Australian Approaches to Innovation and Transitioning to a Low Carbon Economy

Lessons for Quebec

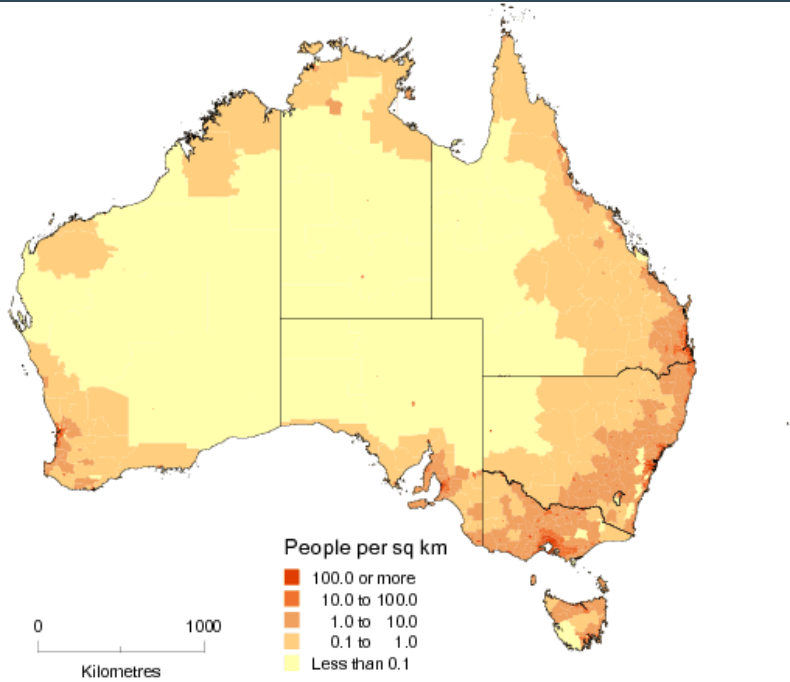
Andrew Pickford, Adjunct Research Fellow, University of Western Australia
Mark Stickells, Director, Business Development and Innovation, University of Western Australia

Overview

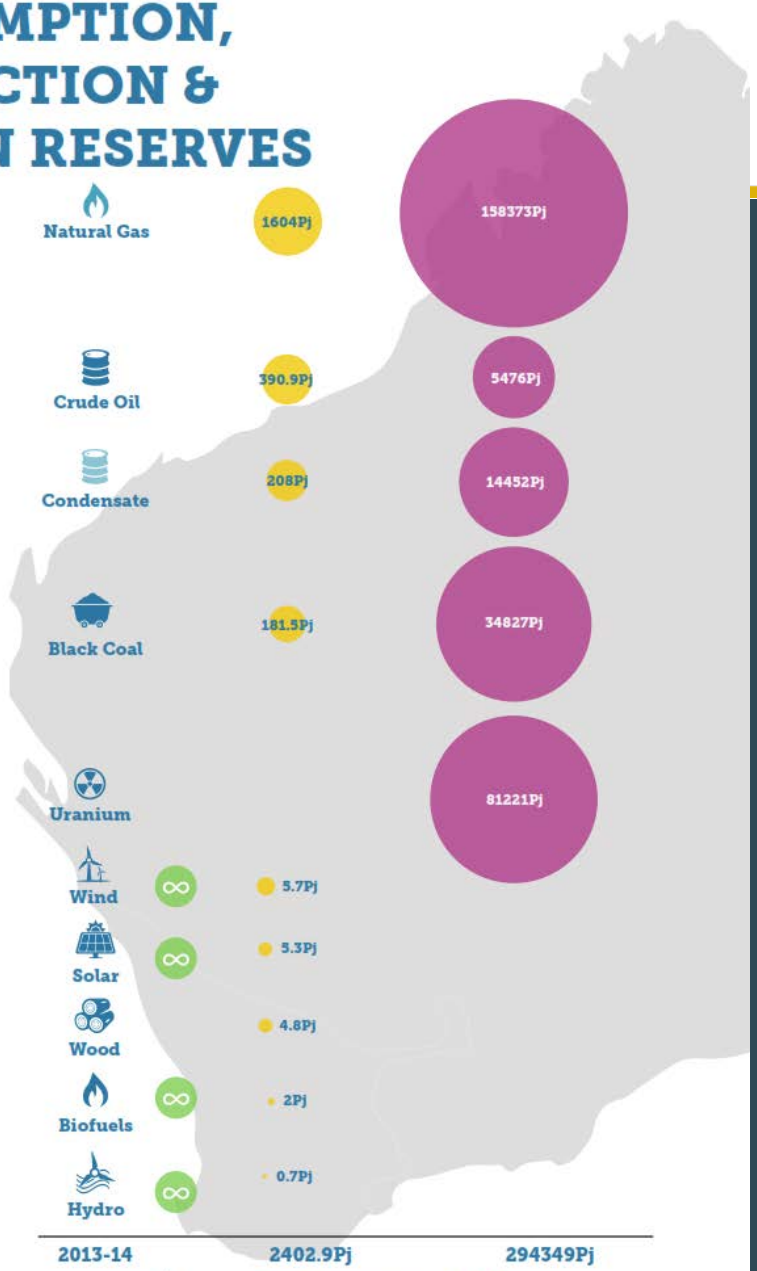
- Natural Resources and Innovation
- Australia’s Energy System
- Case study: Western Australia Energy
- Case study: Global Mining Trends
- Innovation drivers

Le réseau énergétique en Australie occidentale

- **Population**
  - 2.5-million
  - Density of around one person per square kilometre
  - Predominantly located in south west corner
- **Electricity**
  - Islanded electricity system called the South West Interconnected System
  - Peak demand in 2013-14 of 3,702 megawatts.
  - Approximately 6,000 megawatts of installed power generation capacity
    - Gas: 3,400 megawatts
    - Coal: 2,000 megawatts
    - Wind: 500 megawatts



