REPORT

# The contribution of mining to the New South Wales economy

*Prepared for*
*The NSW Minerals Taskforce*

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THE CENTRE FOR INTERNATIONAL ECONOMICS
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# *Executive summary*

The minerals industry makes a significant contribution to the NSW economy.

The CIE estimates that the minerals industry (as defined in this study) derived $12.5 billion in value added in 2012-13. This equates to $3.2 million in value added per square kilometre of area covered by mining activities in NSW. This compares to the value added of agricultural production of around $0.01 million per square kilometre in 2012-13.

The coal sector generates the largest share of value added at approximately $9.6 billion each year or 77 per cent of industry value added. NSW also mines a significant amount of metal ores, primarily copper, gold, zinc, lead and silver. Other metal ores generated approximately $1.6 billion of value added per annum. The remainder is comprised of other mining activity including non-metallic minerals and construction materials.

The minerals industry is estimated to purchase $9.6 billion of goods and services each year, 60 per cent of which is sourced from within NSW and another 22 per cent which is sourced from other parts of Australia.

Approximately 70 per cent of minerals produced (in terms of value) in NSW are used overseas. The remaining share is largely used as inputs for other industries, with 21 per cent of the minerals produced used other industries in NSW and the remaining 9 per cent by businesses in other Australian jurisdictions. In many cases the final output of these industries are then exported (such as for iron and steel).

Coal is also an important part of the electricity supply sector. Approximately 85 per cent of the electricity supplied in NSW is sourced from coal-fired power stations. Therefore, coal plays a role in supporting the broader economy of NSW.

The minerals industry provides an important revenue source for governments, which allows them to support a wide range of services to the broader community. In 2012-13, the minerals industry is estimated to have paid:

- $1.60 billion to the NSW Government, comprising $1.32 billion in royalties, $134.5 million in payroll taxes, and $145.8 million in land taxes.
- $1.47 billion to the Commonwealth Government in company taxes.

In addition to the revenues noted above, there is also a range of other fees and levies (e.g. mine safety levy) paid by the minerals sector as well as local government contributions via rates and other developer contributions.

The minerals industry is a major employer in the NSW economy. Mining, exploration and the Mining Equipment, Technology and Services (METS) sector employs over 40 000 people in NSW.

A summary of value added and employment generated by the minerals industry in NSW and in key mining regions in NSW is provided in table 1.

### 1 Value added and employment, state-wide and in key mining regions

| | NSW | Central West | Illawarra | Hunter region | New England and North West |
|---|---|---|---|---|---|
| | $b | $b | $b | $b | $b |
| **Value added** | | | | | |
| Coal | 9.6 | 1.4 | 0.9 | 6.3 | 0.3 |
| Other metal ore | 1.6 | 0.8 | 0.0 | 0.0 | 0.0 |
| Other mining | 1.4 | 0.2 | 0.1 | 0.4 | 0.1 |
| **Total** | **12.5** | **2.4** | **1.0** | **6.6** | **0.4** |
| **Employment (FTE terms)** | | | | | |
| Coal | 27 988 | 4 183 | 2 734 | 18 312 | 897 |
| Other metal ore | 7 934 | 4 033 | 7 | 125 | 0 |
| Other mining | 7 861 | 902 | 391 | 2 055 | 342 |
| **Total** | **43 782** | **9 118** | **3 132** | **20 492** | **1 239** |

[a] Employment has been calculated in Full time equivalent terms, based on 40 hours per week per FTE.

*Note:* Other metal ores mining incorporates bauxite mining, copper ore mining, gold ore mining, mineral sands mining, nickel ore mining, silver-lead-zinc ore mining and other metal ore mining. Other mining includes non-metallic mineral mining and quarrying, gravel and sand quarrying, other construction material mining, and other non-metallic mineral mining and quarrying, services to mining and exploration.

*Source:* The CIE.

Mining is particularly important to some regional economies. For example, it directly represents:

- almost 20 per cent of the economy and 10 per cent of jobs in the Central West region.
- about 18 per cent of the economy and over 7 per cent of employment in the Hunter region (including Newcastle and the surrounding area). In addition, mining sustains further manufacturing employment, such as in iron and steel manufacturing.

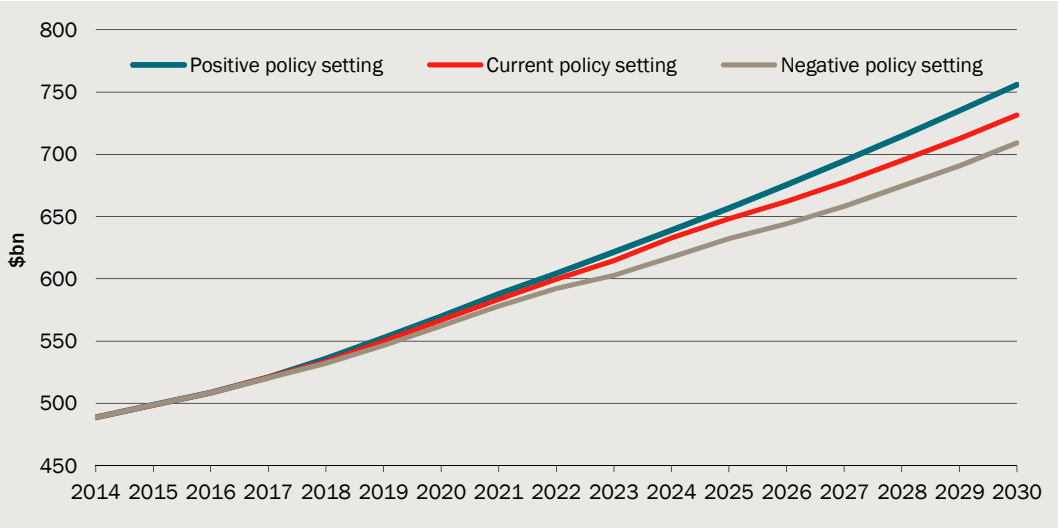
The demand for global minerals in forecast to grow. However, available information suggests that minerals production in NSW could stagnate or, in the case of non-coal resources, decline unless new production is quickly brought on line.

Industry has identified a number of concerns with current policy settings. These are resulting in unnecessary delays and uncertainty in decision-making that is affecting confidence and is expected to impact on the future growth rate of the NSW industry.

The CIE's modelling of alternative scenarios shows the difference between potential growth under positive policy settings and potential growth under negative policy settings could amount to a $13.4 billion difference in mining value added each year by 2030. As shown in chart 2, incorporating both direct and indirect impacts (flow-on effects to other industries), the total impact to Gross State Product of below-potential growth could be as large as $46.8 billion (over 6.0 per cent of the NSW economy) each year by 2030.

This further illustrates the importance of reviewing the current policy settings to ensure that they are delivering the best outcomes for the NSW community as a whole.

**2 Potential impact of 'below-potential' growth of the NSW mining industry on GSP**




*Note:* The analysis is not an evaluation on the merits of the current planning requirements. Rather, it is intended to illustrate the potential benefits that can be achieved if altered policy settings can reduce the time taken to approve mining projects and reduce other potential barriers to investment such as uncertainty related to government policy.

*Data source:* The CIE.

## *Key points*

- **The minerals industry makes a significant contribution to the NSW economy and employs over 40 000 people in NSW.**
- **Mining is particularly important to some regional economies. It directly represents almost 20 per cent of the economy and 10 per cent of jobs in the Central West region. In the Hunter region mining represents about 18 per cent of the economy and over 7 per cent of employment.**
- **The minerals industry provides an important revenue source for governments, which allows it to support a wide range of services to the broader community. In 2012-13 the minerals industry paid about $1.60 billion to the NSW Government and $1.47 billion to the Commonwealth Government.**
- **Industry has identified a number of concerns with current policy settings. It is estimated that the difference between positive and negative policy settings is worth $46 billion to the NSW economy per annum by 2030.**
- **In light of the contribution of the mining industry to the NSW economy, it is important that current policy settings related to the minerals industry are delivering the best outcomes for the NSW community as a whole.**

# 1 NSW mining industry components

***The New South Wales mining industry generated over $21 billion in revenue from the sale of coal, metal ores, other industrial minerals and construction materials in 2012-13. Incorporating other mining services sold to the mining industry, estimates of the gross value of production of the NSW mining industry increased to $24 billion in 2012-13.***

***Coal accounts for around 81 per cent of the value of minerals produced in NSW, with coal production being concentrated in the Hunter Coalfield (accounting for over half of coal production), followed by nearby Western and Newcastle coalfields. Over four fifths of coal produced in NSW is thermal coal.***

***Metal production accounts for 16 per cent of the value of minerals produced, with copper and gold dominating this share. A range of other industrial minerals and construction materials accounts for the remaining 3 per cent.***

Only 3 880 square kilometres are under production titles.[1] Approximately 141 700 square kilometres are privately held coal and mineral exploration titles.[2] NSW has approximately 802 600 square kilometres of land.[3] Therefore, land under mining production titles represents approximately 0.48 per cent of land.

Industry value added[4] is a measure of the contribution by businesses in each industry to the economy. The area under mining in NSW generated $12 510 million in value added terms in 2012-13[5], or $3.2 million in value added per square kilometre. In perspective, this compares to the value added of agricultural production per square kilometre in 2012-13 of around $0.012 million per square kilometre.[6]

1 Data provided by NSW Trade and Investment, 2014.

2 Data provided by NSW Trade and Investment, 2014.

3 Geoscience Australia, 2014. 'Area of Australia – States and territories'.

4 Industry value added is the total value of goods and services produced by an industry (equivalent to gross value of production), less the cost of goods and services used in the process of production.

5 BREE, 2013. 'Gross value of Australian mineral production, by state', Table 23 in *Resources and energy statistics 2013*.

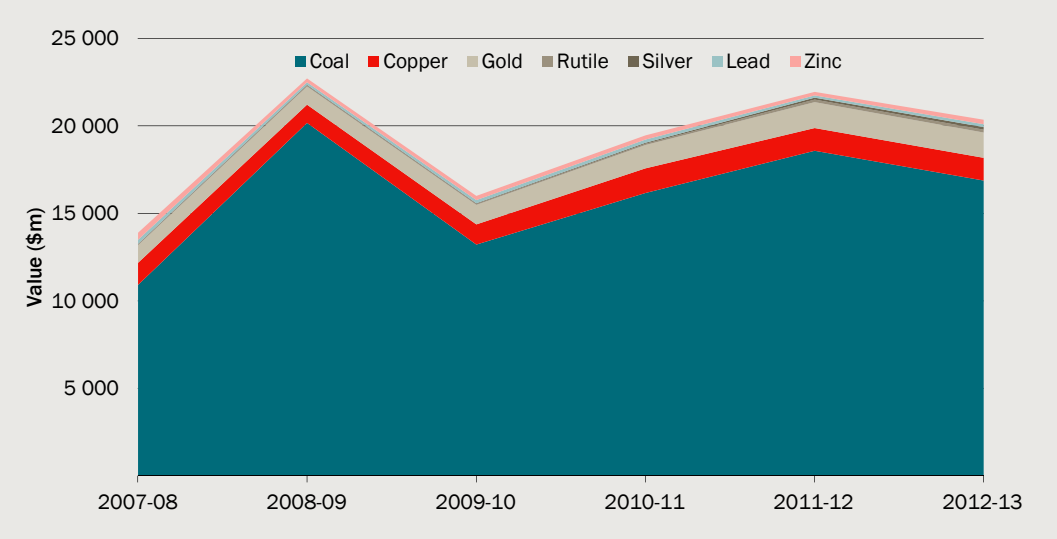
6 The value of NSW agricultural production (including fishing) in 2012-13 was approximately $6.7 billion, spread across 560 000 square kilometres. NSW Parliamentary Research Service, *Agriculture in NSW (July 2012): Statistical indicators 4/12*.

## *Commodities mined in NSW*

New South Wales has an abundance of coal resources, as well as substantive deposits of metallic minerals including gold, copper, silver, lead and zinc. The State also undertakes mining for construction materials such as coarse and fine aggregates, industrial mineral sands (principally for rutile and zircon), limestone and opal among smaller values of other industrial minerals such as magnetite, silica and clays.

Estimates of the value of NSW minerals and metal production, for key commodities, are presented in chart 1.1.

### 1.1 Value of key NSW minerals and metal production at average market prices




*Data source:* NSW Trade and Investment, 2013: *2013 New South Wales minerals industry profile*. Updates supplied by NSW Trade and Investment, 2014.

The latest estimates from the Bureau of Resources and Energy Economics (BREE) suggests that the value of mineral production in NSW was approximately $26.8 billion in 2011-12.[7] While the volume of production in 2012-13 increased, particularly for coal, the value of production moderated.

- **In 2012-13, mining industry gross value of production was over $24 billion, including mining services sold to coal and non-ferrous metals.**[8]

The relative share of minerals produced in NSW in terms of the value of production, is placed in to perspective in chart 1.2, whereby:

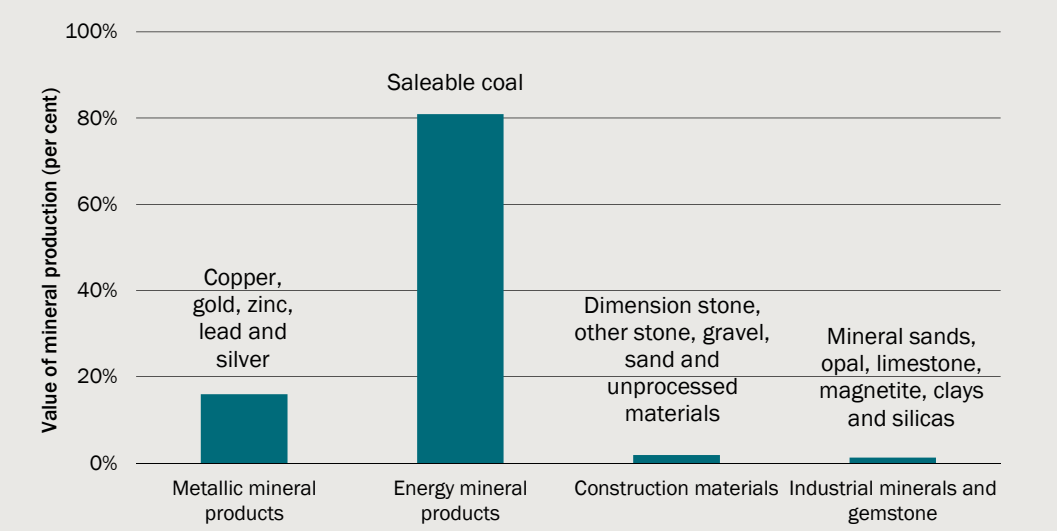
- coal accounts for roughly 81 per cent of the value of mineral production
- metallic mineral products, predominantly copper and gold, account for 16 per cent of the value of mineral production

[7] BREE estimates include petroleum (oil and gas), however the quantities (and value) of gas production in NSW are small and NSW does not produce petroleum liquids.

[8] Non-ferrous metals are metals that do not contain iron. For instance, they include copper, lead, zinc, nickel and precious metals (such as gold and silver).

- the remaining share of value from the sale of minerals in NSW is comprised of construction materials and industrial minerals and gemstone.

### 1.2 Overview of minerals products in NSW




*Note:* Based on 2010-11 data. The share is expected to be similar to present based on analysis of coal and metal ores production in 2012 and 2013.

*Data source:* NSW Trade and Investment, 2013: *2013 New South Wales minerals industry profile*.

## *Coal production*

Australia has been the largest coal exporter in terms of revenue, and oscillates with Indonesia for the largest hard coal exporter on a tonnage basis.[9] It is the largest exporter of metallurgical coal, a high quality black coal that is mostly used to make coke used for the iron and steel making process. Most of the growth in coal exports from NSW is due to increases in demand for thermal coal, which is mainly used in power generation, due in part to strong demand from China.

- **Overall, around 84 per cent of black coal produced in Australia, by volume, is exported.**[10]

The Australian coal industry is made up predominantly by Queensland, New South Wales and Victoria. As shown in chart 1.3, New South Wales produces the second highest volume of coal following Queensland.

The NSW coal industry has experienced a considerable expansion in production in the past decade, with the value of output increasing from approximately $10.9 billion in 2007-08 to in excess of $20 billion in 2008-09.[11] The commissioning of new mines, rail

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[9] International Energy Agency, 2013. *Coal medium-term market report 2013: Market trends and projections to 2018*. p 42.

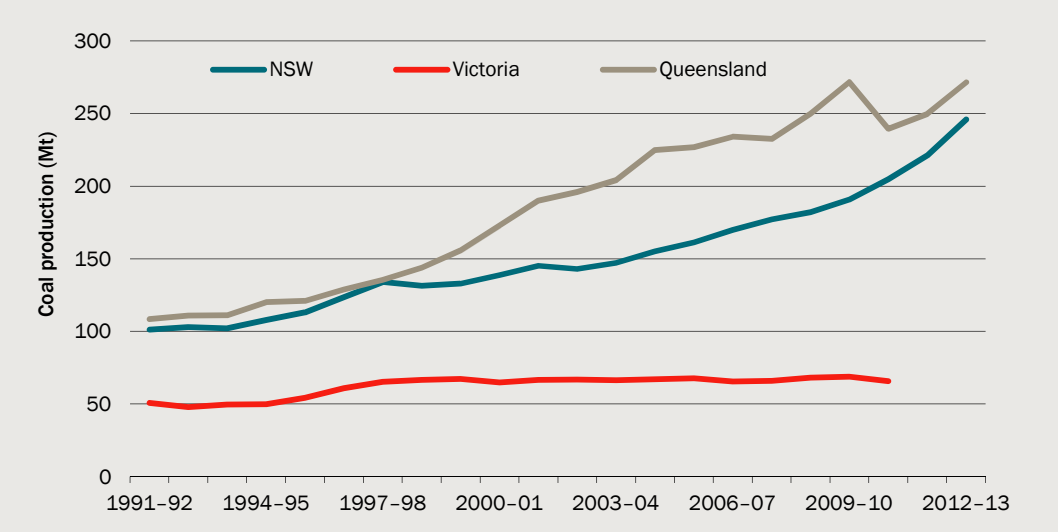
[10] For black coal only, in 2012-13. Estimates are based on BREE, 2014. Resources and energy statistics. Table 42: Summary of Australian statistics for black coal.

