

Industry Skills Forecast and Proposed Schedule of Work

Mining, Drilling and Civil Infrastructure

*Mining, Drilling and
Civil Infrastructure*

*Industry Skills
Forecast and
Proposed Schedule of
Work*

April 2017

Version 2.0 – 28 April 2017



Private & Confidential

28/04/2017

Industry Skills Forecast and Proposed Schedule of Work

The Industry Skills Forecast and Proposed Schedule of Work (ISFPSW) presented here sets out the training product development priorities for the Mining, Drilling and Civil Infrastructure (MDCI) Industry Reference Committees (IRCs) through to June 2021. It is based on research, analysis and consultations with IRC members and other stakeholders. The content in the ISFPSW draws on SkillsDMC's 2016 4-Year Work Plan for the Resources and Infrastructure Industry (RII), though information included in this report has as best as practicable been verified by PwC's Skills for Australia. This skills forecast has a particular focus on the Council of Australian Government (COAG) principles for training package development. The principles, and our responses to them, are described below. Training packages must:

- **Reflect identified workforce outcomes.** We have used the most recent data available in this report to come to evidence based conclusions.
- **Support national (and international) portability of skills and competencies, including reflecting licensing and regulatory requirements.** Where applicable, we advocate for nationally recognised skills in the VET sector, and realise the value of a nationalised system.
- **Reflect national agreement about the core transferable skills and core job-specific skills required for job roles as identified by industry.** Industry, through the IRCs, has provided invaluable feedback throughout the consultation process. Their input forms a key part of our findings particularly as it relates to recognising and responding to the fact individuals are unlikely to remain in the same job for life.
- **Be flexible enough to meet the diversity of individual and employer needs, including the capacity to adapt to changing job roles and workplaces.** Our approach is to look to the future, and where we can, address issues proactively including the recognition that technology and other disruptors will change employer priorities and consequently skills needs.
- **Facilitate recognition of an individual's skills and knowledge, and support movement between the school, vocational education and training (VET), and higher education sectors.** Accessing vocational education from school or reskilling should be a simple and effective process. Access to education always plays a major role in our recommendations.
- **Support interpretation by training providers and others through the use of simple, concise language and clear articulation of assessment requirements.** Plain English communication shows true understanding of the subject matter. We strive to deliver clarity on complex, technical issues.

This ISFPSW has been prepared by PwC's Skills for Australia and the MDCI IRCs.

Yours sincerely,



Sara Caplan CEO PwC's Skills for Australia	Tony Baulderstone Chair Civil Infrastructure IRC	Darryl Cooper Chair Coal IRC	Tim Westcott Chair Drilling IRC	Mark Knowles Chair Metalliferous Mining IRC	Leanne Parker Chair Extractive IRC
--	---	------------------------------------	---------------------------------------	---	--

Executive summary

In developing this ISFPSW, the Skills Service Organisation (SSO) and IRCs aim to refocus the discussion of skills and training to ensure that training design is centred on that which will equip learners with the right knowledge and skills to pursue fulfilling careers in the Mining, Drilling and Civil Infrastructure (MDCI) sector. This requires setting a clear narrative from industry trends, to skill needs, and through to specific training requirements. To do this requires three key elements (as reflected in the structure of this ISFPSW):

- **Understanding the industry** (*Sector overview*) – What activities make up the sector that training is being designed for? What are the sub-sectors within the broader industry and sector and how different or similar are they? Who are the employers and where are they located? Who is undertaking training in the industry and sector and where is that training being undertaken?
- **Understanding the trends shaping the industry and sector and the skills priorities they lead to** (*Skills outlook*) – What is impacting on the industry and sector? This includes how global trends in demographics and digital change are impacting on activities in the sector and how domestic economic conditions are influencing growth as well as industry specific trends. Further, how do these trends influence skills needs within the sector? What are employers telling us about their engagement with vocational education and training (VET) and the skills acquired by learners?
- **Implications for training** (*Proposed Schedule of Work*) – What does the current Training Package look like and does it align with the trends and skills priorities identified? Are there any gaps and what needs to change? How should these training products be reviewed?

The views of businesses, learners and other key stakeholder in the MDCI sector are also critical to understanding the workforce skills needs and therefore the best approach to training product review.

Updates from previous SSO 4-Year Work Plan

This ISFPSW builds on the work undertaken by the interim SSO for the RII Training Package. Key changes between the previous body of work undertaken and this ISFPSW include:

- Condensing the findings of the interim SSO's report into four key trends. These trends are intended to be broad, and each one encompasses many of the previous findings.
- Additional research, including data from the National Centre for Vocational Education Research (NCVER), Australia Bureau of Statistics and various Commonwealth, State and Territory Department statistics, was drawn upon to understand trends, learner challenges and opportunities, and the changed employment landscape over the past year.

PwC's Skills for Australia will continue to work with the IRCs and relevant stakeholders to build upon this content, informing the best approach to training product review.

What is the MDCI sector?

The MDCI sector encompasses a broad range of activities, from open cut coal mining to the construction of water and gas pipelines. The wider MDCI group can be split into the following five sub-sectors:

- **Civil Infrastructure** – This sub-sector includes all civic and industrial infrastructure works (excluding the erection of buildings), and includes the following activities: road construction, plant operation, pipeline construction, trenchless technology, bridge construction, rail construction and tunnelling.

- **Coal Mining** – This sub-sector includes both open cut and underground coal mining. The industry is concentrated in NSW and QLD, with the states containing 97 per cent of black coal economic demonstrated resources (EDR).¹ Brown coal resources are concentrated in Victoria, with around 93 per cent of brown coal EDR located in the Latrobe Valley.²
- **Drilling** – This sub-sector includes both onshore and offshore drilling, as well as surface and underground drilling. Drilling is used in mineral exploration and production, geothermal energy production, water well drilling, civil infrastructure and agriculture. Drilling itself is a multidisciplinary industry and shares many core skills with the sub-sectors in the wider MDCI sector.
- **Extractive Industries (Quarrying)** – The quarrying subsector focuses on the extraction of raw materials used in building and construction, such as sand, rock, gravel and limestone. Given the abundance of these raw materials in many parts of Australia, quarrying sites are generally located close to the major sites of building and construction. As such, the sub-sector is spread across Australia according to population and infrastructure investment.
- **Metalliferous Mining** – This sub-sector includes both the surface and underground mining of iron ore, copper, tin, nickel, gold, silver and zinc. The skills learnt in metalliferous mining are also relevant to the mining of gemstone, uranium and mineral sands.

What are employers telling us?

Drawing from research and initial consultation with employers in the industry and sector, there are two key messages:

- **MDCI jobs require unique skills.** Given the unique work done in the MDCI sector, employers often find that the skills developed outside the sector are not applicable to the sector. For example, individuals who hold maintenance qualifications obtained in a different sector will often need substantial retraining when they enter the MDCI sector. This is in part due to the size of the equipment used in the MDCI sector, but also the complexity and safety hazards that are often present.³
- **Heavy regulation in the sector has placed increased scrutiny and costs on employers.** The MDCI sector is heavily regulated, translating to a high standard of operation of both employers and employees. Employers are often faced with the challenge of keeping up to the standards of the sector, while balancing costs, revenues and profitability. For example, on site verification of competence (VOC) has resulted in increased needs for assessor skills to facilitate VOCs. This creates increased pressure for employers, as there is a trade-off between achieving compliance in a cost effective and timely way and quality of skilling outcomes. Examples of three or more units of competency being trained and assessed in two days are common. Workers will often then be retrained and assessed as part of site specific inductions to ensure they can work safely and efficiently.

What are learners telling us?

Drawing from survey data, such as the NCVER 2016 *Government-funded student outcomes survey*, there are three key messages:

- **RII graduates are earning more than their peers.** Graduates from the RII Training Package earned a median salary of \$70,400 in 2015, compared to \$56,000 across all training packages.⁴
- **It is a male dominated sector.** Males make up 95 per cent of learners in the Training Package, compared to approximately 64 per cent across all training packages.⁵

¹ Australia's Identified Mineral Resources 2016. Geoscience Australia, p. 4.

² Ibid

³ RII UoCs are generally generic to types of equipment, whereas verification of competency is usually linked to specific makes and models

⁴ National Centre for Vocational Education Research (2015) *Employment outcomes after training 2015*

- **RII qualifications are applicable to many industries.** Only 19 per cent of graduates from the RII Training Package are employed in occupation they trained for, but 70 per cent believe that their training was relevant to their employment after graduation.⁶

Trends shaping the sector

Industry feedback, combined with research and analysis indicates that the following trends will be shaping current and future skills needs.

1. Urbanisation of Asia

The continuing urbanisation of Asia will drive reliable demand for Australia's resources well into the future, particularly iron ore, copper and coking coal. With increasing urbanisation comes an increase in energy demand and need for reliability. As Asia cannot support itself on a resources basis at current production levels, this translates to ongoing demand for Australian resources. Asia's shift toward renewable energy means a drop in demand for Australian thermal coal, while other resources, such as those used in wind turbines and solar panels, will increase in demand.

2. Environmental issues

Environmental issues affect the level of regulation and demand for many of the commodities produced in Australia, such as coal and uranium, and have the ability to affect permanent structural change. Pivots in policy from state, territory and federal governments as a result of environmental issues have the ability to enhance or diminish the viability of certain commodities. The recent global push toward renewable energy translates to a bright future for Australian metal miners, and declining prospects for thermal coal miners.

3. Technological change

With the ever increasing sophistication of software programs and integration with automated technology, technological change will continue to affect all industries. Innovative practices, driven by technological change, will bolster economic growth and wealth in the MDCI sector. Technology driven growth will be important for the current workforce, creating new job opportunities for those in roles currently at risk of automation. An increase in demand for users of robotics, remote operating sites and Building Information Modelling (BIM) currently is, and will continue to affect the sector.

4. Evolving business pressures

Business pressures encompass a wide variety of factors, characterising the phase of the industry in its lifecycle (expanding, producing, contracting), impacting the level of competition and regulation within a sector, and driving the cyclical nature of many businesses. The MDCI sector is currently facing two major pressures, namely a drive for efficiency and production as opposed to expansion, and an ever increasing international competition. The ability of the sector to respond and adapt to these pressures will be key to their success.

⁵ National Centre for Vocational Education Research (2015) *Students and courses 2015*

⁶ National Centre for Vocational Education Research (2015) *Total VET graduate outcomes information 2015*

Skills priorities

To enable a flexible and skilled workforce that is able to adapt to the trends shaping the sector, the IRCs have identified the following skills priorities.

1. Analytical skills

With the push toward productivity and efficiency, workers in the MDCI sector will need the ability to prioritise, collect and analyse data, in order to identify the best way forward. Strong analytical skills and an understanding of key factors driving value in their business will enable workers in the industry to make the right decisions.

2. Management and supervisory skills

As much of the mining industry transitions away from expansion and into production, managers need to be able to make tough decisions while keeping morale in the workforce intact. This is particularly true for coal mines and the major gas projects which are entering into production. Strong management and supervisory skills will help keep workers focused and motivated, and help to identify areas in the business where improvements can be made.

3. Digital technology and software skills

Technology is disrupting the way people work in all sectors of the economy. In the MDCI sector, recent advances in software have enabled data to be collected on a level never before seen. In order to make use of this capacity for data collection, workers in the industry need to be up to date with recent software. One such program is Building Information Modelling (BIM), which has already gained widespread endorsement in Australia. Given the high Australian wage, workers in the sector must be able to operate at peak productivity levels if they are to remain competitive, and utilising the latest software will assist them in this pursuit.

Proposed Schedule of Work

PwC's Skills for Australia's mandate as a SSO to our IRCs, as set by the Australian Industry Skills Committee (AISC), is to review all Units of Competency (UoCs) in the RII Training Package within the four years from 2017-18 to 2020-21. The Proposed Schedule of Work presents projects that comprise the review of all these UoCs through to June 2021.

A summary of all projects in the Proposed Schedule of Work is shown in Table 1. The rationale for each project, as well as the principles used for prioritisation and scheduling are included with the full Proposed Schedule of Work in Section F. To deliver consistency to industry, we have accepted the priorities laid out in the first year of SkillsDMC's 2016 4-Year Work Plan that have been approved by the Department of Education and Training. The priorities in the later years are subject to change, upon re-engaging IRCs and relevant stakeholders. Note that only the first year has designated UoCs to review.⁷

PwC's Skills for Australia has already received a large amount of feedback from the IRC, State and Territory Authorities and other stakeholders. We have collated this feedback, and will continue to consult with industry and build on this information as we commence with training product development.

Table 1: Summary of Proposed Schedule of Work

Year	Project name	UoCs for review
2016-17	Mobile plant operation & materials handling units of competency	76
2016-17	Traffic control units of competency	2

⁷ For the purposes of funding forecasts, all remaining units are expected to be reviewed in years 3 and 4 in an even split. Upon further consultation with the MDCI IRCs, the priority of certain projects will be determined and elaborated upon

Mining, drilling and civil infrastructure
 Industry Skills Forecast and Proposed Schedule of Work

Year	Project name	UoCs for review
2016-17	First response emergency units	3
2016-17	Shotfiring units	2
2016-17	Tyre fitting units	2
2016-17	Mine regulation for supervisors (IRCs to present case for change)	3
Total UoCs planned to be reviewed in year 1		91
2017-18	Contemporary and emerging blasting methods	TBC
2017-18	Supply chain approach to skilling	TBC
2017-18	Underground service location and vacuum truck review	TBC
2017-18	Geotechnical risk in quarries	TBC
2017-18	Drilling equipment and method	TBC
2017-18	Bituminous Surfacing	TBC
2017-18	New and emerging technology and systems	TBC
2017-18	Underground coal operations review	TBC
2017-18	Construction material testing units for on-site laboratories	TBC
Year 2		TBC
2018-20	Review remaining UoCs for relevance and suitability	TBC
Years 3 and 4		TBC

Table of contents

Executive summary.....	1
Table of contents.....	7
A. Administrative information.....	8
B. Sector overview	11
The sector at a glance	11
Sub-sector descriptions.....	12
State by state overview	16
MDCI Training Package profile	18
Challenges and opportunities	22
C. Employment	26
Industry employment outlook	26
Sub-sector outlook.....	27
Supply side challenges and opportunities	28
D. Skills outlook	30
Global and domestic environment	30
Trends shaping the sector	30
Creating a future fit workforce.....	38
E. Other relevant skills-related insights for this sector	41
F. Proposed Schedule of Work.....	42
Proposed Schedule of Work - 2017-18 to 2020-2021.....	42
G. IRC signoff.....	46
Appendix A Occupation classifications.....	47
Appendix B VET and other training in the industry	54
Appendix C Review of the Training Package structure	55

A. Administrative information

About PwC's Skills for Australia

PwC's Skills for Australia supports the Civil Infrastructure IRC, Coal Mining IRC, Drilling IRC, Extractive Industries IRC and Metalliferous Mining IRC.

