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# *Productivity, not austerity*

Productivity scorecard – mining focus



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*The mining industry is generating*

**56%**

*less output per hour of work  
employed compared to 2002*

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*Support services have ballooned since  
2002, accounting for*

**13%**

*of hours accrued to the mining  
industry, up from 3% in 2002*

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*The mining industry has committed  
capital to add over*

**250 million  
tonnes**

*of new iron ore and coal output  
beyond 2012*

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## *A productivity focus over austerity measures*



**Jock O'Callaghan**  
Energy, Utilities & Mining Leader  
PwC Australia

### Productivity, not austerity, is key...

The fundamental business dynamic of the mining industry is changing. No longer can miners focus on expansion at any price – the so called “volume frenzy”- and simply rely on high commodity prices to maintain profitability and deliver shareholder returns. Rather, fluctuating commodity prices combined with a ballooning cost base have reduced profits and challenged asset values. This has prompted an urgent need for better capital investment disciplines as well as a closer focus on productivity. Recent senior leadership changes at a number of major mining companies are evidence of this strategic shift as Boards gear up to respond to new priorities.

Productivity continues to be an ongoing challenge across the mining sector and we can see from the latest set of Australian Bureau of Statistics (ABS) data that recent widespread adjustments to headcount and capital investment disciplines have yet

to impact the macro-economic picture of mining productivity. Additionally the sector faces some unique circumstances that make productivity improvement a challenge. These include long lead times in achieving returns from capital investment, the diminishing supply of easily accessible ore, infrastructure and supply chain issues as miners scramble to meet demand for resources. A wide-ranging skills shortage is also a challenge, although we are starting to see this skills pressure ease in some select areas.

With all this in mind, there remains a tremendous opportunity for companies to improve their productivity. Rather than implement austerity measures, focused and strategic changes to process improvements, de-bottlenecking and an embrace of technology can help companies deliver productivity improvements and recover their long-term financial performance.

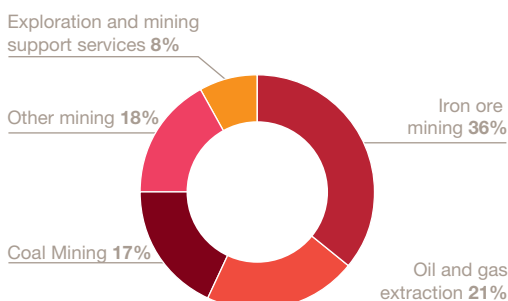
# Context

It has been 12 months since PwC launched its inaugural Mining Productivity Scorecard. Since that time, improving productivity has become an increasingly critical item on the agenda of Australian mining businesses. Softer commodity prices and a persistently high Australian dollar have been the catalysts of action in the mining industry. Headcount reductions, the postponement of major projects and changes to senior leadership in the major miners are reflective of a marked switch from a volume growth mentality to a cost and productivity focus.

The latest ABS data (current to Q4 2012) does not yet show the impact of recent restructures and aggressive cost reduction exercises at a macro level. However, PwC expects the industry to continue to target significant productivity gains over the next 12 months, as the industry continues to focus on the task.

This paper will examine macroeconomic challenges that have shaped labour and capital productivity in mining, and offer insight into how the industry is responding to these challenges.

**Figure A: Iron ore mining, coal mining and oil and gas extraction contributed 74% to GVA in Q4 2012**



Source: ABS (5206)

## Defining productivity

Productivity can be categorised into three categories:

- Labour productivity<sup>1</sup>: Output generated per hour of work undertaken. Measured in dollars of chain weighted gross value added (GVA) per hour;
- Capital productivity<sup>2</sup>: Output (GVA) per unit of capital services; and
- Asset productivity: Real output (\$ or tonnes) per resource employed (equipment, mobile plant, facility etc).

Furthermore it should be noted that the mining industry, as defined by the ABS<sup>3</sup>, includes activities such as:

- iron ore mining
- oil and gas extraction
- coal mining
- exploration and other mining support services
- other (including construction material mining and other non-metallic mineral mining)

Throughout this report, 'Mining productivity' refers to the collective productivity of these industries.

"We've put an extreme focus on issues of productivity and capital discipline, which really are very close to my heart."