[11] NSW Minerals Council Ltd, 2013. *NSW Mining 2012: A snapshot.*

and port capacity in New South Wales, as well as surging import demand in Asia, has resulted in *average* growth of over 6 per cent per annum from 2007 onwards.

In 2012-13, the NSW coal industry increased production by 11 per cent from the previous year to produce a record volume of 245.8 Mt of raw coal (185.6 Mt of saleable coal), estimated to have been worth approximately $16.9 billion, reflecting a fall in prices rather than production.[12]

### 1.3 Raw coal production of major coal producing states (Mt)




*Note: Estimates of production from 2008-09 to 2012-13 are estimated by BREE.*

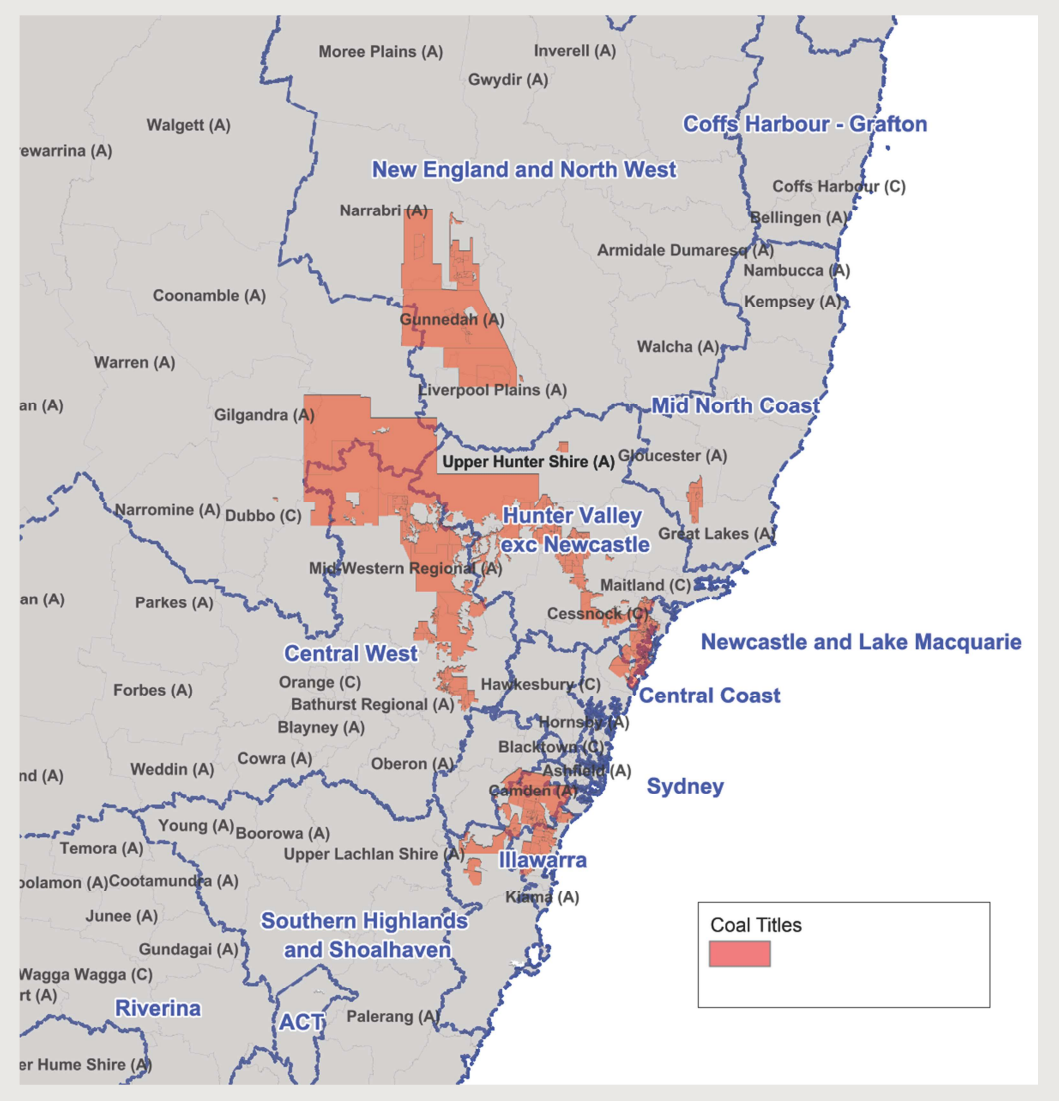
*Data source:* BREE, 2014, Resources and energy statistics. Table 43: Australian raw coal production, by state.

## *Coal producing regions in NSW*

NSW coal producing regions are distinguished by five main coalfields: the Hunter Coalfield, Newcastle Coalfield, Western Coalfield, Southern Coalfield and Gunnedah Coalfield. The main coalfields, and their location with respect to statistical boundaries, are shown on chart 1.4. The main coal resources of NSW are located in the 500 kilometre long, 150 kilometre wide Sydney-Gunnedah Basin, extending from south of Wollongong to north of Newcastle and north-westerly through Narrabri into Queensland. In addition, modest coal reserves are contained in the Oaklands Basin and the Gloucester Basin.

[12] NSW Trade and Investment, 2014. 'Coal'.

## 1.4 Map of coalfields in NSW




*Data source:* ABS GIS Database and NSW Trade and Investment, 2014.

Table 1.5 shows the share of saleable coal produced in 2010-11 for each of the five producing coalfields of New South Wales. The Hunter coalfield accounted for over half of coal produced in that year, followed by the nearby Western and Newcastle coalfields.

The Hunter region's share of production is expected to have increased as indicated by data for the September quarter of 2013-14 (shown in the right hand column). Based on recent quarterly data for 2013-14, compared to 2010-11, coal mining appears to have moved towards Gunnedah, shifting away from Newcastle and the Illawarra.

### 1.5 Share of saleable coal production, by region, 2010-11 and 2013-14

| Coalfields | Statistical area [a] | Share of production, 2010-11 | Share of production, 2013-14 (September quarter) [b] |
|---|---|---|---|
| | | Per cent | Per cent |
| Hunter | *Hunter* | 56 | 60 |
| Newcastle | *Newcastle and Lake Macquarie* | 11 | 8 |
| Western | *Central West* (predominantly) | 21 | 20 |
| Southern | *Illawarra* | 7 | 5 |
| Gunnedah | *North East and New England* | 5 | 7 |

[a] Statistical area, Level 4 (SA4). [b] Latest data provided to CIE.

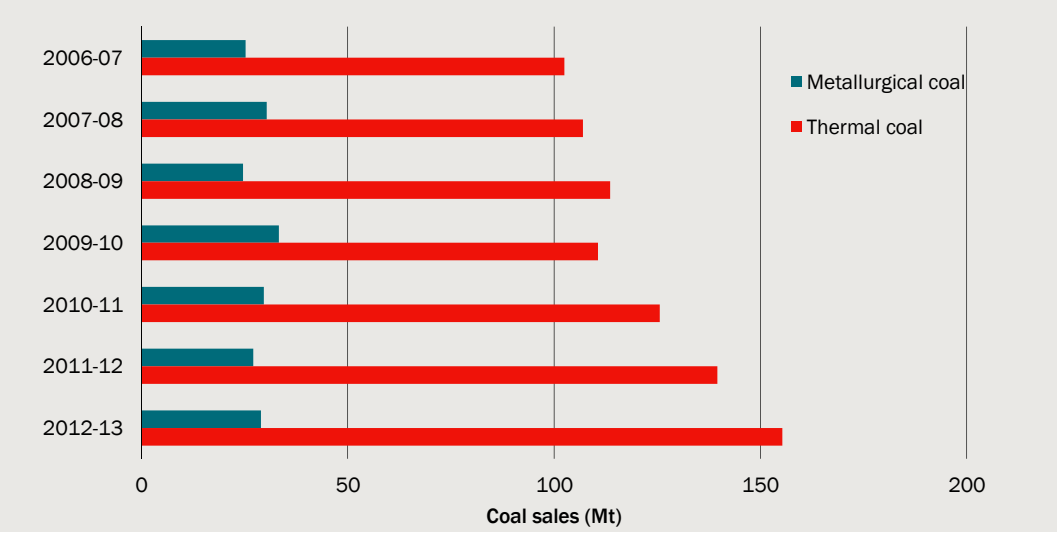
*Note:* Statistical Areas Level 4 is geographical areas that have been introduced by the Australian Bureau of Statistics as the basis for a variety of regional data, including 2011 Census Data.

*Source:* NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*. Latest data provided by NSW Trade and Investment.

Overall, the volume of coal sold in 2012-13 is estimated to have been approximately 186 million tonnes (Mt) – an 11 per cent increase from the previous year. The vast share of coal produced in New South Wales is thermal coal (see chart 1.6).

- Domestic sales of thermal coal for power stations have declined, which is associated with increasing imports of electricity from interstate, an overall fall in electricity demand and rising electricity prices.
  - The share of coal-fired electricity generation was around 97 per cent of all electricity generation in NSW in 2007-08.
  - This fell in response to the commissioning of several gas-fired generators but remains strong, at over 85 per cent in 2013.

### 1.6 Metallurgical and thermal coal sales (million tonnes)




*Data source:* NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*. Updated data supplied by NSW Trade and Investment, 2014.

Export quality metallurgical coal is produced in the Southern, Hunter and Newcastle coalfields. The Southern coalfield, which lies within the statistical area of the Illawarra, is

renowned for producing high quality, hard coking coal. Southern coalfield's hard coking coal is used in blast furnaces for steel and cement production.

Coking coals from the Southern Coalfield dominate the supply to the Australian steel industry's coking plants at Whyalla in South Australia, and BlueScope Steel at Port Kembla in NSW.

## *Metallic mineral products, industrial minerals and gemstones*

Metal production in NSW occurs predominantly in the statistical areas of the Central West, and the 'Far West and Orana'. Copper and gold have the highest values of production of the metals mined in NSW. Together, gold and copper are estimated to have comprised over 75 per cent of the value of metals produced in New South Wales in 2012-13.

Most of the current gold produced in NSW comes from mines located within the Lachlan Orogen (to the south of the Sydney-Gunnedah Basin) and the New England Orogen (to the north of the Sydney-Gunnedah Basin) which has also become a prospective area for copper-gold deposits. Gold is currently mined around Cobar, Dubbo, Orange, Bathurst and Forbes.

The value of gold production has increased substantively over the past five years due to strong demand (and price improvement) following the global economic downturn as investors sought to hold more tangible, secure assets. Gold exploration expenditure contributed to approximately one third of total exploration expenditure in 2012-13.

Copper is currently mined in similar areas to gold (often it is co-mined with gold), in the Lachlan Orogen. This includes in and around Cobar, Parkes, Orange and Temora. A significant share of copper produced in New South Wales, around one third in terms of the value of production, is exported.[13]

Silver-lead-zinc mines are concentrated around Broken Hill (in the Far West and Orana statistical area) although annual production varies by region. They are also scattered across the New England and North West statistical area and Central West statistical area, such as around Cobar. While the production of silver, lead and zinc has fallen dramatically over the past decade, in the past few years, production has been relatively strong.

NSW also mines a diverse group of industrial minerals, worth approximately $0.3 billion in 2010-11. The largest quantities of industrial minerals produced are from mineral sands (rutile, zircon and ilmenite), as well as silica (fine and coarse), gypsum, bentonite and magnetite. In 2010-11, rutile and zircon accounted for 56 per cent of the value of industrial mineral production and 63 per cent including ilmenite.

Limestone, magnetite, structural clays, and silica (course and fine) account for the remainder of industrial mineral production. These are found:

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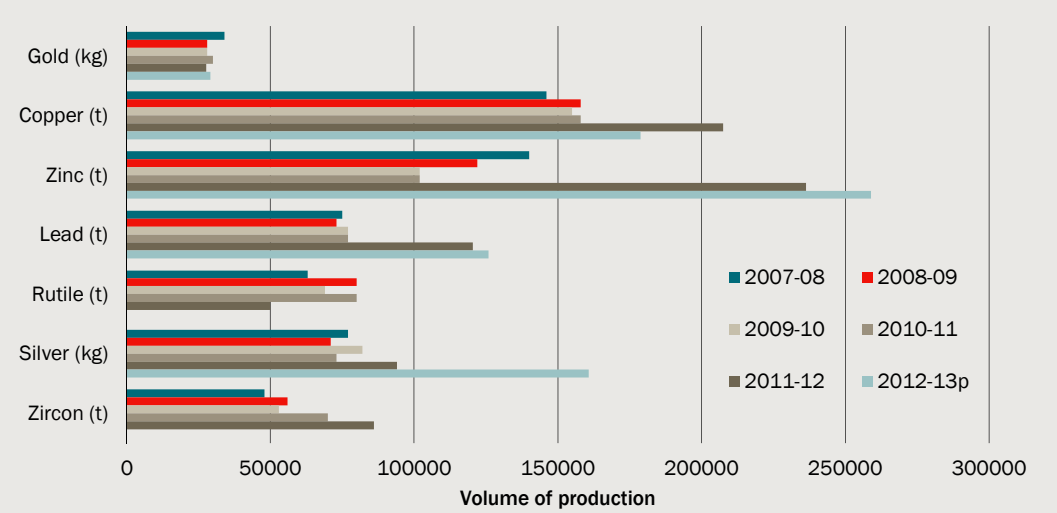
[13] Estimated from NSW Minerals Council Ltd, 2013. *NSW Mining 2012: A snapshot.*

- in the Murray statistical area near to the border with Victoria (Gypsum, heavy mineral sands)
- near to Dubbo in the Far West and Orana statistical area (Magnetite)
- north of Bathurst in the Hunter statistical area (limestone)
- near to Tamworth in the New England and North West (limestone, diatomite)
- around Cowra and Young (magnesite and magnetite)
- near to Goulburn in the Capital Region statistical area (limestone).

Chart 1.7 shows the volume of key metals produced in NSW organised in order of the value of production in 2012-13. It shows there has been an increase in the production of copper, zinc, lead, silver and zircon in 2011-12 and 2012-13 from earlier years.

### 1.7 Volume of production, in descending order of production value



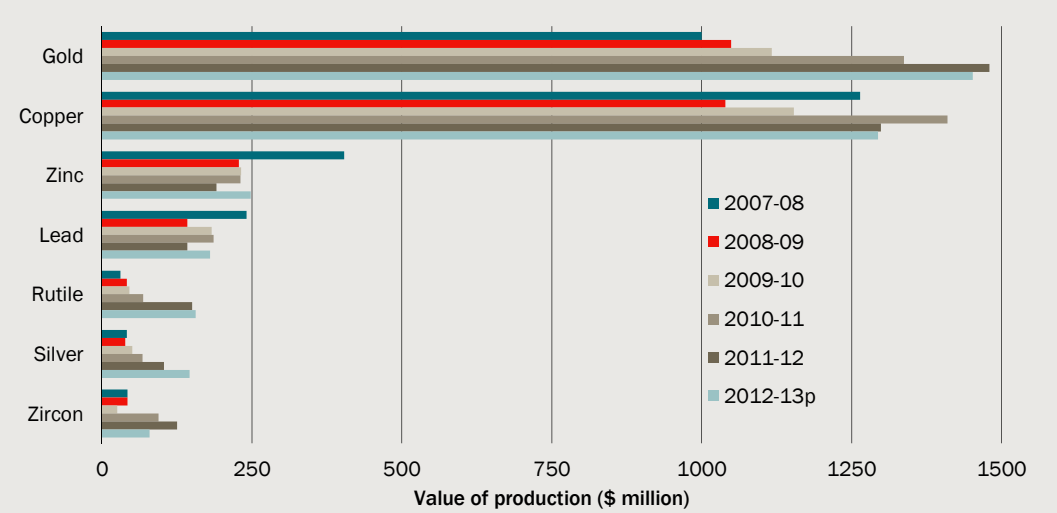

*p Provisional estimates.*

*Note:* Data was unavailable for Zircon and Rutile for 2012-13.

*Data sources:* BREE, published in NSW Mining 2012: A snapshot. Updated data supplied by NSW Trade and Investment, 2014.

The importance of gold and copper production as a share of the value of metal production is demonstrated in chart 1.8. The price of gold has increased substantially over the past five years, supporting the increase in value observed, however gold prices were lower in 2012-13 compared to the previous year. Prices for lead, zinc and copper have declined over the past five years, offsetting the value of rising production.

### 1.8 Value of production, by metal, in millions of dollars




*p Provisional estimates.*

*Data source:* NSW Minerals Council Ltd, 2013. *NSW Mining 2012: A snapshot*. Updated data supplied by NSW Trade and Investment, 2014.

## *Construction materials*

Construction materials are mined across NSW, including in the Central West, Murrumbidgee, Murray, Capital Region, Illawarra, Hunter, New England and North West, Mid North Coast, Coffs Harbour-Grafton and Richmond-Tweed statistical areas.

Approximately half of the construction material found (in terms of revenue) is from crushed and broken stone (known as a 'coarse aggregate'). A further one quarter is 'fine aggregates' or construction sand, used mainly in concrete, mortar and as fill. Gravel and unprocessed construction materials also account for around 14 per cent and 8 per cent of construction materials, respectively. Unprocessed materials include shale, sandstone, weathered igneous and other rocks and loam (soil) which are used without significant processing in road-making, landscaping and as fill.

