of the workforce. For mining engineers, the sector attracts 55 per cent of the total available mining engineers; however, only 12 per cent of mining engineers are women. Conversely, for occupations that show less attachment to the mining industry (i.e. mining's share of total available talent is low), such as administrative clerks (mining's share 1 per cent) and secretaries (mining's share 1 per cent), very high levels of female representation exist, 92 per cent and 99 per cent respectively. As indicated in Figure 18, in general, mining-specific occupations coincide with low female representation.

Figure 18: Mining's share of new entrants versus representation of women in mining-related occupations



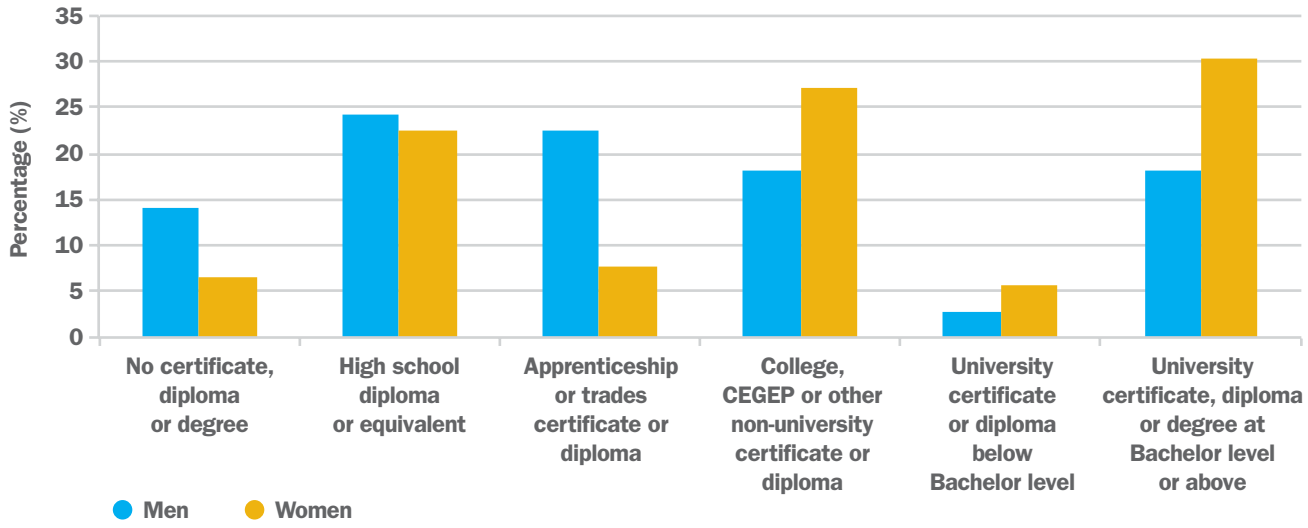
Source: Mining Industry Human Resources Council, 2016

Gender and educational attainment

Given that women are under-represented in mining's labour force, it is important to investigate how this gap represents missed opportunities; to the extent that women may possess comparative advantages — such as having certain skills, education and experience (among other attributes) — their absence signals a potential opportunity to the mining industry.

Women exhibit different education levels in the mining labour force. As Figure 19 shows, compared to men, women are less likely to have an apprenticeship or trades certificate. This imbalance represents an opportunity to better align women's education and skills with the industry's needs, especially given the strong reliance on those with apprenticeship or trades certificates. On the other hand, compared to men, a much higher proportion of women in the mining workforce hold post-secondary degrees or diplomas, at the college or university level.

Figure 19: Highest level of educational attainment in Canada's mining labour force, women and men (2011)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