CONSUMPTION, PRODUCTION & PROVEN RESERVES



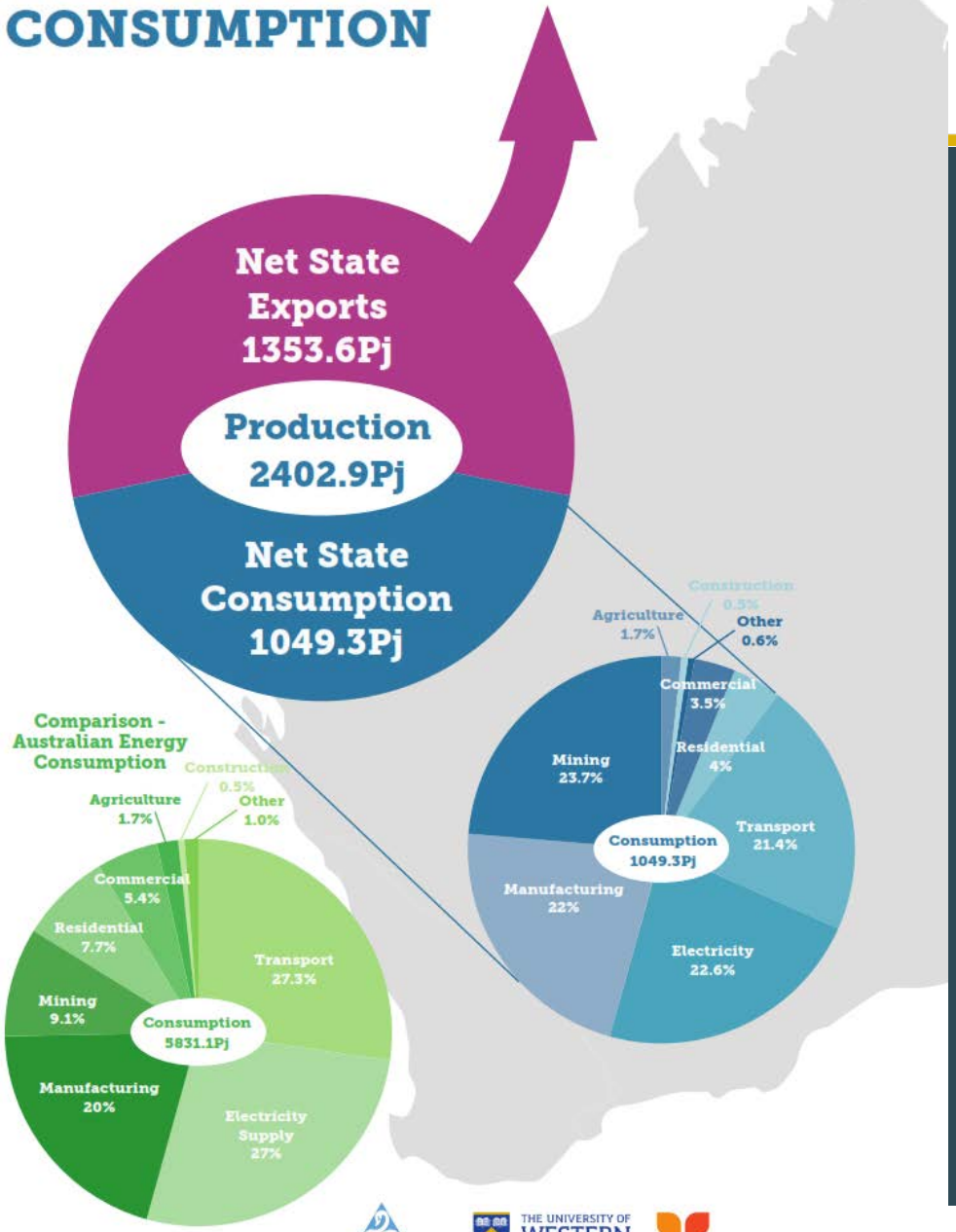
KEY

- Production
- Reserves
- Renewables

CCI · THE UNIVERSITY OF WESTERN AUSTRALIA · Perth USAsia Centre

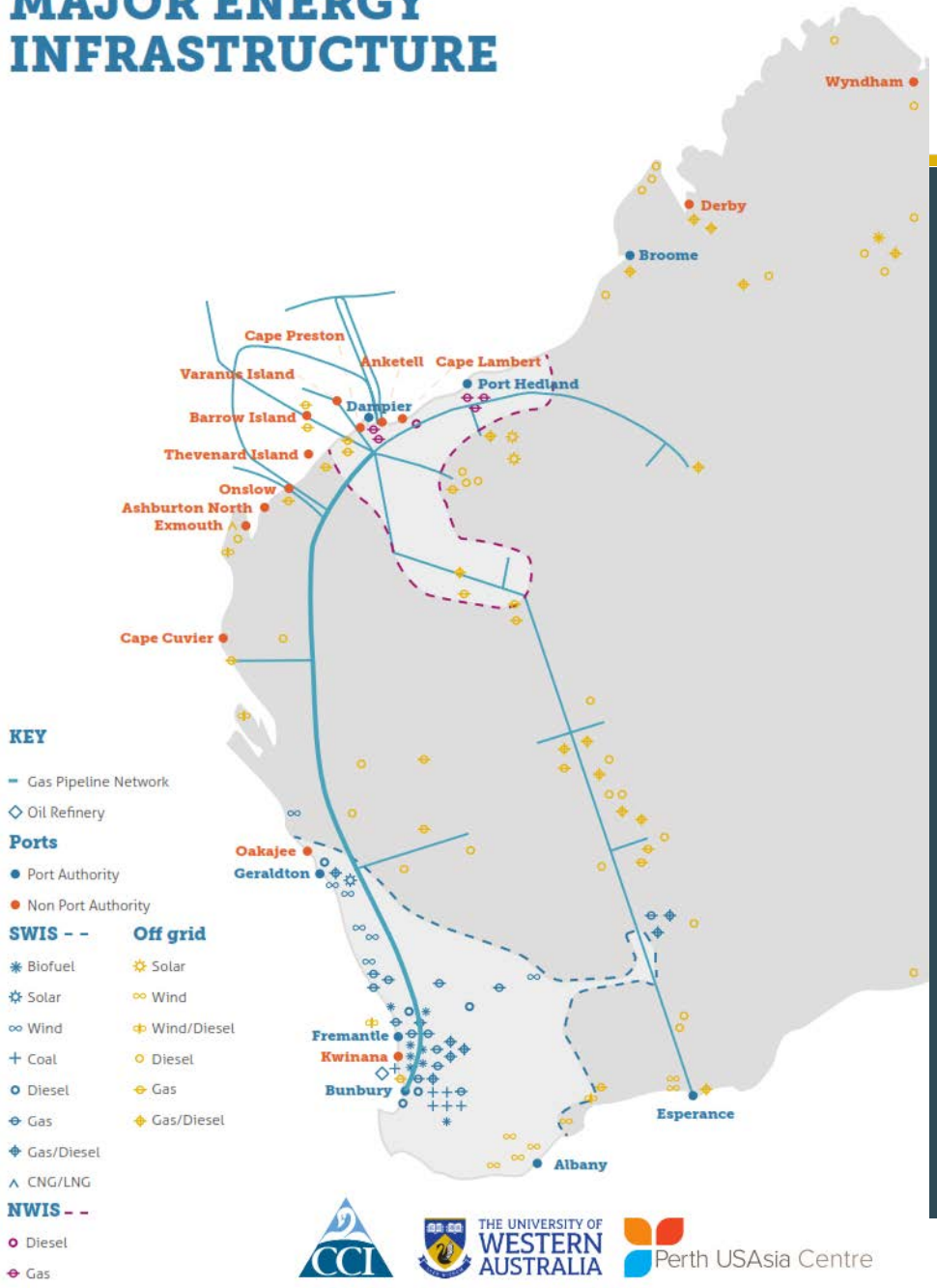
Data was compiled by CCI from various sources of the most recent publically available information, including a uranium reserve estimate from 2014. PJ referees to petajoule, a measurement of energy. 1 PJ is approximately 160,000 barrels of oil equivalent.

