

# Submission

## 2016 National Research Infrastructure Roadmap

### Capability Issues Paper

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#### Questions

##### **Question 1: Are there other capability areas that should be considered?**

The issues paper downplays the significance of geoscience and earth science by considering them only in the context of environment and resource management. This approach overlooks the valuable application of these sciences by the Australian minerals industry, which is a fundamental source of Australia's comparative advantage in the global economy and a major contributor to the nation's innovation effort. As the Department of Industry, Innovation and Science points out:

Australia's innovation and economic performance of the past decade has been dominated by the mining sector, which has ... exploited its comparative advantage to generate enormous growth in investment, output and exports.<sup>1</sup>

Similarly, the CSIRO notes that: 'Innovation has been instrumental in the development of energy and minerals resources'.<sup>2</sup>

Further, the Department of Industry, Innovation and Science notes that Australia's trading partners in Asia will continue to drive global growth and commodities demand.<sup>3</sup>

Apart from being the highest employer of mining engineers (12,500), the resources sector is the largest employer of geologists and geophysicists, directly employing more than 7,000 and indirectly employing almost 5,000. The sector also employs (directly and indirectly) more industrial and mechanical engineers, and more metallurgists and physicists, than any other industry. More than 13,300 industrial and mechanical engineers are employed directly and indirectly in mining, and more than 2,700 metallurgists and physicists.<sup>4</sup>

A critical capability that should be supported and expanded is the pre-competitive information produced by Geoscience Australia (as well as state geological surveys) which define the geology of a basin or a region. This information is essential to encouraging new exploration, as it provides data to potential investors that would not have otherwise been produced. The Department of Finance found that public support for pre-exploration studies is appropriate because they have strong 'public good' attributes. This is because these data, once created, may be obtained by any user without diminishing their availability to other users; and any restriction on access either creates unacceptable efficiency or welfare losses, or is not practical.<sup>5</sup> Moreover, for every dollar invested in pre-competitive programs, there are more than 20 times the net benefits back to the economy.<sup>6</sup>

The long-term challenge for the minerals industry and the nation is that the discovery of new deposits has not kept pace with depletion. Some 80 per cent of Australia's current mineral production is derived from mines discovered more than 30 years ago. In the corresponding period,

<sup>1</sup> Department of Industry, Innovation and Science, [Australian Innovation System Report](#), 2015, p.11.

<sup>2</sup> CSIRO, [Unlocking Australia's resource potential](#), 2015, p.4.

<sup>3</sup> Department of Industry, Innovation and Science, [Resources and Energy Quarterly – March Quarter 2016](#), released on 8 April 2016, Canberra, p. 24f.

<sup>4</sup> Department of Employment, [Job Outlook 2014](#); MCA calculations.

<sup>5</sup> Department of Finance and Deregulation, [Strategic Review of Geoscience Australia](#), May 2011, pp. ix-x.

<sup>6</sup> ACIL Allen Consulting, [Exploration Incentive Scheme Economic Impact Study](#), 2015, p. 78.

Australia's exploration performance – as measured by the discovery of world-class, economically significant mineral deposits – has declined.<sup>7</sup>

The federal government's \$100 million Exploring for the Future budget package confirms that the minerals industry is integral to Australia's national science and innovation agenda. The investment will expand Australia's geoscientific effort in support of the next wave of minerals exploration.

Similarly, the UNCOVER initiative, advanced by the Australian Academy of Science, involves unprecedented collaboration between Geoscience Australia, CSIRO, the mining and exploration industries, state geological surveys and universities to address the challenge of discovering new mineral resources for Australia. The ultimate goal of UNCOVER is to achieve a step-change in knowledge and methodologies that will provide improved data and technologies. This will be critical to discover Australia's minerals wealth beneath the cover in areas that have historically been difficult to explore.<sup>8</sup>

The Australian minerals industry welcomes the bipartisan support for UNCOVER. Ongoing support from both federal and state governments will be critical to the success of the initiative and for the opportunity of Australia leading the world in undercover exploration.

### **Environment and Natural Resource Management**

Question 18: Are the identified emerging directions and research infrastructure capabilities for Environment and Natural Resource Management right? Are there any missing or additional needed?

The MCA considers it important to recognise the extensive investment of long established industries, including minerals sector in environmental and natural resource science. Future investment should seek to leverage this research.

The industry has long-standing relationships with universities and research institutions, such as the University of Queensland's Sustainable Minerals Institute and CSIRO. This research contributes to our understanding of our natural environments and facilitates ongoing improvements in the industry's environmental performance.

The mining sector is third biggest employer of environmental scientists, with more than 1,800 directly employed and more than 11,800 indirectly employed.<sup>9</sup> The Australian minerals industry is a global leader in the development of land rehabilitation and restoration and invests heavily in water resource science, water re-use and treatment. Typical areas of research include:

- Land restoration (for example, the use of CSIRO's Ecosystem Function Analysis tool to assess rehabilitation).
- Plant sciences (for example, BHP Billiton's seed bank initiative in the Pilbara and development of Pilbara seed atlas).<sup>10</sup>
- Water science (for example, improving the identification and management of blue-green algae).<sup>11</sup>

### **Other comments**

It should be noted that the Australian minerals industry supports spending on science and research both by contributing substantially to federal and state revenues and by funding activities directly.

The minerals industry is estimated to have contributed \$165 billion company tax and royalties in the decade to 2014-15.<sup>12</sup> In 2014-15 alone, the industry is estimated to have paid more than \$12 billion

<sup>7</sup> UNCOVER, [Background and future funding requirements](#), December 2015, p. 1.