12,700

Aboriginal peoples worked in the Canadian mining industry in 2015

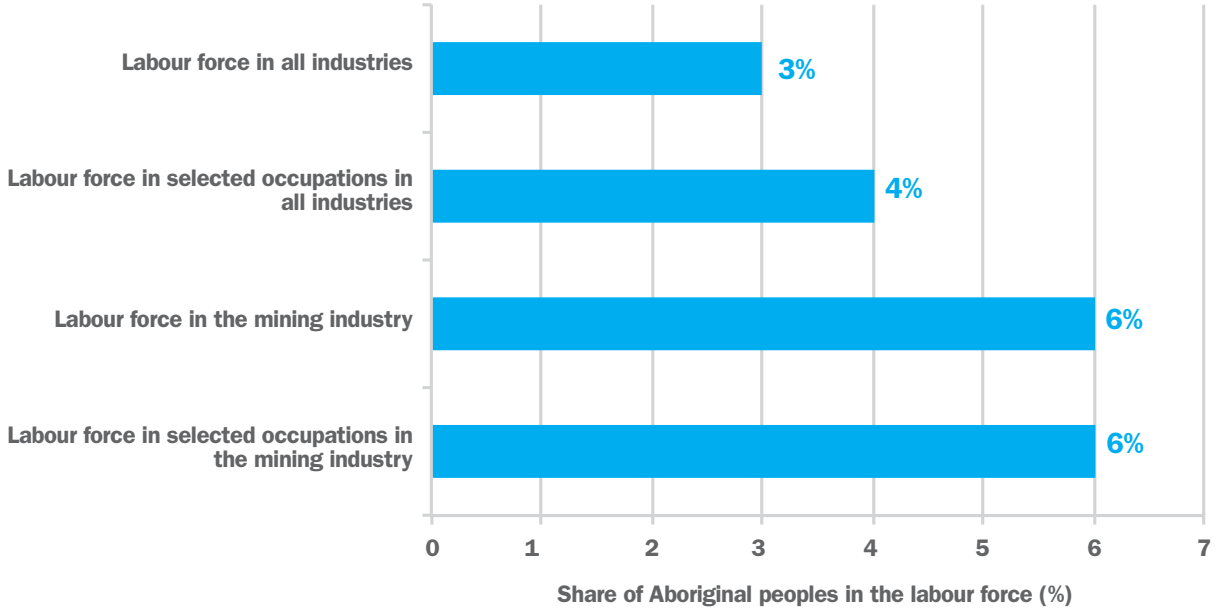
Aboriginal peoples

Aboriginal peoples represent a critical talent source for the mining sector. Many Canadian mining operations are located on traditional Aboriginal territories, and most companies have Impact Benefit Agreements (IBAs) or other agreements with local communities and/or regional governments. The prevalence of these agreements has supported the development of ongoing partnerships between Aboriginal communities and mining organizations. These agreements have also led to the development of skills and training initiatives that support community capacity and workforce development, and have increased mining employers' access to a skilled and engaged local workforce. MiHR's *Mining Essentials: A Work Readiness Training Program for Aboriginal Peoples* is a good example of such an initiative.

As shown in Figure 20, Aboriginal peoples represent just over 3 per cent of Canada's labour force in all industries and close to 4 per cent of all individuals working in MiHR's list of selected occupations. By comparison, Aboriginal peoples show an apparent attachment to the mining industry, representing around 6 per cent of the mining labour force overall, as well as in the selected occupations. Based on these percentages — and MiHR's reported employment for the industry —roughly 12,700 Aboriginal peoples were working in the mining industry in 2015.[7]

Although Aboriginal peoples make up a small percentage of the total labour force, the mining sector has been very successful in engaging with and employing Aboriginal peoples within the industry. In addition, the mining sector and the specific occupations that best define the sector are attracting Aboriginal peoples in higher proportions than their representation in the general labour force.

Figure 20: Representation of Aboriginal peoples in the labour force (2011)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016

