Mining Equipment, Technology and Services

A Roadmap for unlocking future growth opportunities for Australia

EXECUTIVE SUMMARY

MAY 2017

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Executive Summary

Australia's Mining Equipment, Technology and Services (METS) sector has an important role to play in the continued success of Australia's mining industry.

However, the mining industry's increasing dependence on specialist technologies, combined with a changing global landscape is creating new opportunities and threats for the future of Australia's METS sector.

This Industry Roadmap, through a process of sector consultation and analysis, aims to support this decision making process. It explores global mining megatrends and Australia's comparative advantages and identifies five opportunities where Australian METS companies can be internationally competitive. These opportunities are supported by a discussion of the underlying science and technology investments and management skills, culture, processes and business models required to unlock them.

Global mining megatrends are reshaping the METS sector, requiring Australian companies to re-evaluate their role in the industry's future.

The changes are challenging the viability of conventional practices and technologies, creating opportunities for new business models and reducing barriers to entry for new players. Australian METS companies need to ensure that their strategy is aligned with the trends that are set to drive change in the industry over the next 20 years.

FIGURE 1: GLOBAL MINING MEGATRENDS

RETHINKING OUR RESERVES

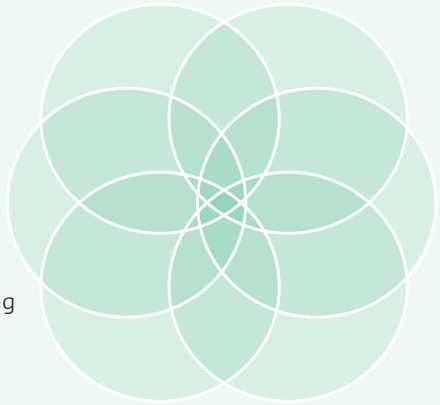
Rates of discovery for high-quality and accessible ores are declining and not keeping up with depletion. Solutions that help exploration under cover, extend the life of a mine and optimise recovery, combined with social expectations for recycling, re-use and urban (or above ground) mining are all playing a role in changing what is deemed economic.

THE INNOVATION IMPERATIVE

A drop in commodity prices, along with rising costs, declining ore grades and concerns about decreasing productivity are compelling the mining industry to focus on operational costs. The mining industry requires creative and innovative solutions to become more productive, sustainable and achieve financial growth.

THE KNOWLEDGE ECONOMY

As emerging economies continue to develop their mining sectors, support in developing applicable skills, services and technologies will be required for efficient and sustainable exploitation of mineral reserves. In advanced economies, increased adoption of specialised digital technologies are resulting in greater collaboration, new business models and fierce competition for talent.



PLUGGED IN AND SWITCHED ON

Digital technologies, data analytics and automation along with greater mobility and increasing connectivity are creating exciting opportunities for the mining industry. These connected technologies are improving safety and environmental outcomes, increasing productivity and driving disruptions across the mining value chain and life cycle.