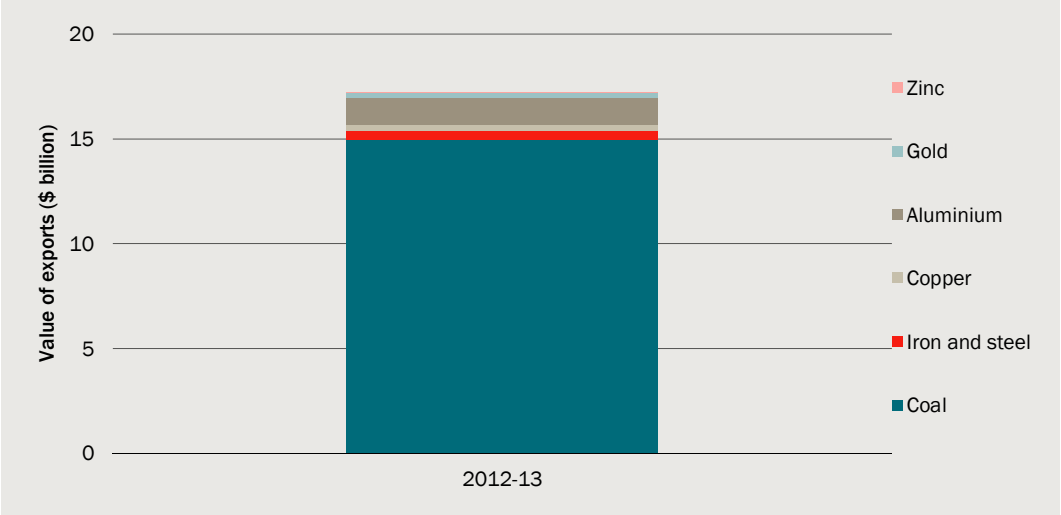
## *Export markets*

The largest export from the NSW minerals industry is coal, with $15.0 billion in exports in 2012-13 (see chart 1.9). Coal is also used in the smelting process to produce iron and steel, which is then exported, accounting for a further $0.4 billion in 2012-13. The remainder is comprised of copper exports worth $0.3 billion in 2012-13, and a small quantity of gold (approximately $118.5 million in 2012 and $275.6 million in 2013)[14] and zinc exports ($36 million, in 2012-13).

[14] Estimates for gold exports are sourced from the Global Trade Information Services database, and reflect reported exports of gold concentrate from NSW ports to offshore markets. The CIE understands that a significant proportion of gold doré produced in NSW (such as from Cadia Valley Operations) is shipped to the Perth Mint where it is refined, however, this would not be

Aluminium exports were valued at $1.3 billion in 2012-13. Although the bauxite used to make aluminium is not mined in NSW, aluminium production also relies on access to reliable and cost effective electricity, which is made possible through NSW thermal coal production.

### 1.9 Value of exports ($bn), mineral industry and iron and steel sector




*Data source:* NSW Trade and Investment. Global Trade Information Services database.

## *Coal*

Over four fifths of the coal produced in New South Wales is exported. Domestic consumption of coal by industries and households in NSW has been trending slightly downwards while coal exports have been steadily increasing (see chart 1.10).

Of the coal exported, typically around 83 per cent is thermal coal. In 2012-13, approximately 155.3 Mt of coal was exported from NSW, including 129.8 Mt of thermal coal and 25.5 Mt of metallurgical coal. The FOB value of thermal coal exports in 2012-13 was $11.7 billion or 78 per cent of the total value of coal exports from NSW, with metallurgical coal valued at $3.3 billion in the same year.[15]

counted in export data. Note that gold mines produce most of their gold in the form of a doré, a gold alloyed with silver and base metals.

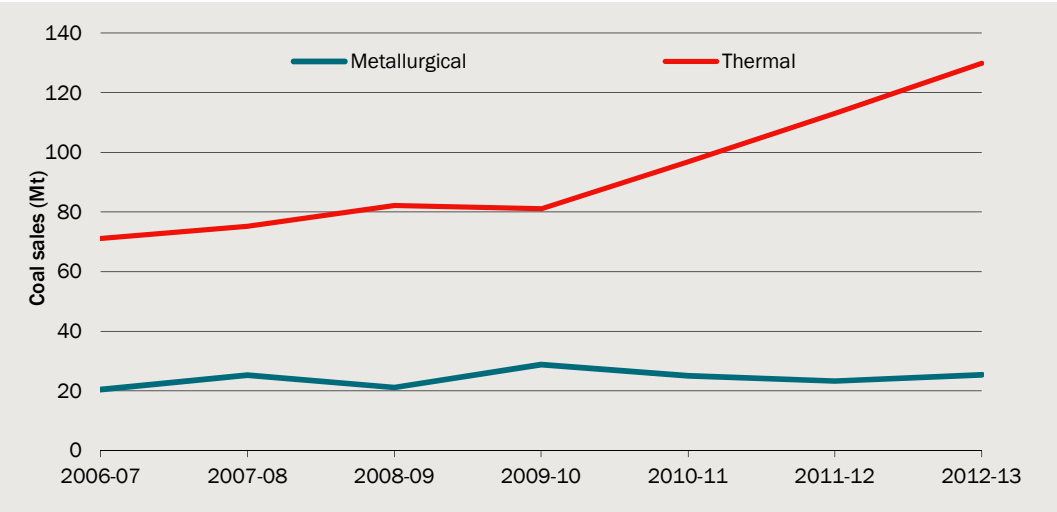
15 Coal Services Pty, 2014. Coal Services Annual Report 2013. p 17.

### 1.10 Domestic and export coal sales (Mt)


*Data source:* NSW Trade and Investment, 2013, *2013 New South Wales coal industry profile*. Updated data supplied by NSW Trade and Investment, 2014.

As shown in chart 1.11, the growth in NSW coal exports is attributed to thermal coal exports, while metallurgical coal exports have remained relatively constant.

### 1.11 Export coal sales, by coal type, from New South Wales (Mt)




*Data sources:* NSW Trade and Investment, 2013, *2013 New South Wales coal industry profile*. Updated data supplied by NSW Trade and Investment, 2014.

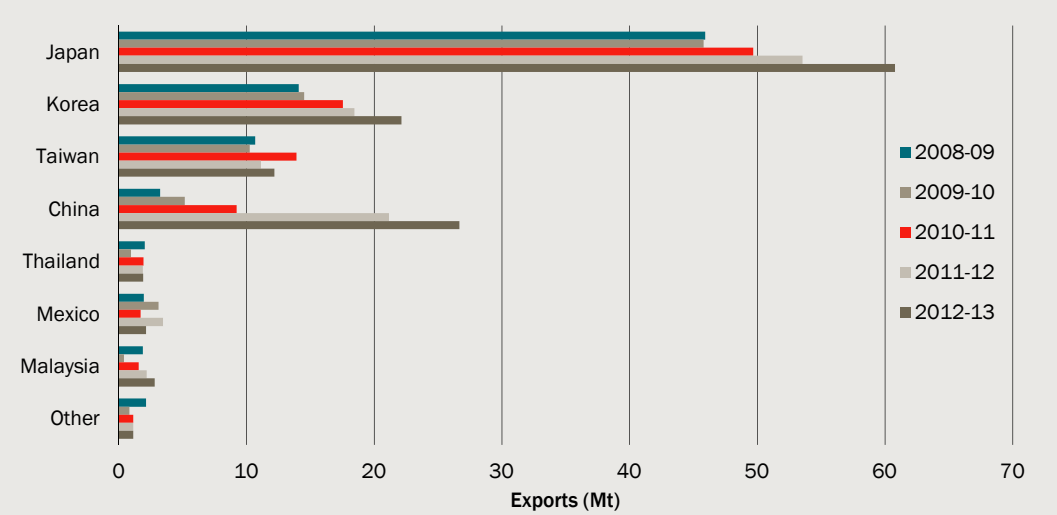
A large share of coal exports, 92 per cent in 2012-13, leaves from Newcastle (142.4 Mt in 2012-13). The mix of coal that is exported varies between ports:

- typically, between 85-90 per cent of coal exported from the Port of Newcastle is thermal coal
- typically, between 35-45 per cent of coal leaving Port Kembla is thermal coal.[16]

16 NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*.

Chart 1.12 shows the majority of thermal coal exported from NSW is destined for Japan (60.8 Mt, in 2012-13) followed by China (26.7 Mt), Korea (22.1 Mt) and Taiwan (12.2 Mt).

### 1.12 Thermal coal exports by destination (Mt)

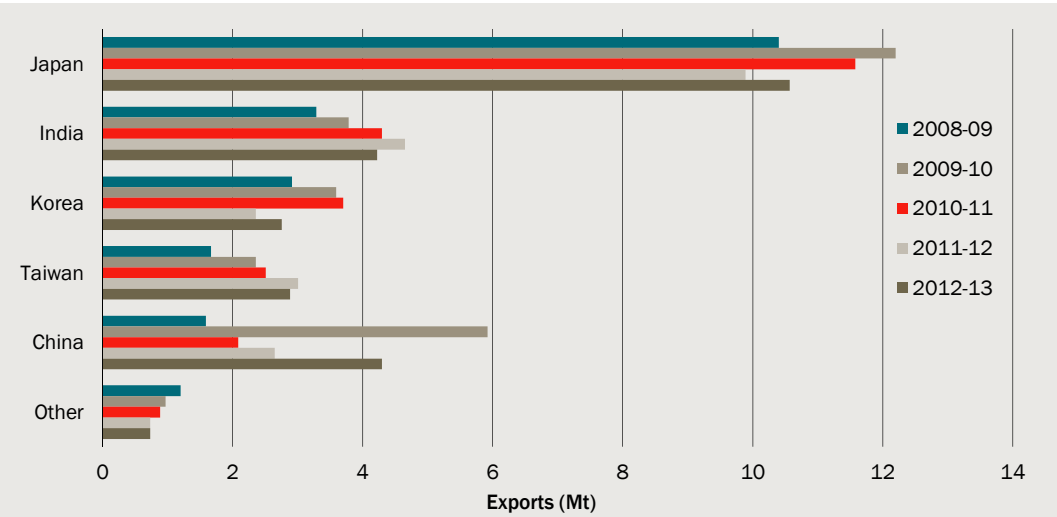



*Data source:* NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*. Updated data supplied by NSW Trade and Investment, 2014.

China has been the largest source of growth for thermal coal exports, increasing by around eight times from 2008-09 to 2012-13.

As shown in chart 1.13, the largest market for NSW metallurgical coal is also Japan (10.6 Mt in 2012-13). In 2012-13, China overtook India (4.2 Mt) to become the second largest export destination for NSW metallurgical coal. Korea and Taiwan are smaller, albeit still important, markets for NSW metallurgical coal.

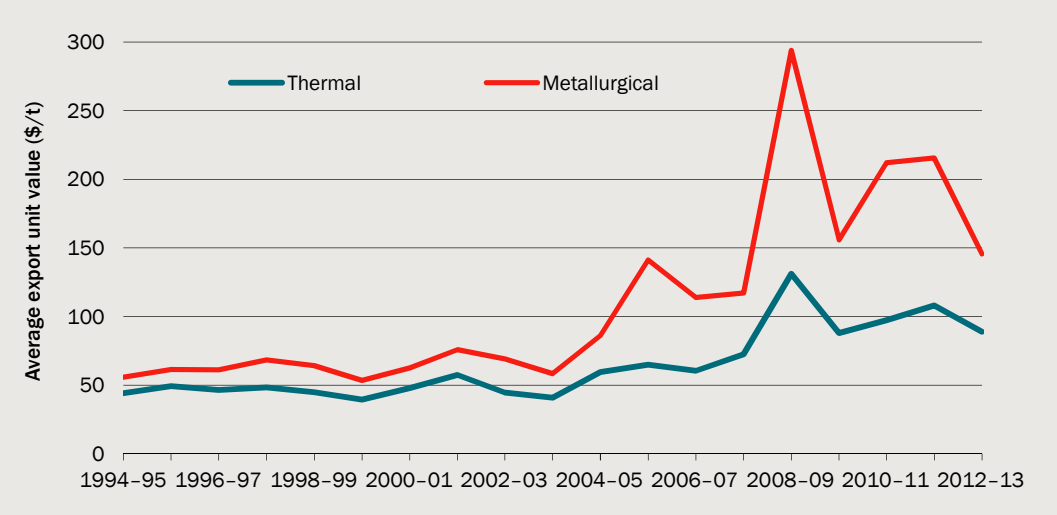
### 1.13 Metallurgical coal exports by destination (Mt)




*Data source:* NSW Trade and Investment, 2013: New South Wales: Coal Industry Profile, 2013. Updated data supplied by NSW Trade and Investment, 2014.

Export prices have risen considerably for metallurgical coal since the early-to-mid 2000s (see chart 1.14), particularly in 2008-09, as a result of tight supply conditions and increased demand, particularly from China. However, prices eased considerably in 2012-13, particularly for metallurgical coal.

**1.14 Average export unit value (dollars per tonne), thermal and metallurgical coal**




*Data source:* BREE, 2014.

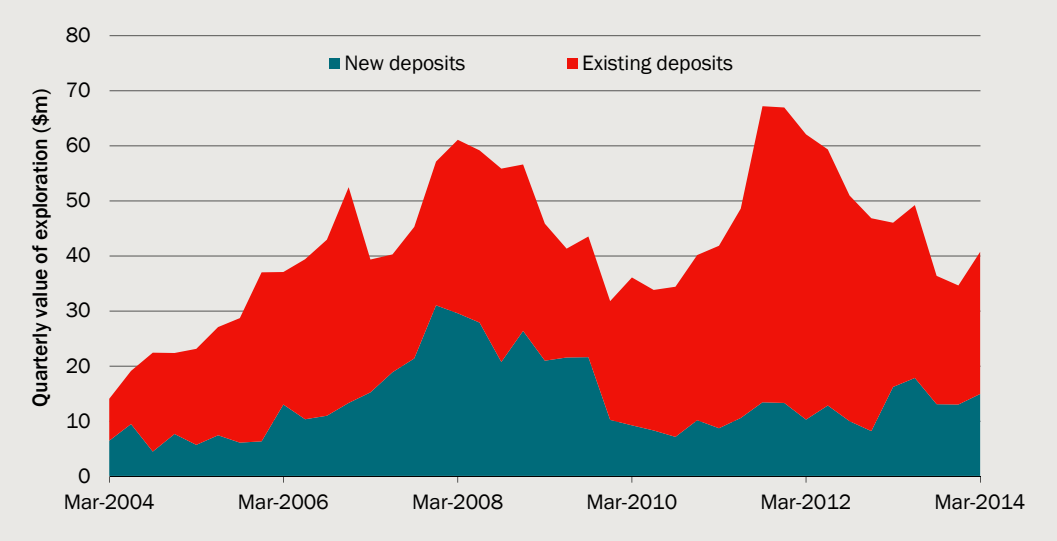
## *Exploration expenditure*

Another important form of investment undertaken by the mining industry is exploration. In the four quarters to March 2014, around $160.9 million was invested in mining exploration in New South Wales. This represents 7 per cent of the total amount of exploration investment in Australia over this period, of $2.29 billion. The proportion of exploration expenditure in NSW over the past decade in any one year has varied from a peak of 11 per cent in 2006 to a low of around 5 per cent in 2010.

In NSW, between half and three quarters of investment is spent on existing deposits ('brownfield'), as opposed to new deposits ('greenfield'). Particularly since the onset of the global financial crisis, there has been a strong preference for investment in existing, rather than new, deposits (see chart 1.15). However, the share of investment in greenfield deposits has recovered somewhat over the past year.

Overall exploration expenditure in NSW has been at levels similar to pre-economic downturn levels in only four quarters since the global financial crisis (from the September quarter of 2011 to the September quarter of 2012). The surge in exploration expenditure in Australia following the recovery again tapered off from September 2012 and around six months earlier – in March 2012 – in New South Wales.

### 1.15 Quarterly exploration expenditure, NSW




*Data source:* Australian Bureau of Statistics, Catalogue 8412.0, Mineral and Petroleum Exploration, New South Wales.

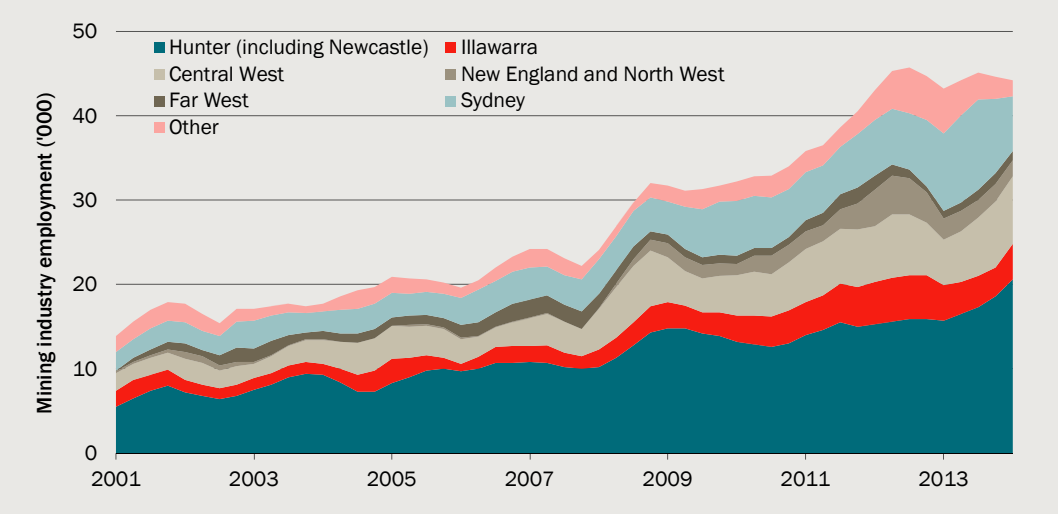
## *Mining industry employment*

Along with the growth in mining industry gross value added (GVA), in recent years, mining industry employment in NSW has increased substantively since 2008 particularly as a result of coal mining. Chart 1.16 illustrates how mining industry employment has grown in key mining regions, particularly from 2008 on.

The substantive expansion in mining industry employment in the Hunter region reflects the increase in coal mining activity. The expansion in mining industry employment observed for the Central West reflects in part the increase in gold mining activity in the region. The overall increase in mining activity was also associated with an expansion in mining industry employment based in Sydney.

Total employment in 'mining' as defined by the ABS (including petroleum) in the four quarters to May 2014 has been, on average, 44 500.