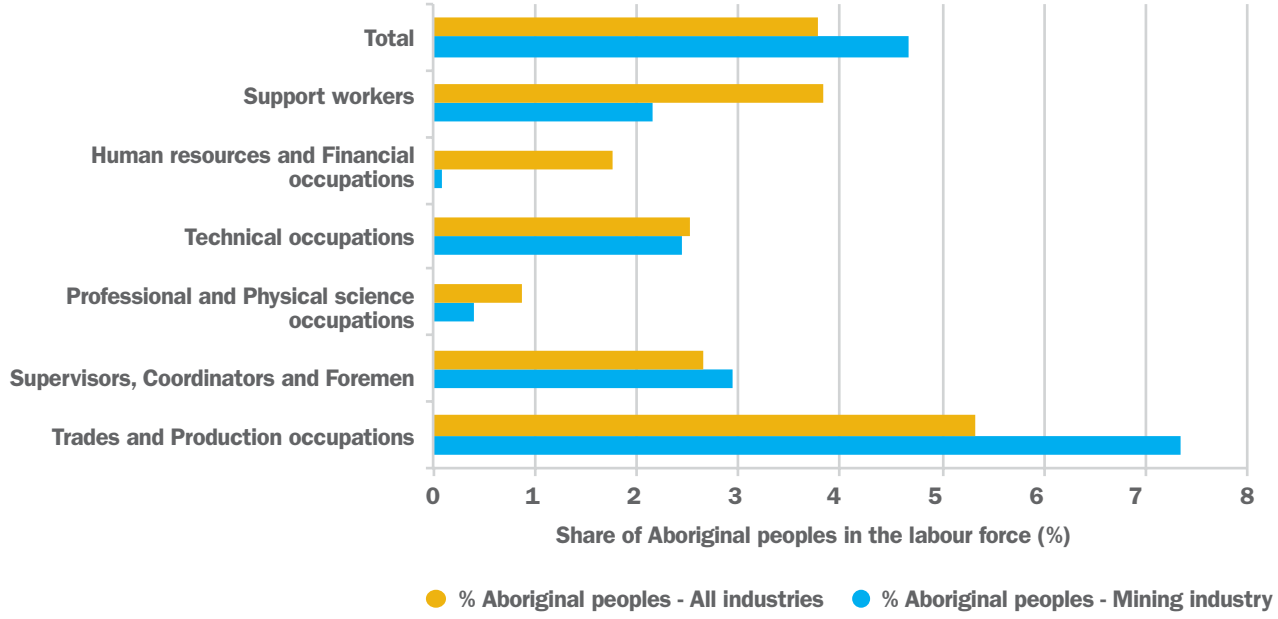
[7]*Note: To the extent that unemployment among Aboriginal peoples in mining is relatively high compared to non-Aboriginal peoples, this number may be overestimated.*

Aboriginal representation by occupation

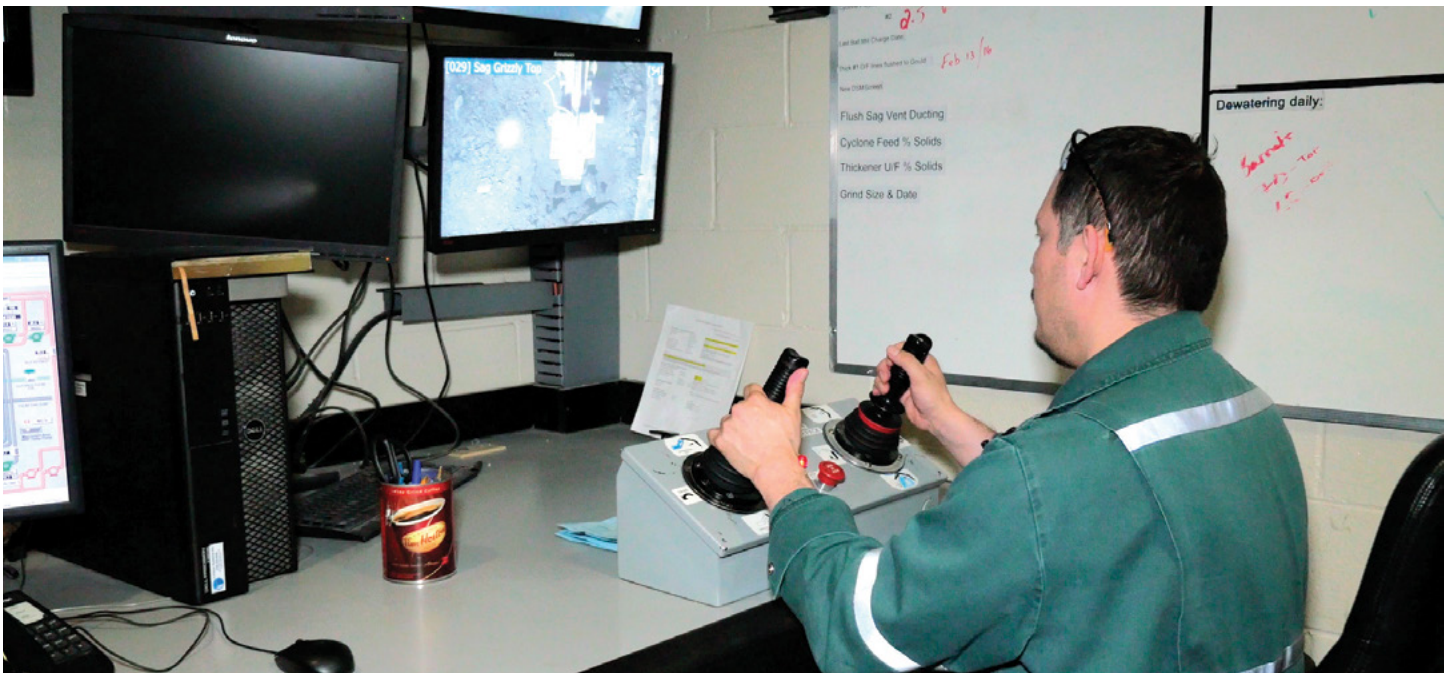
Compared with all industries, the mining industry is exceeding in the engagement of Aboriginal workers in occupations that tend to be specific to mine sites, but is lagging in the attraction of Aboriginal peoples working in professional, science and corporate roles. Figure 21 shows a higher proportion of Aboriginal mining workers in trades and production occupations and in supervisor, coordinator and foremen roles, when compared to all industries.

