QUEENSLAND resources COUNCIL

QRC **STATE OF THE SECTOR**

DECEMBER 2020 QUARTER


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QRC CEOs SAY HYDROGEN IS PART OF OUR LOW-EMISSIONS FUTURE

The Queensland Government has labelled hydrogen as "the next LNG industry for Queensland", predicting hydrogen exports could be worth about $1.7 billion a year by 2030.[1] That would put hydrogen at just under half the value of Queensland's thermal coal exports last year[2], about 15 percent of Queensland's LNG exports, or about twice the value of Queensland's fruit and vegetable exports.[3]

A decade is not much time for an infant industry to achieve global scale, but Queensland is up to the challenge. In just over a decade, Queensland went from having Australia's first home connected to a hydrogen fuel cell[4] to making its first ever delivery of green hydrogen to Japan in 2019. Right now, Sun Metals Zinc Refinery is constructing North Queensland's first hydrogen production facility, so progress in this sector is already underway.[5]

Climate change is a critical global challenge and QRC members are looking to a range of technologies, like hydrogen, to reduce their emissions and grow their businesses. According to the QRC's latest CEO Sentiment Survey, 33% of member CEOs believe hydrogen provides them with an opportunity to reduce emissions in their own business and 33% said hydrogen is an opportunity to grow their business. Only 17% see hydrogen as a competitor to their business.

The CSIRO recognises that "although many hydrogen energy systems are in the demonstration phase, the mining sector is set to be an early adopter."[6] QRC member CEOs agree, with more than half considering hydrogen development opportunities in their business right now. A further 10% of CEOs said they had already committed to hydrogen development projects.

There's plenty of development work underway across the industry. In March 2020, Hatch, Anglo American, BHP and Fortescue formed a Green Hydrogen Consortium to look at ways of using green hydrogen to decarbonise their operations globally. Some of the proposed activities include undertaking research, technology and supply chain development, as well as piloting green hydrogen technologies to de-risk and accelerate the technologies.

Since 2015, Glencore's Raglan mine in northern Quebec has run on a micro-grid powered by an Arctic-rated wind turbine generator connected to a hydrogen energy storage unit.[7,8]

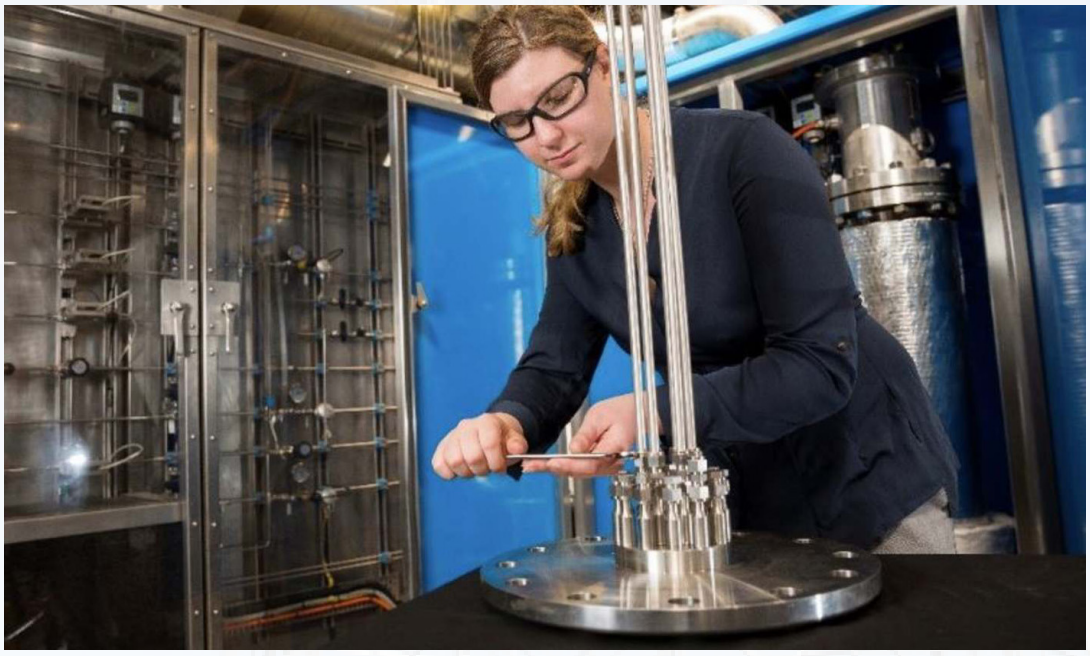


Image source: CSIRO (Brisbane's CSIRO hydrogen energy pilot program)