As a SSO, PwC's Skills for Australia is responsible for working with industry to:

- Research what skills are needed in our industries and businesses, both now and in the future, to provide the right skills to match our job needs; helping us to stay at the forefront of global competitiveness and support continued economic prosperity.
- Identify and understand current and emerging trends in the global and domestic economy and how they impact on Australia's skills needs.
- Work with the IRC to revise our qualifications and training content to better match what people learn with the skills needs of our industries and businesses, giving our population the best possible chance of developing work ready skills.

About the Industry Reference Committees

The MDCI IRCs contain the following members:

- Civil Infrastructure IRC – 13 members;
- Coal Mining IRC – 15 members;
- Drilling IRC – 12 members;
- Extractive Industries IRC – 11 members; and
- Metalliferous Mining IRC – 12 members.

Name	Organisation	Title	IRC role
Civil Infrastructure			
Christopher Melham	Civil Contractors Federation (CCF)	CEO	IRC Member
Pamela Lau	Roads Australia	People Capability Manager	IRC Member
Craig Moss	Institute of Public Works Engineering Australasia (IPWEA)	Director, Professional & Career Development	IRC Member
Trevor Gosatti	Australasian Society for Trenchless Technology	Immediate Past President	IRC Member
Tanja Conners	Australian Asphalt and Paving Association (AAPA)	Director Training & Knowledge	IRC Deputy Chair
Archie Wright	Industry Skills Advisory Council	Industry Engagement Officer	IRC Member
Mark Fagan	Australian Workers Union (AWU)	National Organiser	IRC Member

Brad Parker	Construction, Forestry, Mining and Energy Union (CFMEU)	Assistant Secretary	IRC Member
Paul Casey	Traffic Management Association of Australian Government (TMAA)	Former NSW President	IRC Member
Tony Baulderstone	Jenton Projects Pty Ltd	Director	IRC Chair
SSO to confirm nomination	TBA	TBA	IRC Member
Keith McIlwain	McIlwain Civil Engineering	Director	IRC Member
Phillip Cassell	Eco Group	Managing Director	IRC Member
Coal Mining			
Darryl Cooper	Minerals Council of Australia (MCA)	TBA	IRC Chair
Andrew Clegg	QLD Resources Council	Associate member	IRC Deputy Chair
Andrew Palmer	NSW Mining and Petroleum Competence Board	Secretariat	IRC Member
Russell Albury	QLD Mines Inspectorate	Chief Inspector of Coal Mines	IRC Member
David Connell	NSW Mines Rescue	Regional Manager	IRC Member
Nigel Haywood	Oil, Gas and Energy Resources Growth Centre (NERA)	General Manager, Education and Work Skills	IRC Member
Greg Dalliston	Construction, Forestry, Mining and Energy Union (CFMEU)	District Union Inspector	IRC Member
Brant Softly	Australian Manufacturing Workers' Union (AMWU WA Branch)	Organiser	IRC Member
Troy McKernan	Australian Workers Union (AWU)	Organiser	IRC Member
Harley Doughty	Orica	Head of Global Training Solutions	IRC Member
Antony Shaw	Ashton Coal Operations Pty Ltd	Health, Safety and Training Superintendent	IRC Member
Duncan Campbell	Ensham Resources	Superintendent Training Systems	IRC Member
Michael Hall	AGL Energy Ltd.	Training and Development Specialist	IRC Member
Scott Layton	BHP Billiton Coal	Lead Organisational Capability	IRC Member
Scott Ellis	Rio Tinto	Specialist Training and Development	IRC Member
Drilling			
Peter Hall	Australian Drilling Industry Association	CEO	IRC Member
Waeel Ilahi	WA Department of Mines and Petroleum	Team Leader - Inspector of Mines	IRC Member
Phillip de Coursey	Resources & Engineering Skills Alliance	CEO	IRC Member
Nigel Haywood	NERA	General Manager, Education and Work Skills	IRC Member
Andrew Ogden	Western Irrigation	Managing Director	IRC Member
Ross Pickering	SRG Ltd	Safety and Training Coordinator	IRC Deputy Chair
David Meesey	Savanna Energy	Technical Training Specialist	IRC Member
Philip Spence	Lucas Drilling	Drilling Operations Manager	IRC Member
Tim Westcott	TDW Consulting Pty Ltd/ Australian	Secretary	IRC Chair

Drilling Industry Association			
Steven Mathams	Drillpower QLD	Managing Director	IRC Member
SSO to confirm nomination	TBA	TBA	IRC Member
Rob Wallace	Australasian Assurance Services	Principal Consultant	IRC Member
Extractive Industries			
Paul Sutton	Institute of Quarrying Australia (IQA)	CEO	IRC Member
Leanne Parker	Cement, Concrete and Aggregates Australia (CCAA)	TBA	IRC Chair
Waeel Ilahi	WA Department of Mines and Petroleum	Team Leader - Inspector of Mines	IRC Member
Elizabeth Gibson	Construction Material Processors Association	General Manager	IRC Deputy Chair
Mark Fagan	Australian Workers' Union (AWU)	Organiser	IRC Member
Glenn McLaren	Australian Manufacturers Worker Union (AMWU)	OH&S Advisor	IRC Member
Harley Doughty	Orica	Head of Global Training Solutions	IRC Member
Wesley Woodman	Holcim	Learning and Development Manager	IRC Member
Damien Davies	Boral Construction Materials	RTO Manager	IRC Member
Maria Floro	Hanson	ER Aggregates Training Supervisor	IRC Member
SSO to confirm nomination	Waiting to receive formal advice	TBA	IRC Member
Metalliferous Mining			
Greg Burke	Minerals Council of Australia	TBA	IRC Member
Dick Servin	Rio Tinto	TBA	IRC Member
Waeel Ilahi	WA Department of Mines and Petroleum	Team Leader - Inspector of Mines	IRC Member
John Rowe	Resources Industry Training Council	Manager	IRC Member
Sarah Boucaut	Mining, Equipment, Technology and Services Growth Centre (METS Ignited)	General Manager - Education and Leadership Skills	IRC Member
Glenn McLaren	Australian Manufacturing Workers Union (AMWU)	OH&S Advisor	IRC Member
Mark Fagan	Australian Workers' Union (AWU)	Organiser	IRC Member
Harley Doughty	Orica	Head of Global Training Solutions	IRC Member
Darryl Cooper	Theiss Pty Ltd	Technical Training Specialist	IRC Member
Vicki Anderson	Mount Isa Mines	Senior Skills Centre Advisor	IRC Member
Aaron Gray	Rio Tinto	Quarry Manager	IRC Deputy Chair
Mark Knowles	TBA	TBA	IRC Chair

B. Sector overview

The sector at a glance

The MDCI sector encompasses a broad range of individuals and organisations involved in activities such as civil infrastructure, coal and metalliferous mining, drilling and quarrying.

Taken together, MDCI make up Australia's largest industry, employing more than 1 million people as of 2015, and serving as a pivotal sector to Australian wealth and prosperity.⁸ Historically, mining has been particularly important to Australia, with the nation benefiting from gold rushes since the 1850s, to the present day high demand for iron ore. Civil infrastructure in Australia has recently been bolstered by public investment, with both state and federal governments declaring infrastructure as a definitive priority for the country.

The RII Training Package plays an essential role in skilling workers to operate in the MDCI sector, offering 58 qualifications and 32 skills sets. Figure 1 and Figure 2 illustrate the composition of the mining and construction industries. The RII Training Package does not include building construction, but rather all other forms of construction, such as transport, civic and water infrastructure. A more detailed breakdown of the sub-sectors that make up the MDCI sector is detailed below, in sub-sector descriptions.

Figure 2 Composition of the construction industry by employment proportions

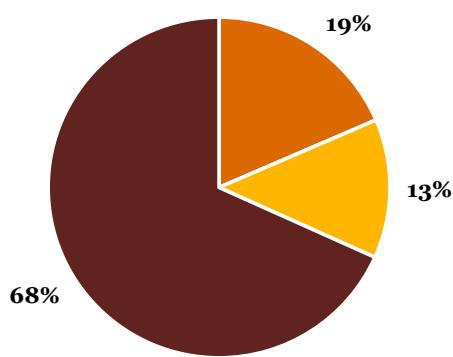
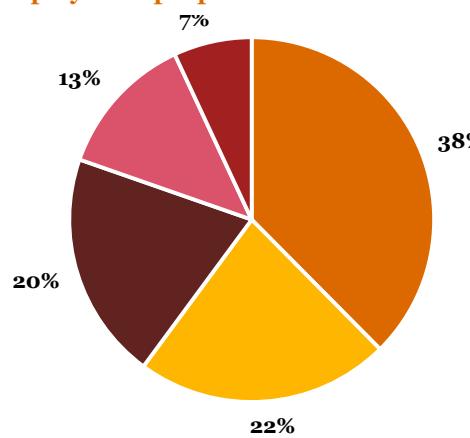


Figure 1 Composition of the mining industry by employment proportions



- Building construction
- Heavy and civil engineering
- Other construction services
- Metal ore mining
- Coal mining
- Oil and gas extraaction
- Exploration
- Quarrying

Source: Australian Bureau of Statistics (2016) Australian Industry by subdivision – employment data. Catalogue 81550.D0002

The MDCI sector has been through significant changes over the past decade, following the extensive mining boom from 2007 to 2014, during which profits in the industry soared and employment was strong. In recent times however, all industries that fall within the MDCI sector have experienced significant changes, either in the form of renewed interest, structural change or technology disruption. As these trends are set to continue, the RII Training Package will play an important role in ensuring workers' skills are kept up to date and that workers are well equipped to move between roles as this industry adapts to these changes.

⁸ Australian Bureau of Statistics (2016) 81550D0001_201415 Australian Industry, 2014-15

Sub-sector descriptions

The MDCI sector is defined, for the purposes of this ISFPSW, as all sub-sectors related to training in the RII Training Package. Using this definition, five key sub-sectors are discussed below.

Figure 3 Composition of RII by sub-sector and IRC

Industry	Mining, Drilling and Civil Infrastructure				
IRC	Coal Mining	Drilling	Metalliferous Mining	Extractive Industries	Civil Infrastructure
Sub-Sectors	Coal Mining	Drilling	Metalliferous Mining	Extractive Industries	Civil Infrastructure

Note: this sub-sector distribution is based on the previous IRC structure

Civil Infrastructure

This sub-sector includes all civic and industrial infrastructure works (excluding the erection of buildings), and includes the following activities: road construction, plant operation, pipeline construction, trenchless technology, bridge construction, rail construction and tunnelling.

- **Sub-sector outlook.** Employment in civil infrastructure increased by 51 per cent from 2007 to 2015, suggesting strong growth in the sub-sector.⁹ From 2014 to 2015, there was a slight drop in both employment and civil infrastructure investment, suggesting that while the industry is strong and is likely to remain so into the future, growth is likely to slow in the coming five years. In 2015, public investment in civil infrastructure increased from \$448 million to \$575 million, representing the highest level of public investment since 2010.¹⁰ This represents the emphasis of state and federal governments on infrastructure programs, particularly around transport, the 2018 Commonwealth Games, and the National Broadband Network. Strong public investment is expected to drive growth in this sub-sector over the next five years.
- **Businesses.** Small businesses are the most common type of employer, representing the private, small scale construction businesses that service the housing market. However, businesses operating complex, large scale infrastructure projects tend to have a large number of employees.¹¹ Therefore, training in the sub-sector needs to cater for a diverse array of working conditions.
- **Workers.** The most common qualification level by enrolment in the civil infrastructure sub-sector is certificate III, representing a majority entry-level delegation of responsibility in the sub-sector. The most common qualification is Certificate III in Civil Infrastructure Plant Operations.

Coal Mining

This sub-sector includes both open cut and underground coal mining. The industry is concentrated in New South Wales (NSW) and Queensland (QLD), with the states containing 97 per cent of confirmed black coal

⁹ Australian Bureau of Statistics (2016). *Australian Industry by subdivision. 81550D0002*

¹⁰ Ibid

¹¹ Australian Bureau of Statistics (2016) *8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2012 to Jun 2016*

reserves.¹² Brown coal resources are concentrated in Victoria, with around 93 per cent of confirmed brown coal reserves located in the Latrobe Valley.¹³

- **Sub-sector outlook.** Employment in coal mining dropped from 45,000 in 2012 to 39,000 in 2015, a decrease of 13 per cent over the three year period. The value of the coal mining sub-sector to the Australian economy peaked in 2009 at \$38.2 billion, then proceeded to decline to \$15.9 billion in 2015, a decrease of 58 per cent.¹⁴ There was a spike in the price of Australian coal from April 2016 to November 2016, with prices almost doubling over this period. This was due in part to efforts by the Chinese government to curb coal production.¹⁵ From November 2016 to February 2017, prices decreased 19 per cent.¹⁶ The Office of the Chief Economist of Australia forecasts an increase in coal exports, increasing from 202 million tonnes in 2016-17 to 209 million tonnes in 2021-22, while the total value of thermal coal exports is expected to drop from \$18.9 billion to \$15.8 billion over the same period.¹⁷¹⁸
- **Businesses.** Large scale businesses dominate the employer market in coal mining, indicating the high capital costs and scaled production required to succeed in the industry.
- **Workers.** Most workers in the coal mining industry have a certificate II or higher. The most common qualification in 2014 was Certificate II in Surface Extraction Operation, representing the entry level qualification for this industry.

Drilling

This sub-sector includes both onshore and offshore drilling, as well as surface and underground drilling. Drilling is used in mineral exploration and production (including coal), geothermal energy production, water well drilling, civil infrastructure and agriculture. Drilling itself is a multidisciplinary industry, and shares many core skills with the other sub-sectors within the wider MDCI sector.

- **Sub-sector outlook.** Employment in the drilling sub-sector has increased steadily over the 2007 to 2015 period, growing from around 10,000 to 22,000. The value of the sub-sector to the Australian economy in 2015 was \$31.9 billion, the highest value in over a decade.¹⁹ The sub-sector will continue to transition from a construction to production phase over the next five years, with revenues forecast to increase as production ramps up.²⁰ Operation and maintenance roles will pick up over this period, in substitution of the construction roles that were required to build the infrastructure. The IRC has presented anecdotal evidence that employment in the sub-sector will increase in the coming years, due to a skills shortage. The success of this sub-sector into the future will depend on the success of the major Liquid Natural Gas (LNG) projects, the largest being the North West Shelf Venture, Gorgon, Wheatstone, Ichthius and APLNG projects.²¹ Success in the sub-sector will also be heavily influenced by global commodity prices. Moving forward, it is expected that onshore drilling will produce more opportunities than offshore drilling.

¹² Australia's Identified Mineral Resources 2016. Geoscience Australia, p. 4.