ENERGY CONSUMPTION



Data was compiled by CCI from various sources of the most recent publically available information.

MAJOR ENERGY INFRASTRUCTURE



THE UNIVERSITY OF WESTERN AUSTRALIA

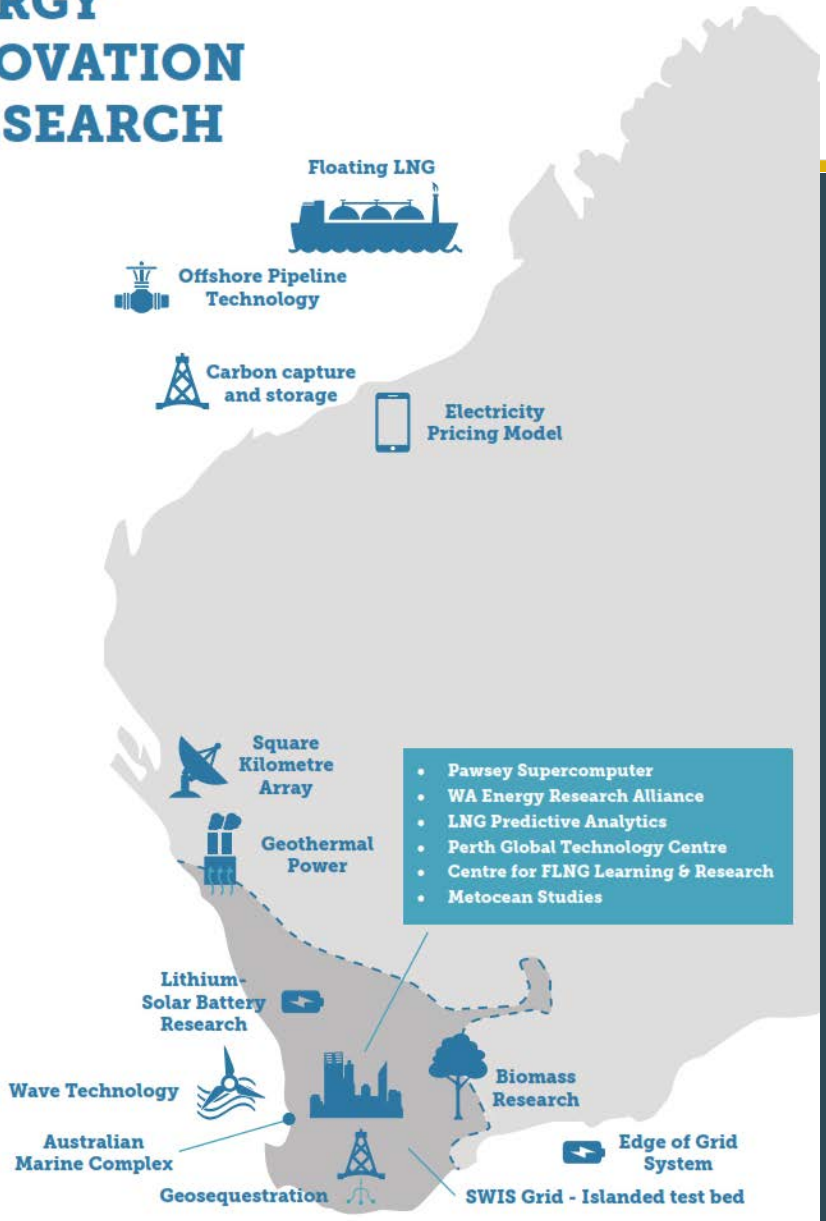
CCI

THE UNIVERSITY OF WESTERN AUSTRALIA

Perth USAsia Centre

ENERGY INNOVATION & RESEARCH

THE UNIVERSITY OF WESTERN AUSTRALIA



CCI THE UNIVERSITY OF WESTERN AUSTRALIA Perth USAsia Centre

Mining in the 21st Century

Rio Tinto Operations Centre, Perth, Western Australia

Image source - http://www.riotinto.com/documents/Mine_of_The_Future_Brochure.pdf

Innovation: State of Play

Founded in 2012

2012 — Inaugural survey
55+ responses across Australia

2014 — Industry wide survey
330+ responses across the globe

2015 — CEO Insights
Interview series with 15 CEOs and Chairmen across the globe

2016 — Full ecosystem survey
800+ responses
Launch in early 2017

2017 — Cross-industry report
Interview series with CEOs across the resources, agriculture, health, infrastructure, defence, and arts, culture & tourism industries to compare and contrast the state of innovation and identify share opportunities

'What this survey really does is drive an arrow through the major mining innovation issues. I hope people pay a great deal of attention to it.'