**Andrew MacKenzie**  
CEO, BHP Billiton  
*AFR Boss*, March 2013

1 Source: Australian Productivity Commission (ACP) website

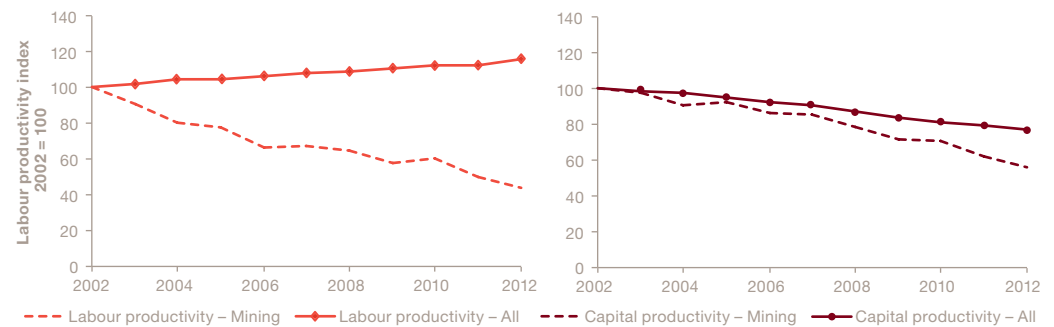
2 Source: ACP website

3 ABS, Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006

## Productivity scorecard results

In 2011 mining contributed 7.2% of output to GDP, up from 4.9% in 2002<sup>4</sup>, reflecting the increasing importance of the industry to Australia. However, despite volume increases, the ABS productivity indexes indicate that mining has been less efficient in its use of both labour and capital resources over the same period. In every year since 2002, mining has produced less output (in terms of chain weighted GVA<sup>5</sup>) per hour of labour employed than the previous year. Today, despite dramatic advances in technology, the ABS estimates that mining is achieving 56% less output per hour of work employed and 44% less output in terms of capital employed<sup>6</sup>.

Figure 1: Labour & Capital Productivity in mining has been reducing over the past 10 years



Source: ABS (5260)

4 ABS 1301.0 - Year Book Australia 2004; Year Book Australia 2012

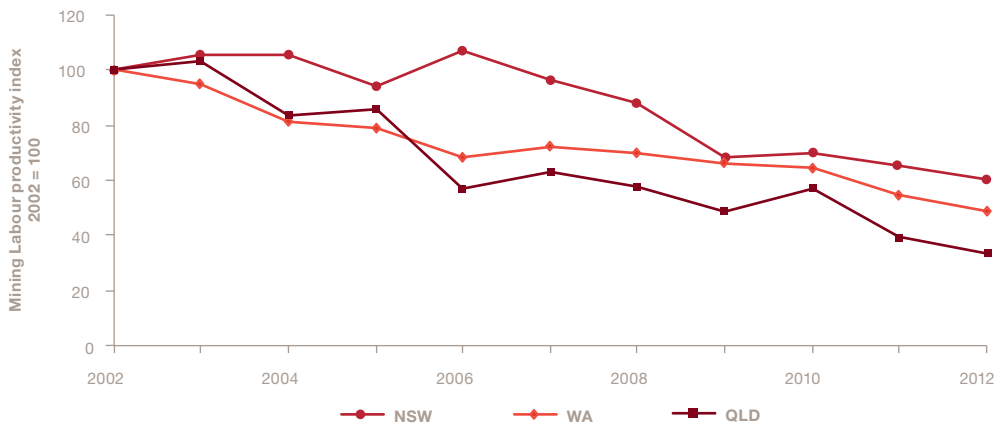
5 Gross value added (GVA) is a measure of the value of goods and services produced in an area, industry or sector of an economy. In national accounts GVA is output minus intermediate consumption and is chain weighted to remove the impacts of price and exchange rate fluctuations.

6 Compared to 2002; ABS 5260

**Queensland has demonstrated the lowest labour productivity, while NSW has performed steadily, but markedly lower than in 2002.**

The three states driving the majority of output are Queensland, Western Australia and New South Wales<sup>7</sup>. Queensland has been the poorest contributor to labour productivity, producing at 33% of the rates achieved in 2002.

Figure 2: Since 2002, each of the major mining states has been on a productivity decline



Source: ABS, PwC Analysis

By contrast, NSW has performed the strongest across the country however still remains substantially below the productivity levels achieved pre-2002.

This period is synonymous with high commodity prices and is widely recognised as the second phase of the boom.