### 1.16 Mining industry employment ('000), key mining regions



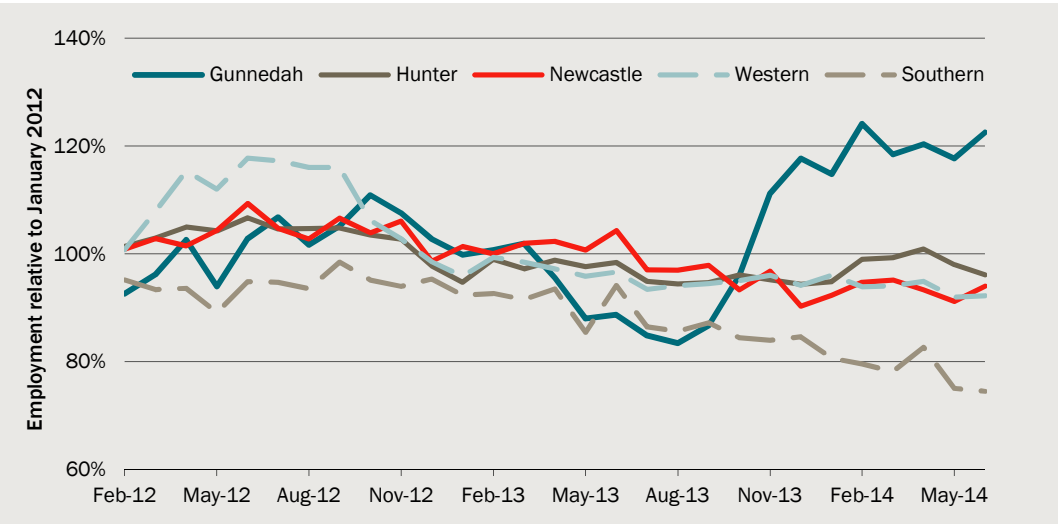

Note: The ABSs' definition of the mining industry is broader than assumed in this study. For instance, the ABS definition includes oil and gas extraction activity, whereas these are excluded from our study (albeit these are small).

Data source: ABS Employed persons (ST RQ1) by Region (ASGS SA4), Sex and Industry (ANZSIC division).

Chart 1.16 shows that employment growth has fallen more recently, and negative growth has been experienced in the New England and North West, Illawarra and Sydney. Data from the Coal Services Pty suggests that coal mining employment has fallen in the past two years in all coalfields with the exception of the Gunnedah Coalfield. Chart 1.17 shows that mining production employment has fallen across NSW, particularly in the last two quarters, where employment was around 7 per cent lower than at the start of 2012. This amounts to a fall of over 3 000 from peak levels in June 2012.

In particular, the Illawarra region has experienced a significant reduction in production employment in coal mines, with employment in the Southern coalfield at 75 per cent of levels in 2012 or a fall of around 1 000 jobs from the start of 2012.

### 1.17 Production employment at NSW coal mines relative to January 2012




*Data source:* The CIE.

# 2 The supply chain

***The CIE estimates that the mining industry (as defined in this study) derived $12.5 billion in value added in 2012-13. The coal sector is the highest value activity, generating the largest share of value added at approximately $9.6 billion each year.***

***Spending on intermediate inputs by the mining industry is estimated to be $9.6 billion each year. Transport and other margins are important to the coal sector and Other mining sector, and across mining account for approximately $1.9 billion. Overall, around 58 per cent of the supply chain is located in NSW, and a further 22 per cent from the rest of Australia.***

***Overall, approximately 70 per cent of minerals produced (in terms of value) is used overseas. The remaining share is used almost entirely by other industries as an intermediate input, with 21 per cent of total use derived in NSW and the remaining 9 per cent by other Australian jurisdictions, whereby final use also usually involves an export component (such as for iron and steel manufacturing).***

The CIE's analysis presented within chapters 2 to 5 is conducted by using the CIE-REGIONS model (see appendix F for further detail). The analysis is provided for three distinct 'sectors' of mining in NSW:

- Coal mining
- Other metal ores mining which incorporates bauxite mining, copper ore mining, gold ore mining, mineral sands mining, nickel ore mining, silver-lead-zinc ore mining and other metal ore mining
- Other mining which includes:
  - non-metallic mineral mining and quarrying, gravel and sand quarrying, other construction material mining, and other non-metallic mineral mining and quarrying
  - services to mining (such as payments to contractors and engineering services)
  - exploration expenditure.

The mining industry is defined as coal mining, Other metal ores mining and Other mining for the purpose of this study.

In this chapter, the CIE-REGIONS model is used to quantify the 'mining industry' supply chain. A model is useful because the value of the parts of the supply chain across regional NSW and in aggregate cannot be directly observed. The CIE-REGIONS model helps to build up a supply chain of the inputs and value added components of each industry, and identifies the associated uses. In later chapters, the supply chain is the used

as the foundation on which the direct and indirect effects of the mining industry is demonstrated, and for projections of the future contribution of mining to NSW.

The CIE provides a regional analysis, which is based on ABS data provided at the Statistical Area Level 4 aggregation.

## *Overview of the direct contribution of the mining industry*

The model is used to estimate the mining industry's *direct* contribution to employment and value added in NSW, based on 2011 Census data scaled to 2012-13.

### *Industry value added*

Industry value added is a more relevant measure of contribution than the gross value of production. Industry value added is the measure of the contribution by businesses in each industry to gross domestic product (gross state product or gross regional product). Industry value added is the total value of goods and services produced by an industry (equivalent to gross value of production), less the cost of goods and services used in the process of production.

Together, industry value added plus taxes less subsidies equal Gross Domestic Product (or state or regional equivalents).[17]

The CIE estimates that the direct contribution of the mining industry to industrial value added in NSW is approximately 2.9 per cent, compared to around 6.6 per cent across Australia (see table 2.1). While this would suggest lower reliance on mining in NSW than other states, this still represents a significant share of non-services industry value added. As we will show below, mining is closely tied to value added and employment in other sectors such as services and manufacturing.

The CIE estimates that the coal sector contributes around 2.2 per cent of industry value added in NSW. While NSW produces nearly *half* of Australia's coal production, on a value added basis, in dollar terms, its contribution is around *30 per cent* (see table 2.2). This reflects the dominance of thermal coal in the supply chain in New South Wales, which is lower value than metallurgical coal.

Other metal ores and Other mining sectors, as a share of industry value added, is also lower than other states. The Other metal ores mining sector accounts for 0.4 per cent of industry value added, and Other mining derives 0.3 per cent of industry value added.[18]

Selected case study regions produce the vast majority of the coal value added in NSW. On the other hand, case study regions do not include other important regions for Other

---

[17] Net taxes (taxes less subsidies) are paid by users of the products on which the taxes are levied and not by specific industries.

[18] The CIE calculated the state average value added per full time employee by broader industry, and applied this to the industrial employment structure in each region, to estimate the contribution of each industry to industrial value added.

metal ores and Other mining sectors, accounting for only around half of sectoral value added in each case.

Table 2.1 shows that the mining industry is a significant contributor to a number of regional economies, in particular, the Hunter region, with mining representing almost 18 per cent of industry value added, and the Central West, with mining accounting for nearly 20 per cent of industry value added.

### 2.1 Industry value added in percentage terms, 2012-13

| Value added in %age terms | Australia | NSW | Central West | Illawarra | Hunter region[a] | New England and North West |
|---|---|---|---|---|---|---|
| Agriculture | 2.4 | 1.7 | 7.6 | 0.2 | 1.1 | 13.4 |
| **Coal** | **2.4** | **2.2** | **11.7** | **7.0** | **16.6** | **3.3** |
| Oil | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Gas | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Iron ore | 1.2 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| **Other metal ores** | **2.0** | **0.4** | **6.6** | **0.0** | **0.1** | **0.0** |
| **Other mining** | **2.2** | **0.3** | **1.3** | **0.5** | **0.9** | **0.6** |
| Manufacturing | 7.2 | 8.0 | 8.0 | 10.3 | 9.6 | 6.9 |
| Utilities | 2.7 | 2.6 | 4.3 | 2.1 | 4.3 | 2.8 |
| Construction | 8.3 | 5.5 | 5.3 | 6.6 | 6.6 | 5.7 |
| Services | 70.6 | 79.2 | 54.9 | 73.2 | 60.9 | 67.1 |
| **Total mining industry** | **6.6** | **2.9** | **19.6** | **7.5** | **17.6** | **3.9** |

[a] The Hunter region incorporates the Hunter Valley (excluding Newcastle) and Newcastle and Lake Macquarie statistical areas.

*Source:* The CIE.

Applying these shares to industry value added in 2013 terms indicates the contribution of various mining activities to New South Wales and key mining regions. The CIE estimates that in 2013 terms:

- the coal mining sector accounted for $9.6 billion or 29 per cent of Australian coal value added
- the Other metal ores sector generated $1.6 billion in value added terms, accounting for a more modest amount of Australian Other metal ores value added (6 per cent)
- the Other mining sector in NSW accounted for around $1.4 billion in value added and 5 per cent of the Australian total.

In 2013 terms, the mining industry (as defined in this study) accounted for around $12.5 billion in value added terms.

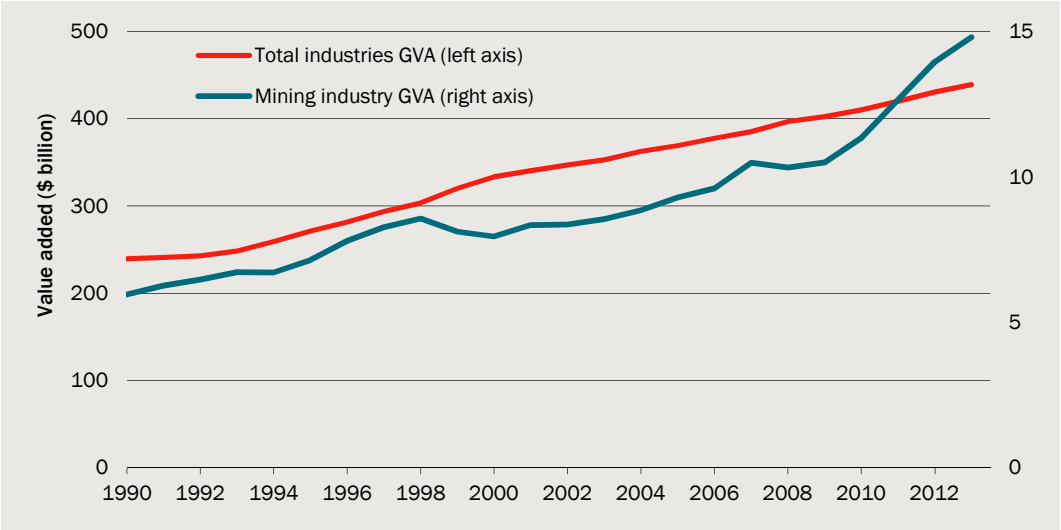
## 2.2 Industry value added and GDP/GSP/GRP (in billions of dollars), 2012-13

| | Australia | NSW | Central West | Illawarra | Hunter region | New England and North West |
|---|---|---|---|---|---|---|
| Industry value added | 1 370.8 | 426.4 | 12.2 | 13.4 | 37.8 | 9.3 |
| Agriculture | 33.4 | 7.2 | 0.9 | 0.0 | 0.4 | 1.2 |
| **Coal** | **32.9** | **9.6** | **1.4** | **0.9** | **6.3** | **0.3** |
| Oil | 6.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Gas | 6.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Iron ore | 16.5 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Other metal ores** | **28.0** | **1.6** | **0.8** | **0.0** | **0.0** | **0.0** |
| **Other mining** | **29.9** | **1.4** | **0.2** | **0.1** | **0.4** | **0.1** |
| Manufacturing | 99.1 | 33.9 | 1.0 | 1.4 | 3.6 | 0.6 |
| Utilities | 36.5 | 11.0 | 0.5 | 0.3 | 1.6 | 0.3 |
| Construction | 114.4 | 23.6 | 0.7 | 0.9 | 2.5 | 0.5 |
| Services | 967.6 | 337.9 | 6.7 | 9.8 | 23.0 | 6.2 |
| Taxes | 150.5 | 50.5 | 1.4 | 1.6 | 4.5 | 1.1 |
| **GDP/GSP/GRP** | **1 521.3** | **476.9** | **13.7** | **15.0** | **42.3** | **10.4** |

*Source:* The CIE.

Between 1990 and 2009, the value added from mining in NSW increased at a similar pace to all industries in NSW. However, since 2009, value added has increased more rapidly. Chart 2.3 shows GVA (gross value added) in chain volume measures, which is an indicator of the change in the quantity of goods and services produced.

## 2.3 GVA of mining and total, New South Wales, chain volume measures




*Data source:* Australian National Accounts: State Accounts. Table 2 Expenditure, Income and Industry Components of Gross State Product, New South Wales, Chain volume measures and current prices.

While mining industry value added in NSW continued to expand in 2012-13, in terms of the quantity produced or sold, it is important to note that in current prices the value of mining fell. This reflects the reduction in prices that has been observed across markets.

### *Employment*

Estimates of the share of employment in terms of full time employees suggests direct mining activities contribute towards a smaller share of employment in NSW than Australia-wide. The services sector comprises a larger share of employment in NSW, compared to Australia-wide. However, mining remains important, particularly to the regions shown in table 2.4 . The number of people employed directly in the mining industry in NSW in 2012-13 is estimated to have been 40 291. When adjusted to full time equivalent terms, direct employment in the NSW mining industry is larger at 43 782 due to the low share of part time employment and workers provided with greater than 40 hours of employment per week.

In the Central West region, for example, mining directly accounts for almost 10 per cent of employment and in the Hunter region, it directly accounts for over 7 per cent of employment and derives additional manufacturing employment related to the mining industry such as in iron and steel manufacturing. Excluding the Newcastle and Lake Macquarie regions, mining industry employment in the Hunter region directly accounts for 15 per cent of employment.

**2.4 Employment shares in percentage terms, 2012-13**

| Employment in %age terms | NSW | Central West | Illawarra | Hunter region | New England and North West |
|---|---|---|---|---|---|
| Agriculture | 2.8 | 12.5 | 0.4 | 1.9 | 19.6 |
| **Coal** | **0.9** | **4.4** | **2.7** | **6.7** | **1.1** |
| Oil | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Gas | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Iron ore | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| **Other metal ores** | **0.2** | **4.3** | **0.0** | **0.0** | **0.0** |
| **Other mining** | **0.2** | **1.0** | **0.4** | **0.7** | **0.4** |
| Manufacturing | 10.4 | 10.2 | 13.6 | 13.1 | 7.7 |
| Utilities | 1.2 | 1.9 | 0.9 | 2.0 | 1.1 |
| Construction | 6.7 | 6.3 | 7.9 | 8.3 | 6.0 |
| Services | 77.5 | 59.4 | 74.1 | 67.3 | 64.1 |
| **Total mining industry** | **1.4** | **9.7** | **3.1** | **7.4** | **1.5** |

*Note:* Employment shares are calculated in Full time equivalent terms, based on 40 hours per week per FTE.
*Source:* The CIE.

## *Dissecting the mining industry supply chain*

In the section above, we outlined the value added component, which is one of the most important measures of the contribution of an industry. However, dissecting the broader

supply chain to understand where inputs are sourced from and where revenues are spent is critical to examining the impact of the minerals industry to the NSW and Australian economies, and to regional economies.

Each sector has a different supply chain, in terms of the inputs utilised in production including intermediate inputs and value adding activities such as labour and capital, and the margins (mostly transport activity) delivering the product to its users (industrial use and exports).

Charts 2.5, 2.6 and 2.7 provide a high-level representation of the supply chain of each of the mining sectors in NSW. The charts display a broader overview of the benefits from mining, beyond simply the value added component. Each of these supply chains, in terms of both inputs and use, will be dissected further below.

Incorporating mining services sold to coal and non-ferrous metals, the gross value of production of the NSW minerals industry is approximately $24.0 billion in 2012-13.[19]

- **However, a better measure of the mining industry's contribution to NSW is industry value added, which across mining and related services activities was $12.5 billion.**

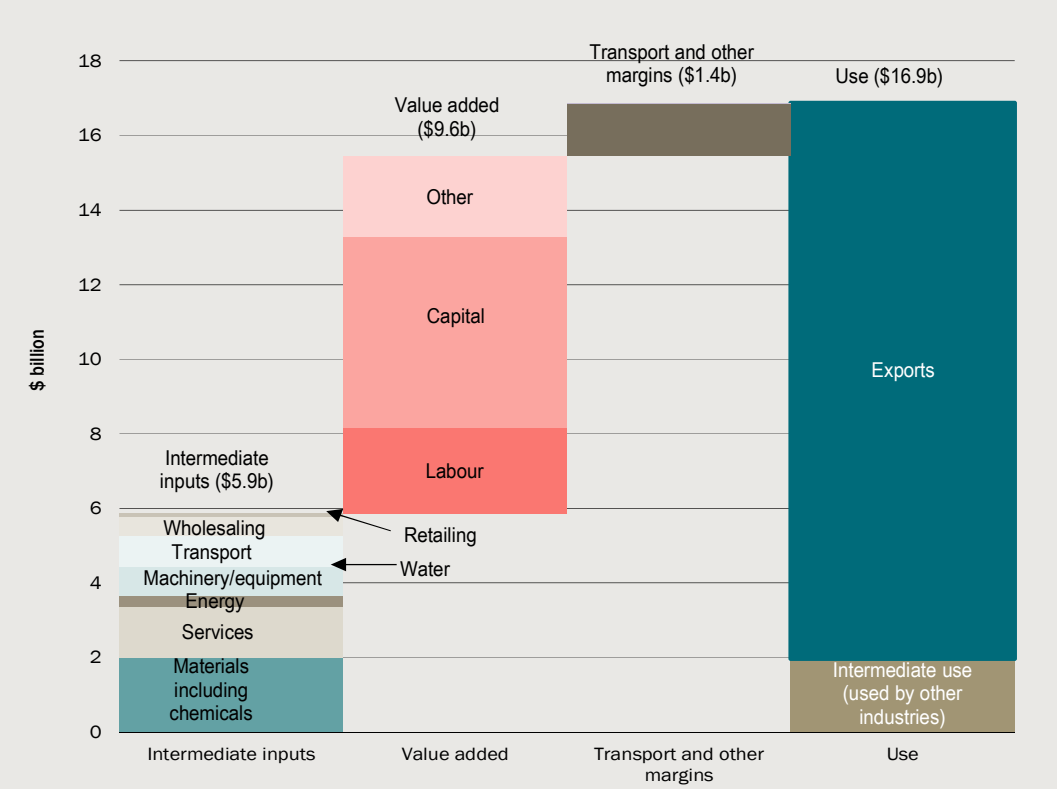
Spending on intermediate inputs is estimated to be $9.6 billion each year across the three sectors. Margins, which are comprised mostly of transport margins, are estimated to be $1.9 billion in total, including $1.4 billion derived by coal and $0.4 billion by the Other mining sector.