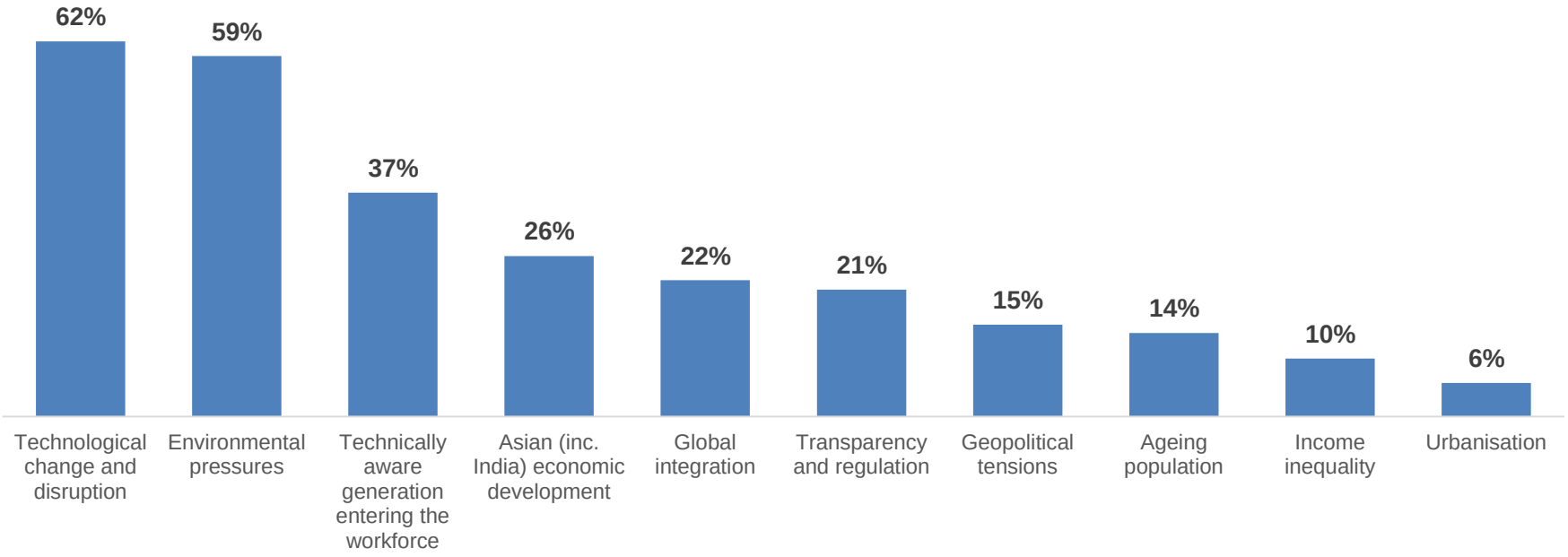
MINING CEO

We are at an incipient point

We asked: Which of the following macro trends will have the biggest impact on mining over the next 15 years?

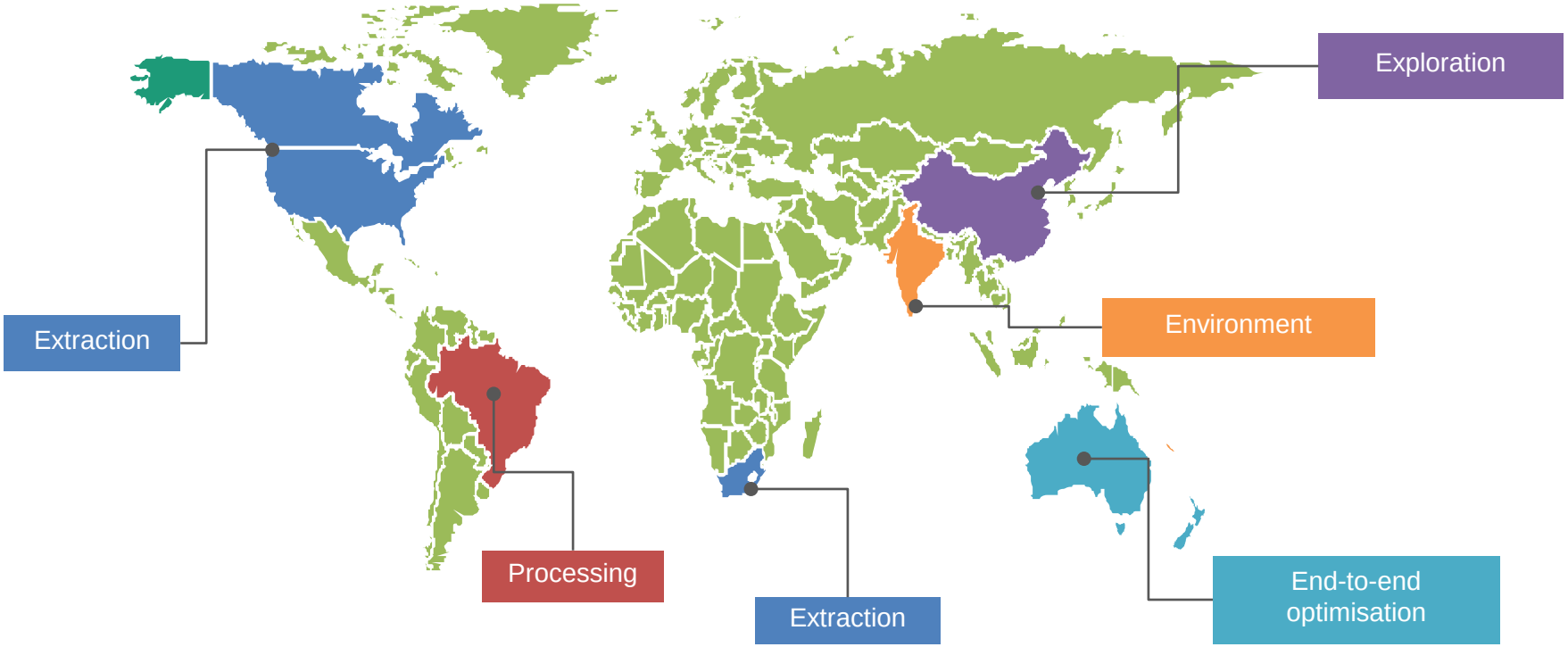
'The Market, Moore's Law and Mother Nature are the three biggest forces shaping the world today.'