NEW SUPPLY, NEW DEMAND

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

THE ERA OF ACCOUNTABILITY

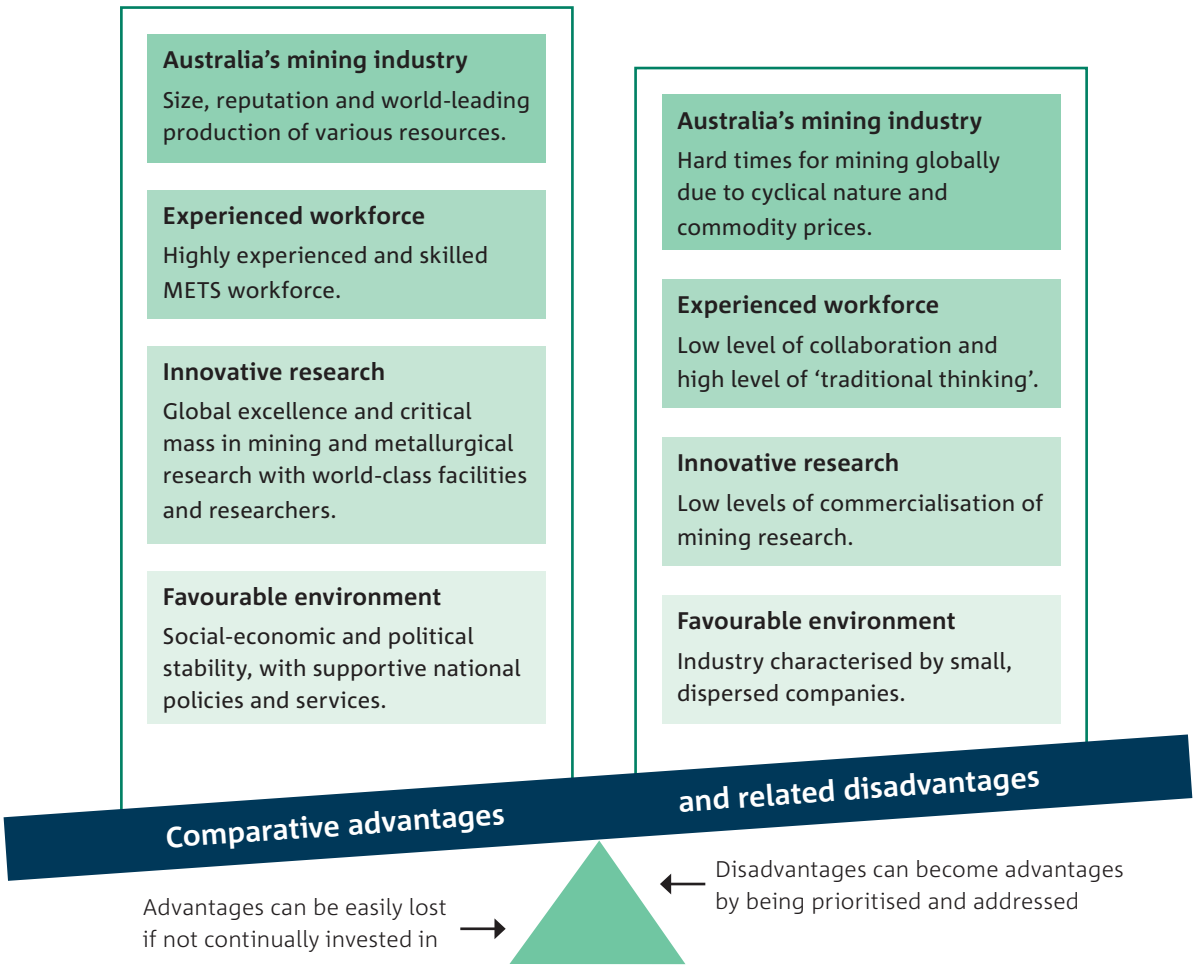
Mining companies will move forward as good corporate citizens, where accountability and environmental success exceeds expectations, strengthening community engagement and support for existing and new projects into the future.

The METS sector has comparative advantages that can be lost if not nurtured, and disadvantages that can become advantages if prioritised.

Australia's METS sector is underpinned by a number of unique comparative advantages that help improve its competitiveness on a world stage. These advantages have related disadvantages that the sector needs to be cognisant of because, despite not being uniquely Australian, they will impact the future competitiveness of the sector if not addressed.

Continued success for Australian METS companies is not guaranteed, as high rates of digital and technological change in the mining sector no longer create a strong barrier to entry. Observations of change and disruption from other industries, such as automotive and aerospace, are hard to ignore. As such, 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.

