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TECHNOLOGY AND THE AGRICULTURE AND MINING SECTORS

Organisation: NSW Minerals Council

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Inquiry

Technology and the agriculture and mining sectors

NSW Minerals Council

14 February 2022

NSW MINERALS COUNCIL

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Introduction

The NSW Minerals Council (**NSWMC**) appreciates the opportunity to assist the Committee on Investment, Industry and Regional Development to inquire into and report on technology in the agriculture and mining sectors.

NSWMC is the peak industry organisation representing the State's $36 billion minerals industry. NSWMC provides a single, united voice on behalf of almost 100 members, ranging from junior exploration companies to Australian and global mining companies operating in NSW, as well as associated service providers.

The continued use of technology and innovation in mining operations, as well as the increased need for metals, critical minerals and high-tech metals will result in significant opportunities for regional NSW in terms of improved work practices, increased investment, high-value and high-skilled job opportunities and overall productivity.

Mining is a strategically important industry for the NSW economy and the industry's economic contribution to the national, state and regional economies is significant. The industry underpins the strength of many regional economies, and has significant flow on benefits to other industries. The NSW mining industry:

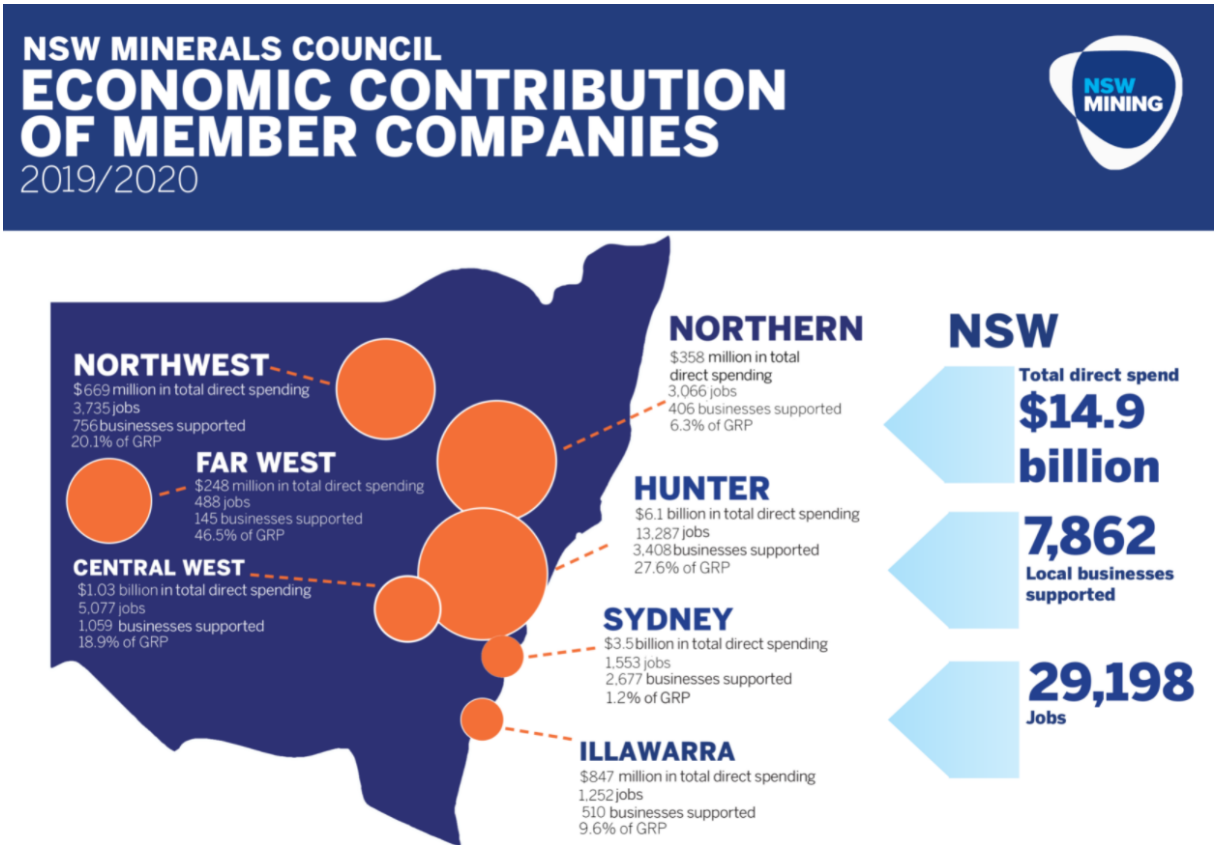
- Is the state's largest export industry by value[1];
- Directly employs 37,500 people in NSW, according to the ABS[2], and supports the jobs of many thousands more people indirectly;
- Directly spent almost $15 billion on goods and services, wages and salaries, local government payments and community contributions in NSW during 2019/20[3];
- Supports almost 8,000 businesses throughout the whole of NSW[4];
- Royalties are forecast to deliver a record $2.8 billion for the State in 2021/22, well up from the original forecasted $1.6 billion, and double the $1.4 billion collected in the 2020/21 budget.[5]
- Provides the metals that are critical for delivering renewable energy infrastructure, transport, manufacturing, telecommunications, advanced manufacturing, batteries, defence and aerospace and technology-enabled primary industries and renewables.

