

QRC STATE OF THE SECTOR

JUNE QUARTER 2018



RESOURCES LEADERS POINT TO A HIGH-TECH FUTURE

A recent Harvard Business Review article observed: *"It's clear that even as innovations bring unprecedented comfort and convenience, they also threaten old ways of regulating industries, running a business and making a living. This has always been true. Thus early cars weren't allowed to go faster than horses, and some 19th century textile workers used sledge-hammers to attack the industrial machinery they feared would displace them".*¹

But far from a threat to industry, the results from the latest Queensland Resources Council (QRC) survey of CEOs point to an innovative and high-tech future for miners. 91% of CEOs were considering further automation activities, 33% were implementing artificial intelligence and 8% planned to implement augmented reality technologies.

CEOs pointed to several new innovations to boost safety and efficiency at their operations. CEOs nominated an increased use of drones, originally developed for military purposes, for inspections, mine planning and safety investigations as part of their operations over the next 12 months. Outside of drones, CEOs were rolling out or considering:

Driverless trucks, semi-automatic drill rigs will be progressively introduced over the next 3 to 4 years"

"[We are implementing the] first automated drill at an open cut mine"

"remote operating practices will remove people from potential risk areas."

QRC member CEO sentiment survey, June 2018

In its report *Artificial Intelligence: the move toward human-like machines*², EY recognised that: *"Apart from enhancing efficiency in business processes, AI can reduce errors and complete difficult human tasks. AI can do work in hazardous situations that include fire, mining and the diffusion of bombs"*. For QRC member CEOs, this means considering a suite of new technologies that will improve safety in mining—from collision avoidance to remote operating practices.

With a strong commitment to safety and working in partnership with government and regulatory agencies on workplace health and safety, the majority of CEOs—87%—recognised the importance of AI to "making better decisions" in their operations. More than half (53%) of CEOs believe "optimising internal business processes" and "capturing and applying knowledge" as among the key benefits of incorporating AI into their operations. The least cited benefit, with only 20% and 13% of CEOs in agreement, was that AI also allowed respectively for "freeing up workers for new tasks" and "reducing headcount".

Nevertheless, CEOs also acknowledged there were challenges incorporating AI into their operations with 64% citing "difficulty integrating AI within existing processes and systems", 36% of responses that AI was "not ready for implementation" and 21% agreed with the statement that AI was "too expensive" and "difficult to access the relevant expertise".

In terms of attracting the relevant expertise for the development and adoption of new technologies, 82% of CEOs agreed their demand for science, technology, engineering and maths (STEM) graduates would increase over the next five years.

¹Harvard Business Review, *When Technology gets ahead of society*, July-August 2018, p. 88
²EY, *Artificial Intelligence: the move toward human-like machines*, May 2016.

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The majority (82%) of CEOs believe their demand for STEM graduates would increase over the next five years, with 35% indicating it would be a “substantial increase” and 47% projecting “some increase”. No CEO expected a decrease with the remaining 18% of responses indicating demand for STEM graduates would remain “much the same level”.

QRC and its member companies are promoting the uptake of STEM through the Queensland Minerals and Energy Academy currently operating in 58 secondary schools across the State. Through school-based programs and camps, the QMEA broadens students' and teachers' knowledge of the sector and places students on pathways into the sector and other STEM industries. The QMEA is to expand to more schools with an ambition to be working with teachers and students in 100 secondary schools in Queensland within five years.

The strong support for QMEA and broader STEM initiatives was clear in the CEO responses to the survey with 58% indicating their company had committed funding or undertaken programs to increase interest in STEM fields.

- The Australian Government's Department of Home Affairs estimates the nation's internet-based economy will grow to 7.3% of gross domestic product—or \$139 billion per annum—by 2020.
- It reported that “eight in 10 Australians access the internet daily. If poor cyber security erodes trust and confidence in cyberspace, the economic opportunity of a connected Australian economy will suffer. On the other hand, Australia stands to prosper significantly with reliable cyber security.”
- The majority of CEO responses—84%—considered cybersecurity was a “moderate” to “very high risk” over the next 12 months, with 16% deeming it a “very high risk”. Only 5% of responses thought cybersecurity presented a “very low risk” to their organisation over the next 12 months.
- Similarly, no CEOs reported a decrease in expenditure on cybersecurity over the last 12 months with 10% of responses indicating a “substantial increase”, 58% reporting “some increase” and 32% reporting expenditure was “about the same.”
- In terms of cybersecurity attacks or incidents over the last 12 months, less than a third of CEOs—32%—reported an attack or incident.