7 These three states contributed 90% of the total mining GVA in 2012.  
8 ABS Labour force Australia (time-space research)

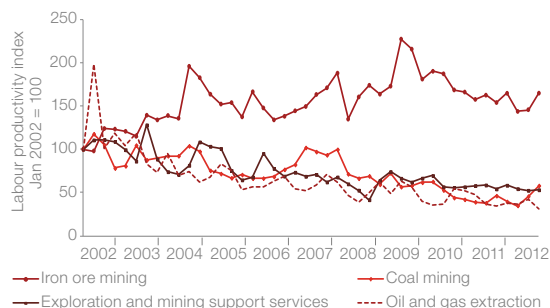
Factors influencing Queensland's relatively lower productivity include:

- The nature of the project cycle, where a number of LNG projects have brought significant headcount expansion to the state without the commensurate gains in output yet coming online;
- A multiuser logistics system which inherently reduces the control which miners have over core infrastructure (especially compared to the Pilbara);
- Recent major flood events and uniquely challenging environmental constraints; and
- Queensland's tighter labour laws in mining and heavily unionised workforce.

**Since 2009, iron ore mining productivity, whilst best in class, has steadily declined.**

Historically, iron ore mining has been the best performer. Even after accounting for asset depletion and skills shortages, the industry has historically performed relatively strongly in terms of labour productivity.

**Figure 3: Since 2009, iron ore has been unable to continue productivity improvements, but still outperforms all other mining activities**



Source: ABS, PwC Analysis

In 2005 China became a serious customer for iron ore, leading to growth rates in iron ore GVA output of 12% year on year. However, an analysis of labour hours utilised over the same period leads to interesting results. Firstly, in the period from Q3 2005 to Q3 2009, labour grew at a CAGR of 8% which drove iron ore to rapidly increase productivity in the period to Q3-09.

Since 2009 however, labour hours in iron ore have grown at a significant 30% CAGR (excluding Q4 2012). As a result, from Q3-09 onwards, iron ore productivity has been declining. However, it should be noted that it is still significantly more productive than coal and other mining activity in terms of its own historical performance (figure 3). Some reasons to explain this difference include:

- Substantial and immediate benefits were achieved as new and existing iron ore assets developed scale. But since 2009 critical assets, in particular port and rail systems, began to reach capacity, potentially bottlenecking the system;
- Iron ore mining has a simple supply chain, as assets have grown and the supply chain has become more complex, some of the previously achieved gains in productivity have been lost;
- Iron ore is generally mined in extremely remote locations, this has extenuated the impact of industry wide skills shortages and pushed up wage rates and employment conditions in a bid to attract talent; and
- High iron ore prices have provided incentive for mining companies to plan and progress mega projects, adding significant overhead burden and labour hours in the form of feasibility study teams.

Despite declining, iron ore productivity... is still significantly more productive than coal and other mining activity in terms of its own historical performance.

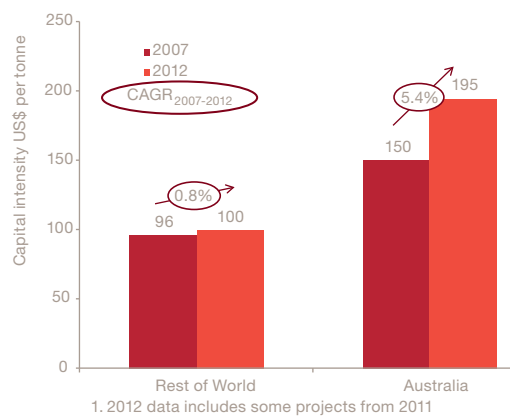
## Austerity measures have resulted in reduced labour hours of 10% from Q3 to Q4 2012.

The latest ABS data suggests that iron ore reduced its workforce by 10% in Q4 2012. This is likely to be the result of aggressive cost cutting across iron ore operations and the data is expected to show this trend continuing in Q1 2013. See page 8 for further detail.

## Aggregate gains in iron ore labour productivity since 2007 have been offset by reductions in capital efficiency.

According to analysis by the Minerals Council of Australia, since 2007 iron ore capital efficiency has almost halved (figure 4). As a result, Australia's lagging capital competitiveness is undermining the potential pipeline of future expansions.