As shown in chart 2.5, the value of coal sector production (and use) was approximately $16.9 billion, with the value added component equivalent to around 57 per cent of the value of production.

- **Coal sector value added accounts directly for 77 per cent of mining industry value added.**

[19] This estimate is similar to official estimates from NSW Trade and Investment of approximately $21.1 billion. However, the CIE's estimates include services to mining and expenditure on exploration, of approximately $2.9 billion. That is, estimates produced using the CIE-REGIONS model are reasonably consistent with information available from Australian government statistics.

## 2.5 Coal sector value chain: inputs and use

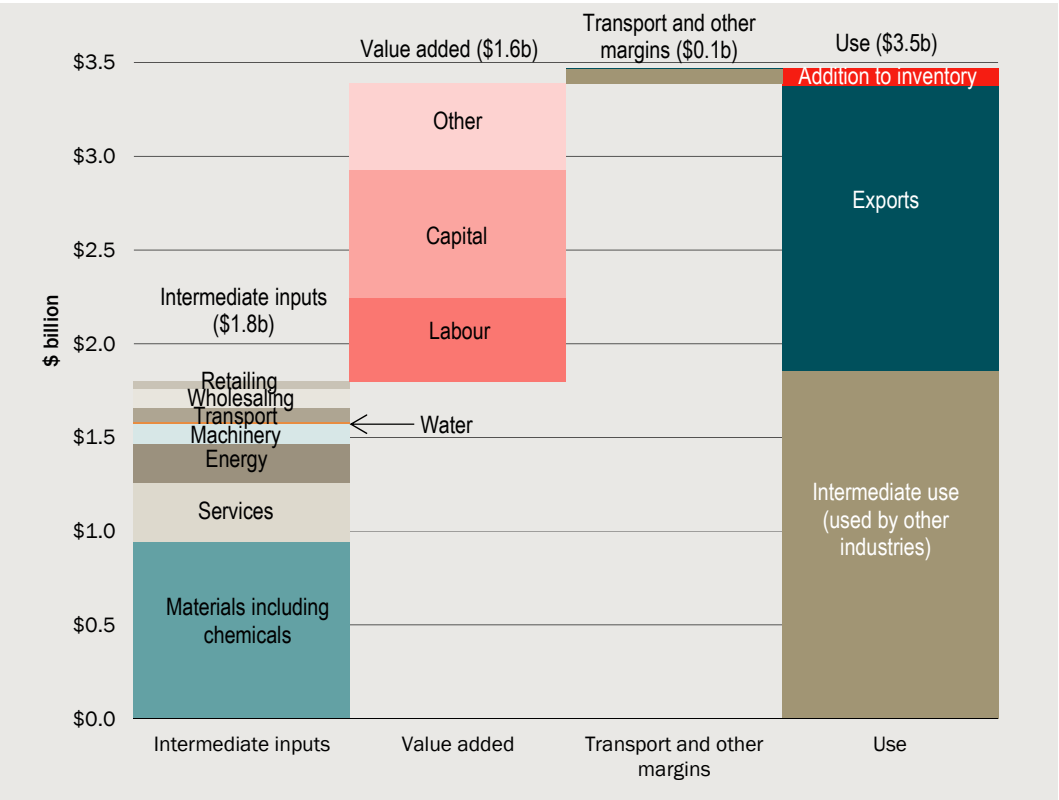



*Note:* The supply chain in based on 2011 because the modelling utilises 2011 Census data, scaled by Value Added to 2013 terms.

*Data source:* The CIE.

Chart 2.6 shows the CIE's estimates of the value of Other metal ores production of around $3.5 billion, representing approximately one fifth of the value of the coal sector. Value added represents a smaller proportion of the gross value of production in the Other metal ores sector, at around 46 per cent.

## 2.6 Other metal ores value chain: inputs and use




*Note:* The supply chain in based on 2011 because the modelling utilises 2011 Census data, scaled by Value Added to 2013 terms.

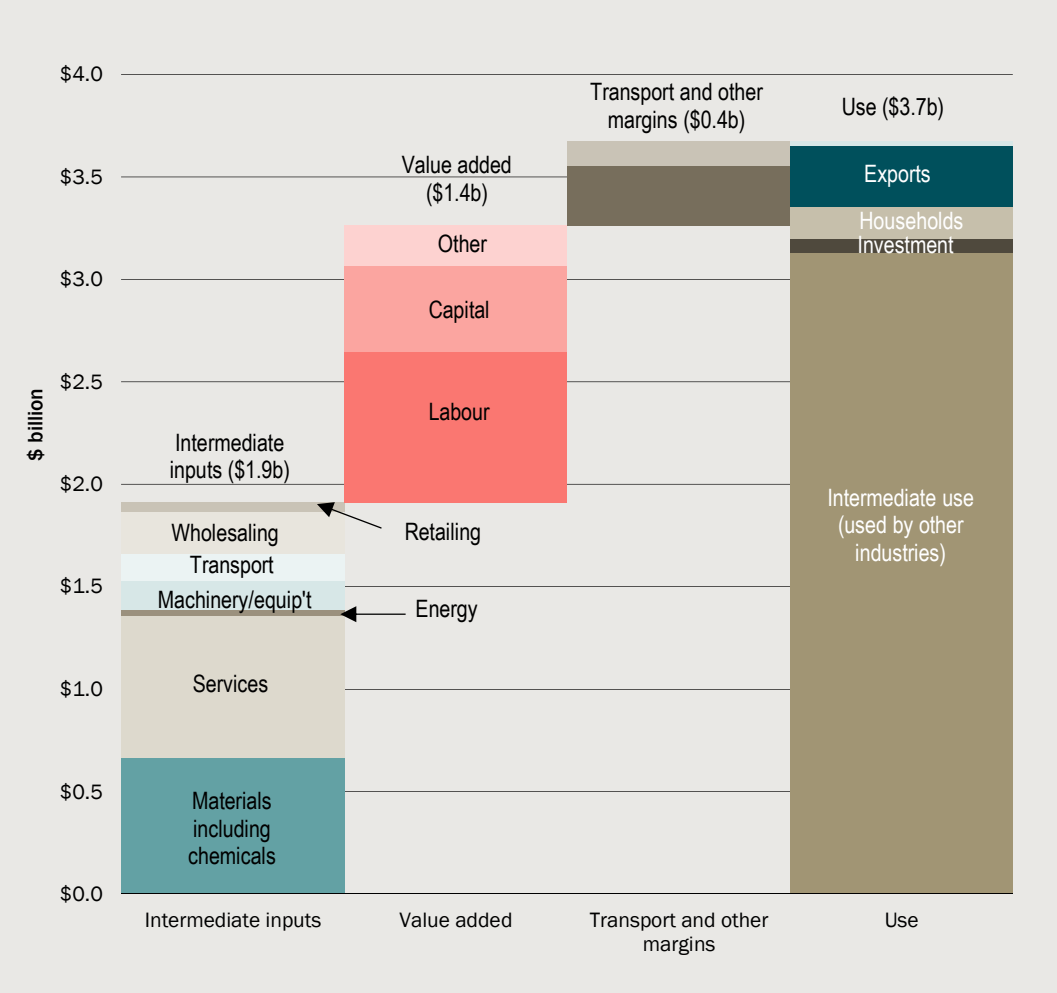
*Data source:* The CIE.

As shown in chart 2.7 (below), the value of Other mining sector output is estimated to be around $3.7 billion.

The share of non-metallic mineral extraction and quarrying and other construction material mining represents approximately one quarter of this value. The remaining three quarters is made up of payments for services to mining and a very small proportion is exploration expenditure.

The value added component of $1.4 billion represents only 37 per cent of the value of production.

### 2.7 Other mining value chain: inputs and use




*Note:* The supply chain in based on 2011 because the modelling utilises 2011 Census data, scaled by Value Added to 2013 terms.

*Data source*: The CIE.

## *Direct contribution through purchases and value added*

Table 2.8 compares the share of supply by input across the three key mining sectors in NSW. Higher value activities are able to extract more rent to factors of production, including labour, capital and land. Box F.3 in appendix F explains in more detail the methodology applied in the aggregation of inputs, and the economic terminology applied to different types of inputs.

- **Table 2.8 shows that the value added share is significantly higher in the case of the coal sector, than Other metal ores and Other mining sectors.**

As well as signalling the value of the mining activity, the relative share provides an indication of the labour or capital intensity and the exchanges occurring between sectors in the process of mining (see below).

### 2.8 Share of supply cost by input (per cent)

| | Coal | Other metal ores | Other mining |
|---|---|---|---|
| | Per cent | Per cent | Per cent |
| **Intermediate inputs, basic prices – share of total** | **35** | **52** | **52** |
| Materials including chemicals | 11 | 27 | 18 |
| Services | 8 | 9 | 19 |
| Energy | 2 | 6 | 1 |
| Machinery/equipment | 4 | 3 | 4 |
| Water | <1 | <1 | <1 |
| Transport | 5 | 2 | 3 |
| Wholesaling | 3 | 3 | 6 |
| Retailing | <1 | 1 | 1 |
| **Value added – share of total** | **57** | **46** | **37** |
| Labour | 14 | 13 | 20 |
| Capital[a] | 30 | 20 | 11 |
| Other[b] | 13 | 13 | 5 |
| **Margins – share of total** | **8** | **2** | **11** |
| Transport margins | 8 | 2 | 8 |
| Other margins | <1 | <1 | 3 |
| Other taxes | <1 | <1 | 0 |

[a] Includes payments to capital, gross depreciation, company and property taxes. [b] Working capital plus other indirect taxes paid.

*Source:* The CIE.

## *Intermediate inputs: predominantly from materials and services*

The highest value intermediate inputs come from materials and services.

In the case of coal and other metal ores mining, a large share of materials is sourced from the 'Other mining' sector which provides construction materials and services to mining. The largest sources of materials in the case of Other mining (over 60 per cent), and the second largest for Coal and Other metal ores mining, is petroleum products. Other important sources of materials are the chemicals, iron and steel products and metal products sectors. In the case of Other metal ores mining, 10 per cent of the intermediate input component is sourced from within the Other metal ores sector itself.

Intermediate inputs from service-related industries are comprised of three main sectors:

- construction services
- business services
- finance.

Other important, but more minor inputs include energy, machinery and equipment, transport and wholesaling. These vary slightly between the sectors such as for energy inputs which represent a higher share of the value of production in the case of Other metal ores mining (at 6 per cent), while wholesaling represents a higher share of the value

of production for Other mining. Machinery and equipment represents between 3 and 4 per cent of the value of production across mining industry activity.

### *Value added components*

As shown in table 2.8 (above), coal production is the highest value added activity of the three mining sectors. Value added is an indicator of the capacity to pay labour, capital and other margins such as to land via royalties because the value of the output is significantly higher than the intermediate inputs at basic prices.

There are a number of additional observations that can be made:

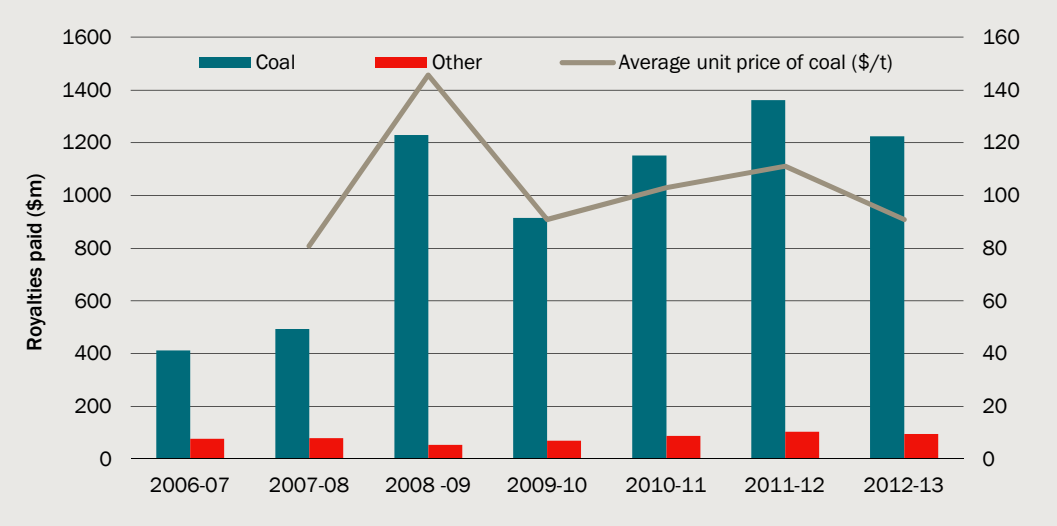
- The coal sector is relatively capital intensive, where capital constitutes over half of the share of value added, comprising three times the share of capital value added than 'Other mining' which relies more heavily on labour.
- Working capital and other indirect taxes paid (as shown by Other value added), which is predominantly comprised of royalty payments, represent a similar share of the value of production of around 13 per cent across coal and other metal ores mining.
  - This compares to Other mining sector activity for which Other value added constitutes only 5 per cent of the value added component, reflecting that royalties are only payable for high value to volume minerals.

Importantly, royalties paid to the NSW government (which are indirectly included within 'Other value added') represent a return to the Australian community for industry access to mineral resources. Royalties paid from coal production account for around 95 per cent of total royalty collection from mineral and petroleum production.[20]

The dramatic increase in royalty payments in 2008-09 (shown in chart 2.9) is partly attributed to the increase in coal prices and production, which contributes to an increase in royalties, which are calculated on an ad-valorem basis, where the royalty is charged as a percentage of the value of production. It is also attributed to the State Revenue and Other Legislation Amendment (Budget Measures) Act 2008 which amended the Mining Regulation to increase all three tiers of the coal royalty rate by 1.2 per cent.

[20] NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*.

**2.9 Coal and other royalties, New South Wales, millions of dollars**




*Data source:* NSW Trade and Investment, 2014.

### *Margins*

Margins comprise between 2 and 11 per cent of the value of production, being smaller for Other metal ores than for coal and Other mining sectors. The low margin for Other metal ores reflects that transportation is a less significant component of production.

Other mining products, which comprise large quantities of construction materials with low unit values, must be obtained as close to markets as possible due to high transportation margins. Construction materials mining competes with a range of other land uses associated with large population centres including urban and industrial development, rural residential development and various infrastructure demands.[21] Services to mining, also covered in Other mining, are expected to have an important transportation component.

The transport component (including both transport costs and transport margins) in coal mining is an even larger share of its cost structure than it is for Other mining.

- **This would suggest that the productivity of mining infrastructure is particularly high, and important.**

## *Sourcing of inputs*

A significant majority of around 58 per cent of the value of production is sourced from within New South Wales. In excess of 80 per cent of the value of production is sourced from within Australia. This means that other sectors in NSW, and Australia, as well as labour, owners of capital and the community through royalties and taxation collections benefit from the payments made by mining companies in the course of establishing and operating a mine.

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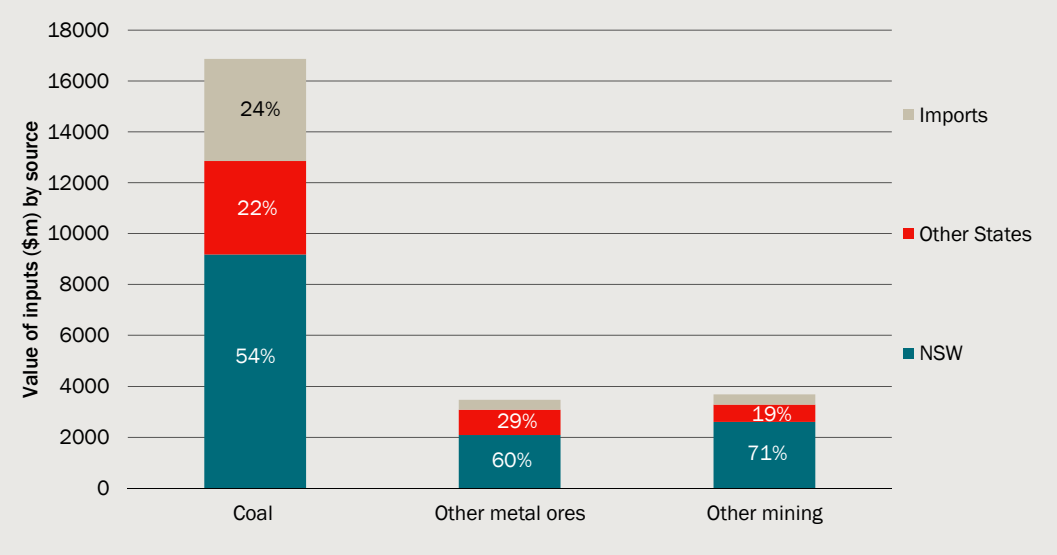
[21] NSW Trade and Investment, 2013: *2013 New South Wales minerals industry profile*.

### *Source of inputs for Coal sector*

As shown in chart 2.10, the coal industry is estimated to have the highest share of the value of production that is attributed to imports. This reflects the high share of capital value added in the supply chain, which predominantly relates to machinery imports and materials.

**2.10 Value of inputs ($m) by industry, by source**

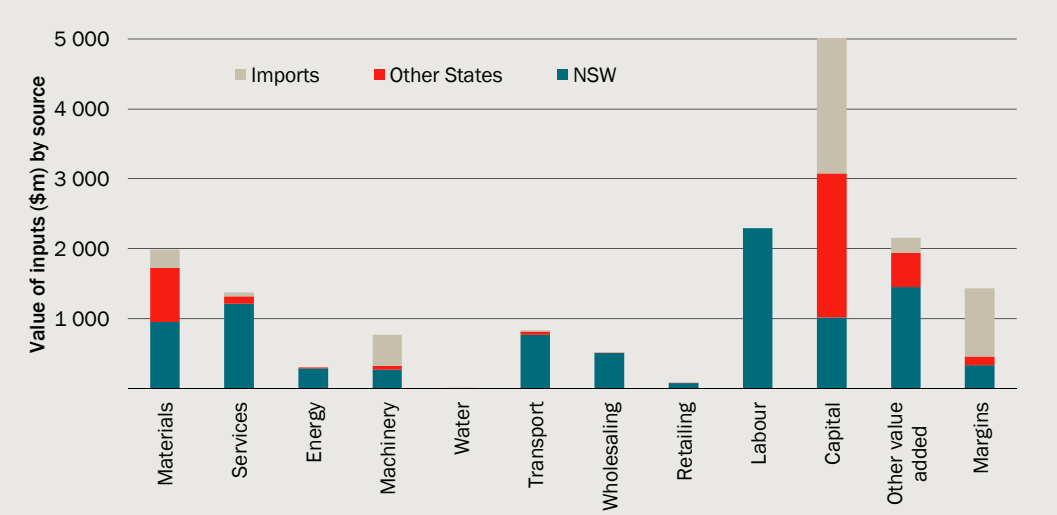



*Data source:* The CIE.