For human resources and the professional and physical science occupations, the mining industry is not attracting Aboriginal workers in these occupational groups at the same rate as other industries.

Figure 21: Representation of Aboriginal peoples in all industries and in mining, by broad occupational category (2011)



Source: Mining Industry Human Resources Council, Statistics Canada, 2016



2%

In many specific occupations, the number of Aboriginal peoples is less than 2 per cent. These include engineering managers, geological engineers, and engineering technologists and technicians.

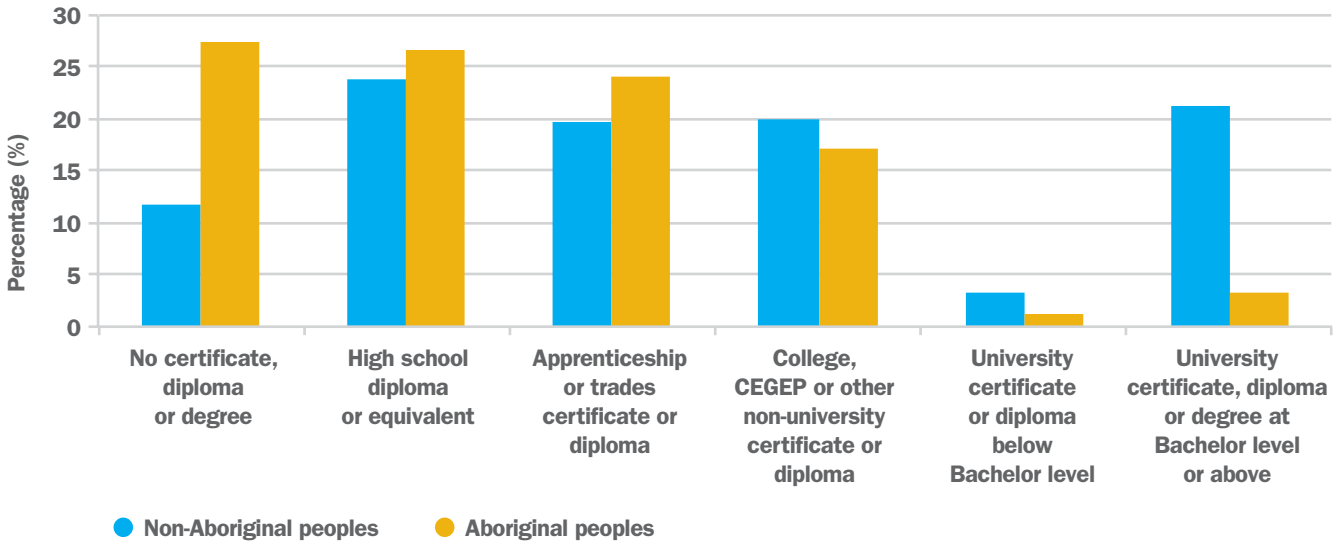
Employment of Aboriginal peoples and educational attainment

As mines are often located close to Aboriginal communities and/or on traditional lands, Aboriginal participation in the labour market provides an obvious benefit both to the mining operations and to the surrounding communities. Yet, ensuring that Aboriginal peoples have access to employment opportunities can be a challenge, considering the disproportional number who either have no certificate, diploma or degree, or simply do not participate in the wage economy.

Figure 22 compares educational attainment among Aboriginal and non-Aboriginal peoples in the mining labour force. The proportion of Aboriginal peoples without a certificate, diploma or degree is considerably higher than for non-Aboriginal populations. This imbalance points to potential limitations for Aboriginal peoples looking to expand their career prospects within the mining industry.

Educational attainment is further related to labour force participation; MiHR's 2015 national outlook report found that those with no certificate, diploma or degree are less likely to participate in the labour force. Equally, labour force participation is significantly boosted among those with a certificate, diploma or degree.