Figure 4: Iron ore capital intensity in Australia has greatly increased, especially compared with other countries



Source: Bank of America Merrill Lynch, JP Morgan, Minerals Council of Australia 2012

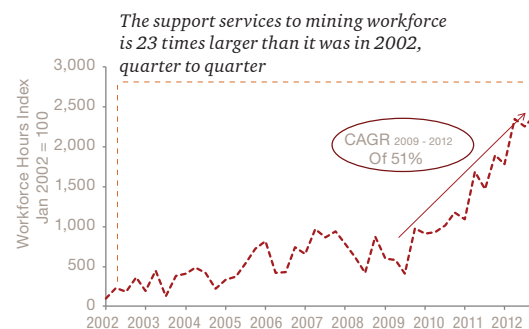
## Support services have ballooned since 2002, accounting for 13% of hours accrued to the mining industry, up from 3% in 2002.

Since 2002, hours accrued to support services to mining have grown at a CAGR of 26%. Today, total hours of support equate to 13% of total hours in the industry, compared to 3% in 2002. Key factors influencing this figure include:

- Miners employing all resources available at any cost to exploit high prices via rapid volume growth;
- Skills shortages creating an environment of ever increasing demands from workforces; and
- Continuing trend towards outsourcing parts of the mining value chain.

Further, across the mining industry, skills shortages have increased reliance on embedded contractors. Significant cultural and behavioural challenges now arise, as miners attempt to remove high cost support services that the industry has come to rely on over the last 10 years. Given the scale and contractual complexity of many projects, responding to these needs will take time and require the development of new in-house technical and managerial skills.

Figure 5: In the last 3 years, the mining support workforce has grown at a CAGR of 51%



Source: ABS (Labour force Australia)

Significant cultural and behavioural challenges now arise as miners attempt to remove some of the high costs....



## Outlook

Labour productivity in mining has three key drivers of improvement going forward.

1. Recent and deep “non-core” layoffs in the industry are expected to translate to macro labour productivity improvements over the short term (in line with our industry segment analysis).
2. In the medium term, the wave of capital investment will reach completion, resulting in large construction workforces contracting to operational workforce sizes (estimated at 60% less FTE’s<sup>9</sup>). This should deliver step change increases in production output from a drastically smaller workforce.
3. Over the medium to long term, heightened focus on sustainable productivity initiatives and investment in process improvement is expected to deliver continued incremental productivity gains.

“Based on public statements and information provided to QRC, we estimate the Queensland coal industry has been forced to shed between four and five thousand positions over the past few months”

**Michael Roche**  
CEO, Queensland Resources Council (QRC)  
Media release, 20 November 2012

### ***Productivity in coal and iron ore is predicted to improve in FY13 based on company responses to external market conditions in the second half of 2012.***

In the August quarter of 2012, falling commodity prices saw Australian miners reduce their workforce substantially. The majority of job cuts in the quarter occurred within the coal sector. Coal miners including BHP Billiton and Xstrata laid off approximately 900 employees from their expansion projects and operational workforce in Q3<sup>10</sup> and this is likely to be the basis of increasing productivity results in coal mining during Q3 & Q4 as hours were cut by 37% in the second half of the year (figure 3). The challenge now faced by the coal sector – is how to continue to deliver similar or increased output with less staff.

Similar cuts by the major miners in iron ore mining in Western Australia should also improve productivity over the short term. In September, FMG announced decisive action on iron ore market volatility<sup>11</sup>. While not announced by Fortescue, a wide range of media reported that about 1000 jobs were cut. Similar announcements were made at Rio Tinto and BHP Billiton. The data reflects this with hours accrued to iron ore mining falling by 10% in Q4 2012, and are expected to fall further next quarter.