Chart 2.11 provides a disaggregation of the supply chain for coal. It shows that most service sectors that provide intermediate inputs to the coal sector as well as energy, water, transport, wholesaling and retailing sector activity are from NSW.

Of the value adding activities, a significant share of capital is owned (and therefore effectively sourced from) overseas. This represents a significant share of coal mining production, which is capital intensive. In addition, given the high percentage of coal that is exported, a significant share of the transport margin is also derived from imports (international rather than domestic freight). For such reasons, around one quarter of the supply chain originates (is sourced from) overseas.

### 2.11 Value of inputs ($m) by source, Coal sector



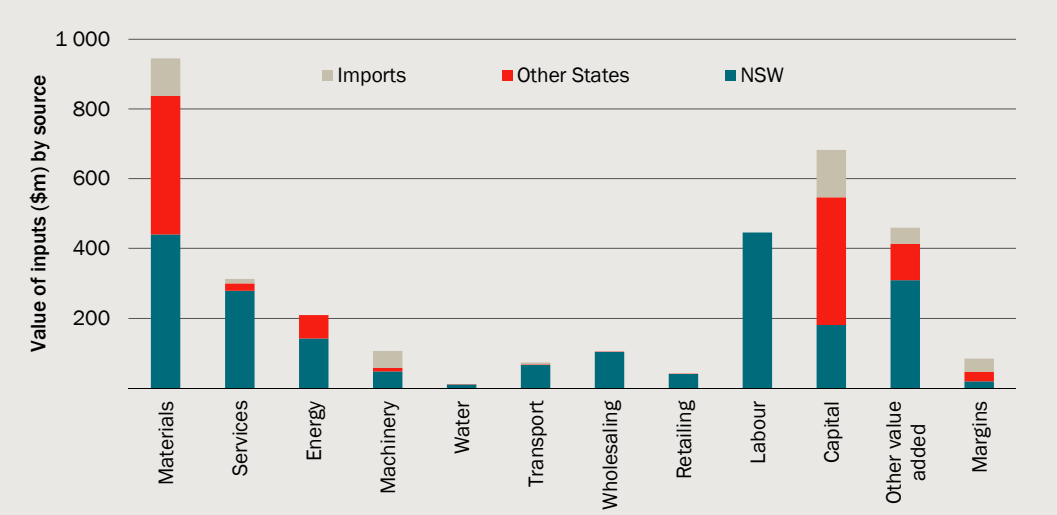

*Data source:* The CIE.

## *Source of inputs for Other metal ores sector*

The supply chain for the Other metal ores sector in NSW is even more domestic-orientated, with around 90 per cent accounted for by domestic inputs – including 60 per cent from New South Wales and around 30 per cent from interstate. Compared to coal mining, a larger share of the capital value added is derived from capital owned within Australia (around 80 per cent) and transportation margins are smaller in general.

Interstate components of the supply chain are predominantly made up of materials including chemicals and capital.

### 2.12 Value of inputs ($m) by source, Other metal ores sector

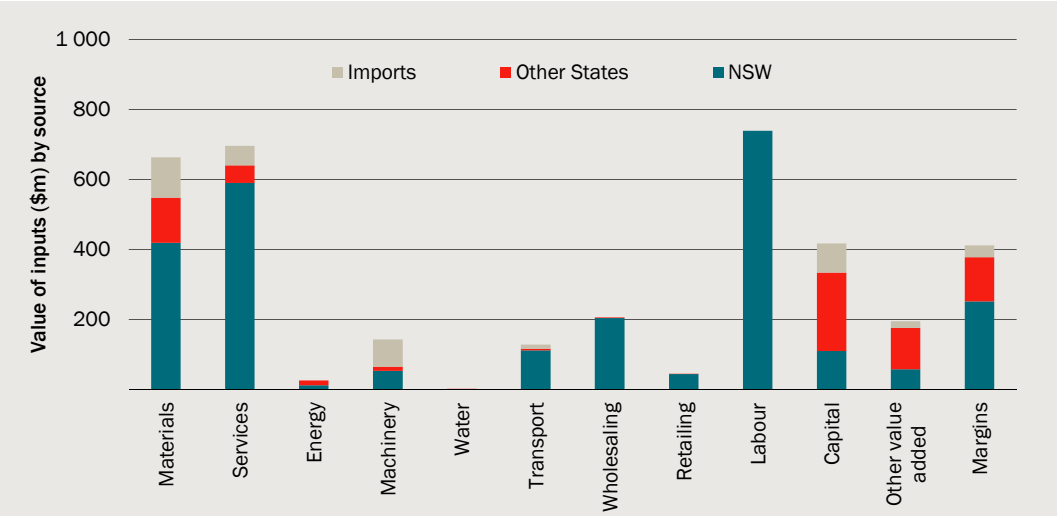



*Data source:* The CIE.

### *Other mining sector*

The contribution of NSW to the Other mining sector is significantly higher than for coal and other metal ores mining due to the high share of labour, services, domestic transport, and domestically sourced materials that are used in the production process and in services to mining. The largest imports are for materials, machinery and equipment, and capital.

**2.13 Value of inputs ($m) by source, Other mining sector**




*Data source:* The CIE.

## *METS Sector*

The Mining Equipment, Technology and Services (METS) sector is an important component of the mining industry. It includes a diverse range of companies, which produce technologically advanced, globally competitive products and services for mining companies worldwide. They range from exploration to contract mining, to manufacturers of heavy equipment and precision augmentation, to satellite navigation, cabling, monitoring systems, projection management, engineering, mine mapping software, specialised technologies and professional and mining consulting services.

They include companies such as Orica, Leightons and Worley Parsons, however the majority of METS companies are small to medium enterprises with revenue of less than $30 million each year. A recent survey conducted in 2013, whereby 860 companies responded, indicated that 84 per cent of the METS sector is Australian owned.[22]

The CIE estimates that the METS sector employed approximately 11 600 people in 2012-13, in full time equivalent terms.

22 Austmine, 2013. *Australia's new driver for growth: Mining equipment, technology and services*. July 2013.

The CIE estimates that the METS sector revenue in 2012-13 was approximately $4.4 billion while value added was approximately $1.8 billion. The sector is estimated to have exported around $389.1 million in that year.

## *Uses*

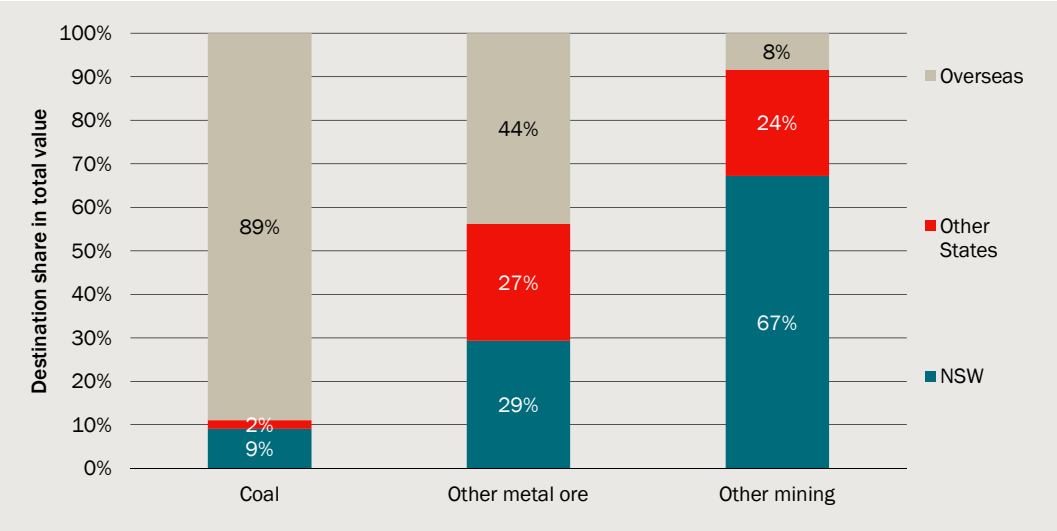
The share of production utilised as intermediate inputs into the domestic production process by firms, and exported varies significantly. However, there is virtually no household and government consumption of the minerals (directly) across each of the three sectors.

A summary of the products made with each of the mineral commodities mined in New South Wales is provided in appendix A.

### *Use is characterised by industrial sector and exports*

Across the three mining sectors, based on 2012-13, around 70 per cent of the use by value is in overseas markets, while around 21 per cent is in New South Wales (as intermediate use by other industries), and around 9 per cent in other Australian jurisdictions. However, the composition is different across the three major mining industries (see chart 2.14). The share of overseas use reflects the export share, while the proportion of domestic use that is consumed in NSW or other states reflects the composition of industrial use (discussed further below).

**2.14 Value of use by destination in 2012-13, in percentage terms**




*Data source:* The CIE.

Table 2.15 provides more detail on the types of use across the three key mining sectors.

- Almost nine tenths of the value of coal production is directly exported.
  - Around 44 per cent of Other metal ores sector output, by value, is exported.

- On the other hand, the Other mining sector is predominantly an intermediate input to other industries.
- Coal is not directly consumed by households. However, over one tenth of coal is used by other industries as intermediate input, with almost three quarters of this used for electricity generation, and one quarter for iron and steel manufacturing.
- Other mining sector output is largely used by the Coal sector (accounting for nearly 60 per cent of total intermediate use), followed by Other metal ores, Construction, Cement, and Iron and steel sectors.
- Other metal ores are used by the Other metals sector, accounting for 87 per cent of the share used by firms (industrial production).

Direct use by 'investment', such as in infrastructure building and by business, and 'households' occurs only for Other mining production, representing a very small proportion of total use across the mining industry.

Over 80 per cent of the coal consumed for industrial use is undertaken within New South Wales, reflecting that:

- all coal-fired electricity generators sourcing NSW coal are located in the state
- however, a significant share of use by iron and steel manufacturing sectors occurs interstate (63 per cent) with a lesser share (of 27 per cent) occurring within NSW.

Other metal ores mining is predominantly used by the Other metals sector, whereby roughly half of users are located in New South Wales and half are interstate. For instance, gold doré (gold alloyed with silver and base metals) from NSW mines is shipped to Western Australia where it is refined at the Perth Mint before being exported. In the model, this is represented as 'industrial use' because it is used as an intermediate input to another sector (in this case, the Other metals sector).

For construction materials, given their low value and high volume and therefore costly nature to transport, they need to be located close to their intended market. Service to mining and exploration expenditure are also 'used' mainly as inputs to NSW mining. Hence, a large share of domestically used Other mining sector output is used in NSW.

### 2.15 Share of production by use (per cent), 2012-13

| | Coal | Other metal ores | Other mining |
|---|---|---|---|
| Intermediate uses (by other industries) | Coal-fired electricity generation, iron and steel manufacturing | Other metals | Coal, other metal ores, construction, cement, iron and steel manufacturing |
| Industrial production | 11 | 53 | 85 |
| Investment | | | 2 |
| Household consumption | | | 4 |
| Exports | 89 | 44 | 8 |
| Government use | | | 1 |
| Other - inventory | | 3 | 0 |

*Source:* The CIE.

# 3 Measuring total effects

***The total contribution of mining is larger than the direct impacts alone. However, providing an estimate of the total contribution of mining is problematic because it is difficult to hypothesise which sectors would be larger or smaller in the absence of mining. However, modelling simulations demonstrate that if production were to fall, the impact on total industrial factor income would be more than double the impact on the mining industry.***

***The NSW mining industry's direct contribution to Commonwealth and State Government revenue is estimated to have been at least $3.7 billion in 2012-13 and growing. This is equivalent to 30 per cent of industry value added. This is comprised predominantly of company tax, minerals royalties and personal income taxes paid on wages (in that order). Again, if the mining industry were to contract this would be expected to negatively impact other sectors and would indirectly reduce government taxation collection.***

The impact of mining activity is not limited to the immediate suppliers and employees of mines that were described in chapter 2. Changes in economic activity resulting from mining have a multiplicative impact on the broader community due to the additional employment and income generation that has a compounding effect. If we were to take away mining we would likely have a much different NSW economy.

However, it is difficult to provide an estimate of the total contribution of mining, as it is problematic to hypothesise which industries would have been smaller or larger in the absence of mining as well as the extent to which labour could be employed in other industries and the impact on general wage levels.

The 'hypothecation' problem can be overcome through using an economic model to quantify the contribution of the mining industry to the NSW economy. A number of modelling simulations have been conducted, using the CIE-REGIONS model discussed in the previous chapter, to illustrate the economic impact of a smaller mining industry on the wider NSW economy.

## Simulation results

It is possible to illustrate the linkages between mining industry production, value added and employment and other sectors through simulating a $100 million fall in state production. The objective of the simulation is to illustrate the importance of the industry to the activity level in the economy as a whole, and within each region. The impact of the fall in production is provided in real terms, with the relative price of coal to the rest of the economy held constant (reflecting changes in the Producer Price Index).

Table 3.1 presents the results of the simulation— a fall in production of $100 million — across the three key sectors. The impact on each region varies, according to each region's role in the mining of that commodity.

### *Direct and indirect impacts of shock to the coal sector*

A reduction to coal sector production has a proportionately larger impact to Gross State Product than the same reduction in the production of Other metal ores and Other mining sectors. The total impact of a reduction in coal production of $100 million to Gross State Product is a decline of approximately $131 million.

### 3.1 Impacts of a fall in production

| Simulation – for each sector, a fall in the value of production of $100 million is modelled | NSW | Central West | Illawarra | Hunter region | New England and North West |
|---|---|---|---|---|---|
| **Coal sector** | | | | | |
| Gross State Product/ Gross Regional Product ($m) | -130.8 | -19.5 | -12.8 | -85.6 | -4.2 |
| **Industrial factor income ($m)** | **-107.9** | **-16.1** | **-10.5** | **-70.6** | **-3.5** |
| **Industrial factor income for mining industry ($m)** | **-48.0** | **-7.2** | **-4.7** | **-31.4** | **-1.5** |
| Household consumption ($m) | -51.1 | -7.6 | -5.0 | -33.4 | -1.6 |
| Net employment (FTE) | -472 | -70 | -46 | -309 | -15 |
| Government revenue ($m) | -22.9 | -3.4 | -2.2 | -15.0 | -0.7 |
| **'Other metal ores' sector** | | | | | |
| Gross State Product/ Gross Regional Product ($m) | -99.0 | -50.3 | -0.1 | -1.6 | 0.0 |
| **Industrial factor income ($m)** | **-80.0** | **-40.6** | **-0.1** | **-1.3** | **0.0** |
| **Industrial factor income for mining industry ($m)** | **-33.2** | **-16.9** | **-0.03** | **-0.5** | **0.0** |
| Household consumption ($m) | -40.9 | -20.8 | -0.04 | -0.6 | 0.0 |
| Net employment (FTE) | -396 | -201 | 0 | -6 | 0 |
| Government revenue ($m) | -19.1 | -9.7 | -0.0 | -0.3 | 0 |
| **'Other mining' sector** | | | | | |
| Gross State Product/ Gross Regional Product ($m) | -94.7 | -10.9 | -4.7 | -24.8 | -4.1 |
| **Industrial factor income ($m)** | **-82.8** | **-9.5** | **-4.1** | **-21.6** | **-3.6** |
| **Industrial factor income for mining industry ($m)** | **-35.5** | **-4.1** | **-1.8** | **-9.3** | **-1.5** |
| Household consumption ($m) | -43.1 | -4.9 | -2.1 | -11.3 | -1.9 |
| Net employment (FTE) | -584 | -67 | -29 | -153 | -25 |
| Government revenue ($m) | -11.9 | -1.4 | -0.6 | -3.1 | -0.5 |

*Source:* The CIE.

The reduction in coal production is associated with a fall of around $48 million in industrial factor income for the coal sector. The total reduction in industrial factor income, accounting for other sectors, is $107.9 million — significantly larger than just the fall in mining industry factor income.

The lower mining and economic activity sees employment falling by an estimated (net) 472 full time equivalent positions across the economy, and a consequential fall in household consumption of around $51 million each year.

Government revenue also falls by around $22.9 million as a result of the $100 million reduction in the value of production.

The impact of a reduction in state-wide production of coal is most significant in the Hunter region. It accounts for over 70 per cent of the fall in industrial factor income across NSW.

### *Direct and indirect impacts of shock to the Other metal ores sector*

A reduction in Other metal ores sector production of $100 million results in a reduction in Gross State Product of approximately $99 million. Industrial factor income across all sectors would fall by $80 million, significantly larger than the direct impact to the Other metal ores sector of $33 million.

Net employment is estimated to fall by approximately 396 full time equivalent positions, resulting in a fall of household consumption (a measure of welfare) by $41 million and reduction in government revenue of $19 million.

Of the case study regions, the impact of a fall in Other metal ores production would be most significant to the Central West, accounting for more than half of the impact on industrial factor income.

### *Direct and indirect impacts of shock to the Other mining sector*

A fall in production for Other mining sector revenue of $100 million is projected to result in a $94.7 million reduction in Gross State Product. This is less than the impact of the same ($100 million) fall in the production of coal and other metal ores mining, due to the more moderate impact on government revenue of $12 million.

The impact on industrial factor income would, again, be significantly larger than the direct impact on the Other mining industry alone.

A $100 million fall in Other mining sector production is projected to result in a net reduction in employment of 584 full time equivalent positions, reflecting the relatively labour intensive nature of the Other metal ores sector.