[1] NEW SOUTH WALES
[2] Australian Bureau of Statistics - Labour Force Statistics May 2021
[3] NSW Mining Industry Expenditure Impact Survey 2019/20
[4] NSW Mining Industry Expenditure Impact Survey 2019/20
[5] https://www.nsw.gov.au/media-releases/nsw-mining-record-royalties-for-christmas

- Supports a world leading Mining Equipment, Technology and Services (**METS**) sector that delivers continual technological innovation;

- Provides the resources needed to deliver over 80 per cent of the electricity used in NSW.

Graphic - Snapshot of NSWMC Economic Survey Results



**Jobs are based on NSWMC survey results which is different ot ABS jobs data*

This is in addition to the significant contribution the mining industry makes through local and community contributions, and the flow-on economic benefits to NSW and to regional areas.

The metals mining sector has experienced substantial growth in NSW over the last five years, almost doubling its contribution to the NSW economy. An analysis of the total direct spending of NSWMC metals mining member companies revealed a spending increase of over 50 percent in the last five years from $1.94 billion in 2015-16 financial year to $3.7 billion in 2019-20. The analysis also showed the number of mining jobs in the metals mining sector in NSW more than doubled from 3,690 to 7,149 during this period.[6]

[6] Metals mining's contribution to NSW hits five year high

The increase in the economic contribution of metals mining has directly resulted in a significant increase in the number of regional businesses supplying the mining sector in NSW, growing by 44 percent over the last five years from 3,980 businesses in 2015-16 to 5,719 businesses in 2019-20.

There are also a number of metals mining projects in the pipeline which could provide up to $7 billion in capital investment and around 6000+ jobs for the State over the coming years. These projects include the development of cobalt, gold, silver and nickel deposits in the west of NSW.

NSW has also seen record levels of exploration across NSW over the decade, driven largely by increased exploration for gold, copper and base metals. NSW has doubled its share of national exploration spending since 2010 and quadrupled its share of greenfields exploration over the same period, showing promising signs for the discovery of the next generation of NSW mines[7].

The NSW Government's 2020 Coal Strategy also highlights the important role coal mining will continue to play in the NSW economy over the coming decades. The report includes forecasts that show the current levels of global coal demand remaining relatively stable to 2050, with falls in some markets to be partially offset by increases in others.

In the 2021 calendar year, the NSW coal industry exported almost 160 million tonnes of coal. [8] The sustained global demand for NSW's high quality mineral resources, including coal, and ongoing high prices have underpinned the record royalties projected to be returned to the State in the 2021/22 Budget.[9]

There is also an increasing domestic and global demand for for high tech metals and critical minerals mined in NSW[10]. In addition to being used for everyday items, these metals are needed for electronics and technology, and electric vehicles, batteries, solar panels and other essential components of renewable energy generation, as well as critical minerals and high tech metal increasingly being used for new technologies such as advanced manufacturing, defence and aerospace.[11]

NSW is highly prospective for an extensive range of minerals and metals, and is well placed to supply the increasing demand for these resources. However, there are challenges if NSW is to realise these opportunities.

Policy settings and the regulatory framework must be attractive for the NSW's existing world class mining industry and METS sector to grow, and to attract new industry entrants to invest.

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[7] Critical minerals and high-tech metals strategy

[8] https://www.portofnewcastle.com.au/wp-content/uploads/2022/01/20211201-External-Monthly-Trade-Report-Dec-2021.pdf

[9] https://www.nsw.gov.au/media-releases/nsw-mining-record-royalties-for-christmas

[10] Critical minerals and high-tech metals strategy

[11] Critical minerals and high-tech metals strategy

Recent reforms to the planning system, as well as implementation of the Strategic Statement for Coal, the Minerals Strategy and the Critical Minerals and High-Tech Metals Strategy provide a good starting point. However the NSW Government must continue to make NSW an attractive destination including continued streamlining of existing regulation, creating flexible regulatory environments that can quickly adapt to advances in technology, continued investment in exploration activities and education, as well as promoting research and development in the industry.