In 2019, Anglo American announced its partnership with ENGIE to develop the world's largest hydrogen-powered mine haul truck. The operational performance of hydrogen-powered trucks is expected to match or exceed their diesel equivalents, with the additional benefits of cleaner air, less noise and lower maintenance costs.[9]

[1]statements.qld.gov.au [2]treasury.qld.gov.au [3]qgso.qld.gov.au [4]statements.qld.gov.au
[5]research.csiro.au [6]csiro.au [7]csiro.au [8]nrcan.gc.ca [9]angloamerican.com

The potential uses of hydrogen are clear, but the timeline is uncertain and will depend on the colour of your hydrogen. The Queensland Government's Hydrogen Industry Strategy centres on green hydrogen, which uses renewables to power water electrolysis. Another way to derive hydrogen is by combusting gas or coal, commonly referred to as grey, brown or black hydrogen. If the emissions from producing grey, brown or black hydrogen are captured and stored, it is referred to as blue hydrogen.

> *"Green hydrogen will be difficult to implement. Producing hydrogen is very energy intensive."*
>
> *"The Government's position is technically premature. We will be a slow follower."*
>
> QRC member CEOs, February 2021

Production costs between the colours vary significantly. Around 24% of member CEOs said they are closely watching the energy cost reductions necessary to make hydrogen commercially viable. In 2019, green hydrogen production costs were roughly two or three times that of grey hydrogen (from natural gas).[10] That spread is expected to narrow, however, with Wood Mackenzie forecasting that on average, green hydrogen production costs will equal fossil fuel- based hydrogen costs by 2040.[11]

Costs aside, member CEOs know that green hydrogen will also have to win the support and acceptance of the community. In a 2019 submission, global professional services firm GHD said "There is likely to be substantial community concern regarding water security for the environment, human use, and agriculture if plants are proposed in inland regions to produce hydrogen by electrolysis, particularly given the current drought and climate change projections."[12]

Land use conflicts may also need to be managed. Under Deloitte's most favourable scenario for green hydrogen growth, Australia would require around 60,000 km2 of wind farms and almost 10,000km2 of solar farms to power its electrolysers. That's an area a little over four times the size of greater Brisbane, or roughly the size of Tasmania.[13]

As we take steps towards a low-emissions economy, the Japanese Government's Strategic Road Map for Hydrogen and Fuel Cells highlights the hydrogen opportunity for Queensland:

Image source: The Department of State Development, Manufacturing, Infrastructure and Planning (Queensland Hydrogen Industry Strategy)

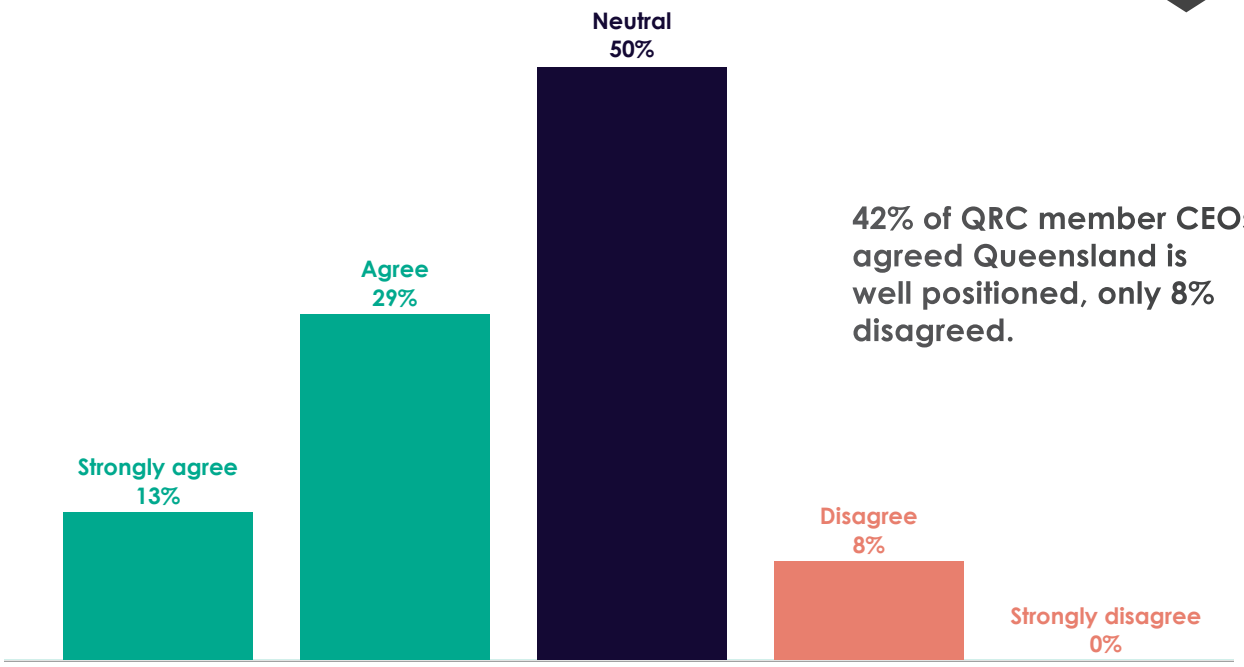
"the current hydrogen supply cost is higher than the existing energies including fossil fuel, however, it is essential to achieve low-cost hydrogen procurement/supply in order to expand the hydrogen utilization." The Roadmap also recognises that "Low-cost, untapped fossil fuel resources, which are abundantly available overseas, can be utilized as CO2-free energy by combining hydrogen production and CCS [Carbon Capture and Storage]."[14]