FIGURE 2: AUSTRALIA'S COMPARATIVE ADVANTAGES AND RELATED DISADVANTAGES

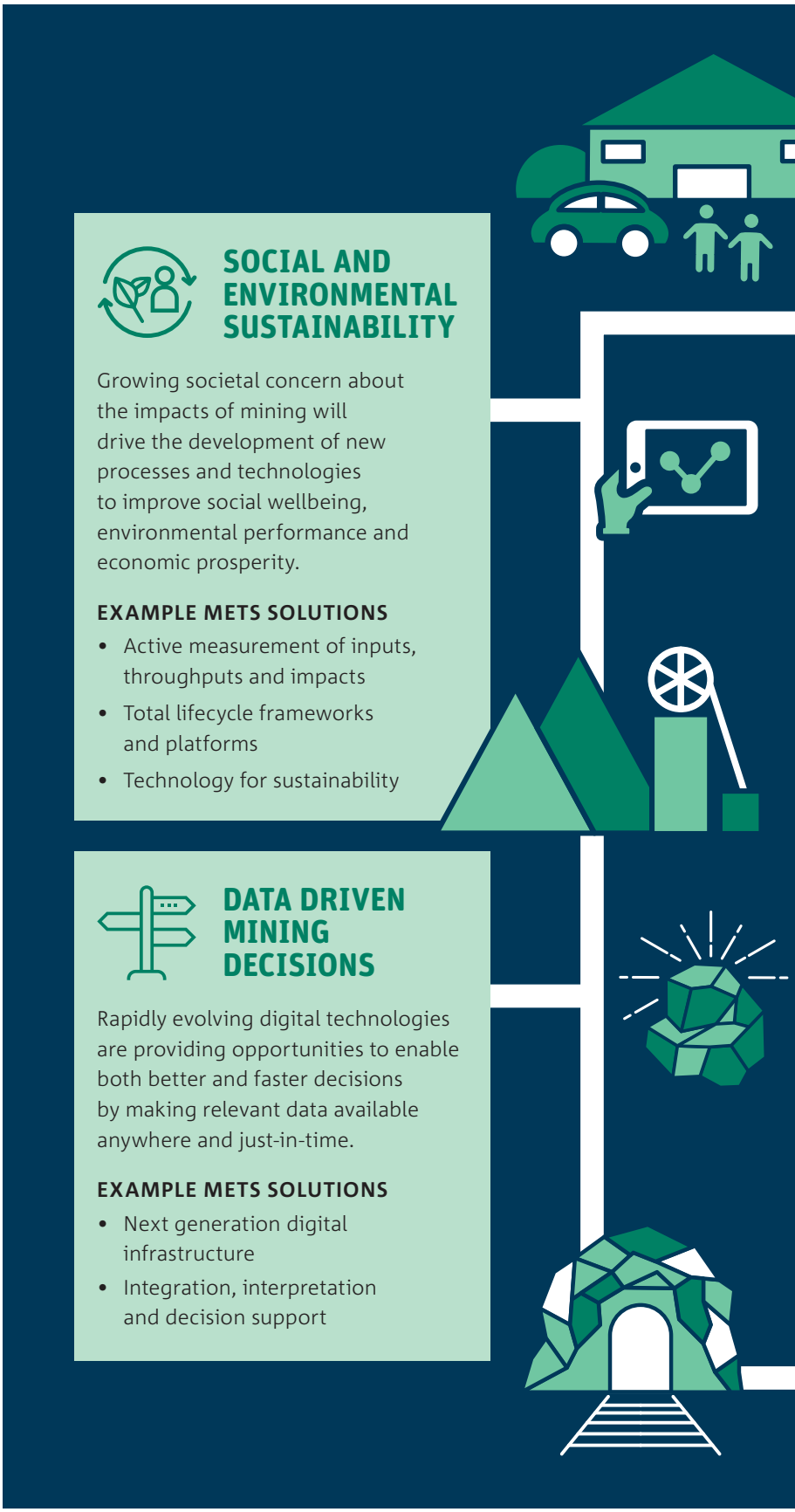


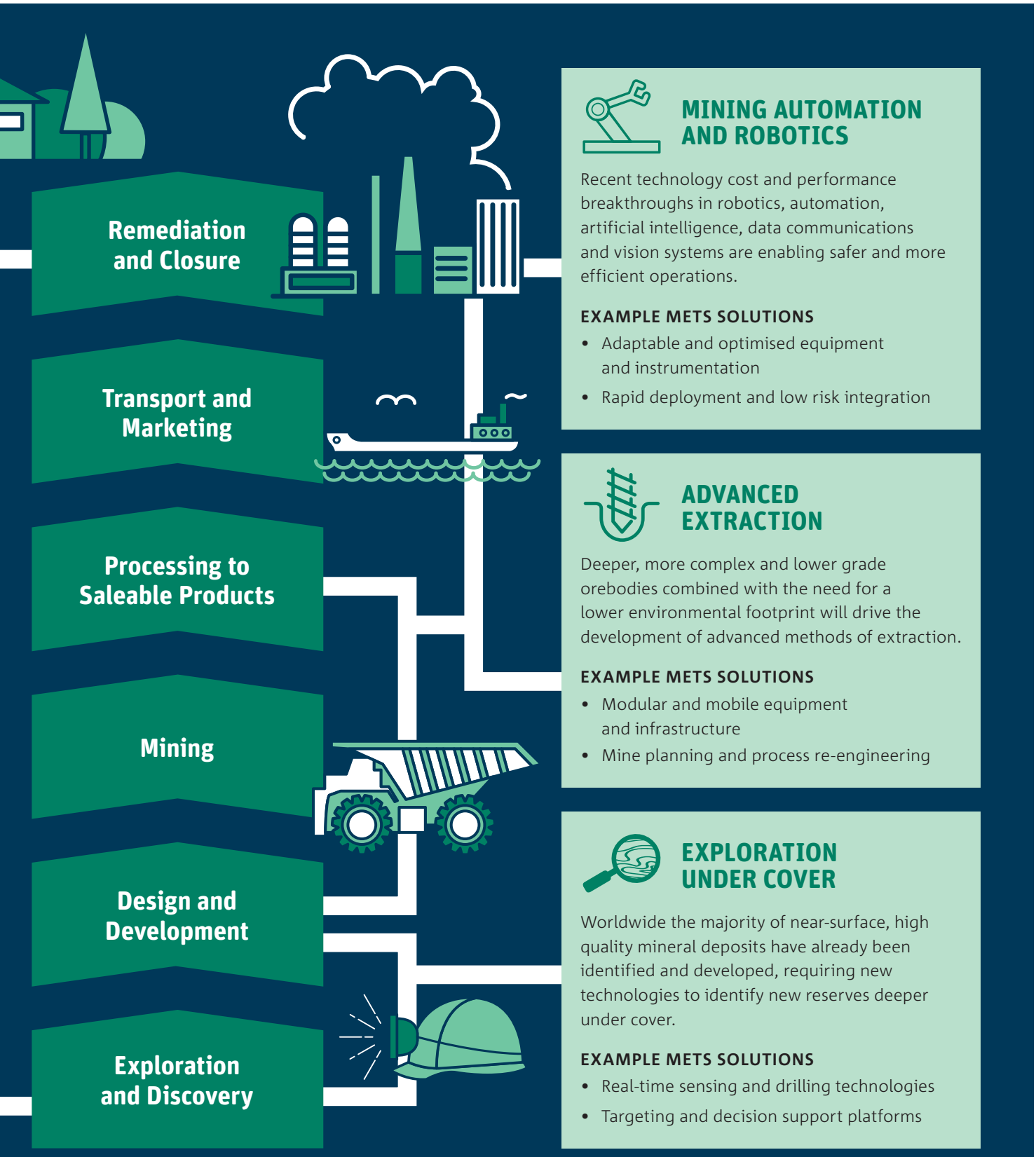
There are many opportunities, however Australian METS companies need to prioritise the right solutions to be internationally competitive.