Queensland Minerals and Energy Academy students attend the 2018 QMEA/BMA Make it Now in Engineering (MINE) Challenge

The QRC State of the Sector CEO survey focus on new technologies, AI, STEM and cybersecurity coincides with the Palaszczuk Government's announcement of its “Our Innovation Future” review of the Government's suite of \$650 million Advance Queensland programs.

KEY INDICATORS

QRC PRODUCTION VOLUME INDEX

NORTH QUEENSLAND POWERING PRODUCTION

The QRC's quarterly Production Volume Index tracks changes in the total production of Queensland's major commodity exports—alumina, aluminium, bauxite, coal, copper, gold, lead, LNG, silver and zinc.

The Production Volume Index is weighted by the value of each commodity.

This means changes in the volume of coking coal (which is nearly two thirds total index value) has a proportionately larger impact on the quarterly index result than, for example, changes in thermal coal volumes (representing approximately 10–15 % of total value).

For the March 2018 quarter (latest available data), the QRC's Production Volume Index decreased by 11 points, to 130 points—which means Queensland's resources production is now 30% higher than when the index began in 2006.

The decrease in the Production Volume Index was driven primarily by lower gold, coal and bauxite production, each down by 16%, 12% and 11% across the quarter. The Index would have fallen further were it not for the strong growth in zinc and silver production for the quarter. Zinc volumes increased by 30% as MMG's Dugald River continued to ramp up production³ while silver production increased by 14% as tonnes of production improved at Cannington.

EXPORT OUTLOOK

The final quarter of 2017-18 delivered a mixed bag of economic news for the global economy. Trade tensions between the United States and China, alongside weakening conditions in emerging economies such as Turkey and Argentina, dampened sentiment. Yet in the same quarter, global economic growth reached its highest pace in nearly seven years at around 4% year-on-year.⁴

Looking ahead, global economic growth is forecast to ease slightly, growing by a healthy 3.7% in 2019. Closer to home, the Office of the Chief Economist expects economic growth from some of our key trading partners to remain robust—that means continued demand for Queensland's commodities over the medium term.⁵

Australia's metallurgical coal exports are forecast to increase by 6% in the two years to 2020. According to the Office of the Chief Economist, India's expanding steel sector will drive metallurgical coal imports—meaning India will overtake China as the world's largest importer by 2020. At the same time, Japan and South Korea's imports of metallurgical coal are forecast to grow modestly, both supported by rebounding domestic demand for steel and rising exports. As for thermal coal, Australian exports are forecast to remain steady to 2020—with India's increasing demand for thermal coal offsetting modest declines in Japanese imports as its nuclear reactors restart.

Global LNG trade is forecast to reach more than 360 million tonnes by 2020—25% larger than 2017 levels. The good news is that much of this LNG demand will stem from some of Queensland's close neighbours. India is forecast to grow its LNG imports by 75% and Pakistan's will more than double by 2020. Meanwhile, the Chinese Government's

CHART 1: QRC PRODUCTION VOLUME INDEX (A\$) (QUARTERLY)
(INDEX BASE JUNE 05/06=100)



Source: QRC, OCE, EnergyQuest, IHS McCloskey

³MMG, [First Quarter Production Report](#)

⁴National Australia Bank, [World on two pages, September 2018](#)

⁵Office of the Chief Economist, [Resources and Energy Quarterly](#), June 2018

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target to double gas use as a share of primary energy consumption by 2020 will add further support to the sector.

Finally, base and precious metals are forecast to achieve mixed export growth over the next two years. Australian zinc exports will enjoy strong growth in the medium term, increasing from 1.15 million tonnes in 2017-18 to 1.6 million tonnes in 2019-20—up 39%. Much of this additional supply will come from Queensland's new and restarting zinc mines including Century, Dugald River and Lady Loretta.

It's a similar story for bauxite, with Australian bauxite exports set to grow by 11% over the next two years— thanks again to new supply from Queensland's Amrun, Bauxite Hill and Hey Point projects. Finally, Australian copper exports are forecast to grow by nearly 15% over the next two years, gold exports by 5%, while aluminium and alumina exports will experience modest declines.