Figure 22: Highest level of educational attainment in Canada's mining labour force, Aboriginal peoples and non-Aboriginal peoples (2011)



Source: Mining Industry Human Resources Council, Statistics Canada, 2015

Immigrants

In MiHR's 2015 *National Employer Labour Market Information Survey,* employers indicated that attracting and retaining more women and Aboriginal peoples were strong focuses in their diversity strategies and efforts. In contrast, mining employers were less likely to report specific diversity strategies that were focused on increasing the engagement of immigrant workers. Recent research into the workforce barriers faced by immigrants in the mining sector indicated specific concerns around the foreign credential recognition process; challenges in validating workplace experience outside of Canada; and difficulties in connecting immigrants with the mining workforce community. There appears to be a disconnect between employers' understanding of how to recruit immigrant workers and cross-cultural sensitivity in mining workplaces.

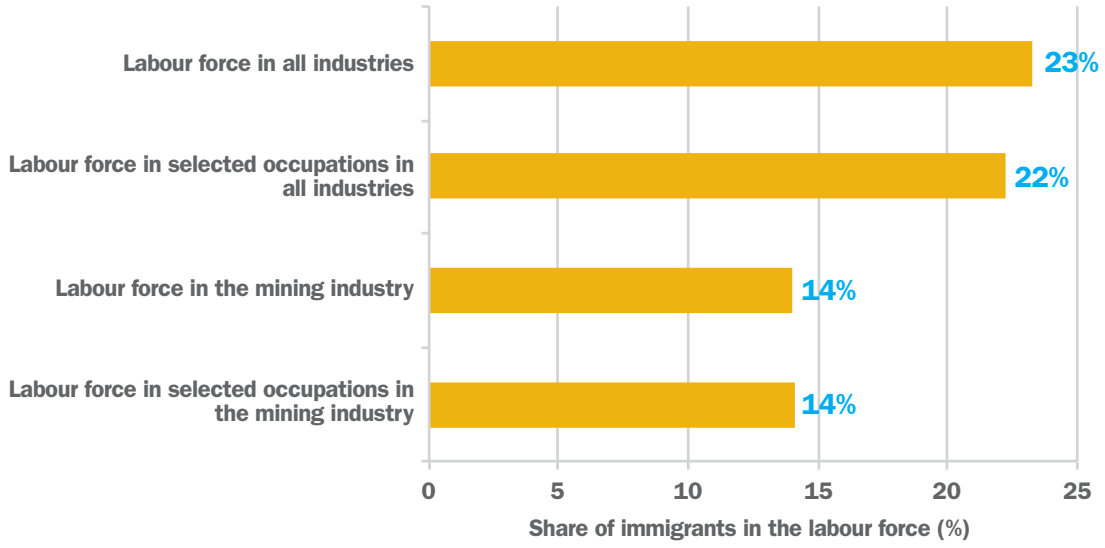
Immigrant workers represent an untapped opportunity of potential labour supply for the mining sector, especially because they tend to have higher educational qualifications than the overall workforce, and bring international experience and new perspectives to the Canadian industry.

As indicated in Figure 23, immigrant workers make up 23 per cent of the total Canadian labour force. By comparison, immigrants represent only 14 per cent of the labour force in the mining industry. When we look specifically at the select occupations that best define the mining industry, immigrant workers represent 22 per cent of the overall workforce in those occupations. Comparatively, when we look at those occupations within the mining industry, immigrants account for only 14 per cent of the workforce.

Similar to the representation of women, the mining industry is not getting its fair share of the immigrant talent pool within the occupations that matter most to the industry.

Based on these percentages and MiHR's reported employment for the industry, there were approximately 32,200 immigrants working in mining in 2015.

Figure 23: Representation of immigrants in the labour force (2011)



