

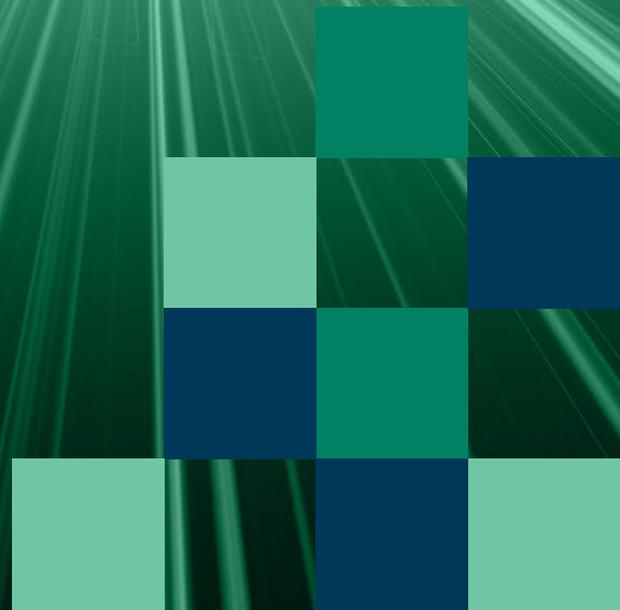
# Mining Equipment, Technology and Services

A Roadmap for unlocking future growth  
opportunities for Australia

SUMMARY

**CSIRO FUTURES**

CSIRO Futures is the strategic advisory  
arm of Australia's national science agency.



# Megatrends: How is the sector changing?

## RETHINKING OUR RESERVES

Discovery rates for accessible ores are declining and not keeping pace with depletion. Solutions that help exploration under cover, extend mine life and optimise recovery, combined with social expectations for recycling, and re-use are all playing a role in changing what is deemed economic.

## THE KNOWLEDGE ECONOMY

As emerging economies continue to develop their mining sectors, support in developing skills, services and technologies are needed for efficient exploitation of mineral reserves. In advanced economies, adoption of specialised digital technologies is resulting in fierce competition for talent.

## NEW SUPPLY, NEW DEMAND

Urbanisation and development of emerging economies will continue to spur demand for mineral resources, which will be supplied from new geographic domains through technology advancements. Rapid adoption of consumer technologies is also changing demand for high-value, low-volume metals and minerals.

## THE ERA OF ACCOUNTABILITY

Mining companies will move forward as good corporate citizens, where accountability and environmental success exceeds expectations, strengthening community engagement and support for the industry.

## PLUGGED IN AND SWITCHED ON

Digital technologies, analytics, automation, mobile technologies and connectivity are creating exciting opportunities for the mining industry. Connected technologies are improving safety and environmental outcomes, increasing productivity and driving disruptions across the mining value chain and life cycle.

## THE INNOVATION IMPERATIVE

Declining commodity prices, ore grades and productivity, together with rising costs are compelling the mining industry to focus on operational improvements. The industry requires creative solutions to become more productive, sustainable and achieve financial growth.

# What challenges do we face?

In a changing landscape, the continued success of Australian METS companies is not guaranteed. High rates of digital and technological change in the mining sector reduce the, once high, barrier to entry for METS companies, resulting in greater competition for equipment and services.

Other challenges include:

- The cyclical nature of the mining industry, which directly impacts METS companies.
- Low levels of industry collaboration, with relationships between METS, mining and research sectors often characterised as transactional rather than strategic, discouraging innovation and forcing price minimisation.
- Weak translation of mining research into commercial outcomes and innovation.

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**METS companies must prepare for increased competition from within and outside of the sector and focus on innovative and creative solutions to provide greater value and ensure continued success and future growth.**

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## How can the sector grow?

There are numerous opportunities for growth available to Australian METS businesses, however, prioritisation will be important to remain internationally competitive. Unlocking growth opportunities will require consideration and planning around people and skills, culture and collaboration, new processes and business models, and enabling science and technology. Key opportunities for METS companies include:

### 1 Social and environmental sustainability

Growing societal concern about the impacts of mining will drive the development of new processes and technologies to improve social wellbeing, environmental performance and economic prosperity.

### 2 Data driven mining decisions

Rapidly evolving digital technologies are providing opportunities to enable both better and faster decisions by making relevant data available anywhere and just-in-time.

### 3 Mining automation and robotics

Recent technology cost and performance breakthroughs in robotics, automation, artificial intelligence, data communications and vision systems are enabling safer and more efficient operations.

### 4 Advanced extraction

Deeper, more complex and lower grade orebodies combined with the need for a lower environmental footprint will drive the development of advanced methods of extraction.