¹³ Ibid

¹⁴ Australian Bureau of Statistics (2016) *Australian Industry by subdivision. 81550D0002*

¹⁵ World Bank Group (2017) *Commodity Markets Outlook January 2017* page 1

¹⁶ World Bank Group (2017) *Commodities Price Data (Pink Sheet) February and March 2017*

¹⁷ World Bank Group (2017) *Commodity Markets Outlook January 2017* page 32

¹⁸ Office of the Chief Economist (2017) *Resources and Energy Quarterly March 2017*

¹⁹ Australian Bureau of Statistics (2016) *Australian Industry by subdivision. 81550D0002*

²⁰ IBISWorld (March 2017) *Oil and Gas Extraction – Industry Outlook*

²¹ Australian Petroleum Production & Exploration Association (2017) *Australian LNG Projects*

- **Businesses.** There are a large number of small employers in the sub-sector, with 902 small sized employers as at June 2015,²² representing the high proportion of contractors in the industry. There are six large incumbents with over 200 employees each, representing complex, scaled operations.
- **Workers.** Most workers in the drilling sub-sector have a certificate II or higher, and few workers have qualifications higher than diplomas. The most common qualification in the industry in 2015 was Certificate II in Drilling Oil/Gas (On shore), representing the entry level qualification for this industry.²³

Extractive Industries (Quarrying)

Quarrying focuses on the extraction of raw materials used in building and construction, such as sand, rock, gravel and limestone. Given the abundance of these raw materials in many parts of Australia, quarrying sites are generally located close to the major sites of building and construction. As such, the sub-sector is spread across Australia.

- **Sub-sector outlook.** Employment in the quarrying sub-sector has remained steady over the period 2007 to 2015, at around 12,000. The economic value of the quarrying sub-sector has been increasing steadily at a rate of 11 per cent over 2007 to 2015 period.²⁴ The future of quarrying is directly linked to the success of the civil infrastructure and residential construction sub-sectors, as these are the primary users of the materials quarrying produces. Given that the prospects of the civil infrastructure sub-sector are good, the quarrying sub-sector is also expected to pick up over the next five years.
- **Businesses.** Like drilling, there is a large portion of small operators in the market, with 691 small employers as at June 2015.²⁵ There are six employers with over 200 employees in the sub-sector, representing the presence of scaled production for more complex, high capital projects.
- **Workers.** Most workers in quarrying have a certificate II or higher. The most common qualification in 2014 was Certificate II in Surface Extraction Operation, representing the entry level qualification for this industry. There is a high degree of interchangeability of qualifications between coal mining, quarrying and metalliferous mining.

Metalliferous Mining

This industry includes both the surface and underground mining of iron ore, copper, nickel, gold, silver and zinc. For the purposes of grouping types of mines by sub-sectors, metalliferous mining also includes the mining of gemstone, uranium and mineral sands.

- **Sub-sector outlook.** The metalliferous mining sub-sector boomed over the period 2007 to 2014, almost doubling in employment numbers (from 34,000 to 65,000 over the period) and seeing a 154 per cent increase in the economic value of the sub-sector.²⁶ In 2015, while employment remained stable, the value of the sub-sector dropped by 13 per cent, down to \$61.1 billion.²⁷ The strong historical growth in the sub-sector was largely attributed to expansions in capacity, particularly in gold mining, as well as the ramping up of production in iron ore extraction. Ongoing demand for infrastructure in China translates to good prospects for iron and manganese miners. Though the gold price is forecast to steadily decline over the coming decade due to rising interest rates,²⁸ high levels of global debt and

²² Australian Bureau of Statistics (2016) *8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2012 to Jun 2016* (Small is defined as 1-19 employees)

²³ Note that according to the MDCI IRC, this qualification represents the entry level qualification for onshore drilling only.

²⁴ Australian Bureau of Statistics (2016) *Australian Industry by subdivision. 81550DO002*

²⁵ Australian Bureau of Statistics (2016) *8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2012 to Jun 2016*

²⁶ Australian Bureau of Statistics (2016) *Australian Industry by subdivision. 81550DO002*

²⁷ Australian Bureau of Statistics (2016) *Australian Industry by subdivision. 81550DO002*

²⁸ World Bank Group (2017) *Commodity Markets Outlook January 2017* page 25, 31

political instability work toward keeping the price of gold inflated, resulting in higher employment in the sub-sector.

- **Businesses.** There are 51 major employers in the sub-sector, each employing over 200 people. This represents the wide variety of metals mined in the sub-sector, and the different skill sets and equipment required to mine each type of resource effectively.²⁹
- **Workers.** Most workers in metalliferous mining have a certificate II or higher. The most common qualification in 2014 was Certificate II in Surface Extraction Operation, representing the entry level qualification for this industry. There is a high proportion of common skills shared between coal mining, quarrying and metalliferous mining.

²⁹ Australian Bureau of Statistics (2016) *8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2012 to Jun 2016*

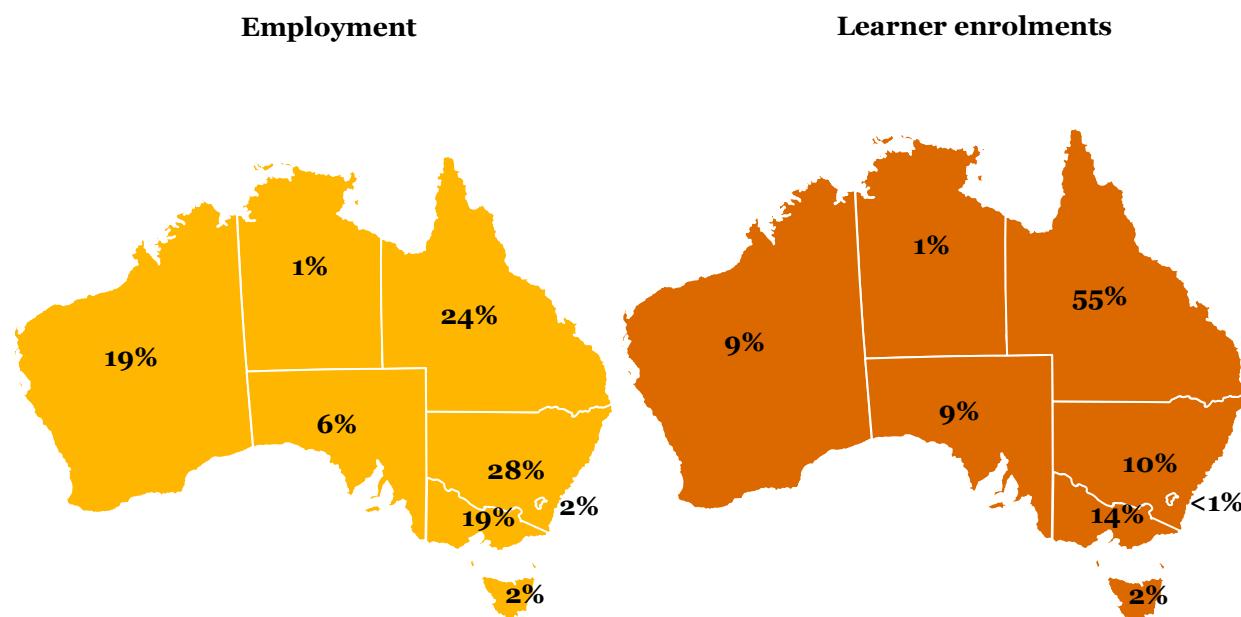
State by state overview

To understand the complexity of this broad sector, it is also important to consider the sector through a state and territory lens. Key differentiating factors between the states and territories include:

- **Distribution of resources.** Given that coal mining, drilling and metalliferous mining are fully dependent on the location of particular ores and minerals, distribution of these activities is concentrated where large, easy to access deposits of the resources are discovered.
- **Sites of major projects.** Civil infrastructure is concentrated around areas of major development, such as greenfield development areas and other large scale infrastructure sites.³⁰ As the materials involved in the quarrying sub-sector are relatively common throughout Australia, as compared to coal and metalliferous ores, quarrying activity is concentrated in close proximity to civil infrastructure. These factors mean that civil infrastructure and quarrying activity is spread across the nation.

Figure 4 illustrates the geographical distribution of learners in the RII Training Package, and workers in the MDCI sector. The distribution of workers is skewed towards New South Wales and Queensland, due to the high proportion of coal mining that occurs in these two states.

Figure 4: Geographic spread of workers and learners



Source: ABS 6291.0.55.003 - Labour Force, Australia, Detailed (by occupation) November 2016, NCVER (2016) Total VET Activity 2015

Differences between states and territories, and key drivers of these differences, include:

- **New South Wales** boasts the largest percentage of current employment in MDCI sector. This is attributable to an abundance of coal and large population. RII learner enrolments are comparatively low compared to current employment. This bias toward other states may reflect the lack of reskilling in NSW, and suggests mining is well into the production phase of the life cycle, as opposed to the investment or construction phase.
- **Victoria** contains around the same amount of workers in the MDCI sector as Western Australia, and the second highest percentage learner enrolments. Though Victoria is not a large producer of black coal, it is the only producer of brown coal, translating to a small number of coal mining jobs in the

³⁰ For example, Clyde, Sunbury and Werribee in Victoria or Yanchep in Western Australia

state. High population growth in the state means that there is a concentration of civil infrastructure and quarrying activity in and around high growth areas, such as Melbourne. Learner enrolments are approximately in line with employment.

- **Queensland's** construction and mining sub-sectors are the first and fourth biggest industries in the state, making up 11 and 7 per cent of the state's economy respectively.³¹ Several major LNG sites were completed in the last five years. As these projects move into production phase, the number of construction workers needed in the industry has decreased, translating to higher unemployment. The number of RII VET enrolments in Queensland is very high when compared to employment. The high number of enrolments is due from structurally higher requirements of vocational qualification in legislation, but also in response to the 2018 Gold Coast Commonwealth Games, which is increasing the need for skilled construction workers, and the retraining of workers who were previously employed in the major LNG plants so they can transition into other roles within the MDCI sector.
- **Western Australia** is currently in a recession,³² due to the decline in economic activity following Australia's mining and construction booms.³³ Employment in the MDCI sector remains high relative to population, at 19 per cent, with many major mines still in the production phase. Learner enrolments are low in Western Australia. This is likely due to the surplus of workers already in the state, and the limited pipeline of projects that are due to start in Western Australia over the coming years, forcing workers to look for training and jobs in other locations.
- **South Australia's** economy is based primarily on healthcare, manufacturing and financial services, rather than mining or construction.³⁴ Employment in the South Australian MDCI sector is proportionate to its population. This suggests that the MDCI sector is neither strong nor weak in South Australia. This is due in part to a lack of accessible natural minerals in South Australia (apart from Olympic Dam), as well as the lack of large scale infrastructure investment compared to the east coast states.
- **Tasmania** comprises a small proportion of the sector, both in terms of jobs and enrolments. The economy is based off healthcare and agriculture, rather than mining and construction.³⁵
- **Northern Territory** comprises a small proportion of employment and enrolment in the MDCI sector. The Northern Gas Pipeline, a major gas pipeline that will connect the gas reserves of the Northern Territory to the east coast market, is due for construction in 2017. This will bring a high, short term boost to the MDCI sector over the construction period.³⁶ Project Sea Dragon, a proposal to build the world's largest prawn farm, is also expected to go ahead, with environmental approval granted in March 2017.³⁷
- **Australian Capital Territory** also comprises a small proportion of employment and enrolment in the MDCI sector.

³¹ Queensland Treasury (2017) *Gross state product at factor cost by industry and main components, Queensland, 2005–06 to 2015–16 (a)*

³² A period of negative growth over two consecutive quarters.

³³ Commonwealth Bank Research, State of the States (2017) *January 2017 State & territory economic performance report*.

³⁴ St George Bank (2016) *State Economic Outlook – South Australia*

³⁵ Department of Treasury and Finance (2016) *State Accounts ABS Cat No 5220*

³⁶ Jemena (2017) *Northern Gas Pipeline*

³⁷ Sea Farms. (2017) *Project Status* <http://seafarms.com.au/project-status/>

MDCI Training Package profile

There are 58 qualifications in the Resources and Infrastructure Industry Training Package (see Table 2). Of the 4.5 million learners enrolled in vocational education qualifications in 2015, **there were 101,803 learners enrolled in the Resources and Infrastructure Industry Training Package**, comprising 2.3 per cent of all learners.³⁸

Table 2: Scale of qualification involvement³⁹⁴⁰

Qualification level	RTOs with scope (March 2017)	UoCs (native and imported)	2015 enrolments
Civil construction			
Certificate I in Resources and Infrastructure Operations	25	16	920
Certificate II in Resources and Infrastructure Work Preparation	80	33	6,591
Certificate II in Civil Construction	71	36	3,044
Certificate II in Bituminous Surfacing	1	25	12
Certificate III in Civil Construction	87	187	14,955
Certificate III in Civil Construction Plant Operations	199	63	33,241
Certificate III in Civil Foundations	6	44	Unknown
Certificate IV in Civil Construction Operations	17	60	33
Certificate IV in Civil Construction Supervision	66	89	2,340
Certificate IV in Civil Construction Design	8	75	90
Diploma of Civil Construction Design	9	82	794
Diploma of Civil Construction Management	13	44	162
Advanced Diploma of Civil Construction Design	8	31	49

³⁸ While data on graduate completion rates would add value to this table, completion rates data is generally less transparent than enrolment data. PwC is currently working with the MDCI IRC to gather and publish a reliable version of this data.

³⁹ Note that some RTOs listed as having a qualification on scope may only deliver some units in the course

⁴⁰ The structure of the table is such that qualifications that are shared across sub-sectors, such as surface extraction being shared across coal, extractive, metalliferous mining and drilling, are in a shared section, so as to avoid duplication.

Qualification level	RTOs with scope	UoCs (native and imported)	2015 enrolments
Advanced Diploma of Civil Construction	3	31	55
Extractive industries			
Advanced Diploma of Extractive Industries Management	5	24	8
Coal mining			
Certificate II in Underground Coal Mining	15	82	1,025
Certificate III in Underground Coal Operations	11	54	248
Certificate IV in Underground Coal Operations	14	33	106
Certificate IV in Surface Coal Mining (Open Cut Examiner)	14	38	748
Diploma of Underground Coal Mining Management	8	30	36
Advanced Diploma of Underground Coal Mining Management	5	28	114
Advanced Diploma of Surface Coal Mining Management	2	25	13
Metalliferous mining			
Certificate II in Underground Metalliferous Mining	24	64	319
Certificate III in Underground Metalliferous Mining	25	66	426
Certificate IV in Metalliferous Mining Operations (Underground)	10	35	12
Diploma of Underground Metalliferous Mining Management	2	28	Unknown
Advanced Diploma of Metalliferous Mining	3	32	9
Drilling			
Certificate II in Drilling Oil/Gas (On shore)	15	26	355
Certificate II in Resource Processing	23	93	653
Certificate II in Mining / Field Exploration	2	23	13
Certificate II in Drilling Operations	22	43	685
Certificate II in Well Servicing Operations	7	20	218
Certificate II in Drilling Oil/Gas (Offshore)	0	21	Unknown

Mining, drilling and civil infrastructure
Industry Skills Forecast and Proposed Schedule of Work

Qualification level	RTOs with scope	UoCs (native and imported)	2015 enrolments
Certificate III in Well Servicing Operations	7	24	179
Certificate III in Drilling Oil & Gas (Off shore)	0	18	Unknown
Certificate III in Drilling Oil/Gas (On shore)	7	24	268
Certificate III in Drilling Operations	23	59	523
Certificate IV in Drilling Oil & Gas (Off shore)	0	16	Unknown
Certificate IV in Drilling Oil & Gas (On shore)	13	22	8
Certificate IV in Well Servicing Operations	7	24	150
Certificate IV in Drilling Operations	8	42	147
Diploma of Drilling Oil & Gas (On shore)	12	20	67
Diploma of Drilling Oil & Gas (Off shore)	0	19	Unknown
Diploma of Drilling Operations	7	25	18
Diploma of Well Servicing Operations	11	17	139
Advanced Diploma of Drilling Management	6	14	1
Cross industry (these qualification apply to multiple sub-sectors)			
Certificate II in Surface Extraction Operations	84	76	15,896
Certificate II in Cross Industry Operations	2	20	Unknown
Certificate III in Surface Extraction Operations	120	104	13,241
Certificate III in Mining Exploration	7	24	115
Certificate III in Mine Emergency Response and Rescue	47	35	1,265
Certificate III in Resource Processing	45	130	1,620
Certificate III in Trenchless Technology	10	51	109
Certificate III in Small Mining Operations	2	44	0
Certificate IV in Surface Extraction Operations	29	57	720
Certificate IV in Resource Processing	18	35	63

Qualification level	RTOs with scope	UoCs (native and imported)	2015 enrolments
Diploma of Minerals Processing	4	24	N/A
Diploma of Surface Operations Management	16	51	Unknown

Source: National Centre for Vocational Education Research (2015) *Total VET activity, enrolments and completions*; Training.gov.au (2016) *RTO Scope Search Reports*

Note: enrolments & completions in 2015. N/A indicates that no data was available on this qualification. In most cases data was not available because the qualification was introduced after Total VET activity reporting began.