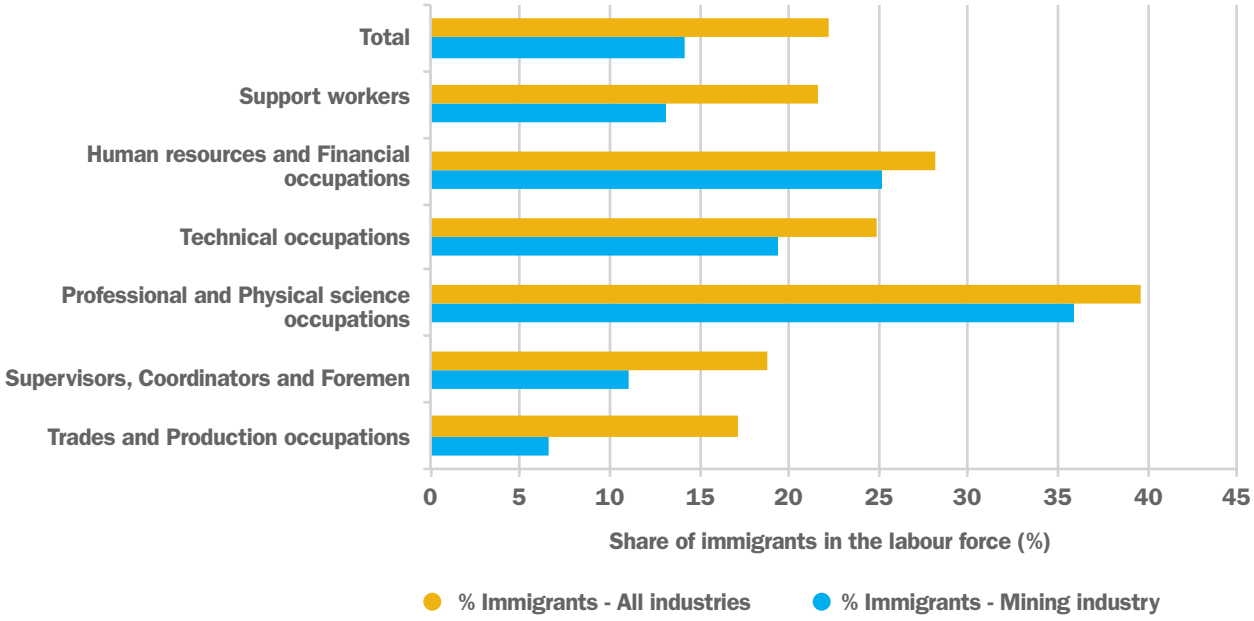
Source: Mining Industry Human Resources Council, Statistics Canada, 2016

The immigrant labour force by occupation

As shown in Figure 24, compared with all industries, the mining sector is underachieving in the engagement of immigrant workers across broad occupational categories. Unlike Aboriginal representation, which showed a higher proportion of workers in occupational categories associated with site operations (e.g. trades and production, and supervisors), immigrant representation is proportionally lower in these occupational categories within the sector, while the occupations more associated with corporate or professional roles, such as human resources, financial occupations and professional and physical sciences, showed less disparity.

Figure 24 demonstrates the share of immigrants in all occupational categories is smaller than in all industries, but is particularly notable in the trades and production occupations - a pattern distinct from that observed for women. This would suggest that the under-performance shown in these occupations is more specific to the mining industry, as other industries have demonstrated a stronger ability to attract immigrants into the trades and production occupations.

Figure 24: Representation of immigrants in all industries and in mining, by broad occupational category (2011)