9 On a project by project basis

10 SMH, 10 September 2012

11 ASX market announcement Q4, September 2012



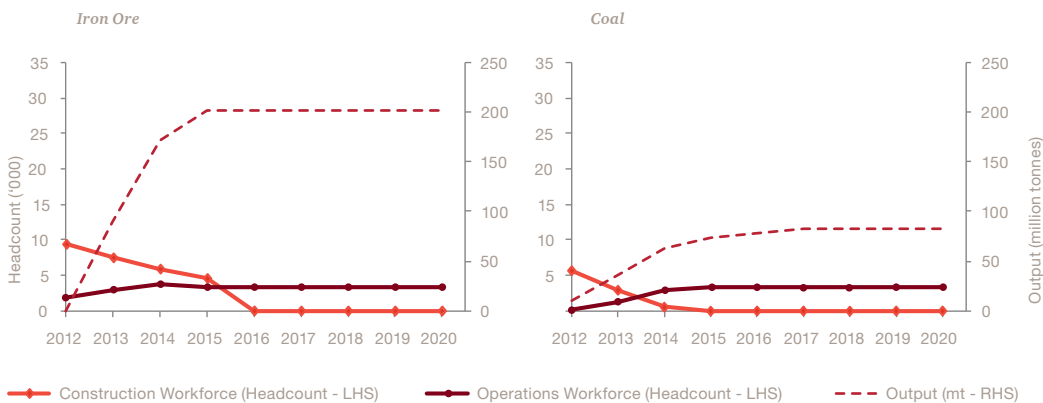
**Capital projects still under development mean that top line labour productivity may continue worsening, before rapidly improving.**

It is important to note in the ABS Data that labour figures used in productivity calculations include the workforce required to engineer, build and develop new assets. Australia has seen a period in history where iron ore and coal have rapidly grown productive output through completion of numerous major projects. By contrast, oil and gas mega projects are still in the study and construction phase, and not yet producing significant output. Figure 6 and 7 below highlight the impact on workforce during the project lifecycle.

Iron ore and coal typically employ 2.5 times the workforce during the construction phase compared to the operations phase. While a significant amount of construction and expansion activities have already occurred, BREE continues to forecast that over 250 million tonnes of new iron ore and coal capacity have been committed to be added to supply by 2016.

“Our usual focus on costs has intensified over the last year...”  
**Marius Kloppers**  
 Outgoing CEO, BHP Billiton  
 AFR, 21 February 2013

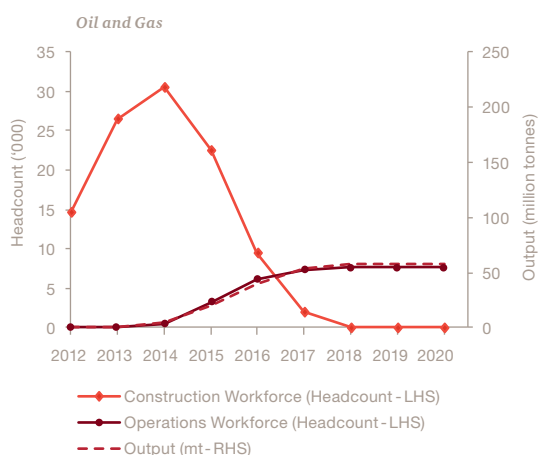
Figure 6: Based on projects under construction or committed to, the construction workforce in iron ore and coal is expected to have peaked in 2012 and should reduce to significantly smaller operational workforces whilst delivering step change increases in productive output



1. Based on projects under construction or committed to.

Source: BREE, Company Reports, PwC Analysis

**Figure 7: Construction in oil and gas is expected to peak in 2014 before delivering step change increases in output**



1. Based on projects under construction or committed to.

Source: BREE, Company Reports, PwC Analysis

Over the last 3 years, investment in new oil and gas output has seen over \$100 billion spent on construction. Spend is forecast to continue for the next 5 years with productive output not expected until beyond 2015. While we recognise that this construction activity represents a significant portion of labour required to build downstream LNG facilities, we still expect oil and gas extraction productivity to improve drastically beyond 2015 as development projects transition to production phases and construction labour is removed from the denominator.

However, top line industry productivity may worsen in the next 3 to 12 months if the expected increases in labour are captured as oil and gas extraction activities.

***Intense industry-wide focus on productivity should see investment in process improvement deliver productivity gain in the longer term.***

In Sam Walsh’s address to employees, following his recent appointment as CEO of Rio Tinto, he noted that his focus will be “about creating greater accountability and responsibility - we must treat the company’s money like it is our own and act like owners of our businesses, not managers”<sup>12</sup>. We have seen changes in senior leadership positions, large cutbacks in capital investment spending and a stronger discipline being applied to improving internal processes. This internal rigour is expected to have positive impacts on productivity over the medium to long term.

“...greater accountability and responsibility – we must treat the company’s money like it is our own and act like owners of our businesses, not managers.”