[10]iea.org [11]woodmac.com [12]GHD response to the National Hydrogen Strategy Issues Paper Series, 28 July 2019 [13]deloitte.com [14]meti.go.jp

The clear message is that green hydrogen is just one of the options available for Queensland. A 2019 report from Deloitte for the COAG Energy Council noted that *"under all scenarios, there is brown hydrogen in the earlier years with a move towards blue and green hydrogen."*[15]

Regardless of the colours of the hydrogen growth path, it's clear Queensland has an opportunity to cement itself as a global energy superpower. More than one third of member CEOs agree Queensland is well positioned to capitalise on an emerging hydrogen sector —with only 8% disagreeing (see Chart 1).

CHART 1: QUEENSLAND IN THE HYDROGEN HOTSEAT



42% of QRC member CEOs agreed Queensland is well positioned, only 8% disagreed.

Source: QRC member CEOs, February 2021

> *"Queensland is well positioned to capitalise on an emerging hydrogen sector"*
> QRC member CEOs

The same unique ingredients that make Queensland a global minerals and energy powerhouse can also support a thriving hydrogen industry—world-class deposits of coal and natural gas, around 300 days of sunshine a year and close proximity to large export markets in Asia. Queensland's resources sector also has a strong history of co-existing with other regional industries. The same skills and safety culture that built Queensland's LNG export industry could be aimed at driving the state's hydrogen sector forward.

If given a chance through a stable and supportive policy regime, technologies like hydrogen can drive a sustainable future for the sector and just as importantly, deliver more opportunities for Queenslanders.