The culmination of the Roadmap process is the identification of five opportunities to support the continued growth of the Australian METS sector. These opportunities span the mining value chain with the Data Driven Mining Decisions and Social and Environmental Sustainability opportunities playing a pivotal and enabling role across the other opportunities. Each opportunity is supported by example METS solutions that could be taken to market, which aim to help businesses identify and prioritise potential areas of specialisation and differentiation within each opportunity.

*The five opportunities for growth are not considered to be an exhaustive list of opportunities available to the METS sector.

FIGURE 3: IDENTIFIED OPPORTUNITIES FOR THE AUSTRALIAN METS SECTOR





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.

EXAMPLE METS SOLUTIONS

- Adaptable and optimised equipment and instrumentation
- Rapid deployment and low risk integration

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.

EXAMPLE METS SOLUTIONS

- Modular and mobile equipment and infrastructure
- Mine planning and process re-engineering

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.

EXAMPLE METS SOLUTIONS

- Real-time sensing and drilling technologies
- Targeting and decision support platforms

Businesses must take action to unlock opportunities, investing in business transformation and new science and technology capabilities.

In order to unlock the various growth opportunities, Australian METS companies should consider the following actions:

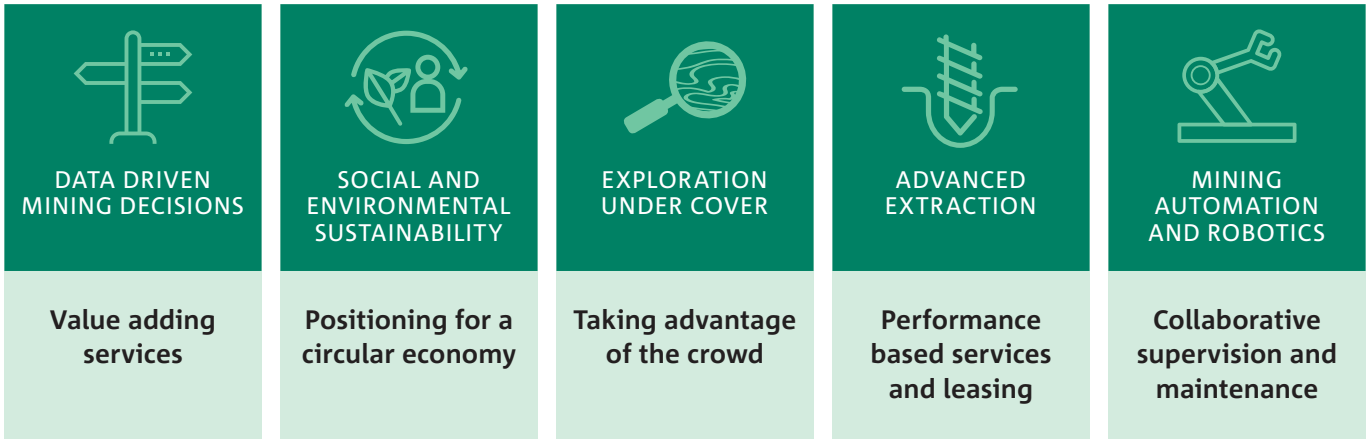
FIGURE 4: SUMMARY OF CHANGES PER GROWTH OPPORTUNITY

	BUSINESS ENABLERS			ENABLING SCIENCE AND TECHNOLOGY
	PEOPLE AND SKILLS	CULTURE AND COLLABORATION	PROCESS AND STANDARDS	
Data driven mining decisions	Foster skills to improve interpretation, modelling and decision making using big and small datasets.	Improve how the business uses and responds to data, moving from reactive to proactive.	Address interoperability and integration issues, working with industry and research to implement appropriate data standards.	• Sensors and the Internet of Things • Analytics and optimisation • Visualisation • Cyber security
Social and environmental sustainability	Establish cross-disciplinary skills – engineering, financial, social, environmental and economic – to better demonstrate the long-term value proposition of triple bottom line solutions.	Connect miner, government, social and environmental groups to support and improve technical and regulatory decision making processes.	Assess operational and regulatory barriers that may limit social and environmental monitoring and reporting, and the associated liabilities.	• Monitoring and sensing • Decision support and stakeholder engagement • Site and equipment design
Exploration under cover	Develop geophysical and geochemical knowledge, data analysis, modelling and geographic information system (GIS) skills.	Increase multidisciplinary collaboration and support activities that improve decision making and resource governance.	Identify and promote best practice in data acquisition, processing, sharing and integration to improve data quality and reduce issues with integrating large exploration datasets.	• Next generation drilling technologies • Expanding exploration knowledge and processes