## *Tax contribution*

The minerals industry pays a significant amount of taxation to the Commonwealth and State governments.

The most significant form of taxation paid to the State is minerals royalties, which were approximately $1.32 billion in 2012-13.[23] Other significant forms of state taxation include land taxes and payroll taxes, which are not reported for separate industries. The CIE's modelling suggests that payroll taxes paid by mining were approximately $134.5 million in 2012-13 and land taxes were approximately $145.8 million.

Smaller amounts are collected by the State government through the mine safety levy, administrative levy, annual rental fees and other mineral industry specific fees and levies. In 2013-14, these are estimated to be approximately $58 million.[24]

Significant forms of Commonwealth government revenue from mining are company taxes and personal income taxation paid on wages. The CIE estimates that company taxes paid by NSW mining were in the order of $1.47 billion in 2012-13, and are expected to have risen to $1.50 billion in 2013-14. Personal income taxes paid by the NSW mining industry in 2012-13 are estimated to have been $0.65 billion, and are projected to have risen modestly to $0.66 billion in 2013-14.

Table 3.2 summarises the main forms of taxes contributed by the NSW mining industry in 2012-13 and expected revenue from taxes on the mining sector in 2013-14.

### 3.2 Mining industry direct contribution to taxation

| | 2012-13 | 2013-14 |
|---|---|---|
| | $m | $m |
| **State government taxes** | **1 598.3** | **1 646.5** |
| Mineral royalties | 1 318.0 | 1 360.0 |
| Payroll tax | 134.5 | 137.5 |
| Land tax | 145.8 | 149.0 |
| **Commonwealth government taxes** | **2 120.1** | **2 167.3** |
| Company tax | 1 471.1 | 1 503.7 |
| Personal income tax | 649.0 | 663.6 |
| | | |
| **State and Commonwealth taxation** | **3 718.4** | **3 813.8** |

*Source:* The CIE.

Additionally, mining companies participating in the NSW Minerals Council survey reported having made direct contributions to local councils through rates and other developer contributions of $41.4 million in 2012-13.

[23] NSW Government, 2014. Budget 2014-15. Budget Paper 2: Budget Statement 2014-15, Chapter 6. General Government Sector Summary of Revenues, Table 6.3.

[24] Supplied by NSW Trade and Investment, 2014.

# 4 Projections of future economic importance of mining

***If mining industry growth were below the expected potential due to negative policy settings then the size of the NSW economy would be smaller. The expected potential for coal production is for average annual growth of up to 2.9 per cent each year between 2014 to 2030 (lower than average growth over the past five years) and for Other metal ores production to grow each year until 2020, plateauing thereafter, due to the lack of significant discovery. Factors such as policy settings that result in greater-than-necessary delays and uncertainties would impact the growth rate of future mining activities in NSW.***

***The CIE's modelling of scenarios shows the difference between potential growth under positive policy settings and potential growth under negative policy settings could amount to a $13.4 billion difference in mining value added each year by 2030.***

***Incorporating both direct and indirect impacts (flow on effects to other industries), the impact to Gross State Product of below-potential growth could be as large as $46.8 billion each year by 2030. This represents a cumulative difference in Gross State Product between 2014 and 2030 of around $304 billion.***

In projecting the future value of mining in NSW, it is necessary to consider both the capacity to supply minerals to the market, as well as the likely demand from current and prospective markets.

On the supply side, the potential to meet current mining production levels depends on the mineral prospectiveness of the area. As discussed below, it is expected that NSW has sufficient reserves to continue to produce coal at current levels. However, supply side issues such as government policy settings have the potential to impact the rate of growth in coal production by making it difficult to attract the necessary capital.

While investment in the exploration of non-coal minerals has been reasonable over the past five years, there is some evidence that future production of non-coal minerals may reduce over time due to the lower rate of discovery for each dollar invested in exploration. The rate of (any) future production decline over the next 15 years (to 2030) will be dependent on exploration expenditure committed – which, in turn, may be impacted by government policy.

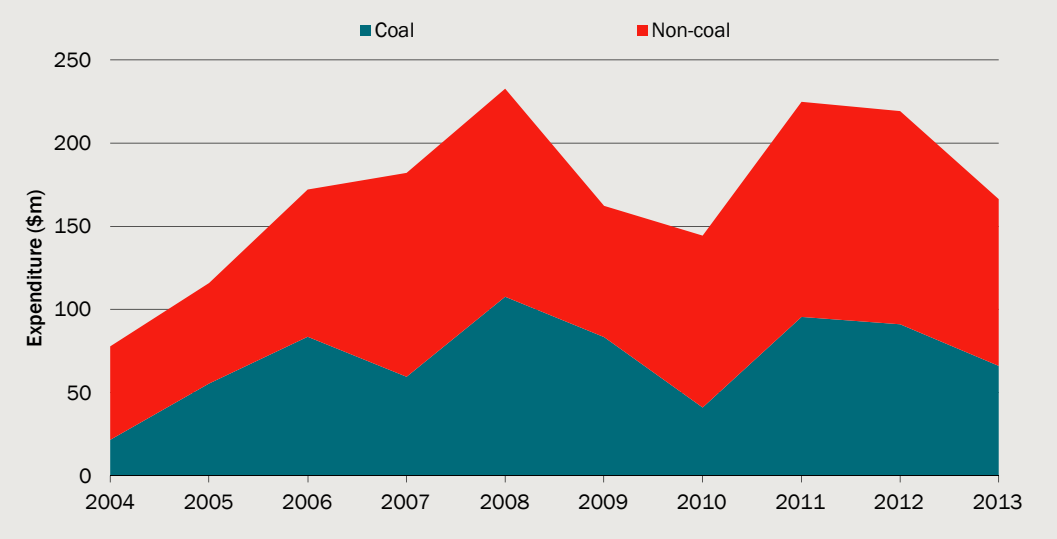
It is therefore necessary to examine a range of scenarios with respect to the potential contribution of mining in the future. The payoffs to policy reform may be reflected in the difference between the positive policy settings scenario where production will grow according to macroeconomic fundamentals of population and economic growth, and the negative policy settings scenario which assumes that investment in exploration and production is constrained by current NSW government policy arrangements. The

scenarios have been developed based on discussions with the Department and the NSW Minerals Taskforce.

## *Exploration expenditure and prospectivity*

Over the past decade, the share of exploration investment in NSW that is spent on coal has generally moved between 30 per cent and 50 per cent, with an average of 42 per cent of total investment over the past decade (see chart 4.1). In periods where coal prices were increasing, such as in 2005, 2006, 2008 and 2009, coal's share of exploration investment has been close to half.

### 4.1 NSW exploration expenditure on coal and other minerals deposits




*Data source:* Australian Bureau of Statistics, Catalogue 8412.0 Mineral and Petroleum Exploration, Australia.

Recoverable coal reserves in 2011 were estimated to exceed 18 billion tonnes, which compares to the raw coal produced in 2012-13 of 245.8 Mt. This suggests there is enough coal available to support current production levels beyond the next few decades.

While there are sufficient reserves of hard coking coal in the Southern coalfields to provide for the domestic steel industry 'well into this century', the depletion of reserves within the collieries servicing export markets could result in 'mine closures over the next two decades'.[25] That is, it is possible that the share of coal sourced from each of the basins could change over the next few decades, for instance, with the Gunnedah coalfield having exhibited significant growth in the past few years and exploration having identified there are substantial coal resources in the area at depths of less than 300 metres.

Table 4.2 shows the estimated recoverable coal reserves in NSW at June 2011, and compares this to the level of production in that same year.

[25] NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*. p 37.

### 4.2 Estimated recoverable coal reserves and production, NSW, 2011

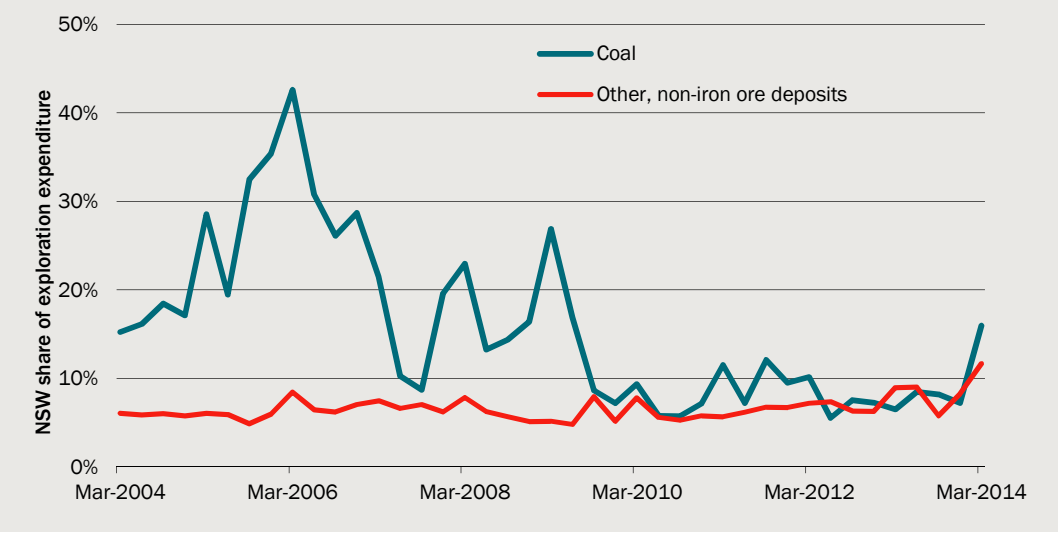
| | Reserves | Production |
|---|---|---|
| | Mt | Mt |
| Hunter | 9 454 | 88.2 |
| Western | 4 507 | 31.8 |
| Gunnedah | 2 055 | 7.6 |
| Oaklands | 1 280 | |
| Southern | 435 | 11.4 |
| Newcastle | 386 | 17.8 |
| Gloucester | 75 | |
| **Total** | **18 192** | **156.9** |

*Source:* NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile.*

The share of total *coal* exploration expenditure spent across Australia that is invested in NSW increased to above 40 per cent in 2006, however, since 2009 it has been sitting at around 10 per cent.

As shown by chart 4.3, NSW's share of Australian exploration investment in other non-coal exploration (other than iron ore, where the share of investment is zero) has been consistent over the past decade at just under 10 per cent.

### 4.3 NSW exploration of coal and other deposits as a share of Australian total, quarterly




*Data source:* Australian Bureau of Statistics, Catalogue 8412.0 Mineral and Petroleum Exploration, Australia.

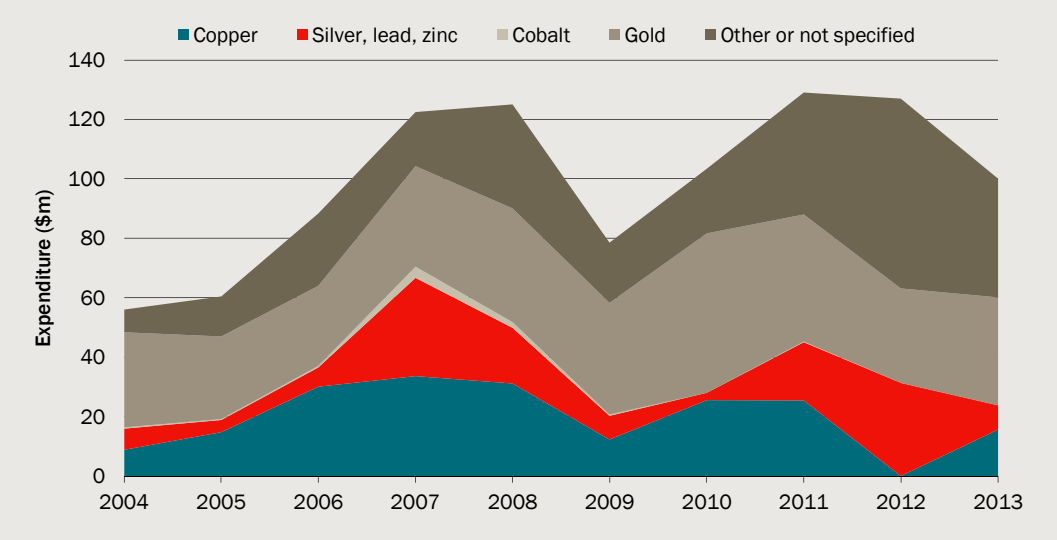
## *Non-coal exploration expenditure*

A major focus for mineral exploration, other than coal, has been on gold and base metal deposits in the Lachlan Fold Belt and Broken Hill regions.[26] There has also been

[26] NSW Trade and Investment, 2013. *2013 New South Wales minerals industry profile.*

investment in exploration of mineral sands deposits in the Murray Basin.[27] The ABS suggests that private sector investment in mineral exploration (excluding coal) in NSW totalled roughly $112.5 million in 2012-13 (see chart 4.4).

### 4.4 Exploration expenditure, gold and base metal deposits ($m)




*Note: The quantity of investment not able to be classified by the ABS suggests that the amount invested in specified categories may be larger, particularly in more recent years.*

*Data source:* Australian Bureau of Statistics, Catalogue 8412.0 Mineral and Petroleum Exploration, Australia.

Investment in gold and base metal deposits reflects commodity price movements. Expenditure data for the last four quarters to March 2014 suggests that annual investment in other (non-coal) minerals has fallen to around $92 million, reflecting the cyclical nature of exploration investment.[28]

In recent years, particularly in 2010-11, price improvements have been driven by demand from expanding economies, especially China.[29] This has led to junior explorers from interstate looking for new opportunities, new international companies in joint venture arrangements, major Australian-based companies now investing substantially in exploration in NSW, and new stock exchange listings of junior explorers with NSW interests.[30]

The copper industry outlook is positive reflecting prospective geology, well developed infrastructure and low average operating costs – which could support the development of

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[27] ABS data does not specifically identify exploration in mineral sands deposits, although where possible includes that investment in total exploration expenditure estimates.

[28] Australian Bureau of Statistics, 2014. Catalogue 8412.0, Mineral and Petroleum Exploration, Australia.

[29] NSW Trade and Investment, 2013. *2013 New South Wales minerals industry profile*. p21.

[30] Ibid.p 21.

new projects.[31] New South Wales has major resources of copper ores and is considered to have good potential for further discoveries, particularly in the Lachlan Orogen.[32]

- **However, new projects are anticipated to rely on innovative mining and processing techniques to achieve lower operating costs, in order to compete with new projects across the world.**

The production of silver in NSW has been steadily in decline since the 1990s. Most silver production occurs as a by-product of mining for other metals particularly the base-metals lead and zinc. Zinc and lead production in NSW has fallen in the past decade. However, data from the ABS shows exploration investment in silver, lead and zinc increased in response to rising prices in 2007-08 and 2012-12.

### *Constraints emerging in non-coal minerals prospectivity*

Many of NSW's mines are mature, and large mines have an average age of 15 years excluding Broken Hill. MinEx Consulting estimates that half of the existing large-scale mines in New South Wales may close down in the next 7-13 years. This presents a challenge because of the lag between discovery and development, which is approximately 10 to 15 years.[33]

The delay in the exploration process has the potential to impact the rate of production in the medium to long term. Junior miners, which account for approximately 80 per cent of the investment in exploration and development undertaken within NSW, currently report having less than half of the funds they would 'normally' have for exploration activities.[34]

The capacity to raise capital is potentially associated with the lack of high value discoveries in NSW, resulting in poor value to cost ratios. Over the past decade, every dollar spent on exploration, on average, generated only $0.55 worth of value, compared with the national average of $1.04.[35] New South Wales has experienced a more significant decline in the number of discoveries than the rest of Australia. The view expressed by the 2014 study was that there has been only one significant discovery made in the past five years.[36]

However, MinEx Consulting provides a range of factors other than purely geological factors that could explain NSW's poor performance. Such explanations include that:

- the value to cost ratio is heavily influenced by the discovery of Tier-1 deposits which are rare events and the strategies pursued by companies involving re-evaluation of old targets near existing mining operations (in which case, 'bad luck' may be partly to blame)

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31 NSW Trade and Investment, 2013: *2013 New South Wales minerals industry profile.* p 43.

32 Ibid p 74.

33 MinEx Consulting, 2014. *Strategic advice on mineral economics and exploration*.

34 Ibid.

35 Ibid.

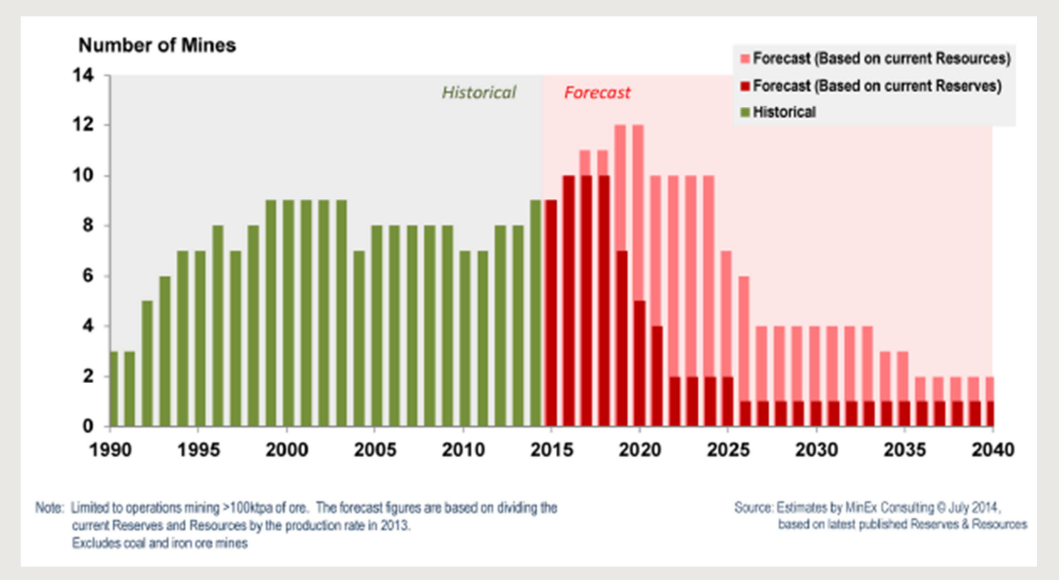
36 Ibid. p10.