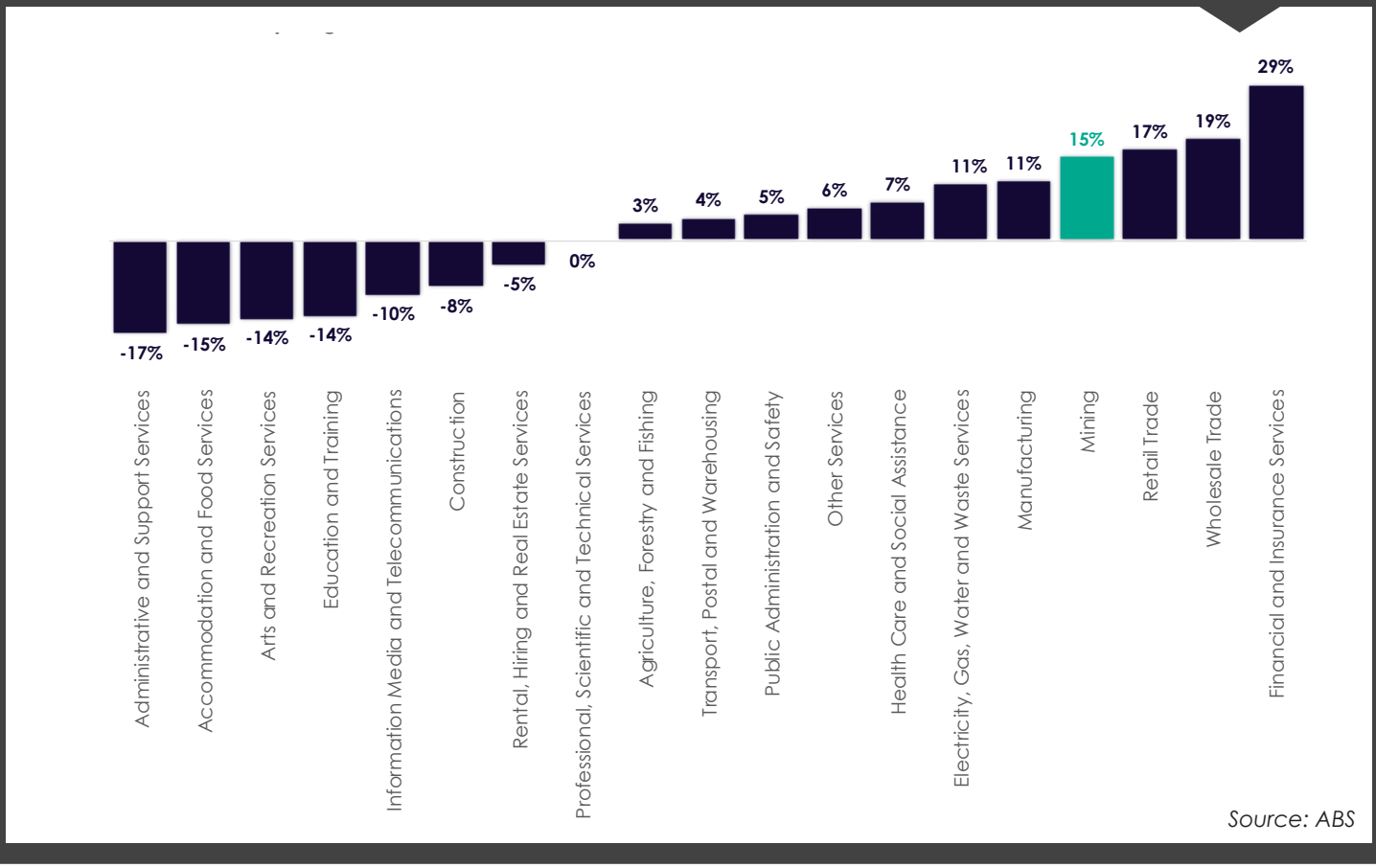
[15] deloitte.com

MORE OPPORTUNITIES ON THE WAY THANKS TO QUEENSLAND'S 'PEOPLE FIRST' STRATEGY

It has been more than a year since the COVID pandemic struck and it doesn't take much digging to see the success of the resources sector's 'people first' strategy. According to the Australian Bureau of Statistics, the number of jobs in Queensland mining (including gas extraction) sector increased by 15% over the 12 months to February 2021—the fourth highest level of any industry.[16]

Queensland's resource-driven COVID recovery owes much to the 'people first' approach taken by Government and strongly supported by the resources industry. Our sector has worked closely with all levels of government to manage impacts on resource communities and their workforce during a challenging year for all. In January 2021, industry's willingness to go above and beyond Queensland Health requirements was recognised by the Chief Health Officer.[17]

CHART 2: QUEENSLAND JOBS GROWTH - 12 MONTHS TO FEB 2021



Source: ABS

QRC member CEOs are now looking at several options to support the vaccine rollout. According to the latest sentiment survey, three quarters of member CEOs said they are looking to supply employees with accurate information on the benefits and risks of vaccination. Two-thirds of CEOs said they would arrange for employees to be vaccinated voluntarily during work hours. Around one in ten CEOs also said they would consider providing incentives for employees to be vaccinated voluntarily.