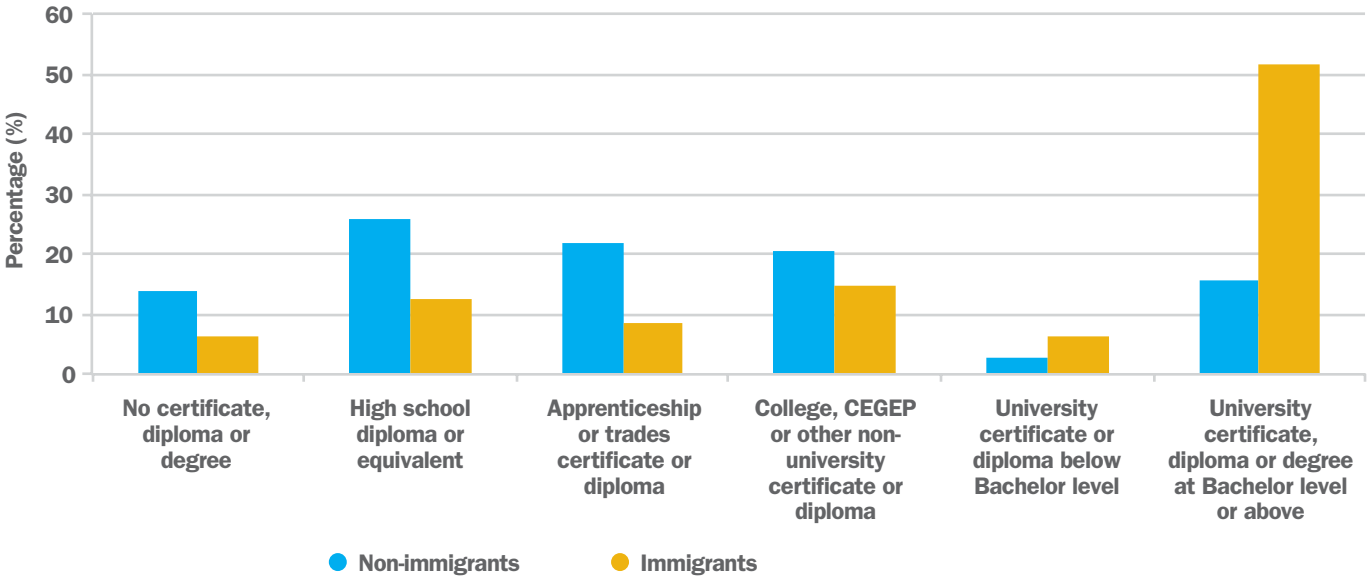


Source: Mining Industry Human Resources Council, Statistics Canada, 2016

Immigrant employment and educational attainment

The movement toward advanced educational attainment in the mining workforce means that those with higher levels of education are in higher demand. As shown in Figure 25, immigrants in the mining workforce are far more likely to hold a university degree, compared to non-immigrant employees.

Figure 25: Educational attainment among immigrants and non-immigrants in the mining industry (2011)



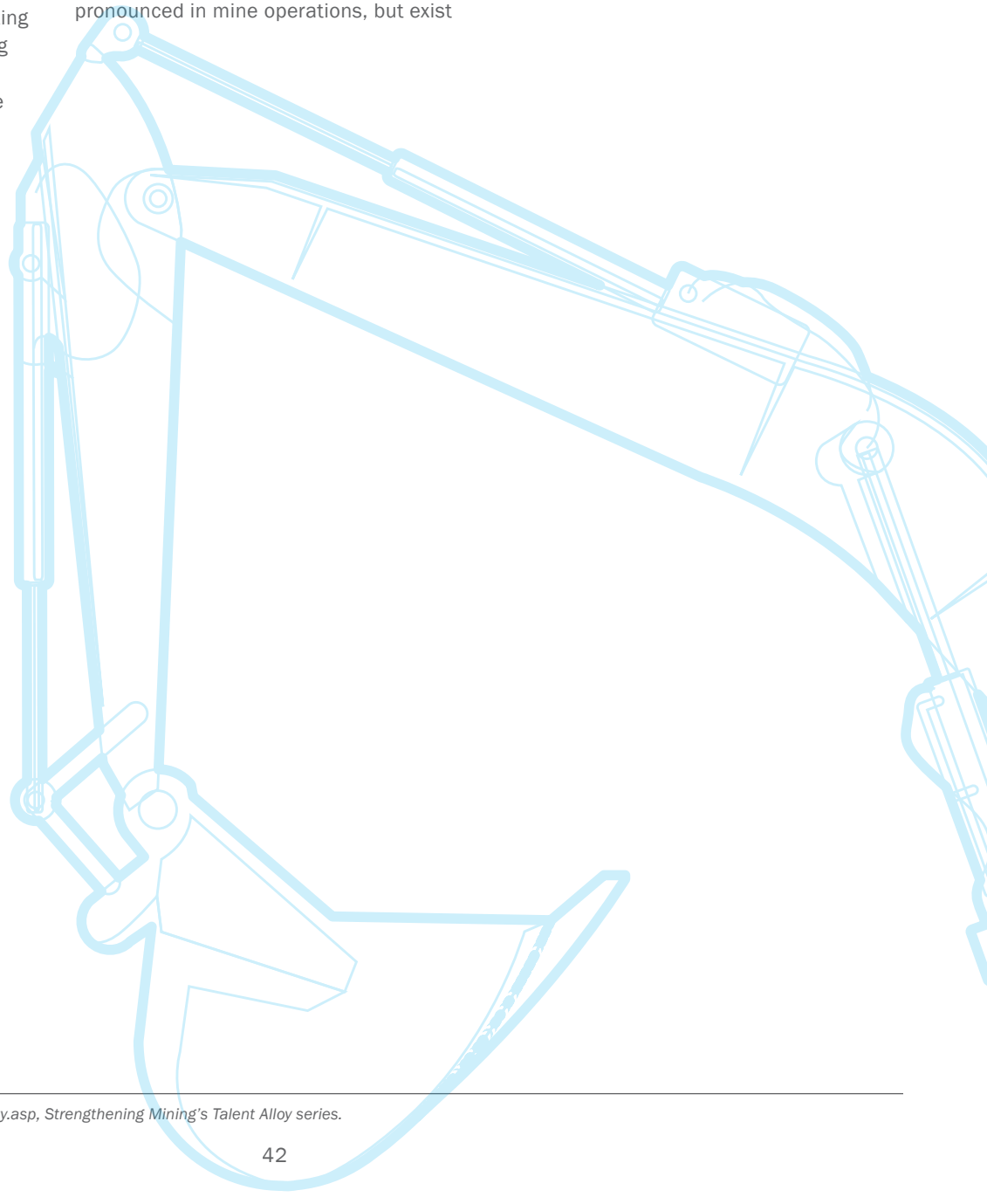
Source: Mining Industry Human Resources Council, Statistics Canada, 2015