The NSW Government must deliver efficient and timely regulatory processes to ensure regulation is able to respond and adapt quickly to technological advances in the mining industry. This should be both anticipatory and reactionary, and should be delivered in close consultation with the industry.

There must also be accessible and relevant programs for the existing mining workforce, as well as for new entrants, to obtain the necessary skills and training to keep pace with technological advances and changing workplace requirements. In particular this should include a focus on science, technology, engineering and mathematics based courses (**STEM**).

Inquiry Terms of Reference

That the Committee on Investment, Industry and Regional Development inquire into and report on technology and the agriculture and mining sectors, with particular reference to:

a) opportunities for regional NSW presented by agricultural and mining technologies and innovations;
b) barriers to the take up and use of agricultural and mining technologies and innovations;
c) measures to support the use of agricultural and mining technologies and innovations;
d) the impact of technologies and innovations on the past, current and future agriculture and mining workforce; and
e) any other related matters.

Opportunities for regional NSW presented by technology and innovation in the mining sector

The use of technology and innovation in mining can deliver a range of significant opportunities for regional NSW.

Mining is a vital industry in NSW supporting jobs in Sydney and in mining regions. Mining has played an important role in economic development in NSW for more than 200 years, providing jobs, security and prosperity to the people of the state.

The deployment of technology and innovation in the mining industry is not new. The NSW mining industry is one of the most innovative, forward-thinking and technology focused industries which will continue to evolve over time as it responds to domestic and global demand for resources, and pursues gains in safety and efficiency through the use of innovation and technology.

Examples of technological innovation include:

- Environmental monitoring - remote sensing of biodiversity offsets, drone technology, noise and air quality monitoring networks
- Automation technology - delivering health and safety improvements such as the use of underground driverless trucks in the CMOC Northparkes mine[12] and the introduction of an autonomous haulage fleet at Whitehaven's Maules Creek operations. [13]
- Automated long wall mining for improved safety and productivity - Whitehaven's Narrabri underground mining operations[14]
- Greenhouse gas emissions reduction - South32 is partnering with the CSIRO to support the development of technology to safely abate emissions from ventilation air methane in underground coal mines[15]
- Safety - the industry is constantly looking to integrate innovative technology solutions to improve its strong safety record. Technology solutions that have been implemented or are in the process of being implemented include automated fatigue monitoring systems and proximity detection systems.
- AmpControl - development of ventilators for COVID
- Water treatment - treatment of mine water technology to improve quality for discharge or re-use (including irrigation) - Springvale WTP and the Ulan WTP.

A report prepared by Ernst Young for the Minerals Council of Australia in 2019 - *Future of work: The economic implications of technology and digital mining*[16], also provides a snapshot of potential future technological trends in mining including:

- Artificial intelligence
- 3D visualization, simulation and modeling
- Autonomous drilling and other assets

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[12] Northparkes driverless trucks head deep underground

[13] https://whitehavencoal.com.au/wp-content/uploads/2020/09/Whitehaven-Coal-Sustainability-Report-2020-How-we-operate.pdf

[14] https://whitehavencoal.com.au/our-business/our-assets/narrabri-mine/

[15] https://www.south32.net/docs/default-source/exchange-releases/2021-south32-sustainability-briefing.pdf?sfvrsn=d8a76a71_2

[16] https://www.minerals.org.au/sites/default/files/The%20Future%20of%20Work%20-%20The%20economic%20implications%20of%20technology%20and%20digital%20mining%20-%20EY%20Report%20-%20February%202019.pdf

- Machine learning
- Increased electrification
- Remote integrated operating centers

Advancements in technology in the mining sector will have increased productivity, safety and environment benefits. The Ernst Young report suggests advances in technological innovation can deliver productivity improvements of between 9% and 23%.

Increasing use of technology will result in the continued diversification of the mining workforce, requiring a wider range of skilled employees in both traditional and emerging areas of mining operations. As workforce requirements change there will be an increasing demand to develop and/or attract workforces with required skills to regional areas.

The importance of education and training in mining, which is particularly relevant in practical-skills intensive industries, will grow as the sector adapts to new demands and technologies. Regional areas where mining is prevalent, such as the Central West, Hunter and Illawarra regions will be well positioned to take advantage of opportunities associated with the delivery of education and training, which can be delivered in partnership with local mining industry operations, by public, private and community providers.