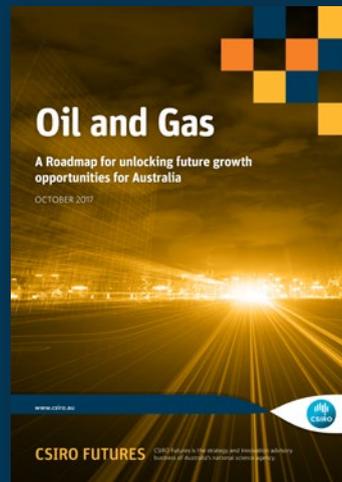
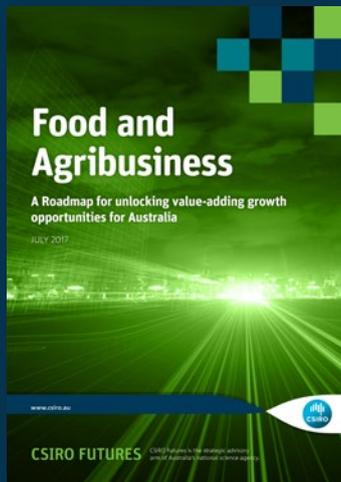
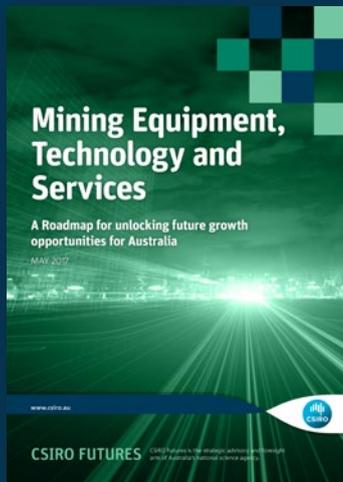
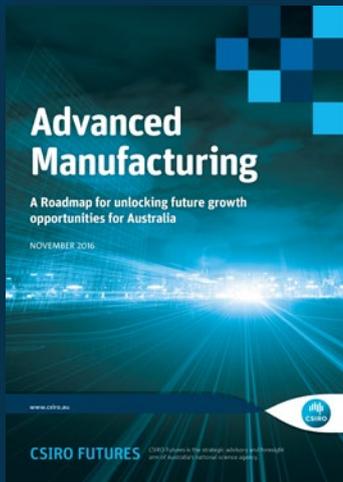
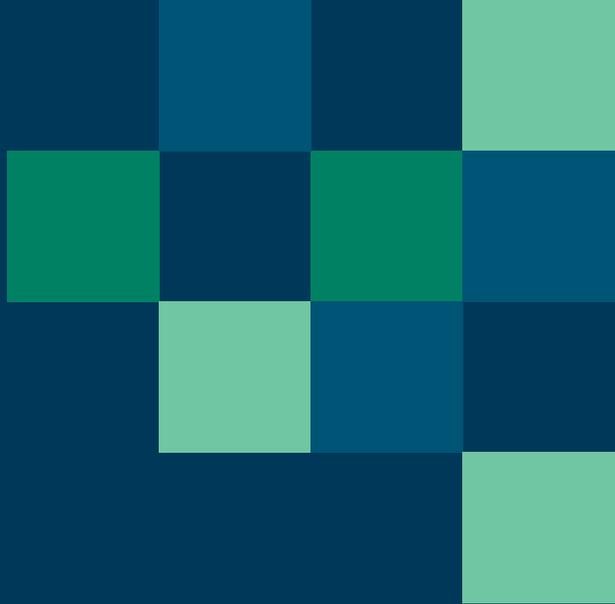
### 5 Exploration under cover

Worldwide the majority of near-surface, high quality mineral deposits have already been identified and developed, requiring new technologies to identify new reserves deeper under cover.

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Read more in the full report:  
[www.csiro.au/METS](http://www.csiro.au/METS)

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## CSIRO FUTURES

CSIRO Futures is the strategic advisory arm of Australia's national science agency. We work with senior decision makers in Australia's largest companies – and government – to help them translate science into strategy and plan for an uncertain future. We build on CSIRO's deep research expertise to help our clients create sustainable growth and competitive advantage by harnessing science, technology and innovation.

## CSIRO MINERAL RESOURCES

CSIRO's Mineral Resources business works across the minerals value chain to grow Australia's resource base, increase the productivity of the minerals industry and reduce its environmental footprint, both in Australia and globally. As one of the largest minerals research groups in the world, we work with more than 150 partners internationally, including exploration and mining companies, METS sector businesses, research institutions and government.

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## FOR FURTHER INFORMATION

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