Thomas Friedman



Different regions have different needs

We asked: Where in the value chain do you see the greatest value over the next 15 years?



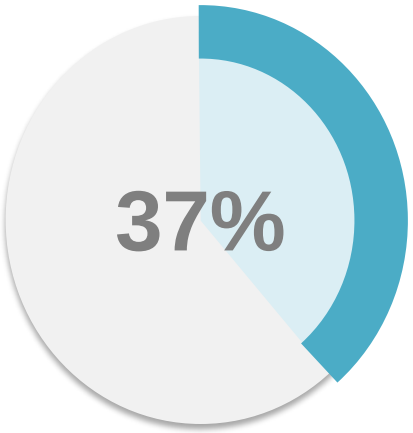
Society's expectations are increasing

We asked: Why is mining perceived negatively in society?

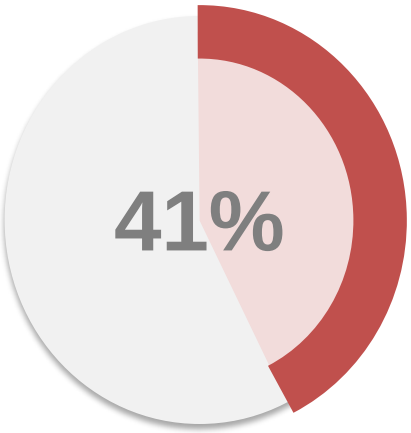
High profile accidents **Community impact** **Environmental impact**

Innovation is more critical than ever before

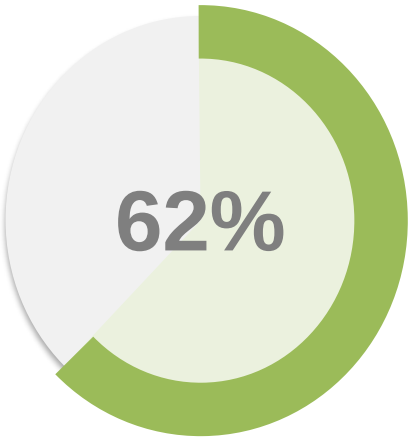
Companies that claim innovation is critical to their company's survival in the long term



2013



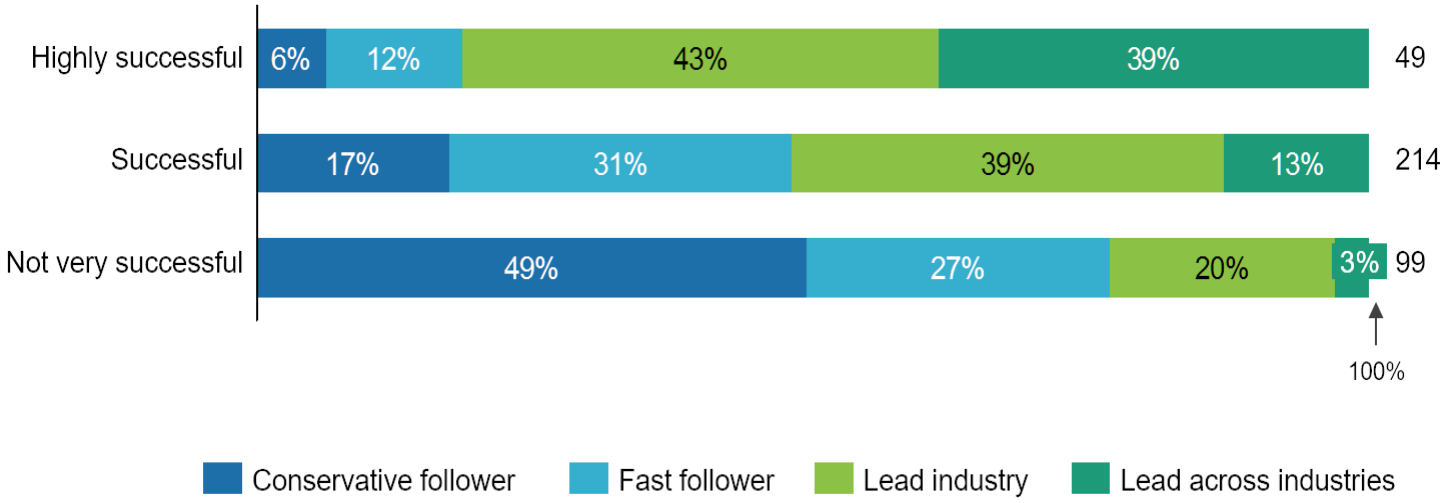
2015



2017

Being a follower is not an option

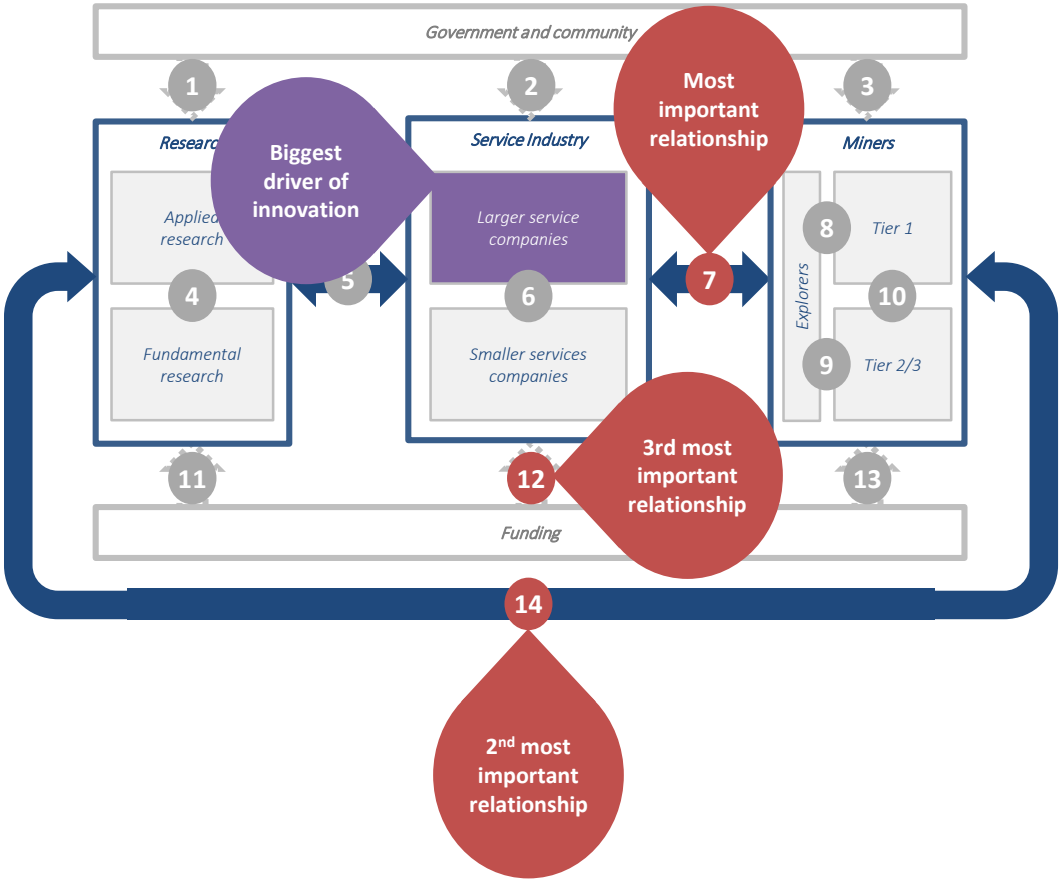
We asked: What is your company's approach, and how successful have you been introducing new innovations into your business?