Existing programs such as the CSIRO Generation STEM Community Partnerships Program in the Central West and Orana regions of NSW, and the Pathways to Resource Industry & Mining Employment (PRIME) Program in the Hunter, exemplify the potential for more such collaborative education initiatives in regional areas.

The adaptation of new technology in the mining sector will have flow on effects to the existing world class METS sector in NSW, much of which is located in regional areas. As noted the NSW mining industry directly contributes to around 8,000 businesses and suppliers located in NSW, most of which are in regional areas.

As employment and resource requirements change over time, new business opportunities associated with the development, delivery and servicing of new technology will emerge across the State. The existing NSW METS sector, along with other new entrants delivering specialised skills into the market will be well placed to capitalise on these new investment and employment opportunities particularly in regional areas.

Supplying an increased domestic and global demand for critical minerals and high-tech metals will also present new industry, investment and employment opportunities in the development of related industries, including downstream processing and technology.

There will also be significant export opportunities as the demand for, and use of critical minerals and high-tech metals grows globally. The Australian mining sector is already a world leader in export experience, capturing nearly 29 per cent of the world export market for minerals. This has significantly increased from 2000, when Australia had 12.7 per cent of the

world export market[17]. The mining industry is also the state's largest export industry by value [18].

The NSW mining industry and our world leading METS sector are well positioned to capitalise on its already extensive expertise and experience, and its well established global supply links.

Challenges facing the mining industry in the take up and use of technologies and innovations

The NSW Government's mining policy framework outlines a range of initiatives which if all implemented, provide a sound basis to ensure the state is well positioned to take advantage of future mining opportunities, particularly in the metals and critical minerals sector:

- NSW Minerals Strategy - *To significantly grow investment in mineral exploration and mining in NSW to position the state as a major global supplier of metals for the economies of today and the future.*[19]
- NSW Critical Minerals and High-Tech Metals Strategy - *Outlines the NSW Government's vision to build on our existing potential and position NSW as a major global supplier and processor of critical minerals and high tech metals well into the future.*[20]
- NSW Strategic Statement on Coal Exploration and Mining in NSW - *sets out the NSW's Government's approach and a four-point action plan built around: 1. Improving certainty about where coal mining should not occur; 2. Supporting responsible coal production; 3. Reducing the impact of coal mining; and 4. Supporting diversification of coal-reliant regional economies to assist with the phase-out of thermal coal mining.*

However, there are challenges that will need to be overcome if the full potential is to be realised. These include flexible and timely policy and regulatory settings, and importantly an adaptive and capable workforce.

Where conditions are optimised, industry will be incentivised to undertake the required investment to deliver technological advances. The Ernst & Young report suggests the Australian mining industry will need to invest between $15b to $50b in technology and people

[17] https://www.industry.gov.au/sites/default/files/May%202018/document/pdf/australia-2030-prosperity-through-innovation-full-report.pdf?acsf_files_redirect

[18] NEW SOUTH WALES

[19] NSW Minerals Strategy

[20] Critical minerals and high-tech metals strategy

to realise the full potential.[21] A conservative or ineffective approach to investment due to the prevailing environment would limit the ability to realise the full potential benefits.

Flexible / Timely Policy and Regulatory Settings

There are still challenges facing the mining industry when introducing new technology, and the ability for existing policy settings to accommodate change in a timely and effective manner. There can be a lag period between the promotion of technological advances, and the ability for the regulatory framework to adapt.

For example, drone use in the mining industry is increasing, resulting in genuine gains in safety and technology. The Civil Aviation Safety Authority (CASA) which regulates drone use recognises the challenges in keeping pace with the use of drones. In response they have undertaken various reviews of regulation, and have implemented a number of reforms responding to the increase of, and changing nature of use of drone technology. The latest discussion paper released in late 2021 proposed a raft of changes including use of drones in indoor or confined spaces, maximum operating heights, operation within 30 metres of a protected person amongst others.

In NSW, industry has been trialling the use of remote sensing technology via drone use, satellite imagery and aircraft for analysing rehabilitation and biodiversity outcomes. The technology can deliver a range of benefits including improved health and safety outcomes by reducing field work, as well as greater frequency and cost effectiveness for checking progress. Industry is working proactively with the government to present findings and benefits associated with the use of this technology. While industry and government are working constructively on this issue, physical site inspections are still required to certify rehabilitation and biodiversity offset outcomes, rather than remote sensing technology.

There have also been challenges associated with the introduction of new safety technologies. These include operational, technical and regulatory hurdles. For example, some mining companies are currently in the process of trialling proximity detection technologies. Challenges include the development of suitable technical solutions for a dynamic and rugged mining environment, constraints associated with underground mining settings such as gas and communications and regulatory settings. The industry is proactively working with the Resources Regulator to improve the collective understanding of these challenges and to collaboratively develop solutions to these.