Note 2: RTOs with scope correct as of March 2017 and may be subject to change.

Licencing, regulatory or industry standards issues

Licencing and regulatory requirements in the MDCI sector are high, with various federal and state stipulations. Given the diversity of activity undertaken in the sector, the regulatory and licencing requirements for each sub-sector can vary significantly. Table 3 identifies relevant sector regulation and occupational licencing for each sector. Note that this information is based off the interim SSO's findings. The information below will be supplemented through further research by PwC's Skills for Australia.

Table 3: Licence and regulatory requirements

Regulator	Sub-sectors affected
Mining regulators	
New South Wales Department of Industry – Resources Regulator	Coal, metalliferous, drilling and quarrying
Queensland Department of Natural Resources and Mines	Coal, metalliferous, drilling and quarrying
Tasmanian Department of Infrastructure, Energy and Resources	Coal, metalliferous, drilling and quarrying
Department of Economic Development, Jobs, Transport and Resources	Coal, metalliferous, drilling and quarrying
Northern Territory Department of Mines and Energy	Coal, metalliferous, drilling and quarrying
Western Australian Department of Mines and Petroleum	Coal, metalliferous, drilling and quarrying
South Australian Department of Primary Industries and Regions	Coal, metalliferous, drilling and quarrying
Safety regulators	
Safe Work Australia	All sub-sectors
Work Safe ACT - Office of Regulatory Services	All sub-sectors
WorkCover New South Wales	All sub-sectors
NT WorkSafe	All sub-sectors
Fair and Safe Work QLD	All sub-sectors
SafeWork SA	All sub-sectors

Regulator	Sub-sectors affected
Workplace Standards Tasmania	All sub-sectors
WorkSafe Victoria	All sub-sectors
Worksafe WA - Department of Commerce	All sub-sectors
Specialist regulators	
Australian Explosives Industry Safety Group	Coal, metalliferous, drilling and quarrying
NSW Office of Water	Water well drilling
QLD Department of Natural Resources and Mines	Water well drilling
VIC Department of Environment, Land, Water and Planning	Water well drilling
SA Department of Environment, Water and Natural Resources	Water well drilling
TAS Department of Primary Industries, Parks Water and Environment	Water well drilling
NT Department of Land Resource Management	Water well drilling
WA Department of Water	Water well drilling
Australian Drilling Industry Association	Water well drilling

Challenges and opportunities

The views of businesses, learners and other key stakeholder in the MDCI sector are critical to the SSO and IRCs' understanding of skills needs in the workforce. The approach to training product review is centred on this feedback and their views of the challenges and opportunities in their sector and sub-sectors. Table 4 identifies some of the key stakeholders relevant to the sector.

Table 4: Stakeholders in the MDCI sector

Stakeholder groups	Key stakeholders
Civil Infrastructure	<ul style="list-style-type: none"> • Civil Contractors Federation • Australian Constructors Association • Roads Australia • Engineers Australia • Institute of Public Works Engineering Australasia (IPWEA) • Traffic Management Association of Australia • Australian Asphalt and Pavement Association • Construction Skills QLD • Austroads • Australasian Society for Trenchless Technology (ASTT) • AustStab • Dial Before You Dig • Construction & Mining Equipment Industry Group (CMEIG)

Stakeholder groups	Key stakeholders
Coal mining	<ul style="list-style-type: none"> • Minerals Council of Australia (MCA) • Australian Mines and Metals Association (AMMA) • Coal Services NSW • Mine Managers Association Australia (MMAA) • Queensland Coal Mining Safety and Health Advisory Committee (CMHAC) • NSW Mining and Petroleum Competence Board • Mines Rescue Services (Queensland and New South Wales)
Drilling	<ul style="list-style-type: none"> • Australian Drilling Industry Association (ADIA) • Australasian Society for Trenchless Technology (ASTT) • International Association of Drilling Contractors (IADC) • National Uniform Drillers' Licensing Committee (NUDLC) • Piling & Foundation Specialists Federation (PFSF) • Australian Drilling Industry Training Committee (ADITC) • NSW Mining and Petroleum Competence Board
Extractive industries (quarrying)	<ul style="list-style-type: none"> • Institute of Quarrying Australia (IQA) • Cement, Concrete and Aggregates Australia (CCAA) • Australian Asphalt and Pavement Association (AAPA) • Construction Material Processors Association VIC • Victorian Limestone Producers Association (VLPA) • NSW Mining and Petroleum Competence Board
Metalliferous mining	<ul style="list-style-type: none"> • Minerals Council of Australia (MCA) • Australian Mines and Metals Association (AMMA) • NSW Mining and Petroleum Competence Board
State Training Advisory Bodies	<ul style="list-style-type: none"> • Resources Industry Training Council (RITC WA) • Industry Skills Advisory Council Northern Territory (ISAC NT) • Resources and Infrastructure NSW Industry Training Advisory Body (NSW RII ITAB) • Energy Skills Queensland (ESQ) • Building Industry Consultative Council Industry Advisory Body (VIC) • Manufacturing and Engineering Skills Advisory Board Incorporated (VIC) • Construction Industry Training Board (SA)
Primary unions	<ul style="list-style-type: none"> • Construction Forestry Mining & Energy Union (CFMEU) • Australian Workers Union (AWU)
Training Providers	<ul style="list-style-type: none"> • Secondary schools (not all provide training) • Technical and Further Education institutions (TAFEs) • Universities (not all provide training) • Enterprise Registered Training Organisation Association (ERTOA) • TAFE Directors Australia (TDA) • Australian Council for Private Education and Training (ACPET)
Industry Growth Centres	<ul style="list-style-type: none"> • Mining Equipment, Technology and Services • Oil, Gas and Energy Resources

These initial views are drawn from brief consultation with the IRCS, desktop research and the previous ISC's 2016 4-Year Work Plan. The view presented below will be verified and expanded upon through wide consultation with the IRCS, industry, employers and learners in PwC's Skills for Australia's development of Cases for Change and other ongoing work.

Employer challenges and opportunities

Given the unique work carried out the MDCI sector, employers often find that the skills developed outside the sector are not applicable to the MDCI sector. For example, individuals who hold maintenance qualifications obtained in a different industry sector will often need substantial retraining when they enter the resources sector. This is in part due to the size of the equipment used in the MDCI sector, the complexity and safety hazards that are often present, as well as the remote nature of much of the work in the sector, increasing the need for self-reliance.

The MDCI sector is heavily regulated, translating to a high standard of operation required of both employers and employees. Employers are often faced with the challenge of keeping up to the standards of the sector, while balancing costs, revenues and profitability. For example, on site verification of competence (VOC) has resulted in increased needs for assessor skills to facilitate VOCs.

This results in a conflict of interest for employers, as there is a trade-off between achieving compliance in a cost effective and timely way, with quality of skilling outcomes. Examples of three or more units of competency being trained and assessed in two days are common. Workers will often then be retrained and assessed as part of site specific inductions to ensure they can work safely and efficiently. Employers are ultimately responsible for the standard of training, bearing the cost.

Learner challenges and opportunities

To give learners the best possible opportunity to gain fulfilling jobs, and to help Australia to succeed, it is important to understand the outcomes learners receive from training. The IRCs and SSO need to understand which aspects of training are serving them well and which aspects can be improved.

It is first useful to understand learners and graduates in the RII Training Package. A typical learner enrolled in RII Training Package is:

- **Predominantly male.** Males make up 95 per cent of learners in the industry, compared to approximately 64 per cent across all training packages.⁴¹
- **In a major city.** 37 per cent of RII qualifications are delivered in the jurisdiction of major cities, with inner regional areas making up 28 per cent.⁴²
- **More likely to be Indigenous than learners of other Training Packages, with an English speaking background.** Indigenous learners make up 7 per cent of enrolments for RII Training Package, compared to 4 per cent across all Training Packages. Non-English speaking background learners make up 5 per cent of enrolments in the RII Training Package, compared to 17 per cent across all Training Packages.⁴³
- **In Queensland.** 51 per cent of RII qualifications are delivered in Queensland, compared to 25 per cent across all training packages.⁴⁴ This is in part due to the extensive legislative requirements in QLD surrounding workers.

A typical graduate from the RII Training Package is:

- **Earning more than other graduates.** Graduates from the RII Training Package earned a median salary of \$70,400 in 2015, compared to \$56,000 across all training packages.⁴⁵

⁴¹ National Centre for Vocational Education Research (2015) *Students and courses 2015*

⁴² National Centre for Vocational Education Research (2015) *Students and courses 2015*

⁴³ National Centre for Vocational Education Research (2015) *Students and courses 2015*

⁴⁴ National Centre for Vocational Education Research (2015) *Students and courses 2015*

- **Working across a variety of industries.** Only 19 per cent of graduates from the RII Training Package are employed in RII fields of work after graduation.⁴⁶
- **Employed at the same rate as other VET learners.** Graduates from the RII Training Package are employed at 79 per cent, whereas graduates from total VET programs are employed at 78 per cent.⁴⁷

While data on learner outcomes is limited, one source, the NCVER survey data, gives us evidence on employment prospects.⁴⁸ A key finding from this data is that learners have good full time employment outcomes.

Graduates of RII Training Packages are employed full time at a rate well above the VET average. 66 per cent of RII graduates have full time jobs, compared to the VET average of 47 per cent.⁴⁹

This proportion of full time employment for graduates makes RII an attractive Training Package for those seeking job security and reliability of income.

⁴⁵ National Centre for Vocational Education Research (2015) *Employment outcomes after training 2015*

⁴⁶ National Centre for Vocational Education Research (2016) *Total VET graduate outcomes information 2016*

⁴⁷ National Centre for Vocational Education Research (2015) *Employment outcomes after training 2015*

⁴⁸ NCVER (2016) Government-funded student outcomes.

⁴⁹ National Centre for Vocational Education Research (2015) *Employment outcomes after training 2015*

C. Employment

The purpose of this section is to provide a broad overview of the magnitude and growth of employment in the MDCI sector and to discuss the factors which are likely to influence the supply of graduates to fill positions in the sector. It provides context for the detailed analysis of trends influencing the industry and sector in Section D. In the 4-Year Work Plans developed by the previous ISC, data was provided by the Department.

The Department has since advised that updated statistics will be provided to SSOs as part of the detailed Industry Skills Forecast and Proposed Schedule of Work refresh in 2018. PwC's Skills for Australia is working with the Department and IRCs to build on this section, working to better reflect employment conditions specific to RII graduates, thus showing a deeper understanding of the current labour market.

Employment growth is forecast in some sub-sectors of the wider MDCI sector, and job losses in others. Metalliferous mining, civil infrastructure and quarrying will continue to experience good business conditions, while drilling employment may increase on the back of a skills shortage.⁵⁰ The long term prospects of jobs in coal mining is uncertain, and is dependent on a variety of factors, including the pace of policy adaptation in Australia and Asia, the price competitiveness of renewable technology and the coal price sensitivity impact on the viability of current and planned coal mines in Australia. Over the short term, jobs are expected to remain steady, though given the recent employment trend from 2012 to 2015, the number of available jobs may decrease modestly.⁵¹

Industry employment outlook

Employment at the occupational level is standardised as defined by ANZSCO.⁵² Viewing the MDCI sector as a set of related occupations serviced by the Training Package is more consistent with both the view of employers and the definitions used in this ISFPSW. The MDCI sector, as defined by the occupations related to the Training Package, collectively employs the largest number of Australians, at over 1 million in 2015.⁵³

Since the analysis of employment by occupations is complicated by the need to refer to a large number of occupations, which may be quite different in nature, the analysis in Figure 5 is focused on a categorisation of occupations. However, it should be noted that, as the classifications adopted are broad, it may be the case that some workers are trained in other training packages.