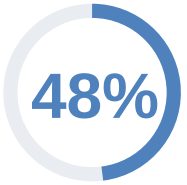


Less than ½ of mining companies describe themselves as leaders, compared to followers

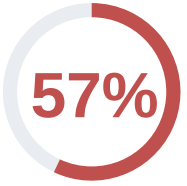
Ecosystem health drives innovation

Actions and relationships that drive innovation in the ecosystem





Governments should facilitate collaboration platforms



Mining companies should involve suppliers in their innovation process

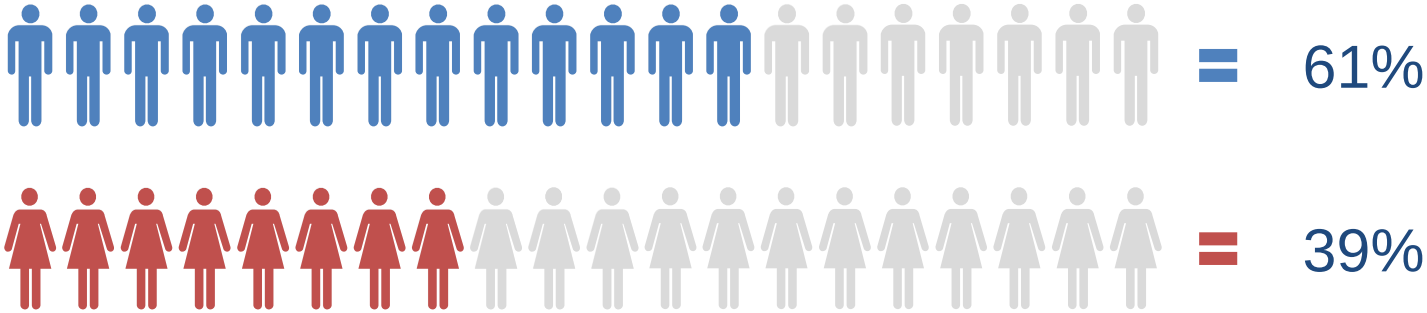
view CEOs as drivers of innovation in mining companies

of services companies say that all employees drive innovation

Diversity could be the answer

Greatest potential for technological disruption

EXTRACTION

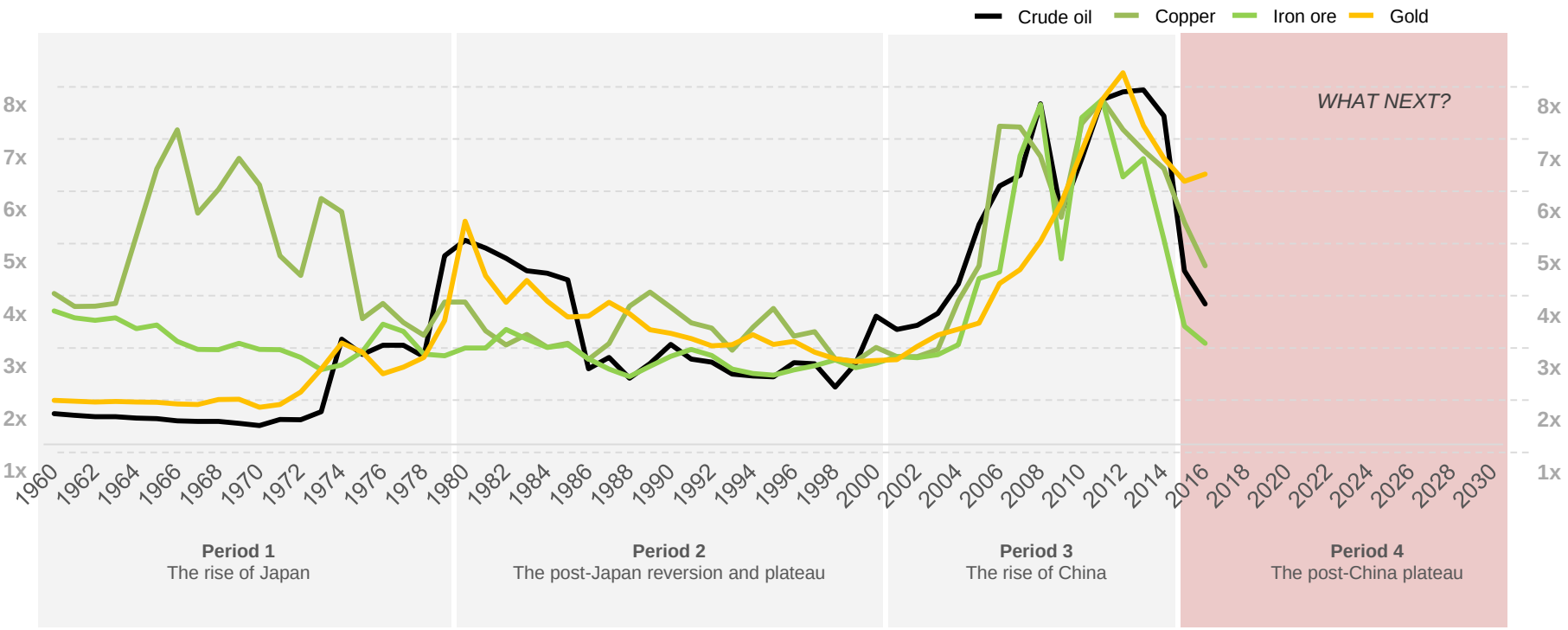


NEW BUSINESS MODEL

Innovation Drivers

Thank you

The mining industry is marked by cyclicality



Note: Prices listed in chart are 2016 World Bank forecasts published on July 26th 2016

Systemic design is required for sustained success

We asked: How should investment in innovation achieve the best overall social, environmental and economic development outcomes?