Advanced extraction	Develop skills in installing, operating and manufacturing advanced extraction technologies as well as advanced drilling, sensing, sorting and processing technologies.	Improve alignment of performance drivers and foster interdisciplinary collaboration across mining, metallurgical and geological personnel.	Support development of regulatory frameworks for advanced extraction technologies, including standards for interoperability of technologies.	• Advanced drilling and cutting technologies • Sensors and ore sorting • Integrated beneficiation technologies
Mining automation and robotics	Foster skills in the operation and maintenance of autonomous and robotic equipment; develop technical expertise in material sciences and nanotechnology.	Challenge the role of automation and robotics in mining, and use change management to address cultural acceptance of technologies.	Support sector wide actions to address interoperability issues, leveraging existing initiatives – e.g. AMIRA (P1025), EMESRT and GMSG projects.	• Machine vision, materials and robotics • Control systems and algorithms • Virtual and augmented reality

A changing business environment and evolving market creates support for a range of new business models within the METS sector.

Each opportunity identified within this report is supported by example business models that may be leveraged across a range of solutions and opportunities.

FIGURE 5: BUSINESS MODEL EXAMPLES PER GROWTH OPPORTUNITY



Long term success will be achieved by increasing collaboration across the entire Australian mining and METS innovation ecosystem.

While the identified growth opportunities and enablers largely focus on actions for individual METS businesses, long-term success requires collaboration across the entire Australian innovation ecosystem – including miners, METS, government, investors, educators and the research community.

From a science and technology perspective, the research community will need to ensure projects are well aligned to industry needs and that technologies are developed from market pull rather than technology push. This includes streamlining and improving the approach to industry partnership, ensuring the research engagement process is efficient and not overly complicated or onerous on industry.

A key vehicle for achieving this is the METS Ignited 10 Year Sector Competitiveness Plan (SCP) and the key programs of work and industry knowledge priorities (IKPs) that have been identified. This Roadmap seeks to complement the SCP and the sector's broader vision providing input into current and future IKPs. Given the cyclical nature of the industry, the report structure also provides a narrative and key questions that can be continuously applied at a company level to inform the strategic decision making process.