QRC VALUE OF PRODUCTION INDEX

STILL ON THE PACE

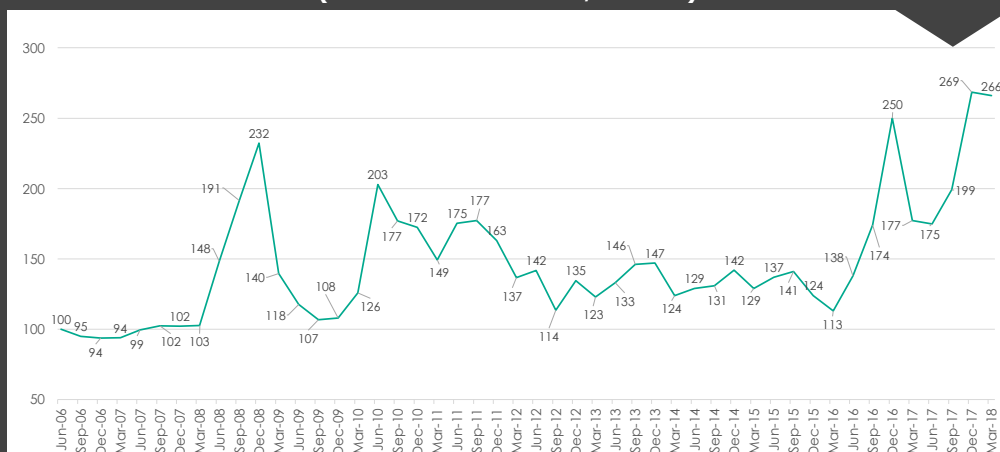
QRC's Value of Production Index reflects changes in the prices of the resources that Queensland produces. The weighted index reflects the same mix of commodities as the QRC production volume index, which includes LNG production from the December 2016 quarter.

Over the March 2018 quarter, the QRC's Value of Production Index decreased from 269 to 266 points—a minor decrease from the record value achieved in the previous quarter—but still enough to make it the second highest value in the index's 12 year history. In dollar terms, the value of the commodities produced by the sector reached A\$21.9 billion—a \$213 million drop in value since the previous quarter, but still well above historical values. LNG was in second place, with 12% of the sector's production value in the quarter.

Chart 3 provides a breakdown of this quarter's average price changes for each commodity. Spot prices of nearly all Queensland commodities

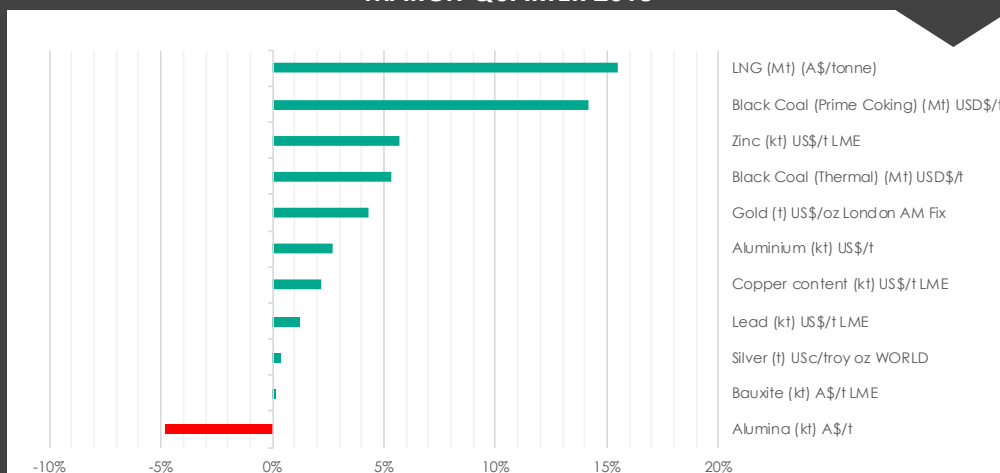
experienced price gains over the quarter—with alumina (-0.5%) the only commodity to see a decrease in the quarter. LNG achieved the largest price increase in the March Quarter, increasing by 15%, followed by prime coking coal at 14% over the quarter.