<sup>8</sup> UNCOVER, [Background and future funding requirements](#), December 2015, p. 1.

<sup>9</sup> Department of Employment, [Job Outlook 2014](#); MCA calculations.

<sup>10</sup> Minerals Council of Australia, [Mine rehabilitation in the Australian minerals industry](#), Canberra, February 2016.

<sup>11</sup> Australian Coal Association Research Program, [People, passion & the pursuit of excellence](#), ACARP, 2011, p. 39.

in company tax and royalties – more than double the level paid prior to the mining boom. Royalty payments to state and territory governments have increased almost threefold from \$3.2 billion in 2005-06 to \$8.4 billion in 2014-15.<sup>13</sup> At the same time, the Productivity Commission confirms that: ‘The estimated effective rate of assistance from tariff and budgetary assistance for mining is negligible’.<sup>14</sup>

Further, the Australian minerals industry contributes hundreds of millions of dollars annually to scientific endeavours through a range of innovative partnerships with research bodies. Collaborative vehicles include:

- **Cooperative Research Centre Mining (CRCMining)**, which operates to deliver transformational research and innovations that maximise mining productivity and enhance resource utilisation, safety and sustainability (\$12.2 million in 2013-14 with \$6.2 million contribution from industry, now wholly funded by industry).<sup>15</sup>
- **Cooperative Research Centre Optimising Resource Extraction (CRC ORE)**, which works to improve the efficiency and cost-effectiveness of mineral extraction (\$110 million of funding including \$76 million from industry).<sup>16</sup>
- The **Australian Coal Industry’s Research Program (ACARP)**, which aims to improve the industry’s competitiveness, safety and environmental performance (\$273 million in funding to 1,468 projects since ACARP’s inception in 1992).<sup>17</sup> ACARP has conducted 754 projects with universities, CRCs and the CSIRO to improve health, safety and environmental outcomes.<sup>18</sup>
- The Australian black coal industry’s **COAL21 Fund**, which invests in the demonstration of low emissions coal technology (\$300 million committed to date).<sup>19</sup>
- **AMIRA International** – a mining industry vehicle headquartered in Melbourne that leverages R&D – has developed almost 700 projects and attracted \$578 million of investment since 1959.<sup>20</sup>

In addition, the MCA values and supports the existing and future infrastructure investments into AuScope in their contribution to mineral exploration. AuScope has provided valuable cost-effective and timely access to earth science and geospatial data for researchers. Ensuring the continuing seamless integration of data systems and knowledge infrastructure is crucial in supporting future mineral geoscience research.

The minerals industry makes a significant financial contribution to Australia’s higher education sector to ensure a high quality supply of Australian graduates. The MCA-operated Minerals Tertiary Education Council (MTEC) has contributed \$50 million to support the continued teaching of mining related tertiary courses since 2000. MTEC engages with 17 Australian universities to build capacity in higher education through national collaborative programs in the core disciplines of mining engineering, metallurgy and minerals geoscience.

The MCA-supported Minerals Industry National Associate Degree (MINAD) project has developed two new associate degree programs in mining engineering and minerals geoscience. These degree courses enable existing minerals industry employees to upskill into paraprofessional and professional roles, providing career advancement opportunities for individuals while improving overall workforce skills and capacity.

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<sup>12</sup> Deloitte Access Economics, [Minerals Industry Tax Survey 2015](#), Report prepared for the Minerals Council of Australia, December 2015.

<sup>13</sup> Deloitte Access Economics, op. cit.

<sup>14</sup> Productivity Commission, [Trade and Assistance Review 2014-15](#), Canberra, June 2015, p. 26.

<sup>15</sup> CRCMining, [Transforming Mining: Annual Report 2013-14](#), p. 41.

<sup>16</sup> CRC ORE, [About Us](#).

<sup>17</sup> ACARP, [What is ACARP? The Australian Coal Industry’s Research Program: Annual Report 2015](#), p. 3.

<sup>18</sup> Figure supplied to the MCA by ACARP.

<sup>19</sup> Minerals Council of Australia, [About COAL21](#).

<sup>20</sup> AMIRA International, [Who we are](#).

Industry investment in minerals related teaching and learning at participating universities was \$11 to \$13 million in 2013-14 alone. In 2016, MTEC committed to investing a further \$2 million in higher education consortiums. Over 4,500 graduates have benefitted from industry investment in MTEC supported programs since 2000. Some 85 per cent of all four-year trained mining engineers, 100 per cent of four-year trained metallurgists and 64 per cent of four-year trained minerals geoscientists come from these programs.

To support the transition from university to the workforce, MCA members provide paid vacation work and structured practical experience to more than 600 undergraduates from a wide range of disciplines each year at an annual cost that exceeds \$6 million in wages alone. Major minerals companies also have structured graduate programs that support individual career development and personal growth.

Further, MCA is actively preparing the geoscientists for the future through funding of the new National Exploration Undercover School (NExUS) at the University of Adelaide ([www.nexus.org.au](http://www.nexus.org.au)). By addressing key themes identified by UNCOVER, the NExUS program will take up to 30 geoscience students (from honours-level upwards) through a three-week intensive program consisting of classroom and field work activities to develop the knowledge and tools required to address the challenges and opportunities of mineral exploration in Australia into the future.

Public support for science and research that enables minerals exploration and development is critical both to the long-term performance of the industry and to the maintenance of a key comparative advantage for the Australian economy.