[16] ABS, Labour Force, Australia, Detailed [17] qrc.org.au

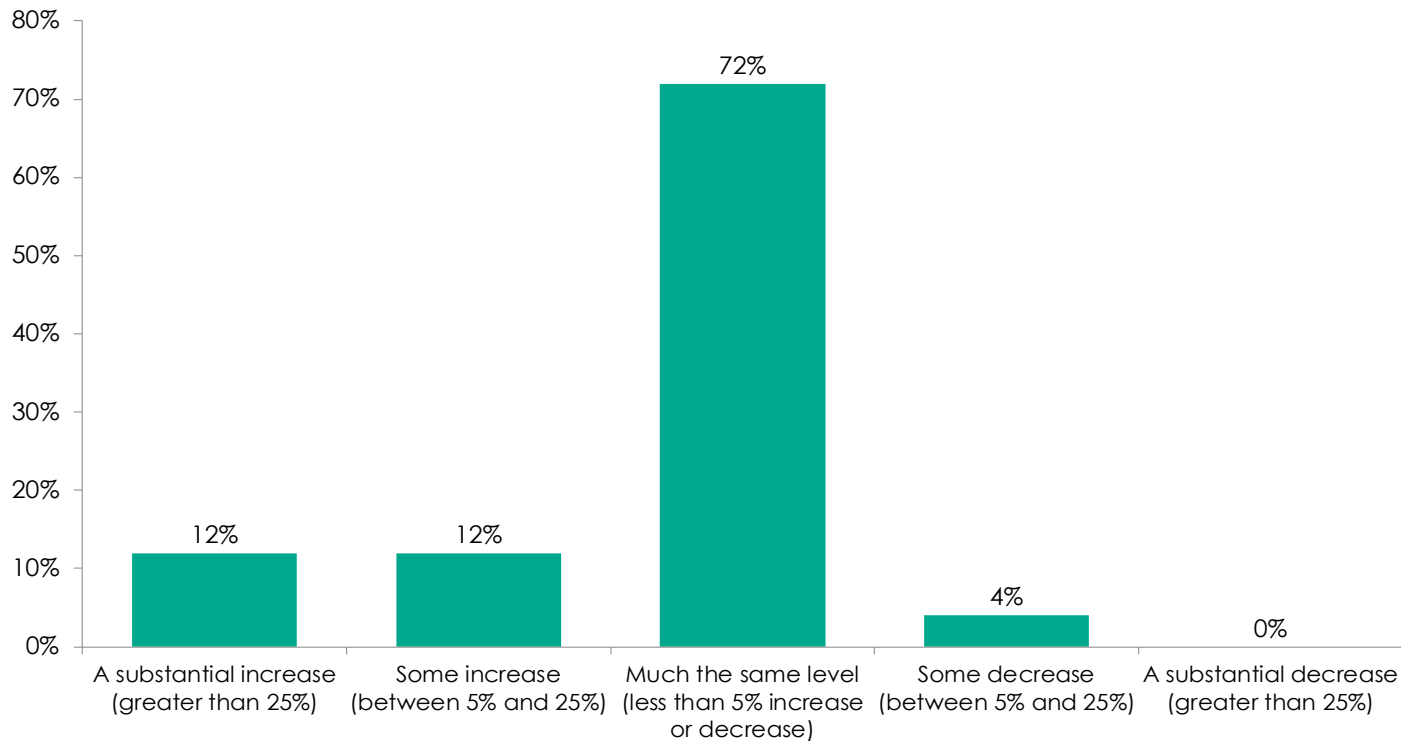
"We will work with our communities to ensure they have the same opportunity to receive the vaccine as our workforce."

"We are considering policies for encouraging vaccines for staff travelling to remote communities/interstate."

QRC member CEOs, February 2021

Maintaining this 'people first' focus will keep our communities safe and let the sector focus on creating more employment opportunities locally. Looking to the next 12 months, 24% of member CEOs surveyed said they planned to increase employment at their Queensland operations, with half expecting a substantial increase of more than 25%. Meanwhile, only 4% of CEOs expect a decrease in their workforce over the same period (Chart 3) which is a clear vote of confidence for the sector and Queenslanders.

CHART 3: QUEENSLAND JOBS GROWTH - 12 MONTHS TO FEB 2021



Source: QRC member CEOs, February 2021

Only 4% of CEOs expect a decrease in their workforce over the next 12 months, a clear vote of confidence for the sector and Queenslanders.