CHART 2: QRC VALUE OF PRODUCTION INDEX (A\$) (QUARTERLY)
(INDEX BASE JUNE 05/06=100)



Source: QRC, OCE, EnergyQuest, IHS McCloskey

CHART 3: AVERAGE QUARTERLY COMMODITY PRICES CHANGES — MARCH QUARTER 2018

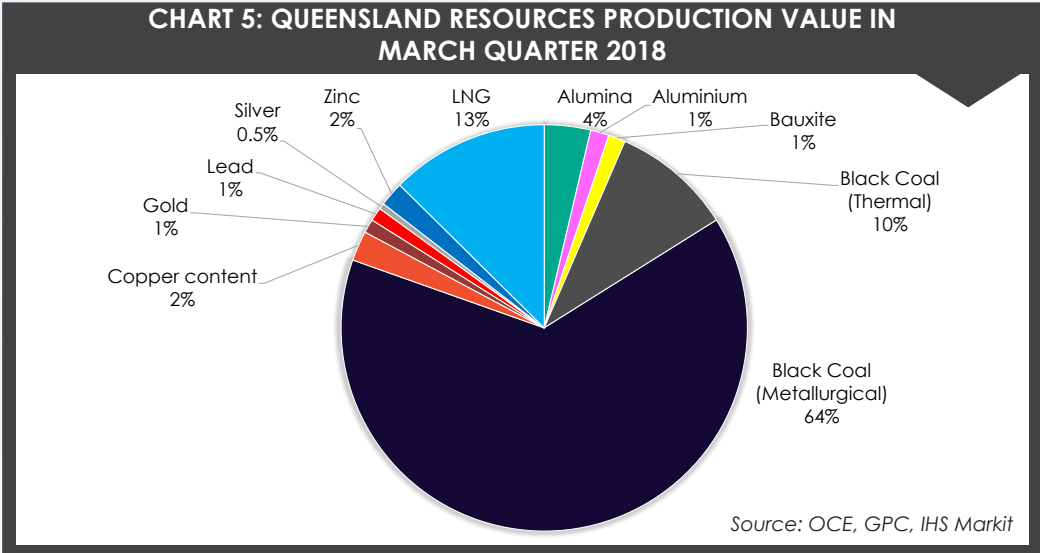
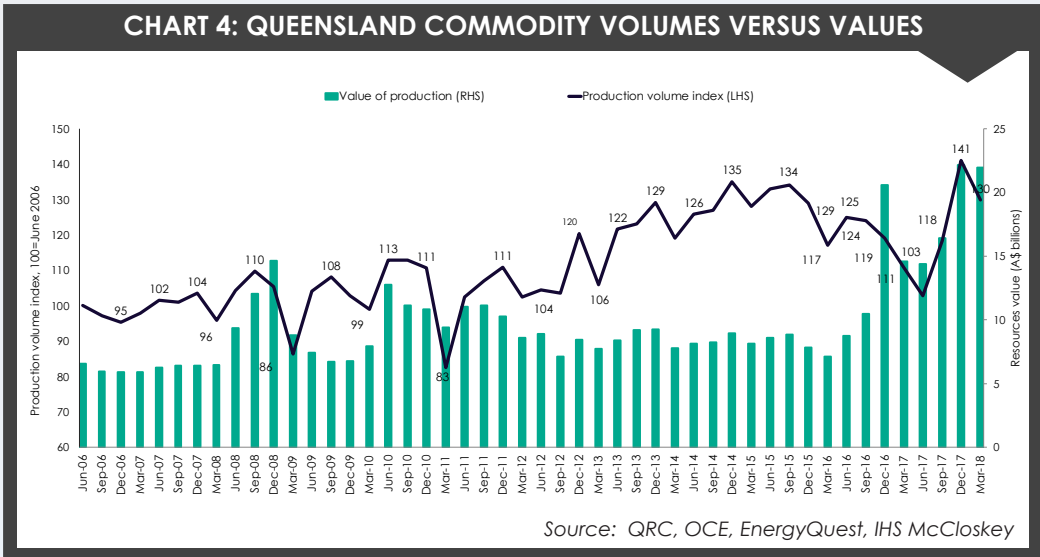


Source: OCE, IHS Markit

QRC VALUE OF PRODUCTION INDEX CONTINUED

Chart 4 shows both the volume and value of Queensland commodities in the March 2018 quarter were only slightly off the index records set in the previous quarter. Despite the decrease in value over the quarter, the export value of Queensland's resources has more than tripled since the index began—from \$6.5 billion in June 2006 to \$21.9 billion this quarter.

Chart 5 provides a breakdown of the value of Queensland's resource production in the December quarter. In the March 2018 quarter, coal production made up 75% of the all Queensland's resources production. LNG is in a comfortable second place, with 12% of the sector's production value in the quarter. Finally, zinc's share of production value increased from 1% to 2% in the quarter, reflecting the ramping of supply from MMG's Dugald River mine.