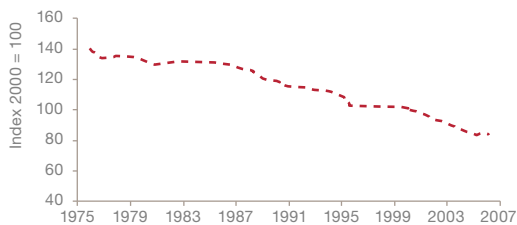
**Sam Walsh**  
CEO, Rio Tinto  
*The Australian*, 23 January 2013

<sup>12</sup> *The Australian*, 23 January 2013

# Challenges to productivity

**The nature of the resource asset means inherent factors are constantly weighing negatively against productivity.**

**Figure 8: The productive yield of Australian coal, iron ore, copper**



The estimated yield decline in Australian mining reflects the composite result of ore grade changes in metal ore mining, changes in the raw/saleable coal ratio, and changes in the rates of flow of oil and gas.

Source: Mudd (2007); ABARE (Australian Commodity Statistics, various); Australian Productivity Commission 2008

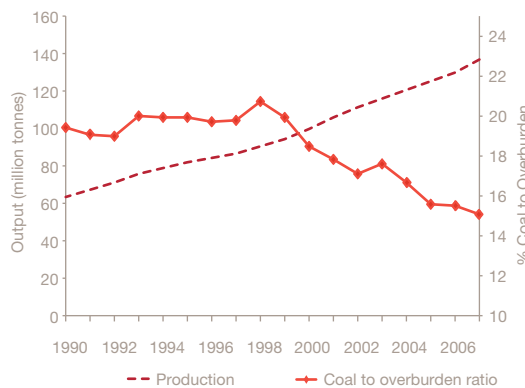
Without reserve replenishment and new production coming online, miners fight the tide to maintain, let alone improve productivity. If new projects are pursued offshore, their Australian productivity performance will be under pressure.

**Asset quality diminishes over time.**

Mining companies have a habit of building short and long term mine plans focused on extracting high grades and high margins as early as possible to offset initial capital costs. In general, product mined earlier will be nearer the surface, easier to extract and require minimal processing. Over time miners have had to work harder and more efficiently, simply to alleviate the productivity pressures applied by a depleting asset<sup>13</sup>.

**Figure 9: Coal production versus overburden removal effort has been a clear issue in the Australian coal industry as coal mines move increasingly deeper over time and inherently require increased levels of supporting infrastructure and waste movement**

1. Coal to overburden ratio based on Queensland coal open cut operations only.



Source: Mudd (2007); ABARE (Australian Commodity Statistics 2007); Australian Productivity Commission 2008

“We’ve always been wanting to keep building and keep putting the cash which we generate into new assets... [instead] we’ve got to learn about demand and supply.”

**Ivan Glasenberg**  
CEO, Glencore International  
*Bloomberg*, 27 February 2013

Miners need to innovate just to stay in the game, let alone lead the market...

<sup>13</sup> BREE has recently released analysis which adjusts the ABS data for asset depletion. See their latest report for more information - “Australian Mining Productivity”, 25 March 2013

# Improving productivity

## *The productivity battle is being fought by Australian miners across multiple avenues.*

Mining is always fighting an uphill battle on the productivity front and needs to innovate just to stay in the game, let alone lead the market.

As prices have fallen from the heady highs of recent years, the productivity challenge has shifted from being capital focused to asset focused. Australian miners are aggressively pursuing productivity improvements via three key levers:

1. Optimising the productivity of the asset base – achieving scale and targeting specific and marketable product blends, using cost effective extraction technologies.
2. Mining operation productivity improvements – aggressive mine site process improvement initiatives, focused on both technology & people.
3. Rationalising organisational overhead – seeking standardisation and minimisation of corporate process, and efficiencies through right-sizing and fit-for-purpose administrative functions.

## *Technology led process improvement plays a critical role in our productivity future.*

While accurately defining the impact that technology can have on improving productivity is extremely difficult, we do know that technology is a critical, long-run factor that positively influences productivity outcomes.

Across iron ore and coal, four key technological improvements have emerged as answers to improving productivity in these industries over the medium term:

1. Automation of mining equipment – small scale and whole of mine.
2. Remote operation of equipment in a centralised location.
3. Integrated pit to port logistics management.
4. Bespoke energy efficiency measures and remote site power generation innovations.