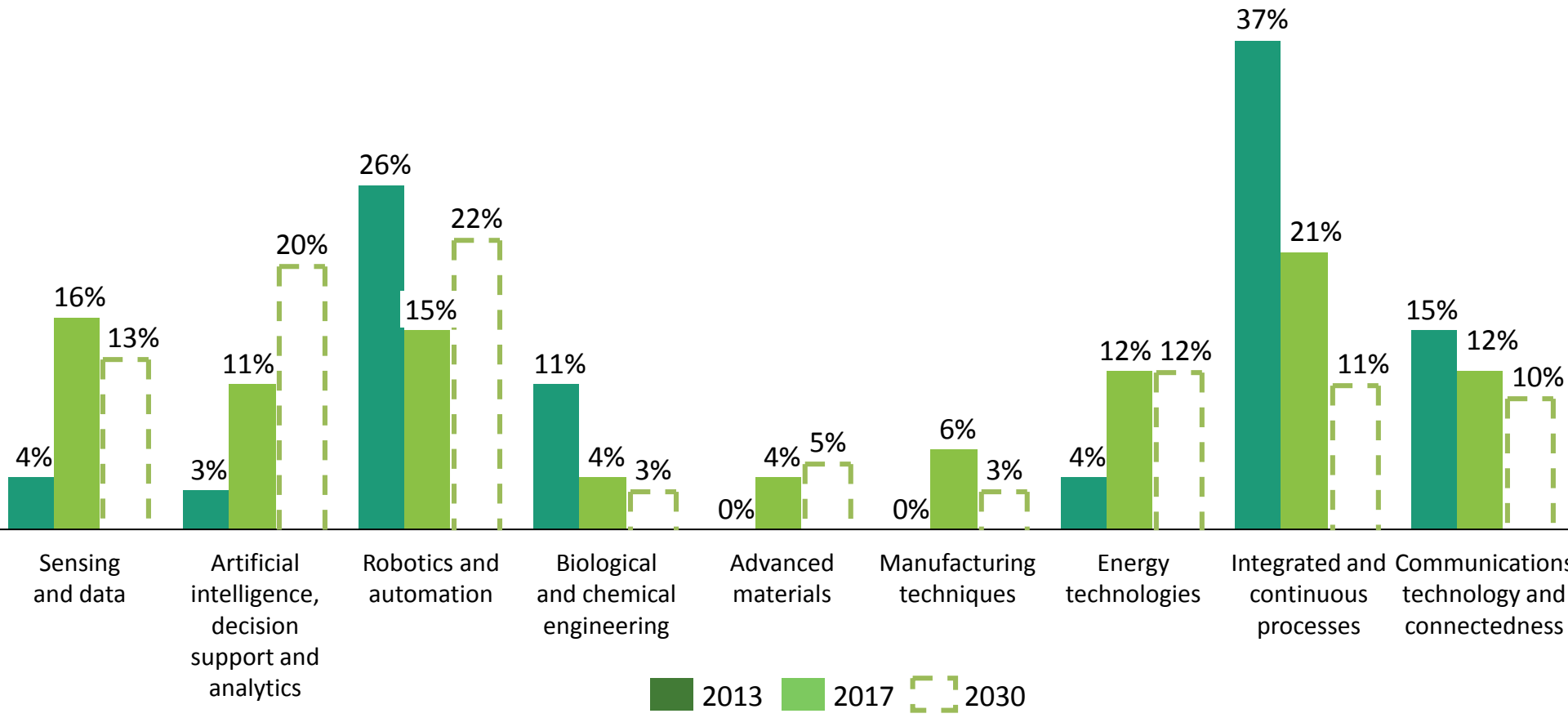
Companies should focus on 3 key areas of outside the fence investment for the highest return:

37% **Invest in local services and infrastructure**

30% **Focus on low footprint design**

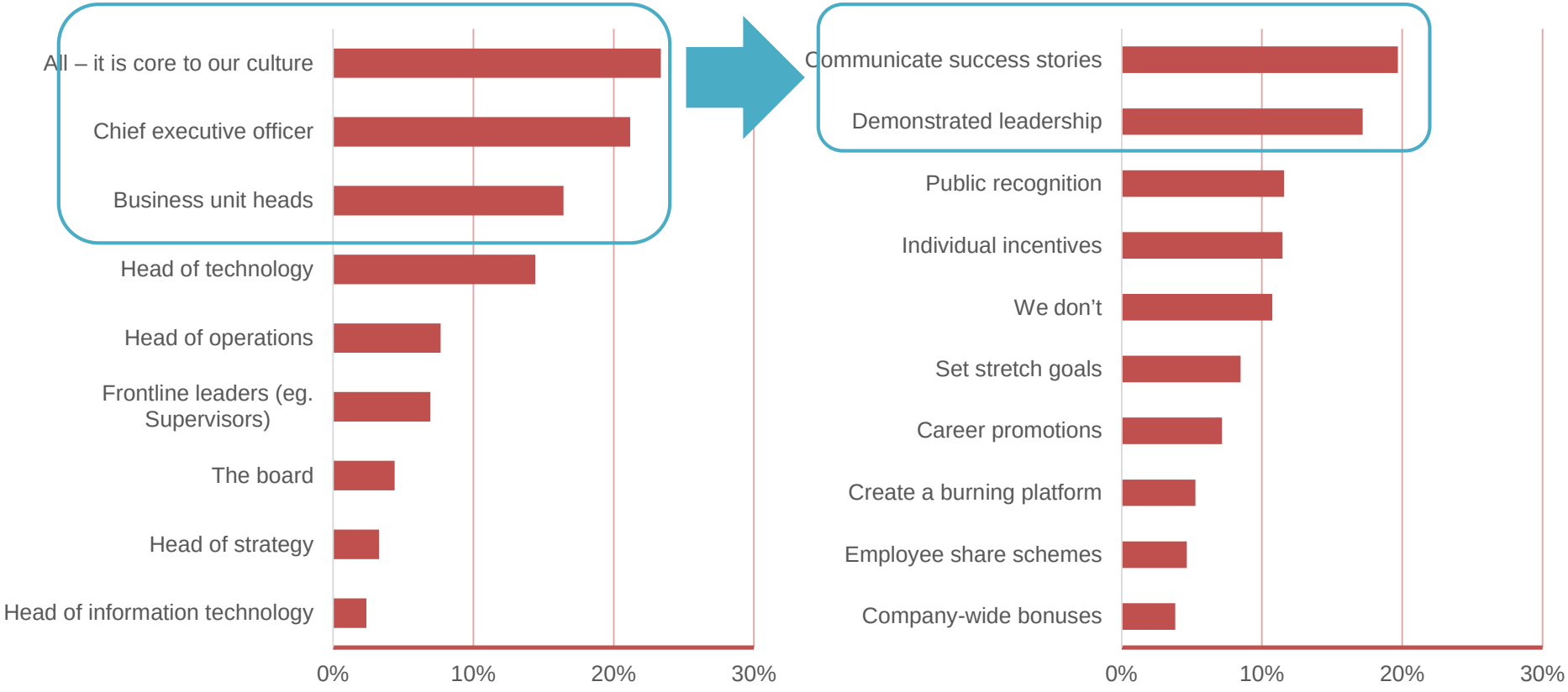
The risk of technological disruption is real

Areas most subject to disruption over the next 15 years



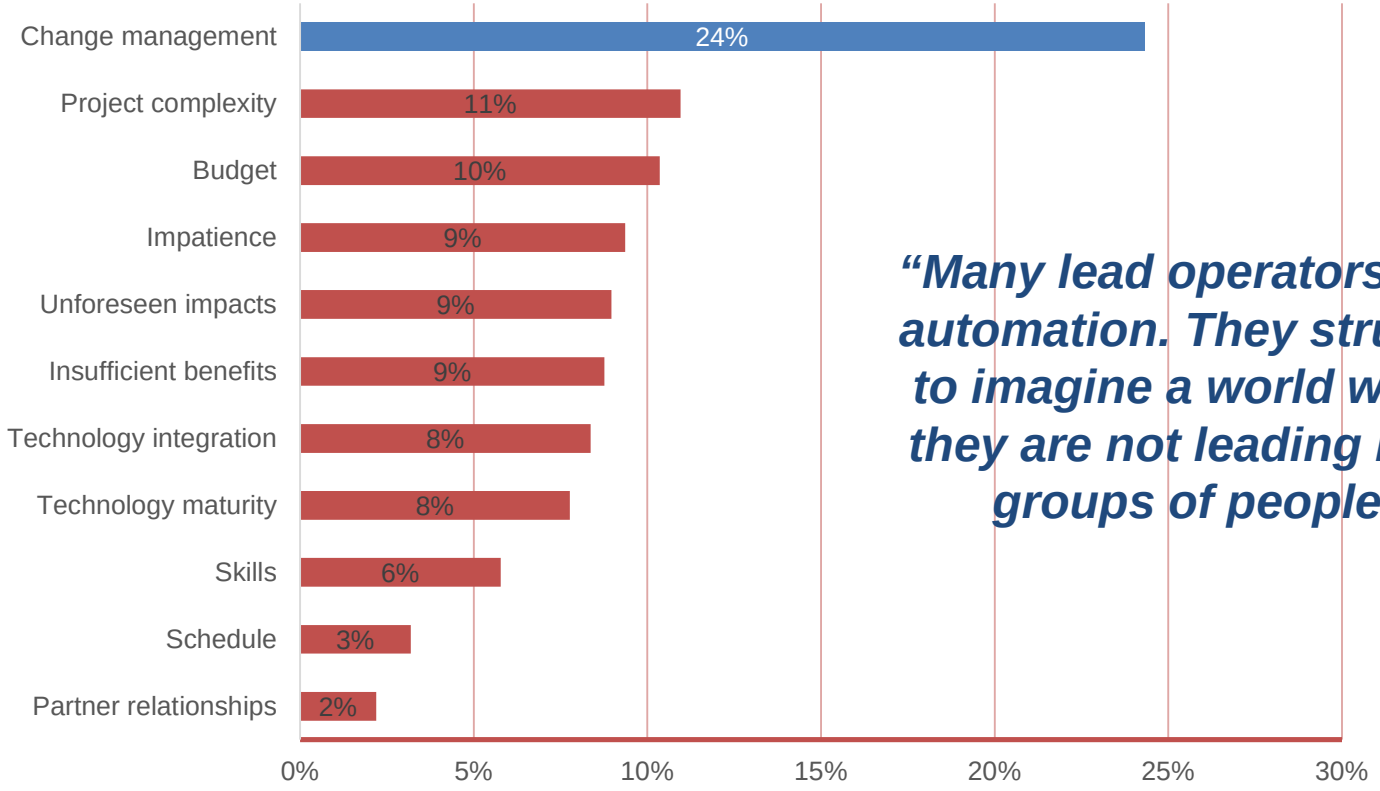
Business leaders shape this culture

We asked: Which underlying technology areas receive the most innovation focus in your company?



Key skills are required to foster acceptance

We asked: When implementation programmes of new innovations fail, what is generally the reason?



"Many lead operators hate automation. They struggle to imagine a world where they are not leading large groups of people"

A cultural shift to embrace innovation is required

A shift in industry culture as well as new skills are required to leverage technological change

Technological change and disruption (robotics, automation, and AI) are expected to impact innovation in mining over the next 15 years

Resistance to change and skill availability are considered the greatest people challenge to implementing technologies

One in five respondents reported **industry culture** as the biggest impediment to innovation in mining

INNOVATION STATE OF PLAY

2017 Mining Industry Survey Initial Insights

Supported by:

The University of Western Australia

EMI Energy & Minerals Institute

VCI

METS IGNITED
Engage in our future