MMG's Dugald River Mine

QRC CEO SENTIMENT INDEX

The QRC CEO Sentiment Index is collected through a quarterly survey of QRC's producer and explorer members with the typical response rate being between 20-35 companies. The companies surveyed cover mining and energy, minerals processing, contracting, exploration, electricity generation and oil and gas extraction activity in Queensland.

Each quarter CEOs are asked to nominate to what extent they expect a series of eleven factors will impact on the objectives of their organisation over the next 12 months. All responses are weighted to arrive at a single sentiment value for that factor. The weighting means the factors generating the greatest concern receive the lowest scores and are lower down on the negative axis.

The results for the June quarter 2018 point to a clear shift in industry sentiment—with attracting or retaining skilled employees now the number one concern for QRC member CEOs. It has been close to seven years since CEOs rated attracting skilled employees as their chief concern (September quarter 2011)—yet this increasing concern is not a surprise given the surge in mining related-job advertisements in Queensland's resources regions.

Despite the higher salaries available, CEOs said public perceptions of the industry made attracting new talent difficult:

"The lack of people ...is a long-term issue for the whole industry. Mining has been beaten for so long there is no longer a strong attraction to enter and remain in the industry."

"It's difficult to attract professionals and graduates are in short supply when industry is being unfairly portrayed as a sunset employer."

"increasing labour demand will increase staff turnover [in our business]"

"Automation, big data and artificial intelligence means there's need for new talent in our industry"

Uncertain and/or poor regulation has ended its nine-quarter run as the top concern of CEOs, dropping to the second in terms of negative sentiment. Although, that's not a cause for celebration, with the negative sentiment towards uncertainty or poor regulation increasing over the quarter— but just by less than the attracting or retaining skilled employees category. CEOs gave a few recent examples of regulatory uncertainty for their business:

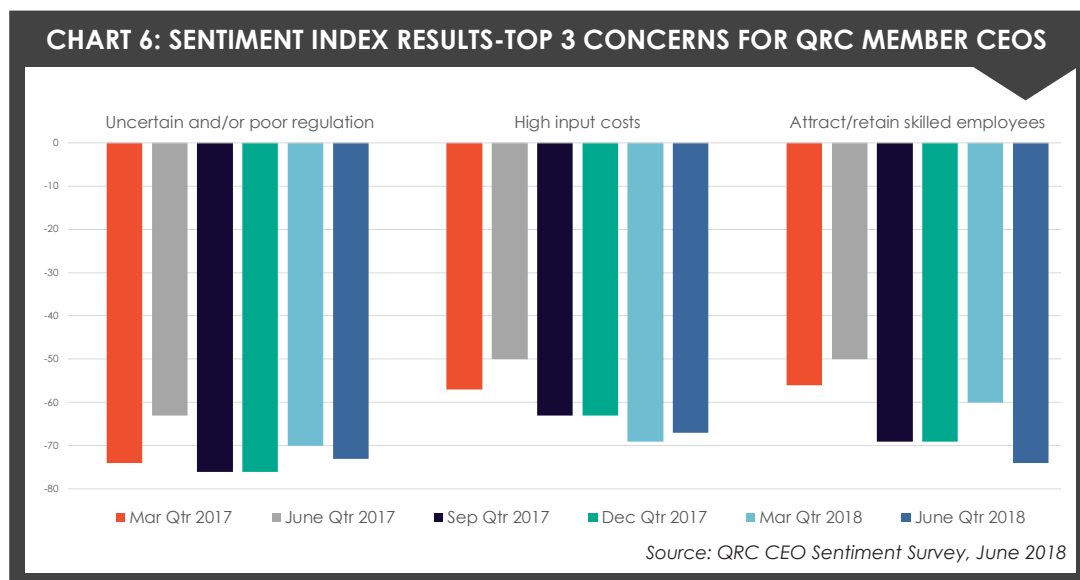
"Financial Assurance changes and lack of consultation on key legislation are a concern"

"Potential retrospectivity around upcoming legislation is causing uncertainty around investment decisions"

"The Queensland Government is unsupportive of the industry ... with poor regulation and little consultation"

Given the increasing demand for labour, it's no surprise that high input costs are the third highest concern for CEOs—continuing the category's steady increase from the low of June 2017. Over the same four quarters, according to the ABS, input costs to the coal mining industry have increased by 4%, a large change from the cost deflation as recently as September 2016.

Chart 6 illustrates the change in sentiment over recent quarters for our member CEOs' top three concerns.





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