Engaging a more diverse workforce: under-representation and underutilization

The mining sector faces significant challenges in the engagement of women, Aboriginal peoples and immigrant talent. There are some occupations that have higher proportional representation in mining compared to the overall labour force — but there is strong indication that something specific about the mining sector is preventing a more representative labour pool. Recent research conducted by MiHR on workplace barriers outlined some aspects of the mining workplace culture and implicit bias that may be a factor in this inclusion lag. In May 2016, MiHR published a suite of studies looking at workplace barriers and documenting the experiences of women, Aboriginal peoples and immigrants working in the mining industry.[8]

For women and immigrants, broad under-representation is layered over specific occupational gaps. For Aboriginal workers, despite greater proportional representation in the mining sector, there are specific occupations where underutilization is occurring. Understanding how these groups differ with regards to under-representation and underutilization supports the development of more effective policy and strategic initiatives. For example, the sector may focus strategies on engaging more highly qualified Aboriginal workers in mining occupations, while engaging more immigrants in mine operations roles. For women, like immigrant workers, the occupational differences are more pronounced in mine operations, but exist in all occupational categories — resulting in a need for a more comprehensive strategy to address barriers that occur early in the talent pipeline and within mining workplaces.

In May 2016, MiHR launched a national dialogue on diversity in the mining workforce. The purpose of this dialogue is to engage stakeholders in developing practical ways to help mining organizations engage a more diverse workforce, create inclusive workplace cultures and set a future research agenda for workforce planning and diversity issues.



[8]*See http://www.mihr.ca/en/publications/Diversity.asp, Strengthening Mining's Talent Alloy series.*

SUMMARY AND CONCLUSIONS

The key characteristics, observations and trends contained in this report provide a reference and guide for governments, educators, policymakers and employers, as they address the major human resources challenges in Canada's mining industry. This section summarizes the main findings and highlights their significance to the development of potential counter-balancing strategies moving forward.

As highlighted, the industry has experienced a weaker economy in recent years, and as a result, has responded by scaling back on operations. Projected performance in the first six months of 2016 for key determinants of mining employment — such as commodity prices — have fallen below the level expected one year ago. Yet, the long-term outlook for these factors and for the employment in the industry has remained similar, in spite of an adjustment over the last year. The inherent volatility of Canada's mining industry can overshadow the long-term view. Therefore, the recent environment — although relevant to the industry today — is balanced with a 10-year horizon in mind.

This report provides a deeper examination of employer's hiring needs, which have been evolving over time. Since previous forecasts produced by MiHR, updated projections reveal that employers' needs are progressing toward workers with advanced levels of education and training. Also, the demographics of the industry's labour force suggest that the industry will be tasked with compensating for a loss of experienced workers over the next decade. The situation is even more challenging, considering how the occupational structure of the workforce will change over time, with the introduction of new technologies and processes within the mining industry.

Even as the need for workers is continually shifting, many of the industry's key human resources issues centre on an overall lack of labour supply — a characteristic that is consistent throughout economic cycles. There are many opportunities for the mining industry to strengthen the talent pipeline. Notably, the under-representation of diverse groups in the industry — including women, Aboriginal peoples and immigrants — suggests that the industry is not getting the most out of all potential labour sources that exist in Canada. Mining will need to continue to take steps towards creating a more inclusive workplace that fosters workforce diversity in order to remain competitive in the future.

This problem is amplified during a strong economy but is not removed during an economic downturn. As such, a well-functioning labour market is able to respond and react to all economic situations, and positive outcomes will only be made possible through a healthy pipeline of labour supply from all sources.

Notes

Notes

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