KEY INDICATORS

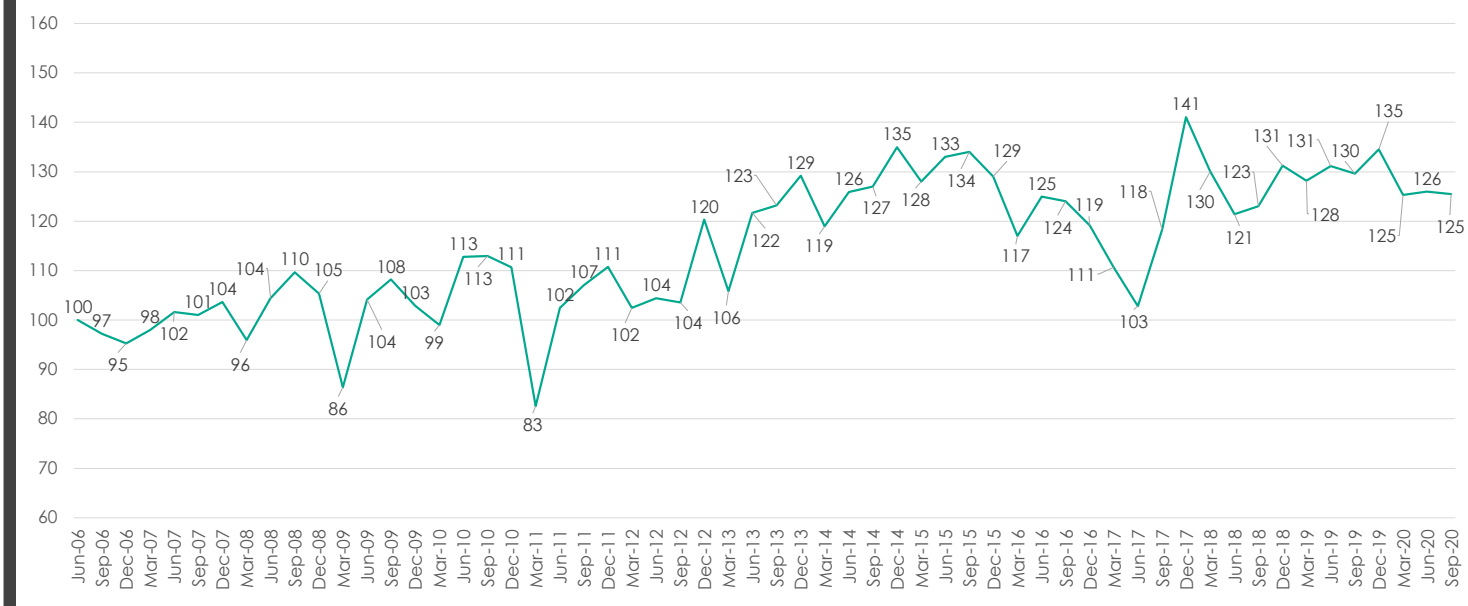
QRC PRODUCTION VOLUME INDEX -
STEADY OVER THE QUARTER

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 production volume of each commodity. This means changes in the volume of coking coal - which is over half of the total index value - has a larger impact on the quarterly index result than, for example, changes in thermal coal volumes which represent approximately 10–15 % of total value).

For the September 2020 quarter, the QRC's Production Volume Index decreased slightly to 125 points, which is one point down on the June 2020 quarter and ten points down on the same quarter in 2019. For this quarter, Queensland's copper (-14%), gold (-13%) and bauxite (-7%) production drove the decline, while lead production increased by 8% across the quarter. The remaining commodities, including coal and LNG remained steady across the quarter. Despite the mild fall, Queensland's resources production is 25% higher than when the index first began in 2006.

CHART 4: QRC PRODUCTION VOLUME INDEX - SEPTEMBER 2020 QUARTER (A$) (QUARTERLY) (INDEX BASE JUNE 05/06=100)