These examples highlight the structural hurdles that often frustrate the efficient and timely take up of new technologies, despite the best efforts of industry and government.

[21] Page 50 - https://www.minerals.org.au/sites/default/files/The%20Future%20of%20Work%20-%20The%20economic%20implications%20of%20technology%20and%20digital%20mining%20-%20EY%20Report%20-%20February%202019.pdf

The NSW Government should continue to pursue practical regulatory reforms that further enhance the ability for all industries to innovate. This could include (but not limited to):

- Pilot or trial programs to test new technology without the need to wait for regulation to catch up; or
- Streamlined modifications of development consents where alternative technologies are proposed to replace an approved approach; or
- flexible certification/compliance regimes that embrace the use of emerging technologies (e.g replace physical inspections with drone technology)

The NSW Government should also continue to seek to work constructively with industry to identify available innovative solutions driven by technological advances, and can also ensure there are simple and flexible processes to resolve any regulatory impediments that may be hindering implementation.

The NSW Government could use the regulatory trial or 'regulatory sandbox' concept[22] so that new and innovative technologies in mining and agriculture that are constrained by current regulatory settings can be tested under controlled conditions. This would allow a more rapid pathway for the evaluation and development of new technologies with the endorsement of the appropriate regulatory authorities.

> *The most appropriate regulation will not always be developed by regulators working in isolation,but more likely by working in partnership with regulated entities. Co-design and co-development of regulatory models with stakeholders, including the use of regulatory trials and sandboxes, can be an effective policy development tool in complex, uncertain and dynamic environments that demand adaptability from governments[23].*

Examples of the trial or "regulatory sandbox" approach/framework being implemented include:

- Australian Energy Market Commission - developing a framework where participants can test innovative concepts in the market under relaxed regulatory requirements at a smaller scale on a time limited basis[24]
- Australian Securities and Investments Commission - allowing businesses to test certain innovative financial services to facilitate innovation[25]
- Australian Energy Regulator - Proposing a framework to help energy innovators and start-ups navigate complex regulatory frameworks and enable the trial of new products and services to deliver greater choice and cheaper energy options[26]

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[22] NSW govt will offer regulatory sandboxes to test new tech - Strategy - iTnews

[23] https://www.productivity.nsw.gov.au/sites/default/files/2018-03/final_report_-_nsw_regulatory_policy_framework_-_independent_review_2017_0.pdf

[24] Regulatory Sandboxes | AEMC

[25] https://asic.gov.au/for-business/innovation-hub/enhanced-regulatory-sandbox/

[26] https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/trial-projects-guidelines-regulatory-sandboxing

Furthermore, the NSW Government, in collaboration with the Australian Government, other States and Territories and relevant international jurisdictions should proactively investigate new trends in anticipation of emerging technology of innovation, and work with industry on any necessary regulatory changes.

A flexible and anticipatory regulatory regime is vitally important to support innovation and technological advances.

Capable Workforce - Education and Training

Education and training of the workforce will be vital to unlock the full potential and future opportunities that technological advances in mining will deliver to regional areas. The quality of education is a key determinant in whether the future workforce receives the relevant foundation of knowledge and skills for future jobs or the ability to obtain advanced qualifications.[27]

As in the past, the skills needed for mining operations will change in line with advances in technology. To take advantage of opportunities, the current and future NSW mining and METs workforce must be equipped with the skills and knowledge crucial to future jobs.

Consistent with the changing nature of Australia's general employment mix[28] STEM skills are vitally important as mining innovation and technology advances. Initiatives such as the CSIRO Generation STEM Community Partnerships Program in the Central West and Orana regions of NSW are strongly supported.

All levels of the education system, including vocational education and training (VET), must be responsive to and targeted towards the knowledge and skill requirements presented by innovation and emerging new technologies. There should be sufficient levels of investment in education to ensure the system is equipped to provide quality education content and attract higher regional participation, particularly in STEM and other relevant areas.

The mineral and resources industry already faces critical skills shortages across a range of professional and trade occupations. Training packages and credentials therefore, must be able to rapidly adapt to reflect changing skill and regulatory requirements as new technologies emerge and subsequently become integral to mining operations and the associated METS sector.

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[27] Australia 2030: Prosperity through innovation

[28] https://www.industry.gov.au/sites/default/files/May%202018/document/pdf/australia-2030-prosperity-through-innovation-full-report.pdf?acsf_files_redirect