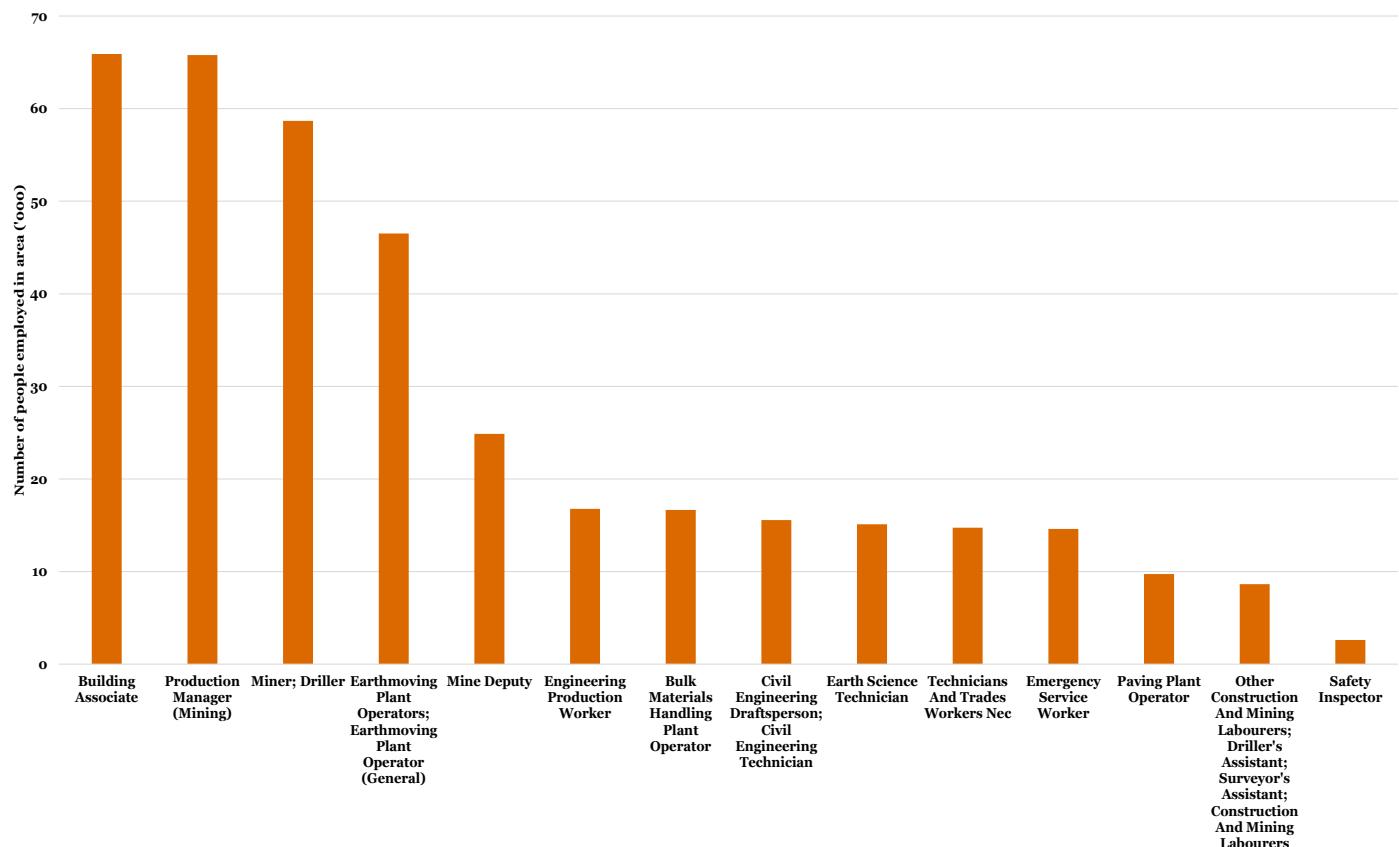
⁵⁰ Anecdotal evidence provided by IRC

⁵¹ It is noted that there are many robust views of the future of thermal coal in Australia, especially from those with vested interests. While it is acknowledged no forecasts are certain, this report takes the position of a neutral party forecasting the skills needed in the MDCI sector.

⁵² Australian Bureau of Statistics (2006) *Australian and New Zealand Standard Classification of Occupations* Cat. No. 1220.0 (2006)

⁵³ Australian Bureau of Statistics (2016) 81550DO001_201415 Australian Industry, 2014-15

Figure 5 Number of people (in thousands) employed in various RII occupations in 2015



Source: Australian Bureau of Statistics. (2016) 6291.0.55.003 - EQ08 - Employed persons by Occupation unit group of main job (ANZSCO), Sex, State and Territory, August 1986 onwards

Figure 5 shows that the majority of employees in the sector are skilled, with building associates (supervisors) and production managers making up the most common occupations in this sector.

Sub-sector outlook

The MDCI sector is broad, and encompasses a vast array of professions and trades, with each sub-sector having its own unique influencing factors. For this reason, it is necessary to separate out the different sub-sectors, and examine them individually.

Civil Infrastructure

The growing proportion of public investment in civil infrastructure is reflective of the clear pivot of state and federal governments toward the importance of infrastructure. Major transport projects are occurring in Brisbane, Melbourne and Sydney, as well as rurally, with the building of the Inland Rail. Strong public investment is expected to drive growth in this sub-sector over the next five years.

Future employment trends in this sub-sector depend largely on public investment. Continued emphasis by governments on infrastructure will result in rising employment in this sub-sector.

Coal Mining

Employment in coal mining dropped from 45,000 in 2012 to 39,000 in 2015, a decrease of 13 per cent over the three year period. Though sustained demand for coking coal will help to support a portion of the sub-sector, the prospects for thermal coal are less certain, and will depend on a variety of factors including the pace of policy adaptation and the price competitiveness of renewable technology.

Drilling

Employment in large sections of the drilling sub-sector is currently very high, though the IRC suggests there is a skills shortage in the sub-sector currently. Employment may increase as a result of this shortage.

Extractive Industries (Quarrying)

Quarrying is the least cyclical of the MDCI sub-sectors, with steady historical growth and a steady to flat growth forecast in jobs into the future. Technological disruption may affect the sub-sector, in the form of displacing low skilled labour, however as the population continues to grow and demand infrastructure, employment in quarrying will remain steady.

Metalliferous Mining

Employment in the metalliferous mining sub-sector is prone to cyclical trends, especially in relation to mining precious metals, such as gold and silver. Though the gold price is forecast to steadily decline over the coming decade due to rising interest rates,⁵⁴ high levels of global debt and political instability work toward keeping the price of gold inflated, resulting in higher employment in the sub-sector. The sustained demand for Australia's iron ore exports also serves to keep employment strong.

Supply side challenges and opportunities

An important consideration in determining the magnitude and growth of employment in the MDCI sector is the supply of graduates trained for work in the sector. To gain a full understanding of the how employment demand will be met requires an understanding of the factors which are likely to influence the decisions of learners to enrol in training and then enter the workforce.

Table 5 lists some of the factors which may influence the decision of workers to undertake training and enter the workforce. These listed influences may not be applicable to every occupation but rather are only applicable to the average of all RII Training Package learners. Not all occupation and training decisions are made on a rational basis and it can be inherently difficult for an individual to weigh up these long term factors. Emotion and perception are likely to play a large part in the career decisions of workers, rather than explicit analysis of the factors listed in Table 5.⁵⁵

Table 5: Supply side influences – challenges and opportunities

Supply side influence	Details
Wages	Graduates from RII qualifications enjoy higher earnings than the average VET graduate, earning \$70,400 after completing training compared to the average of \$56,000. This serves as a good opportunity for the sector to drive enrolments.
Job security	The cyclical nature of the MDCI sector results in a large turnover of staff in the lows of the cycle, and skill shortages in the highs. This is a large challenge to the industry, as workers looking for job security will avoid this sector.
Working conditions	There is a strong culture of fly in-fly out work in the MDCI sector, especially in mining. This results in workers being displaced from their homes and families. Given the temporary nature of many camp sites for workers, the option to move closer to the site of the mine work permanently is not attractive to many workers. This serves as a challenge to the sector.

⁵⁴ World Bank Group (2017) *Commodity Markets Outlook January 2017* page 25, 31

⁵⁵ Jim Bright, Robert Pryor, Sharon Wilkenfeld, & Joanna Earl (2005) - *The Role of Social Context and Serendipitous Events in Career Decision Making*- International Journal for Educational and Vocational Guidance Vol 5 (1): 19-36

Supply side influence	Details
Promotion	Graduates from the RII Training Package report a high rate of promotion as a result of their training, at 29 per cent compared to 21 per cent across all VET graduates. This serves as a good advertising opportunity for promoting the RII Training Package.
Diversity	Given the high proportion of males in the sector, at 95 per cent, ⁵⁶ the sector can seem very daunting to females looking to enter the workforce. This represents a challenge to the sector, as half the population is effectively not participating.
Innovation	Mining and construction have had historically low rates of innovation, with only the agriculture and postal sectors going through less innovation. Though this may have been a challenge in the past, recent trends in the sector, especially from large players, are turning this factor into an opportunity to innovate in the sector. A willingness to innovate will help attract change makers to the sector, who will serve to supplement traditional ideas and approaches.

Supply side influences for potential learners are mixed, with clear challenges being balanced by opportunities. Having the right number of people entering the labour market for certain occupations is different to those people having the right, future fit, skills. The following section analyses the trends affecting these potential workers and how training can ensure this supply.

⁵⁶ National Centre for Vocational Education Research (2015) *Students and courses 2015*

D. Skills outlook

Understanding the global and domestic forces driving change in the Australian job market is crucial to workforce planning, and therefore a critical step in mapping the skills that should be prioritised in the MDCI sector.

Global and domestic environment

Australia has enjoyed nearly 24 years of solid economic growth at an average annual growth rate of 3.3 per cent, above the G7 average of 1.6 per cent in the same period.⁵⁷ Over this time, Australia has capitalised on emerging market growth from China and India and remained partially sheltered from the decline in developed countries following the aftermath of the global financial crisis. Australia now faces challenges in maintaining this level of growth, with slow wage growth threatening living standards. To overcome these challenges, Australia needs a flexible and skilled labour force ready to adapt to changes in the market. The ongoing demand for Australian iron, metals and coking coal, means that mining in Australia will continue to be an important industry for years to come. Infrastructure has also become a national priority, with an increased emphasis on renewing and updating Australia's infrastructure, making for a solid pipeline of large scale projects in civil infrastructure.⁵⁸

Trends shaping the sector

This section outlines **four key trends** shaping the MDCI workforces over the medium to long term.



Urbanisation of Asia will drive growth in the mining industry to the future, while business pressures and technological change will affect efficiency and productivity in the sector. Environmental conditions will continue to adversely affect the mining of certain materials, such as thermal coal, whilst bolstering others, such as uranium, iron, copper and aluminium. The construction industry will also need to adapt to changing business pressures and technological change, while growth in this sub-sector will depend heavily on the priorities and commitments of the state and federal governments. Overall, while there are substantial pressures on the MDCI sector to change, the resilience of the sector and the long term demand for its products is substantial. The sector is sure to continue to be a vital part of the Australian economy many decades into the future.

⁵⁷ Australian Bureau of Statistics (December 2016) *National Accounts: National Income, Expenditure and Product*, cat. No. 5206.0, Table 1; OECD (2016) *Economic Outlook: Statistics and Projections*, Real GDP forecast, annual growth rate 1992-2015

⁵⁸ Infrastructure Australia (February 2016) *Australian Infrastructure Plan: Priorities and reforms for our nation's future*.

1. Urbanisation of Asia

The continuing urbanisation of Asia will drive reliable demand for Australia's resources well into the future. An increase in urbanisation directly translates to an increase in two factors:

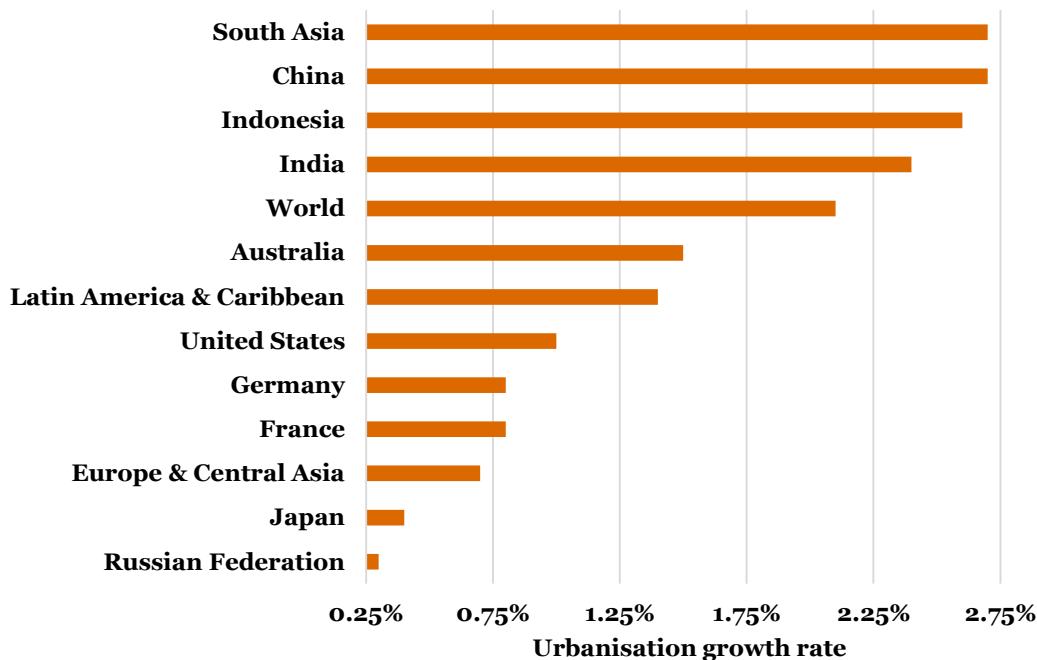
- **Energy**, which is fundamental to not only the construction of new materials, but also to the powering and maintenance of all settled populations; and
- **Infrastructure**, such as rail, roads, schools, hospitals and residential and non-residential buildings. These vital pieces of infrastructure support urban populations and ensure access to basic services.

Both these areas require resources from the Australian coal mining, drilling and metalliferous sub-sectors, as Asia cannot supply the quantity of materials required for this expansion using materials from their relevant jurisdictions.

Energy

With increasing urbanisation comes an increase in energy demand and need for reliability. Figure 6 shows that China and India had the fastest growing rate of urbanisation of major population bases from 1990 to 2015.

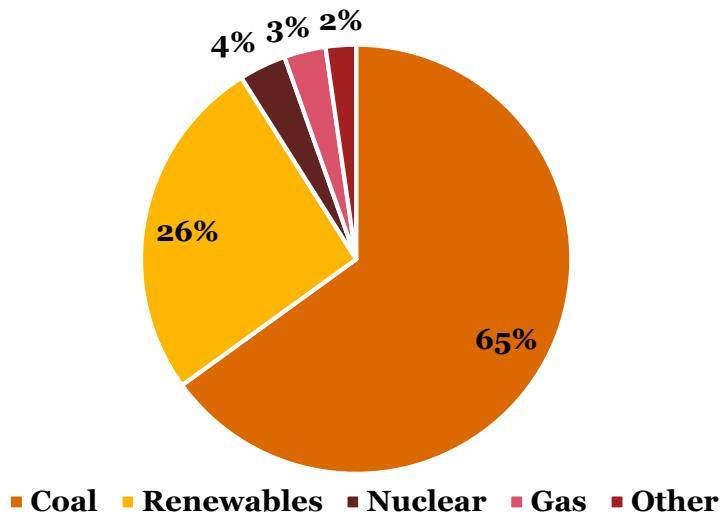
Figure 6 Annual growth rate in urban population from 1990 to 2015



Source: The World Bank. *3.12 – World Development Indicators: Urbanisation*.

Energy comes from many sources, the most common being coal fired power stations, renewables, nuclear and gas fired power stations. In China, Asia's largest consumer of energy, coal makes up 65 per cent of the energy mix, followed by renewables, at 26 per cent.

Figure 7 China's energy production by type in 2016



Source: China Energy Portal: 2016 detailed energy statistics

While the energy mix may change moving forward, phasing out coal fired powered stations is likely to be a gradual process and will take years. In Australia, this means that while the value of total thermal coal exports is expected to drop from 2016-17 to 2021-22, sudden, sweeping job losses are unlikely to occur in the near future. With the uptake of renewable energy comes an increase in demand for iron, steel, copper, aluminium and other metals used in the renewable energy sector.

Taken together, these findings point toward sort term sustained demand for thermal coal, and a sustained or increased demand for iron ore, coking coal, copper and aluminium in the medium to long term.