Source: QRC, OCE, EnergyQuest, IHS

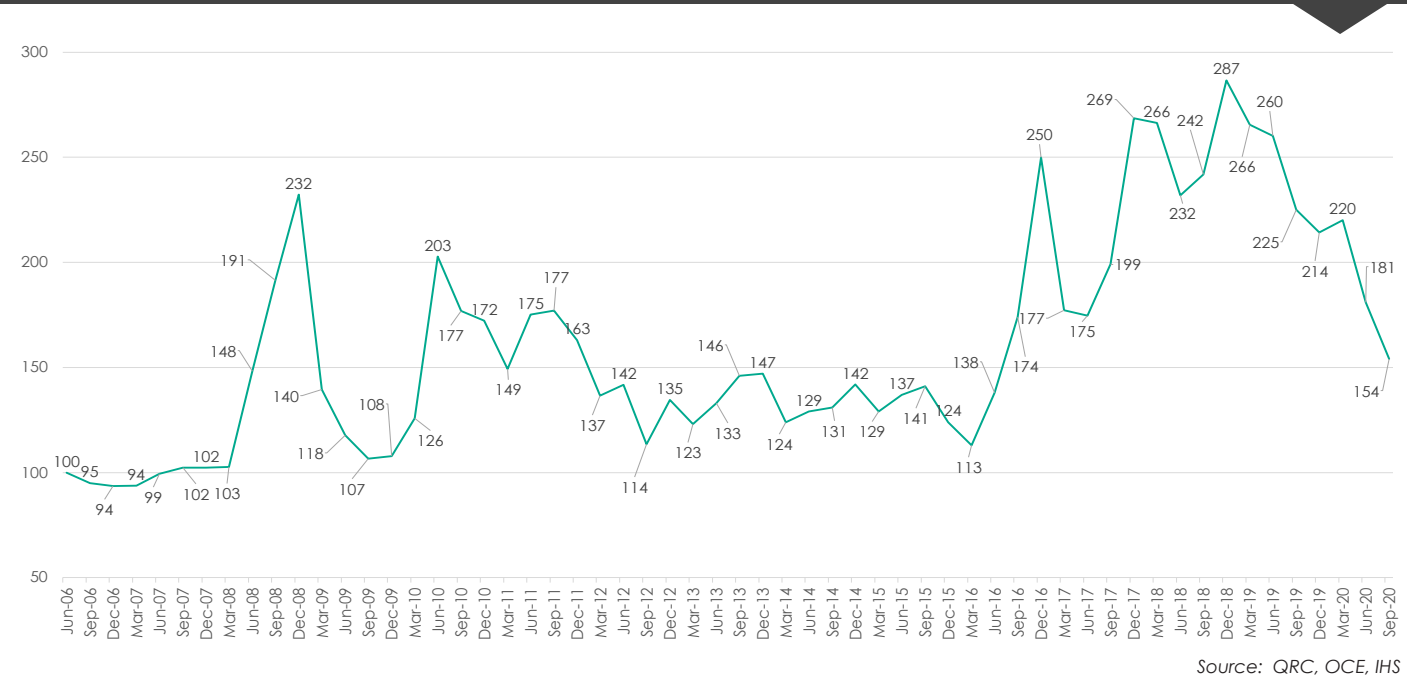
QRC VALUE OF PRODUCTION INDEX

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 September 2020 quarter, the QRC's Value of Production Index dropped a further 27 points from 181 to 154 points. Declining commodity prices through COVID-19 drove the index to its lowest value since June 2016. Price decreases in LNG (-37%), thermal coal (-10%) and hard coking coal (-5%) more than offset the strong price increases in silver (48%), copper (22%), zinc (19%), gold and lead (both 12%). This index result shows Queensland's resources production value remains over 50% higher than when the index first began in 2006.

CHART 5: QRC VALUE OF PRODUCTION INDEX - SEPT 2020 QUARTER (A$) (QUARTERLY) (INDEX BASE JUNE 05/06=100)



Source: QRC, OCE, IHS

CEO SENTIMENT INDEX

Each quarter, the QRC prepares its CEO Sentiment Index by surveying its full member CEOs. The survey typically receives between 20-35 responses from mining and energy, minerals processing, contracting, exploration, electricity generation and oil and gas extraction members in Queensland.

The survey asks CEOs to nominate the extent to which they expect a series of eleven factors will impact on their organisation's objectives over the next 12 months. Since the March 2020 edition, the QRC has also included "Public Health Impacts of COVID-19" as an additional sentiment factor.

The QRC weights the responses to create a single sentiment value for each of the sentiment factors. The weighting means the factors generating the greatest concern receive the lowest scores and are lower on the negative axis.

Six months ago, the impact of COVID-19 was clearly visible in CEO responses, with sentiment declining on several fronts and the public health impacts of COVID remaining a top-tier issue. Now in the December quarter, the sector's resilience is clear. Sentiment towards the public health impacts of COVID has improved significantly, dropping out of the top three to sixth place. In more good news for the sector, eight of the remaining eleven sentiment categories also showed positive gains across the December quarter.

The state of the global economy remains the single greatest concern for member CEOs with this category taking out the number one area of concern for six consecutive quarters. While sentiment towards the global economy has improved by 15 points since the beginning of the pandemic, CEOs clearly remain troubled by conditions:

> *"The strong Australian dollar is cruelling our year."*

"Demand for commodities in a COVID environment will keep prices/demand in a volatile state. Additional project approvals will stretch capital funding in an already unfavorable coal environment."

"The global macroeconomic environment is challenging due to increased uncertainty with recent China policy changes."

"The coal price and exchange rate has a huge impact on profitability."