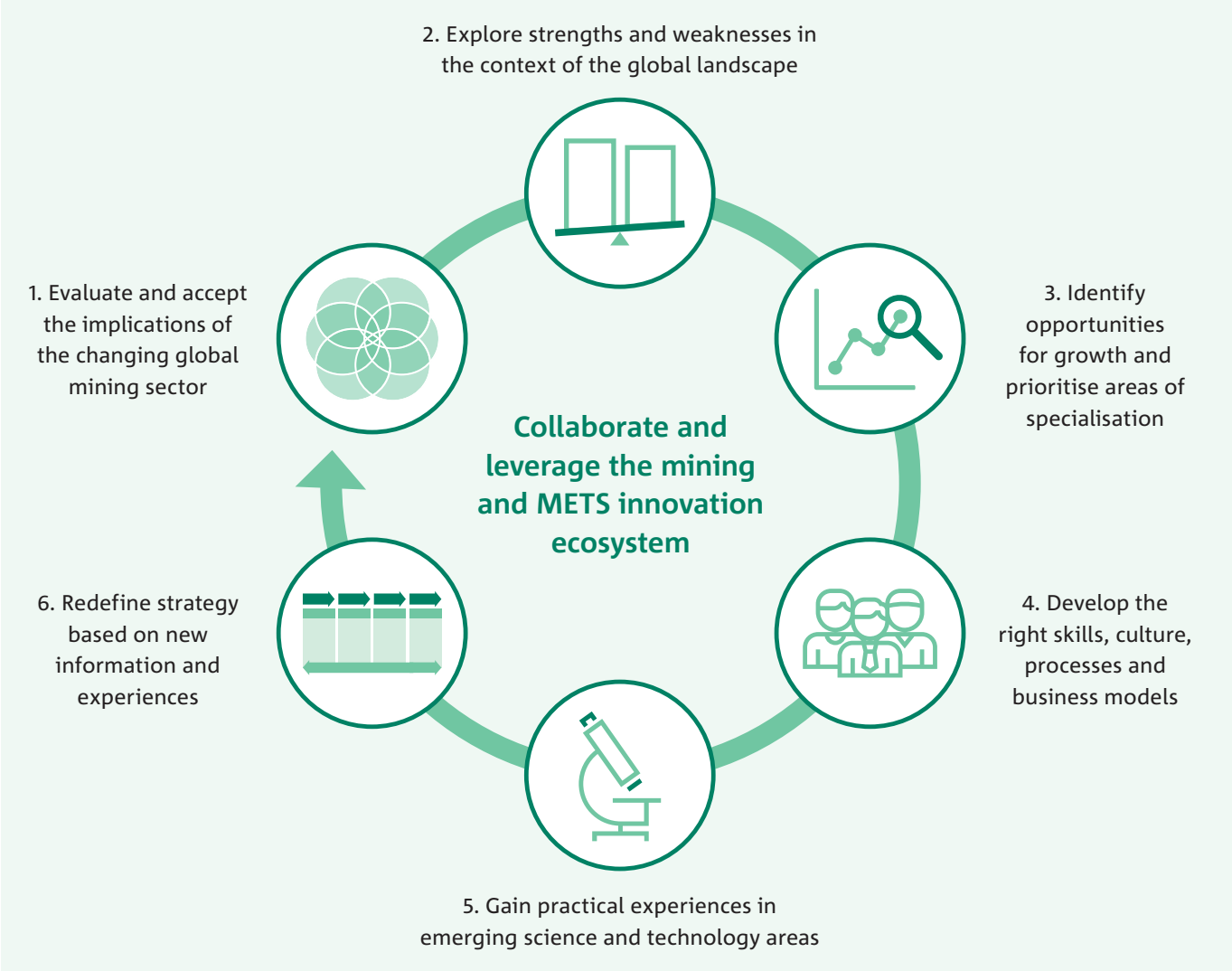
Call to action

Working together, the Australian METS sector is well placed to succeed. METS businesses will need to take calculated risks and invest in the future, and can use this Roadmap and the SCP as a tool for sustained competitive advantage (Figure 6).

METS SECTOR VISION

The Australian METS industry is an aligned, efficient and agile industry ecosystem with a high degree of collaboration, global leadership in innovation, and a growing share of the global market.[1]

FIGURE 6: USING THE METS ROADMAP



1 METS Ignited (2016). *Industry-led Growth Centre for METS.* [Online] Available from: http://www.metsignited.org/Category?Action=View&Category_id=72 Accessed 19/12/2016

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WE DO THE EXTRAORDINARY EVERY DAY

We innovate for tomorrow and help improve today – for our customers, all Australians and the world.

Our innovations contribute billions of dollars to the Australian economy every year. As the largest patent holder in the nation, our vast wealth of intellectual property has led to more than 150 spin-off companies.

With more than 5,000 experts and a burning desire to get things done, we are Australia's catalyst for innovation.

WE IMAGINE
WE COLLABORATE
WE INNOVATE

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