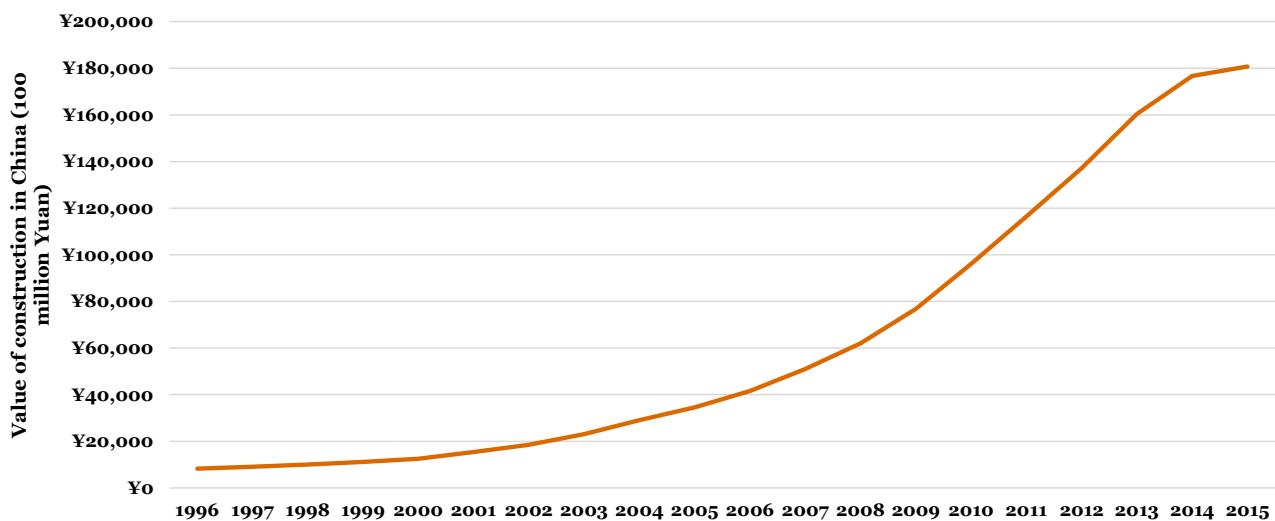
Infrastructure

As China continues the trend toward urbanisation, increasing amounts of infrastructure are required to meet the migration to populated areas. Transport infrastructure, such as roads, tunnels and bridges, social infrastructure, such as hospitals and schools, and utility infrastructure, such as power lines, water ways and pipelines are all needed to meet the continued urbanisation.⁵⁹

Figure 8 shows the historical value of construction in China from 1996 to 2015. The growth is remarkable and though the growth rate has decreased in recent years, the Chinese economy will inevitably require more investment to support its urbanising population.

⁵⁹ Reserve Bank of Australia, Wilkins, Kelsey and Zurawski, Andrew (June 2014) *Infrastructure Investment in China*

Figure 8 Value of construction in China (100 million Yuan) from 1996 to 2015



Source: National Bureau of Statistics of China (2016) *Total Output Value of Construction (100 million yuan)*

These infrastructure construction projects require large amounts of steel,⁶⁰ which in turn requires iron and coking coal. This suggests that demand for Australian iron and coking coal will be sustained well into the future.

As Asia further develops rare earth minerals, which are used in advanced technology such as telecommunications, demand will also increase.

What does this mean for the MDCI workforce?

Job demand	<ul style="list-style-type: none">Uncertainty in demand for thermal coal minersIncrease in demand for metalliferous miners (particularly copper and iron)Sustained demand for coking coal miners
Skills needs	<ul style="list-style-type: none">Adaptability in responding to changes in direction and pace of Asia's energy policyStrong management and supervisory skills to reside over remaining life of coal minesAnalytical skills to predict future demand of particular resources and optimise current production

2. Environmental issues

Environmental issues affect the level of regulation and demand for many of the commodities produced in Australia, such as coal and uranium, and have the ability to affect permanent structural change across the mining sectors. Changes in policy from state and federal governments as a result of environmental issues have the ability to enhance or diminish the viability of certain commodities.

⁶⁰ Asia is also looking to countries that have established vocational education systems in place, such as Australia, for guidance on how to effectively train workers and deliver these projects

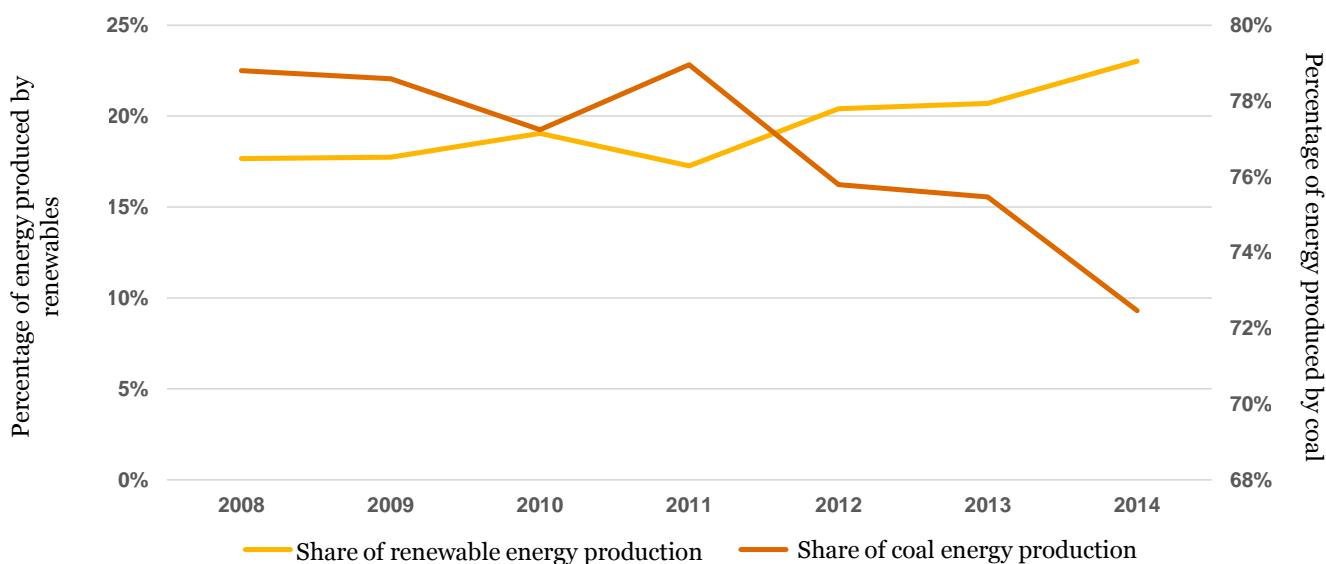
With the signing and ratification of the Paris Agreement by 135 countries, most notably China, the United States, Japan and India,⁶¹ there has been a strong push for lower emissions technology to be used in power production globally. The Paris Agreement ultimately aims to reduce CO₂ emissions from the signatory countries, primarily through increasing the supply of renewable energy and decreasing the burning of fossil fuels.

Japan, the largest consumer of Australian coal, aims to increase the share of its renewable energy production from 10 per cent (2014) to 24 per cent (2030).⁶²

The push toward renewable, clean energy production is also being translated into policy in China⁶³ and India.⁶⁴

In January 2017, China's National Energy Administration cancelled 103 coal fired power stations that were planned for production. Figure 9 shows the share of energy production in China from coal and renewables from 2008 to 2014. The share of renewable energy production has increased from 18 per cent to 23 per cent over this period, while coal power has reduced from 79 per cent to 72 per cent.⁶⁵ This has an adverse effect on the demand for Australian thermal coal.

Figure 9 Percentage share of coal vs renewable energy production in China



Source: International Energy Agency (December 2014) People's Republic of China – Energy Statistics

Steel (iron), copper and aluminium are used extensively in the construction of wind turbines and solar panels, while steel and concrete are essential in hydroelectricity production. As Australia is a large exporter of all these materials, implementation of stricter environmental regulation in Asia will result in growth in the iron, coking coal, copper and aluminium export trades.

⁶¹ United Nations (2016) *Paris Agreement*

⁶² Japan Ministry of Economy, Trade and Industry (2014) *4th Strategic Energy Plan*

⁶³ New York Times (January 2017) *China Cancels 103 Coal Plants, Mindful of Smog and Wasted Capacity*

⁶⁴ The Economic Times (November 2015) *Will try to achieve pledged renewable energy targets in less than four and half years: Piyush Goyal*

⁶⁵ International Energy Agency (December 2014) People's Republic of China – Energy Statistics

What does this mean for the RII workforce?

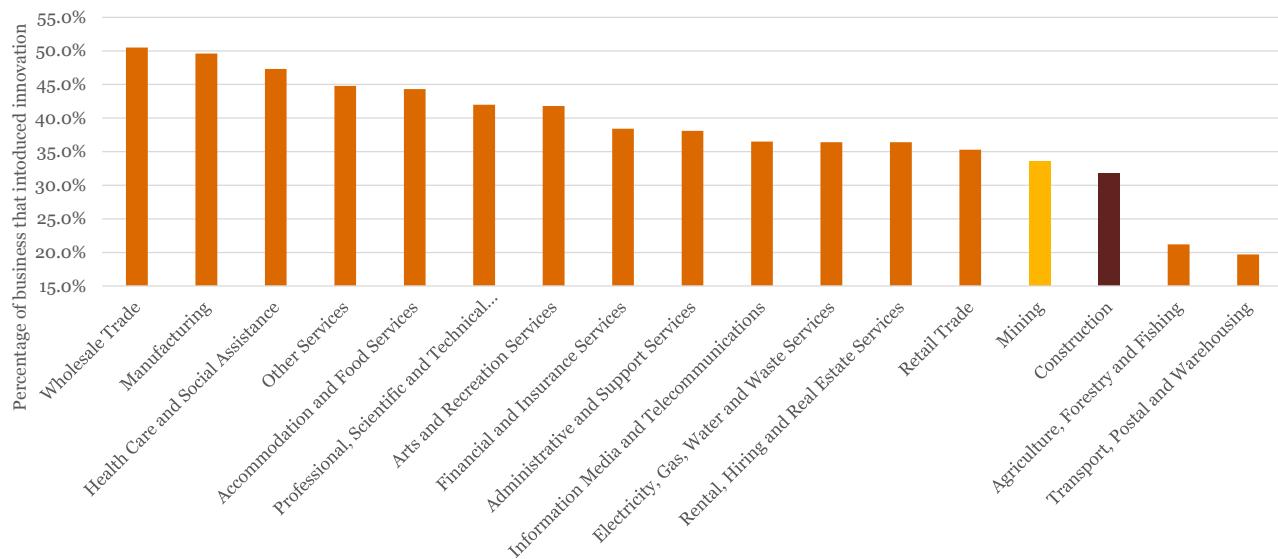
Job demand	<ul style="list-style-type: none">• Uncertainty in demand for thermal coal miners• Increase in demand for metalliferous miners (particularly copper, iron and aluminium)• Sustained demand for coking coal miners
Skills needs	<ul style="list-style-type: none">• Strong management and supervisory skills to reside over remaining life of coal mines• Analytical skills to predict future demand of particular resources and optimise current production

3. Technological Change

With the ever increasing sophistication of software programs and integration with automated technology, technological change will continue to affect all industries. Innovative practices and technological change will bolster economic growth and wealth in the MDCI sector. Technology driven growth will be important for the current workforce, creating new job opportunities for those in roles currently at risk of automation.

Compared to other sectors of the Australian economy, the MDCI sector has been a sector of comparatively less innovation. The Australian Bureau of Statistics measures how innovative sectors are through the annual business characteristics survey, the results for 2015 are as shown in Figure 10.

Figure 10 Percentage of business that implemented innovation by sector, 2015



Source: Australian Bureau of Statistics (2016) 81660DO002_201415 Summary of IT Use and Innovation in Australian Business, 2014-15.
Research source: Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data

Though innovation in the sector has been low, large players in the industry are beginning to innovate at higher levels.

Australia's two largest mining companies, BHP Billiton and Rio Tinto, have begun to use automated technology in remote regions of Australia.

Rio Tinto announced their "Mines of the Future" program in 2008, which aims to utilise remote, automated technology to operate remote mines from a central location. 69 remotely controlled trucks are currently in use, with plans for further expansion of the fleet.⁶⁶

BHP Billiton is also in the early stages of the trend toward automation, with up to 30 fully automated drills to be deployed across five iron ore mines in Western Australia.⁶⁷

The rapid emergence of drone technology, digital engineering, 3D printing and automated manufacturing is also changing the way the construction sub-sector is operating. One particular technology, Building Information Modelling (BIM), has already gained widespread endorsement in Australia.

BIM allows construction workers to view a digital representation of a project, from planning, through to construction and operation, serving as a central platform of collaboration for all stakeholders. As more information can be fed into a BIM system, such as through drone technology and laser mapping, greater levels of monitoring and control can be delivered to the worksite.

In 2016, Infrastructure Australia recommended that BIM be mandatory for all large scale, complex infrastructure projects.⁶⁸

Finally, PwC's *A Smart Move*⁶⁹ report suggests that jobs in mobile plant operation and machine operation are likely to be automated in the next 20 years. These more low skilled employees will have to be retrained in other areas if they are to remain in the sector on a long term basis.

These changes, along with the trend toward automation of low skilled labour, mean that the MDCI sector is evolving into a more digitally based system.

What does this mean for the RII workforce?

Job demand	<ul style="list-style-type: none">Increased demand for digital designersDecreased demand for low skilled labourIncreased demand for remote operatorsIncreased demand for data interpretersIncreased demand for ongoing, agile learners
Skills needs	<ul style="list-style-type: none">Digital technology skills, such as BIM, digital design and data interpretationAnalytical skills to optimise current productionSoftware skills to understand the capabilities and limitations of software used in the workplace

⁶⁶ Rio Tinto (March 2017) *Mines of the Future*

⁶⁷ IT News (June 2016) *BHP Billiton hits go on autonomous drills*

⁶⁸ Infrastructure Australia (February 2016) *Australian Infrastructure Plan – Priorities and Reforms for Our Nation's Future*

⁶⁹ PwC (2015) *A Smart Move* page 10

4. Evolving Business pressures

Business pressures encompass a wide variety of factors, such as the phase of the industry in its lifecycle, the level of competition and regulation within a sector, and the cyclical nature of many businesses.