While these initiatives have penetrated some segments of the industry, wider industry investigation and espousal of these productivity stimulant technologies is inevitable.

## *Profitability through productivity, not austerity...*

The Australian mining industry has faced challenging circumstances over the last decade, whilst still delivering unprecedented production growth. Moving into the next decade, profitability will need to be driven through investments in productivity, rather than pure volume growth to achieve sustainable success.

Technology is a critical, long-run factor influencing productivity and plays a major role in offsetting the effects of resource depletion.

Technology improvements often have an equally important safety theme.

# The PwC approach to productivity

The PwC Approach to improving productivity in mining delivers real bottom line benefits:

- 1. We have a proven methodology** – Our productivity offering is built around three key priorities: Optimise Mineral Inventory, Optimise Asset Base and Optimise Unit Cost.
- 2. We have an experienced team** – Our strong analytical resources work alongside senior experts with significant performance improvement experience. Many of our consultants have engineering backgrounds and subject matter experts are available for specific issues.
- 3. We are committed to our clients' success** – We align our success to yours by placing a portion of our fees at risk. Our pragmatic experts collaborate with client teams to constructively challenge the status quo and develop sustainable solutions.
- 4. We deliver sustainable improvements** – We understand the challenges our clients face in implementing improvement opportunities and we leverage our experience to guide our clients through implementation.

- 5. We have strong implementation capability** – We engage clients at all levels of their organisation – from Board of Directors to front line managers. We ensure after we complete an engagement our client has all necessary skills, tools and controls to sustain the identified or achieved improvement.
- 6. We bridge operational and financial outcomes** – We successfully bring together operational expertise and financial accounting rigour to make sure improvements achieved are fully monetisable.

Our productivity experts consistently deliver quantifiable and real-dollar results in improving the productivity of mining and mining services clients.

For further information, please contact our productivity experts listed below or your usual PwC contact.

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# Mining Excellence@PwC

## Delivering local solutions to global challenges

The mining sector is facing a range of competing trends and a rapidly changing global business environment. Against the backdrop of commodity price fluctuations, miners need to balance shareholder dividend expectations whilst maintaining an investment pipeline in the midst of increasing operating costs. Safety, environmental and community principles also continue to shape the industry as miners look to achieve their licence to operate and deliver on corporate responsibilities.

*Mining Excellence@PwC* has been designed to mobilise and leverage PwC's collective global knowledge and connections to deliver an exceptional and tailored client experience, helping our clients navigate the complex industry landscape and meet their growth aspirations. Our team of specialists is exclusively focused on the sector and brings an industry-based approach to deliver value for you and your organisation.

## Mining Excellence@PwC provides our clients:

### leading edge knowledge and insight

With significant investment in the research behind our mining publications and a comprehensive industry learning and development program, our professionals can share both industry and technical insight with our clients, such as:

- A library of industry publications designed to help challenge “conventional” thinking and delve into topical industry issues. This includes:
  - flagship publications including *Aussie Mine*, *Mine* and *Mining Deals*
  - The *Insight Series* focuses on specific issues most important to miners



- An extensive industry development program for our people and clients. This features our annual university-style course *Hard Hat: The Mining Experience*.



### connections to our vast network of mining experts and global client portfolio

We have the widest network of industry experts who work out of strategic mining hubs across the globe to help better connect you to vital mining markets.

Our connections provide:

- seamless client service delivered with collaborative cross-border account management
- maximised deal potential through a well-connected global community of mining leaders
- a well-connected and mobile workforce to ensure effective service delivery in even the most remote mining locations.



**“Working in the sector for over 20 years, I have seen and worked across the mining sector in both good times and bad. It’s fantastic to see our clients and PwC teams working together to respond to the ever-changing business dynamics miners face today.”**

Tim Goldsmith, PwC Global Mining Leader

### the delivery of an experience that meets our clients’ definition of ‘value’

With mining experts working in each key Australian state, our award winning teams are helping clients deliver on specific projects and organisational growth aspirations. We offer advisory, tax and audit services to global corporations and locally listed companies.

*Mining Excellence@PwC* complements this with:

- a suite of niche mining consulting capabilities focused on optimising value across mining operations and effectively managing risk to help our clients grow their business and deliver shareholder value
- a comprehensive client feedback program to ensure we are always improving and delivering on individual client needs.