QRC member CEOs, February 2021

Sentiment towards uncertain and/or poor regulation is once again a major concern for CEOs and tied for second place with raising capital. Several member CEOs also pointed to regulatory delays having real impacts on their business:

> *The regulatory environment in Queensland is making new investment in projects, and the operation of existing operations, increasingly difficult."*

"[We] seek to invest in other jurisdictions whose regulations and regulators are inclined to work with mining companies to find practical solutions to sustainable mining, rather than simply applying increasing cost."

"We are waiting on government approvals for client projects which means we do not have continuity of work and may have to re-allocate equipment instead of sitting idle."

QRC member CEOs, February 2021

Finally, sentiment towards raising capital increased one place to achieve equal-second spot in this latest survey. CEOs do, however, continue to point to the link between ESG performance and capital raising as a major concern:

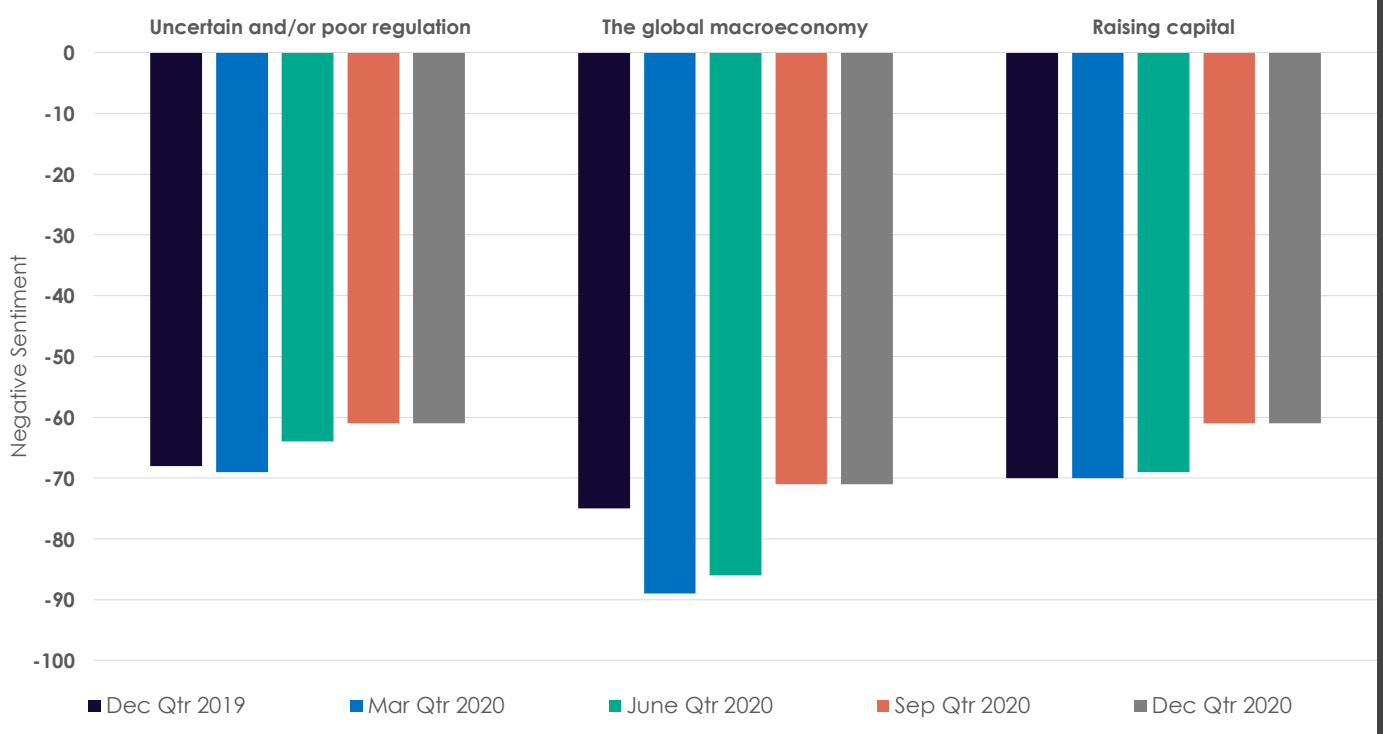
> *Increasing pressures from ESG has reduced ability to access capital and insurance placing greater uncertainty on our business."*

> *"Poor sentiment with oil and gas companies brought about by the green push from investors."*

QRC member CEOs, February 2021

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

CHART 6: CEO SENTIMENT INDEX RESULTS-TOP 3 CONCERNS FOR QRC MEMBER CEOS



Note: Public health impacts of COVID-19 is a new sentiment factor for the March 2020 quarter.
Source: QRC

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