The major business pressures affecting the MDCI sector are:

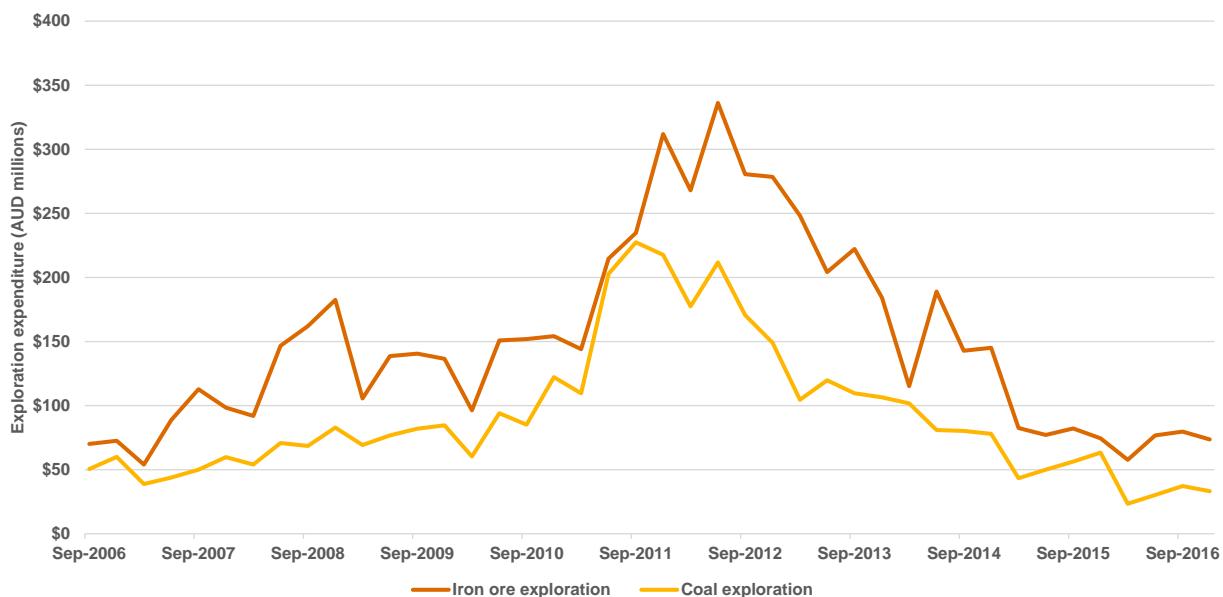
- Focus on efficiency and production as opposed to expansion; and
- Increasing international competition.

Efficiency and production

During the mining boom, a vast amount of capital was invested into the development of identified mineral resources, as well as exploration. Since the boom's end, there has been a shift in focus away from expansion and opening new mines, toward efficiency gains and production.

Figure 11 below shows the escalation and decline of mining exploration expenditure of iron ore and coal in Australia. At the height of the mining boom in 2011-12, exploration expenditure peaked for both commodities.

Figure 11 Exploration expenditure in Australia (AUD millions) 2006-2016



Source: Australian Bureau of Statistics (December 2016) 8412.0 *Mineral and Petroleum Exploration, Australia*

This trend places increased pressures on production managers, and has resulted in job losses of lower skilled labour in the sector. This push also emphasises the need for optimisation of operations, which requires analytical software integration.

International competition

Australia faces increasing competition in mining from the international community. In iron ore developments, the largest iron ore mine was opened in Brazil in December 2016 by Vale, and is expected to produce over 90 million tonnes of iron ore per annum by 2018.⁷⁰

In China, as the National Energy Administration (NEA) continued to push for a greater proportion of clean energy production, the NEA has announced the planned shut-down of 500 outdated coal mines, leading to a reduction of 50 million tonnes per annum.⁷¹ This will serve to bring the average cost of production of coal down, as the more efficient mines will make up a greater proportion of overall production.

These two major developments will result in pressure for Australian mines to keep a low relative cost per unit of production, compared to Brazil and China. The high Australian wage, relative to Brazil and China, pronounces this pressure even further.

What does this mean for the RII workforce?

Job demand	<ul style="list-style-type: none">Increased demand for data interpretersDecreased demand for low skilled labourIncreased demand for ongoing, agile learners
Skills needs	<ul style="list-style-type: none">Analytical skills to optimise current productionSoftware skills to better and capture and understand data, and where efficiencies can be achieved

Creating a future fit workforce

Table 6 sets out a list of skills priorities, as identified in the previous ISC's 2016 4-Year Work Plan. PwC's Skills for Australia will test the currency of this list through further consultation with industry. Rankings are from most important (1) to least important (5).

Table 6: Priority skills in MDCI

Skill	Rankings	Coal Mining	Civil Infrastructure	Drilling	Extractive Industries	Metalliferous Mining
Technical capability including production skills and plant operation	1	2	1	1	1	
Leadership and Management	5	1	4	2	2	

⁷⁰ Wall Street Journal (April 2013) *Brazil's Vale Expects \$11B Iron-Ore Mine License Soon*

⁷¹ China Daily Asia (February 2017) *China to close 500 outdated coal mines*

Skill	Rankings	Coal Mining	Drilling	Civil Infrastructure	Extractive Industries	Metalliferous Mining
Information Technology and Technological Change	3	3	3	5	3	
Workplace Safety and compliance	4	4	2	3	5	
Foundation Skills/Language, Literacy and Numeracy	2	5	5	4		4

In addition to skill priorities identified in this section, a supplied list of 12 generic workforce skills have been ranked in order of importance to relevant employers. For the MDCI sector these skills have been ranked by the previous ISC in partnership with the IRCs as shown in Table 7.

All skills listed in Table 7 are important. Low ranking does not imply that the skill is not important, but rather that these skills are not critical priorities for employers in MDCI. Ranking are from most important (1) to least important (12).

Table 7: Importance of generic workforce skills

Skills	Civil Infrastructure	Coal Mining	Drilling	Extractive Industries	Metalliferous Mining
Managerial / Leadership	5	1	3	1	1
Technology	2	5	2	7	2
Design mindset / Thinking critically / System thinking / Solving problems	7	2	4	2	3
Learning agility / Information literacy / Intellectual autonomy and self management	4	6	7	3	5
Communication / Virtual collaboration / Social intelligence	6	4	1	10	6
Science, Technology, Engineering and Mathematics (STEM)	1	9	5	5	7
Language Literacy and Numeracy (LLN)	3	7	10	9	8
Data analysis	12	3	9	11	4
Environmental and Sustainability	8	10	8	6	12
Entrepreneurial	10	11	12	4	9
Customer service / Marketing	9	12	6	12	10
Financial	11	8	11	8	11

E. Other relevant skills-related insights for this sector

Not applicable, all skill needs and priority analysis is included above in Section D.

F. Proposed Schedule of Work

Proposed Schedule of Work - 2017-18 to 2020-2021

The Proposed Schedule of Work presents activities anticipated to be conducted through to June 2021. This section is structured into two parts:

- **Progress update for projects endorsed for 2016-17**
- **Proposed Schedule of Work – 2017-18 to 2020-2021**

PwC's Skills for Australia has already received a large amount of feedback from the IRC, State and Territory Authorities and other stakeholders. We have collated this feedback and will continue to consult with industry and build on this information as we commence training product development.

Progress update for projects endorsed for 2016-17

The previous ISC presented a business case in 2016, setting out industry supported training product development for the first year of the training product development plan. The scope of the business case only confirmed the first year of the training product development plan. There were six items in the first year plan, covering a variety of UoCs and qualifications, as presented below in Table 8.

Table 8 Status of projects 2016-17

Year	Project	UoCs (by grouping)	Rationale	Status
2016-17	Mobile Plant operation & Materials Handling Units of Competency	<ul style="list-style-type: none">• 25 starting with RIIHAN• 51 Starting with RIIMPO	These units, focused around safety and operations, are some of the most common courses in the industry. They are also checked frequently for regulatory compliance.	Business case approved
2016-17	Traffic Control Units of Competency	<ul style="list-style-type: none">• RIIWHS302D Implement traffic management plan• RIIWHS205D Control Traffic with stop-slow bat	The level of proficiency that needs to be demonstrated in this unit is highly contentious, as there is no nationalised regulator. In some jurisdictions, meeting the specified three site demonstrations is almost impossible, given the remote location of work. There are also high safety risk involved in this role.	Business case approved
2016-17	First response emergency units	<ul style="list-style-type: none">• RIIERR201D Conduct fire team operations• RIIERR204D Provide aided rescue to endangered personnel• RIIERR302D Respond to local emergencies and incidents	These units are central to the safety of those in the coal and metalliferous sub-sectors. Improvements in clarity around protective equipment, firefighting equipment, strategies and techniques are required.	Business case approved
2016-17	Shotfiring units	<ul style="list-style-type: none">• RIIBLA202E Support underground Shotfiring operations• RIIBLA203D Conduct	These units need to be updated to incorporate modern equipment and practices. A clear	Business case approved

Year	Project	UoCs (by grouping)	Rationale	Status
		mobile mixing of explosives	distinction between shortfirers and those in support of shortfirers also needs to be made	
2016-17	Tyre Fitting Units	<ul style="list-style-type: none"> • RIISAM210D Remove and fit wheel assemblies • RIISAM211D Remove, repair and refit tyres and tubes 	These units do not presently cover the unique challenges and safety concerns of working on the large tyres found in the RII sector. There have been several deaths as a result of poor preparation in these units.	Business case approved
2016-17	Mine Regulation for supervisors	<ul style="list-style-type: none"> • Note that these units may change subject to consultation with IRCs • RIICOM301D Communicate Information • RIIRIS301D Apply risk management processes • RIIWHS301D Conduct safety and health investigations 	<p>This review has been requested by the Coal Mining IRC. However these units are commonly used within qualifications for all five sectors so careful consideration will need to be given to any proposed amendments to ensure they meet industry needs for all sectors. The result may be the identification of new sector specific units.</p> <p>These three units are used within regulation as the minimum requirement for supervisors at mines in some States. There is significant dissatisfaction with the standard of RTO delivery of these competencies. The dissatisfaction is with both the quality of delivery and the effectiveness of the training in meeting the industry need.</p>	IRCs to represent case for change

Approach to the Proposed Schedule of Work

To ensure consistency for the MDCI sector in the scheduling of reviews, the review plan identified by the previous ISC, and endorsed by the IRCs, will be adopted for the Proposed Schedule of Work. This plan reviews the relevant Training Packages at the qualification level, with new qualifications, skill sets and units of competency proposed for development where necessary. Whilst this schedule of work forms the basis for the current review plan, PwC's Skills for Australia will continue to work with the MDCI IRCs to refine if necessary.

The Proposed Schedule of Work will be revisited and reviewed in an ongoing manner, with a formal review and resubmission annually. This will allow the plan to respond to sector issues or emerging trends.

Proposed Schedule of Work – 2017-18 to 2020-21 and rationale

Table 9 presents the MDCI IRCs' Proposed Schedule of Work for 2017-18 to 2020-2021.

The previous ISC developed rationales to support the development of new Training Package content. On the basis that the previous IRCs accepted the proposed schedule of work, that the rationales were developed in conjunction with industry partners and that the basis for new training content remains the same, the rationales have been included in the current ISFPSW as they appeared in the previous 2016 4-Year Work Plan. These are also included in Table 9.⁷²

Table 9 Proposed Schedule of Work

Year	Project	UoCs (by grouping)	Rationale
2017-18	Contemporary and emerging blasting methods	<ul style="list-style-type: none"> *Development of new content: <ul style="list-style-type: none"> • Blast modelling • Wireless initiation of blasts • IT systems/technology • Conducting strata blasts 	An update to blasting courses needs to be undertaken, as new methods of blasting, such as strata blasting, is not well understood. New blast modelling and data collection technology also needs to be taught as part of an update in this area. This review will also include units around accretion blasting.
2017-18	Supply Chain approach to Skilling	<ul style="list-style-type: none"> *Development of new content – national surface exploration apprenticeship (being developed at the state level in WA) 	Given the high costs of doing business in Australia, workers need to be able to work up and down the supply chain, and demonstrate agility. Currently, training up and down the supply chain is limited.
2017-18	Underground service location and Vacuum Trucks	<ul style="list-style-type: none"> • RIICCM202D - Identify, locate and protect underground services and • NWPNET012 - Use locating devices 	Current units do not adequately cover the use of modern technology, especially electromagnetic locating equipment. The vacuum excavation industry is currently unregulated, leading to different standards in practice. New nationally accredited Training Package content needs to be developed to support improved consistency in operator skills and knowledge.
2017-18	Geotechnical Risk in Quarries	*Not specified	Recent fatalities in quarries as a result of geotechnical risks suggests training in this area is inadequate. A range of skills and knowledge gaps are present, including in assessing, geotechnical risk, inspection and monitoring.
2017-18	Drilling equipment and method	*Not specified	Drilling is a continuously evolving process, with new techniques constantly being developed. Training in drilling needs to be updated regularly to reflect the progress in this area of competency.
2017-18	Bituminous Surfacing	*Not specified	Training in this area does not adequately prepare learners for roles in the jobs, and there is a lack of knowledge in graduates around how the parts of the process fit together.
2017-18	New and emerging technology and systems	*Not specified	<ul style="list-style-type: none"> A business case needs to be developed to determine industry's support for new content to be developed for the following emerging technology and potentially other areas: Remote operating centres; Increased use of information technology; and

⁷² For the purposes of funding forecasts, all remaining units are expected to be reviewed in years 3 and 4 in an even split. Upon further consultation with the MDCI IRCs, the priority of certain projects will be determined and elaborated upon

Year	Project	UoCs (by grouping)	Rationale
			Use of drones in the MDCI sector.
2017-18	Underground coal operations review	RII30215	Current packaging rules for Certificate III in Underground Coal Operations are difficult to achieve in some workplaces due to the structure of elective units. These difficulties are a contributing factor to the lower level of enrolments as a proportion of workers employed in underground coal. Specialisation in underground mining is more prevalent than in surface mining. This specialisation limits opportunities to facilitate the required rotation to achieve the current packaging rules.
2017-18	Construction material testing units for on-site laboratories	*Not specified	The update is driven by the recent introduction of mandatory, on-site lab testing of quarry materials, as set down by the National Association of Testing Authorities.
2018-2020	Review remaining UoCs for relevance and suitability	Remaining UoCs	To ensure all UoCs are relevant and suitable, all UoCs must be reviewed within the four year period.

G. IRC signoff

This Industry Skills Forecast and Proposed Schedule of Work was agreed to by:



Tony Baulderstone

Chair

Civil
Infrastructure
IRC

28/04/2017

Darryl Cooper

Chair

Coal IRC

28/04/2017



Tim Westcott

Chair

Drilling IRC

28/04/2017

Mark Knowles

Chair

Metalliferous
Mining IRC

28/04/2017



Leanne Parker

Chair

Extractive IRC

28/04/2017

Appendix A Occupation classifications

Defining and classifying occupations can be difficult in any sector. In the vocational education and training context, using classifications that are too general can lose the nuance of skill levels or technical details acquired in each qualification. However, using classifications that are too specific can make general trends identification or commentary impossible.

For this Industry Skills Forecast and Proposed Schedule of Work we have largely drawn on terminology used in the training packages, as published in Resources and Infrastructure Industry Training Package release 2.0 on training.gov.au.

Table 10 sets out the following classifications:

- Australia and New Zealand Standard Classification of Occupations (ANZSCO) developed by the ABS. These occupations have been mapped to qualifications by NCVER and are used for Department of Employment forecast projections. Therefore ABS and NCVER data is consistent with ANZSCO definitions. The limitation of these definitions is that they are somewhat narrow and therefore may not be an accurate representation of all parties within the sector.
- Taxonomy developed by the former ISCs, mapped qualifications in Training Packages to occupations. However, these occupations are not mapped to ABS or NCVER data collection, and therefore do not provide any quantitative information as to the size of the workforce.

Table 10 provides the ANZSCO and Taxonomy classifications as published in Resources and Infrastructure Industry Training Package release 2.0 on training.gov.au. In this publication, each qualification has been mapped to one ANZSCO classification.

Given these limitations, Table 10 should be used as a guide only. The reader should refer to the description of the training product on training.gov.au for more information on the intended skills and potential occupations under each qualification.

Table 10: Different occupation classifications

Sub-sector	Qualification level	ANZSCO mapping	Taxonomy mapping
Civil Infrastructure	Certificate I in Resources and Infrastructure Operations	Other Construction And Mining Labourers	Civil infrastructure Worker
	Certificate II in Civil Infrastructure	Earthmoving Plant Operators	Civil Infrastructure Worker; Asphalt Worker.
	Certificate III in Civil Infrastructure Plant Operations	Earthmoving Plant Operator (General)	Grader Operator (Mining); Grader Operator (Civil infrastructure); Excavator Operator (Mining); Bogger Operator; Shotfirer's Assistant; Water Cart Operator; Quarry Mobile Equipment Operator; Bulldozer Operator; Shotfirer; Pipelayer Operator; Scraper Operator (Mining); Inbye and Outbye Operator; Sales Loader Operator; Scraper Operator (Civil infrastructure); Haul Truck Operator (Mining); Grader Operator (Extractive Industries); Quarry Equipment Operator; Dozer Operator (Mining and Extractive Industries); Front-end Loader Operator; Plant Service and Maintenance Operator (Quarry); Face Loader Operator; Quarry Processing Plant Operator; Scraper Operator (Extractive Industries); Backhoe Operator; Mobile Plant Operator (Extractive Industries); Excavator Operator (Mining and Extractive Industries); Earthmoving Plant Operator; Excavator Operator (Civil infrastructure); Haul Truck Operator (Extractive Industries).
	Certificate III in Civil Infrastructure	Earthmoving Plant Operator (General)	Leading Hand (Civil infrastructure); Bridge Constructor; Road Marker; Road Builder; Utilities Industry Worker (Transmission Laying); Road Paver; Timber Bridge Constructor; Tunnel Constructor; Site Maintenance Construction Worker.
	Certificate III in Civil Foundations	Earthmoving Plant Operator (General)	Foundation Layer; Foundation/Construction Driller;
	Certificate IV in Civil Infrastructure Operations	Building Associate	Earthworks Operations Technician; Tunnel Operations Technician; Bituminous Surfacing Operations Technician; Civil infrastructure Technician; Road and Pavement Operations Technician.
	Certificate IV in Civil Infrastructure Supervision	Building Associate	Road and Pavement Civil Infrastructure Supervisor; Roads Maintenance Team Leader; Foreman (Civil Infrastructure);
	Certificate IV in Civil Infrastructure Design	Civil Engineering Draftsperson	Civil Infrastructure Design Assistant
	Diploma of Civil Infrastructure Design	Civil Engineering Draftsperson	Civil Infrastructure Designer

Sub-sector	Qualification level	ANZSCO mapping	Taxonomy mapping
Coal Mining	Diploma of Civil Infrastructure Management	Civil Engineering Technician	Civil Infrastructure Site Manager
	Advanced Diploma of Civil Infrastructure Design	Civil Engineering Draftsperson	Senior Civil Infrastructure Designer
	Certificate II in Bituminous Surfacing	Paving Plant Operator	Road Paver; Asphalt Worker.
	Advanced Diploma of Civil Infrastructure	Civil Engineering Technician	Civil Infrastructure Contract Manager
	Certificate II in Underground Coal Mining	Miner	Open Cut Miner (Metalliferous Mining); Open Cut Coal Miner; Civil Infrastructure Worker.
	Certificate III in Underground Coal Operations	Miner	Scraper Operator (Mining); Underground Coal Miner; Coal Preparation Operator; Jumbo Operator; Haul Truck Operator (Mining); Quarry Equipment Operator; Continuous Mining Machine Operator; Grader Operator (Mining); Long Hole Driller; Inbye and Outbye Operator; Shotfirer; Dozer Operator (Mining and Extractive Industries); Bogger Operator; Longwall Miner; Shotfirer's Assistant.
	Certificate IV in Underground Coal Operations	Mine Deputy	Underground Coal Mine Supervisor
	Certificate IV in Surface Coal Mining (Open Cut Examiner)	Safety Inspector	Open Cut Examiner
	Diploma of Underground Coal Mining Management	Production Manager (Mining)	Mine Surveyor
	Advanced Diploma of Underground Coal Mining Management	Production Manager (Mining)	Coal Mine Manager; Mining Director.
Drilling	Advanced Diploma of Surface Coal Mining Management	Production Manager (Mining)	Open Cut Coal Mine Supervisor
	Certificate II in Drilling Oil/Gas (On shore)	Driller's Assistant	Floorman (Oil/Gas On Shore)

Sub-sector	Qualification level	ANZSCO mapping	Taxonomy mapping
Certificate II in Drilling Operations	Driller's Assistant		Mineral Exploration Driller's Assistant; Rouseabout; Mineral Production and Development Driller's Assistant; Trenchless Technology Driller's Assistant; Water Well Driller's Assistant; Seismic Driller's Assistant; Field Assistant/Fieldworker (Mining); Blast Hole Driller's Assistant; Geotechnical Driller's Assistant; Shotfirer's Assistant; Leasehand; Foundation/Construction Driller's Assistant.
Certificate II in Well Servicing Operations	Driller's Assistant		Floorman (Oil/Gas On Shore); Mineral Production and Development Driller's Assistant; Geotechnical Driller's Assistant; Mineral Exploration Driller's Assistant; Floorman (Oil/Gas Off Shore); Foundation/Construction Driller's Assistant
Certificate II in Drilling Oil/Gas (Offshore)	Driller's Assistant		
Certificate III in Trenchless Technology	Earthmoving Plant Operator (General)		Trenchless Technology Driller; Directional Driller/
Certificate III in Drilling Oil & Gas (Off shore)	Driller		Floorman (Oil/Gas On Shore)
Certificate III in Drilling Oil/Gas (On shore)	Driller		Floorman (Oil/Gas On Shore)
Certificate III in Drilling Operations	Driller		Directional Driller; Trenchless Technology Driller; Foundation/Construction Driller; Jumbo Operator; Mineral Exploration Driller; Shotfirer's Assistant; Long Hole Driller; Mineral Production and Development Driller; Geotechnical Driller; Shotfirer; Environmental Driller; Tunnel Constructor; Blast Hole Driller; Water Well Driller;
Certificate IV in Drilling Oil & Gas (Off shore)	Driller		Oil/Gas Off Shore Senior Driller
Certificate IV in Drilling Oil & Gas (On shore)	Driller		Oil/Gas On Shore Senior Driller
Certificate IV in Well Servicing Operations	Driller		Oil/Gas On Shore Senior Driller; Oil/Gas Off Shore Senior Driller; Derrickman (Oil/Gas On Shore).
Certificate IV in Drilling Operations	Driller		Environmental Senior Driller; Geotechnical Senior Driller; Seismic Senior Driller; Blast Hole Driller; Foundation/Construction Senior Driller; Trenchless Technology Senior Driller; Mineral Production and Development Senior Driller; Mineral Exploration Senior Driller; Water Well Senior Driller

Sub-sector	Qualification level	ANZSCO mapping	Taxonomy mapping
Extractive Industries	Diploma of Well Servicing Operations	Driller	Oil/Gas Off Shore Senior Driller; Oil/Gas On Shore Senior Driller;
	Diploma of Drilling Oil & Gas (On shore)	Driller	Oil/Gas On Shore Drilling Supervisor
	Diploma of Drilling Oil & Gas (Off shore)	Driller	Oil/Gas Off Shore Drilling Supervisor
	Advanced Diploma of Drilling Management	Mine Deputy	Drilling Operations Manager; Off Shore Installation Manager
	Certificate III in Well Servicing Operations	Driller's Assistant	Floorman (Oil/Gas Off Shore)
Metalliferous Mining	Advanced Diploma of Extractive Industries Management	Production Manager (Mining)	Quarry Operations Area Manager; Quarry Operations Technical Manager; Coal Mine Manager; Quarry Business Manager
	Certificate II in Underground Metalliferous Mining	Miner	Excavator Operator (Mining and Extractive Industries); Underground Miner (Metalliferous Mining).
	Certificate III in Underground Metalliferous Mining	Miner	Bogger Operator; Shotfirer's Assistant; Dozer Operator (Mining); Quarry Mobile Equipment Operator; Jumbo Operator; Quarry Equipment Operator; Haul Truck Operator (Mining); Long Hole Driller; Scraper Operator (Mining); Shotfirer; Grader Operator (Mining).
Various	Certificate IV in Metalliferous Mining Operations (Underground)	Mine Deputy	Underground Mine Supervisor (Metalliferous Mining)
	Diploma of Underground Metalliferous Mining Management	Production Manager (Mining)	Mine Manager (Metalliferous Mining)
	Advanced Diploma of Metalliferous Mining	Production Manager (Mining)	Quarry Operations Area Manager; Quarry Business Manager; Mine Manager (Metalliferous Mining); Quarry Operations Technical Manager; Mining Director
	Certificate II in Resources and Infrastructure Work Preparation	Other Construction And Mining Labourers	Small Mine Operator
	Certificate II in Resource Processing	Bulk Materials Handling Plant Operator	Coal Preparation Operator; Processing Plant Attendant (Extractive Industries); Process Operator (Mineral Processing).
	Certificate II in Mining / Field Exploration	Surveyor's Assistant	Field Assistant/Fieldworker (Mining).

Sub-sector	Qualification level	ANZSCO mapping	Taxonomy mapping
	Certificate II in Cross Industry Operations	Construction And Mining Labourers	Small Mine Operator; Open Cut Coal Miner; Open Cut Miner (Metalliferous Mining); Civil Infrastructure Worker
	Certificate II in Surface Extraction Operations	Miner	Grader Operator (Extractive Industries); Sales Loader Operator Mobile Plant Operator (Extractive Industries); Bogger Operator; Shotfirer's Assistant; Haul Truck Operator (Extractive Industries); Scraper Operator (Mining); Grader Operator (Mining); Dredge Operator; Plant Service and Maintenance Operator (Quarry); Remote Control Room Operator; Open Cut Miner (Metalliferous Mining); Laboratory Attendant (Extractive Industries); Excavator Operator (Mining); Haul Truck Operator (Mining); Weighbridge Operator; Scraper Operator (Extractive Industries); Processing Plant Attendant (Extractive Industries); Excavator Operator (Mining and Extractive); Water Cart Operator; Face Loader Operator; Quarry Equipment Operator; Open Cut Coal Miner.
	Certificate III in Mining Exploration	Earth Science Technician	Geological Technician (Mining)
	Certificate III in Mine Emergency Response and Rescue	Emergency Service Worker	Emergency Response Team Member
	Certificate III in Surface Extraction Operations	Miner	Dredge Operator; Weighbridge Operator; Sales Loader Operator; Grader Operator (Mining); Plant Service and Maintenance Operator (Quarry); Excavator Operator (Mining); Scraper Operator (Extractive Industries); Bogger Operator; Haul Truck Operator (Mining); Senior Open Cut Coal Miner; Scraper Operator (Mining); Quarry Operations Leading Hand; Shotfirer's Assistant; Mobile Plant Operator (Extractive Industries); Water Cart Operator; Face Loader Operator; Shotfirer; Open Cut Coal Miner; Quarry Mobile Equipment Operator; Haul Truck Operator (Extractive Industries); Quarry Equipment Operator; Grader Operator (Extractive Industries); Remote Control Room Operator; Excavator Operator (Mining and Extractive Industries); Quarry Processing Plant Operator.
	Certificate III in Resource Processing	Engineering Production Worker	Process Operator (Mineral Processing); Senior Process Operator/Senior Production Operator (Mineral Processing); Remote Control Room Operator; Coal Preparation Senior Operator.

Sub-sector	Qualification level	ANZSCO mapping	Taxonomy mapping
	Certificate III in Small Mining Operations	Miner	Small Mine Operator
	Certificate IV in Surface Extraction Operations	Safety Inspector	Open Cut Mine Supervisor (Metalliferous Mining); Shotfirer; Open Cut Coal Mine Supervisor; Open Cut Miner (Metalliferous Mining)
	Certificate IV in Resource Processing	Technicians And Trades Workers	Mineral Processing Supervisor
	Diploma of Minerals Processing	Production Manager (Mining)	Process Plant Manager (Metals and Minerals)
	Diploma of Surface Operations Management	Production Manager (Mining)	Mine Surveyor; Mine Manager (Metalliferous Mining); Quarry Operations Area Manager; Coal Mine Manager; Quarry Manager; Quarry Operations Technical Manager; Quarry Operations Manager;
	Diploma of Drilling Operations	Mine Deputy	Mineral Production and Development Drilling Supervisor; Blast Hole Drilling Supervisor; Seismic Drilling Supervisor; Environmental Drilling Supervisor; Water Well Drilling Supervisor; Trenchless Technology Drilling Supervisor; Mineral Exploration Drilling Supervisor; Foundation/Construction Drilling Supervisor; Geotechnical Drilling Supervisor
	Diploma of Minerals Processing	Production Manager (Mining)	Process Plant Manager (Metals and Minerals)

Source: training.gov.au

Appendix B VET and other training in the industry

Australians wishing to acquire new skills in the mining drilling and civil infrastructure industry can choose from many education and training options, varying from formal training to on the job learning. Factors driving the decision to enrol in VET, rather than take an alternative learning pathway, include funding availability, reputation and quality of the training, the learner's previous education and experience, and employer preferences.

The SSO and IRCs' role is to understand how the RII Training Package is used to skill learners to excel in the MDCI sector, then design training packages accordingly. A thorough understanding of the training landscape helps us answer two questions important to training package design:

- Why are learners choosing to enrol in qualifications and courses in the RII Training Package over other training, both now and into the future?
- Will changes to the RII Training Package fill a training gap or provide better accessibility of training compared to other options?

To answer these questions, analysis on the dynamics between training package enrolments and the following education and training options is presented below:

- **accredited VET courses and non-nationally recognised training courses**
- **higher education**
- **schooling, and**
- **in-house and other private training.**

Important dynamics to consider include the substitutability and competition (influenced by funding and availability) of the options, the relevance of the different forms of training to particular sectors, and employer preferences.

PwC's Skills for Australia will undertake an analysis of these factors stemming from engagement with industry, IRCs and government. This will inform the development of training packages that are suited to industry needs and facilitate the success of learners.

RII Training Package

The RII Training Package is comprised of:

- **58** qualifications
- **32** skill sets
- **792** native and **180** imported units of competency.

Appendix C Review of the Training Package structure

This appendix makes an initial assessment of the Training Package structure and considers how qualifications, skill sets, and UoCs could be better constructed, ensuring better communication of skills attainment to industry and better skills outcomes for learners.

PwC's Skills for Australia will engage in a review of Training Package structure for mining, drilling and civil infrastructure. Consideration will be given to whether there are any clear issues within the Training Package and manner in which it is structured to facilitate learner outcomes and employer expectations. A necessary consideration within the review will involve assessing the practicalities and impacts of any potential changes.

www.skillsforaustralia.com