- the increase in unit exploration costs associated with the mining boom and the technical factors making exploration more difficult (such as targets being under deeper ground)
- information may still be emerging about the full success of recent years of expenditure.

According to MinEx Consulting, based on current Ore Reserves, only one large non-coal mine (Cadia) is expected to be operating in 12 years' time. Based on both Mineral Resources and Ore Reserves[37], half of the State's large scale mines (that produce over 100 kilotonnes of ore per annum) are expected to close down between 2021-2027.

MinEx Consulting's estimates of the number of large non-coal mines operating in NSW between 1990 and 2014, and projections to 2040 are shown in chart 4.5.

### 4.5 Estimated number of mines operating in NSW: 1990-2040




*Note: The chart is limited to operations mining over 100 kt per annum of ore. The forecast figures are based on dividing the current Reserves and Resources by the production rate in 2013. The chart excludes coal and iron ore mines.*

*Data source:* MinEx Consulting, 2014. Based on latest published Reserves and Resources at July 2014.

## *Important determinants of production*

Mineral production in NSW has the *potential* to increase, overall, in the longer term as a result of the development of new projects and the expansion of a number of existing projects, particularly for coal, gold and copper.[38] The outlook is positive due to

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[37] Mineral Resources include resources that are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Reserves, including both probable and proven mineral reserves, which are economically and technically viable after taking account of all relevant processing, metallurgical, economic, marketing, legal, environment, socioeconomic and government factors. See The JORC Code: 2012 Edition.

[38] NSW Trade and Investment, 2013: *2013 New South Wales minerals industry profile*.

reasonable geological prospectivity, infrastructure connectivity and proximity to ports, access to advanced technology and the availability of a skilled workforce.[39]

- **In the medium term, however, profitability levels face downward pressure due to high operating costs and the downwards fluctuation in commodity prices.**

The International Energy Agency (IEA) notes that Australian coal production is subject to some uncertainty, particularly in terms of its capacity to limit cost escalations, which will be necessary to increase export volumes in order to compete with other relatively high-cost competitors such as the United States and Russia.[40]

The *upper potential* rate of resource extraction in future is likely, therefore, to be determined by the growth path of industrial and manufacturing activity and consumer demand in major consuming regions of the world, particularly in Asia, and the rate of expansion in the supply capacity in other regions of the world.

- **However, other factors such as productivity levels, reflecting a range of factors from the availability of skilled labour to mining approvals processes, are likely to play a more significant role in determining actual production levels.**

### *World coal market to 2018, and impact on demand for Australian coal*

A large share of the coal produced in NSW (approximately 84 per cent in 2012-13) is exported, such that future demand will reflect the demand for coal in export markets. Despite the uncertainty surrounding greenhouse gas regulation and policy, and movement towards lower emissions intensive sources of energy such as gas, the IEA projects increasing demand for coal.

The IEA projects that international seaborne hard coal trade will grow by approximately 23 per cent, in total, over the period from 2012 to 2018, equivalent to growth of 226 million tonnes of coal-equivalent (Mtce)[41] each year.

- **The IEA suggests that incremental seaborne exports will come predominantly from Australia and Indonesia, with Australia to increase annual thermal and metallurgical coal exports by 79 Mtce by 2018 – accounting for approximately one third of the increase in the international seaborne trade.**[42]

However, if Chinese demand is lower due to lower-than-expected growth or higher-than-expected transition away from coal, exports from higher cost mines in Australia and the United States would be most affected. While the lower demand for imported coal in

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[39] Ibid. p 43.

[40] International Energy Agency, 2013. *Coal medium-term market report 2013: Market trends and projections to 2018*. p 99.

[41] 1 Mtce is equivalent to 0.7 million tonnes of oil equivalent (Mtoe), with 1 Mtoe equivalent to $10^{-7}$ Gcal. See International Energy Agency (IEA), 2011. *Coal information: 2011 edition: Documentation for beyond 2020 files.*

[42] International Energy Agency, 2013. *Coal medium-term market report 2013: Market trends and projections to 2018*. p 95.

China would partly be offset by increased demand from India, high cost producers are expected to struggle under this scenario due to lower prices. [43]

Chinese demand will depend on the interaction of two opposing pressures on coal demand. Firstly, coal demand is driven by the policy shift towards cleaner technologies and the implementation of coal consumption cuts in some regions, as a result of climate change policy and concerns over air pollution. It should be noted that NSW thermal coal is low ash and relatively clean burning coal, meaning that moves in China and elsewhere to control air policy with ongoing reliance on coal-fired electricity may deliver a competitive advantage in NSW. There is also an increase in the size of the middle class with increasing demand for power. Furthermore, efforts to reduce coal consumption may be constrained by limited domestic gas supply and the high cost of renewable energy.

### *Thermal coal*

The IEA projects that the seaborne trade in thermal coal will grow by around 3.6 per cent each year from 2012 to 2018.[44]

- India is expected to account for nearly half of the incremental market growth, growing by 11.7 per cent each year, with the IEA suggesting that domestic coal supply in India will not keep pace with rising thermal coal demand.
- China is expected to remain the largest importer of thermal coal, due to low price growth of imported coal, and is projected to increase its coal consumption by 2.6 per cent each year to 2018.

Higher demand in Asia is expected to boost Australian thermal coal exports to 2018, with Australia expected to account for roughly 30 per cent of the increase in incremental global thermal coal exports (an extra 49 Mtce per year by 2018).

### *Metallurgical coal*

The IEA projects metallurgical coal exports to increase by around 3.2 per cent each year to 2018, as a result of prosperous Asian economies, whose expected GDP growth translates into increasing need for steel and metallurgical coal. Australia accounts for around 60 per cent of the world's shipped metallurgical coal, with NSW accounting for approximately 25 per cent of Australian metallurgical coal exports, and world production is highly concentrated around Australia plus the United States and Canada (together accounting for 90 per cent).

Therefore, growth in demand for seaborne metallurgical coal means higher demand for Australian metallurgical coal exports, projected to increase by 3.3 per cent each year to 2018 (an extra 30 Mtce per year by 2018).[45]

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[43] Ibid. p 95.

[44] International Energy Agency, 2013. *Coal medium-term market report 2013: Market trends and projections to 2018*. p 97.

[45] Ibid p102.

While Japan is projected to remain the largest importer of metallurgical coal, growth is expected to be slow, at around 1.0 per cent each year, due to sluggish GDP growth and a mature domestic steel industry.

### *World coal market beyond 2018, and implications for Australia*

There is considerable uncertainty around the *extent* to which coal will continue to increase as the world's energy requirements grow. Over the past decade, coal has 'met nearly half of the rise in global energy demand' and grew faster even than total renewables.[46] However, overall energy demand and the role of coal-fired electricity in the energy mix depends heavily on the greenhouse gas emissions policy decisions made by countries, particularly India and China, which account for almost three quarters of projected non-OECD coal demand growth.

The US Energy Information Administration (EIA) released the International Energy Outlook 2013 projections, which make projections for coal use to 2040. The EIA projects that:

- non-OECD coal demand will grow, with China and India accounting for around three quarters of this growth.
  - China's consumption of coal is expected to peak around 2035, but China will remain the world's largest consumer and importer of coal [47]
  - India's coal consumption will continue to rise, surpassing the United States as the second largest consumer of coal after 2030. [48]
- non-OECD coal use would decline, reflecting the impact of fuel market fundamentals and environmental regulations that support a shift to natural gas and renewables, particularly in the OECD Americas and OECD Europe regions.[49]

The US EIA projects that world coal consumption rises at an average rate of 1.3 per cent each year, including 1.8 per cent growth, on average, across non-OECD countries which more than compensates for the small (0.2 per cent) decline in consumption across OECD countries.[50] The US EIA's historical data on world coal consumption for 1980-2010 and projections for 2011 to 2032 are shown in chart 4.6.

The latest projections for Australian coal exports made by the US EIA indicate expectations for growth in coal production due to Asia. These projections may be conservative, as they assume that domestic demand falls in relation to the introduction of the carbon price on July 1 2012, which has since been repealed.

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46 International Energy Agency, 2012. *World Energy Outlook 2012.*

47 United States Energy Information Administration (EIA), 2013. *International Energy Outlook,* 'Coal' July 25 2013.

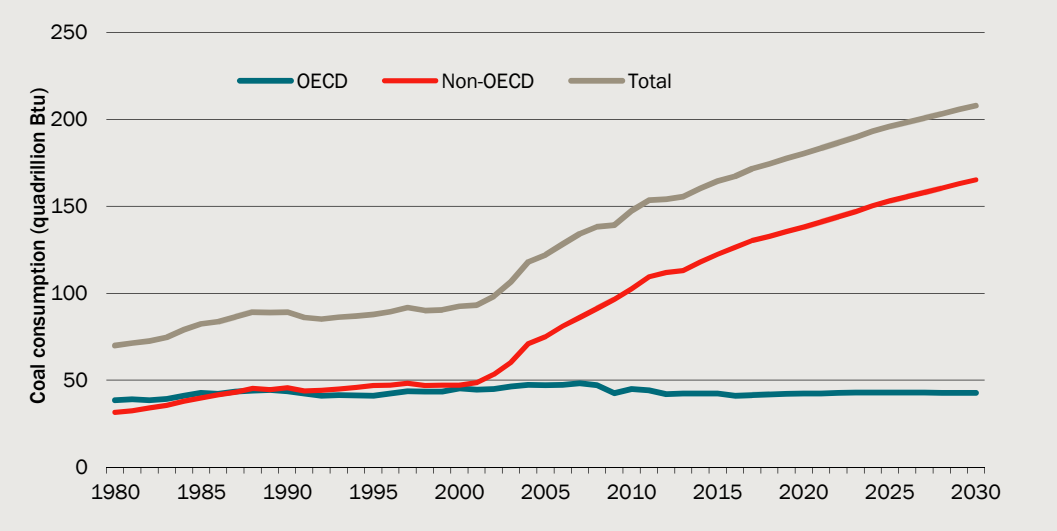
48 Ibid.

49 Ibid.

50 The US EIA projections assume that the carbon price that was introduced on July 1, 2012, which has since been repealed, and would support the reduction in reliance on coal fired electricity generation from 63 per cent in 2010 to 39 per cent in 2040.

The growth is expected to come from China and India, with China's share of consumption expected to grow from around 47 per cent (current levels) to 57 per cent by 2025 and decline to 55 per cent in 2030 as a result of the introduction of policies and regulations that encourage the use of cleaner energy sources particularly natural gas.[51]

### 4.6 Projected world coal consumption, 2014 to 2030




*Data source:* US EIA, *International Energy Outlook 2013*, July 2013.

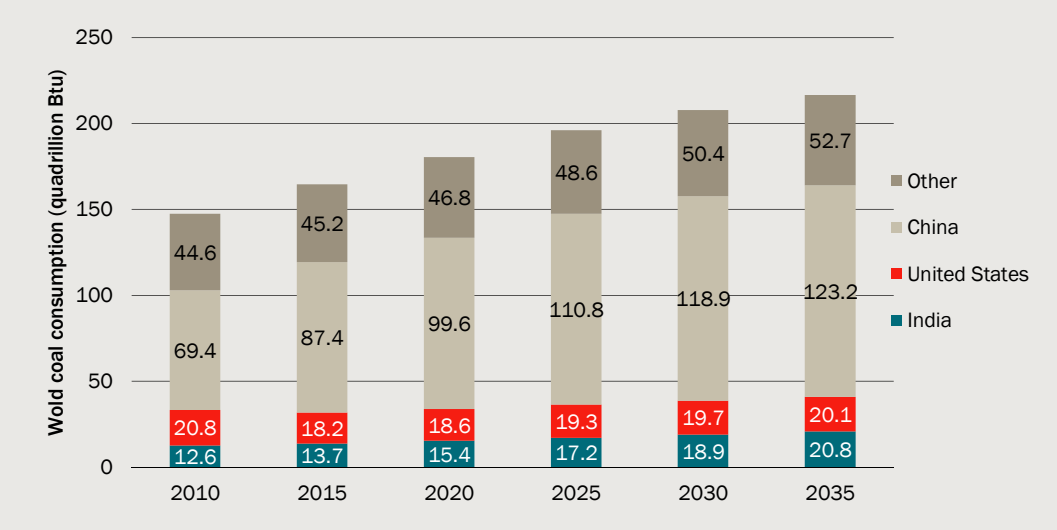
As shown in chart 4.7, China accounts for the largest increase in world coal consumption by leading consuming countries between 2015 and 2035 – accounting for 70 per cent of the increase. China is the leading coal consumer, growing around 1.9 per cent each year to 2040, with the pace of growth slowing gradually and beginning to decline from 2035.

India, which imports metallurgical coal from NSW, is expected to increase steel production capacity and cement production to meet growing needs as GDP expands. South Korean coal consumption increases at approximately 0.5 per cent each year to 2040, with the extra coal primarily for steel production in the industrial sector.

Japan, the largest consumer of coal exports from NSW, is expected to reduce its consumption over the long term as it shifts towards renewable energy and natural gas, and its steel production declines after 2020 as population and domestic demand decline.

51 United States Energy Information Administration (EIA), 2013. *International Energy Outlook,* 'Coal' July 25 2013.

### 4.7 World coal consumption by leading consuming countries, 2010-2035




*Data source:* US EIA, *International Energy Outlook 2013*, July 2013.

Table 4.8 presents US EIA projections for coal production, and the growth in production across periods.

### 4.8 US EIA coal production projections, Australia and world

| | Production | |
|---|---|---|
| | Australia | World |
| | Mt | Mt |
| 2010 | 424 | 7 216 |
| 2015 | 496 | 7 886 |
| 2020 | 487 | 8 617 |
| 2025 | 524 | 9 341 |
| 2030 | 534 | 9 893 |
| 2035 | 579 | 10 299 |
| | % per annum | % per annum |
| 2010-2015 | 3.2 | 1.8 |
| 2015-2020 | -0.3 | 1.8 |
| 2020-2025 | 1.5 | 1.6 |
| 2025-2030 | 0.4 | 1.2 |
| 2030-2035 | 1.7 | 0.8 |
| **Average annual growth rate - 2010-2035** | **1.26** | **1.45** |

*Note:* Estimates have been converted from billions of short tons to million tonnes.

*Source:* Estimated using projections from US EIA, *International Energy Outlook 2013*, July 2013.

The EIA expects that demand for coal exports from Australia will, on average, grow over the period 2014-2030 (the period relevant to our projections); however, growth varies between periods.

- Overall, the expected growth in Australian coal production is 1.26 per cent each year over the period 2010-2035, slightly below projected global production growth of

1.45 per cent, which may partly reflect conservative assumptions for domestic coal demand in Australia.

- However, while coal projections for Australia are relevant to projections for NSW coal demand, growth in the production of coal may vary across regions.

### *Domestic demand*

The Australian Energy Market Operator (AEMO) expects that electricity demand across the National Electricity Market will continue to increase by around 1.3 per cent over the next decade.[52] While the increase in gas-fired electricity generation capacity in NSW may be augmented, there are a range of uncertainties regarding gas-fired power generation over coal-fired generation in the medium and long term. AEMO indicates that demand for gas-fired generation in both NSW and Queensland is more sensitive to the gas price than a carbon price. Hence, with gas prices soon to be dominated by LNG export markets there is uncertainty around the sustainability of low gas prices in the medium term.[53]

We could expect some continuation of the shift in electricity generation away from coal.

### *Market for base metals – outlook to 2019*

Other than coal, and closely related iron and steel, NSW's other main export commodities are copper and a small amount of zinc. The outlook for copper is positive over the medium term, due to strong growth in demand from developed economies.

## *Supply side constraints: planning uncertainties and delays*

While the demand for coal from Australia is expected to continue to increase due to strong underlying demand, the mining industry has raised concerns about current planning arrangements, which have the potential to constrain the growth in the supply of coal from New South Wales, particularly over the next five to 10 years. The industry reports that planning issues have contributed towards difficulty in raising capital for investment and pose additional hidden costs that can reduce the probability that 'hurdle' rates of return will be achieved, and which, if achieved, would in turn allow for projects to go forward.

The Fraser Institute Mining Survey,[54] which surveys mining companies across the world, provides a measure of the relative competitiveness of potential destinations for investment in mining. It provides a Policy Potential Indicator for every mining province in the world by asking managers and key industry figures how they rate government regulation of their projects. New South Wales was the worst of all Australian

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52 Australian Energy Market Operator, 2013. *2013 Electricity Statement of Opportunities: For the National Electricity Market.* August 2013

53 NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*.

54 See Fraser Institute, 2014. *Survey of mining companies: 2013.*

jurisdictions, scoring 64.7 (compared to WA which scored best of all Australian jurisdictions at 90.3), and ranked NSW 39 out of 112 destinations.

- **While NSW was ranked best in terms of infrastructure availability, the mining industry has raised concerns regarding the delays in approvals processes, and changes to regulation with poor transitional arrangements.**
- **Planning issues included the uncertainty in the outcomes of the planning process and the government's lack of willingness to make difficult decisions (lack of policy framework underpinning decisions).**[55]

The NSW minerals industry has raised a number of specific challenges in the current structure of planning and mining decision-making process, including:

- the approvals process, involving a plethora of different steps, being unnecessarily complicated
- the delays associated with the approvals process, which make mining approval timing typically longer than other states
- the lack of mining policy framework to guide decisions made such as on granting production licenses, resulting in:
  - inconsistent application of the decision-making criteria (which is not clearly defined through the Planning Assessment Commission's decision-making delegation)
  - hence, the lack of understanding of the criteria by mining proponents.

As previously discussed, exploration expenditure is currently insufficient to find enough mineral deposits to replace lost mines. The ability to raise capital for exploration or production may be affected both by cyclical market conditions, such as commodity prices, as well as government planning arrangements. It is important and yet potentially difficult to separate the role of both factors in making projections for future growth.

## *Factors underpinning model projections to 2029-30*

In conducting longer term projections of the production of coal and other minerals, uncertainties increase reflecting the range of possible scenarios across a range of important variables. To make 15 year projections for the contribution of mining to NSW, it is important to understand the key forces underpinning the demand and supply across the markets that NSW mining supplies: both domestic and export.

As discussed above, mineral exploration has indicated that NSW has sufficient resources to maintain or increase the supply of *coal* for the next 15 years (under the positive policy setting scenario).

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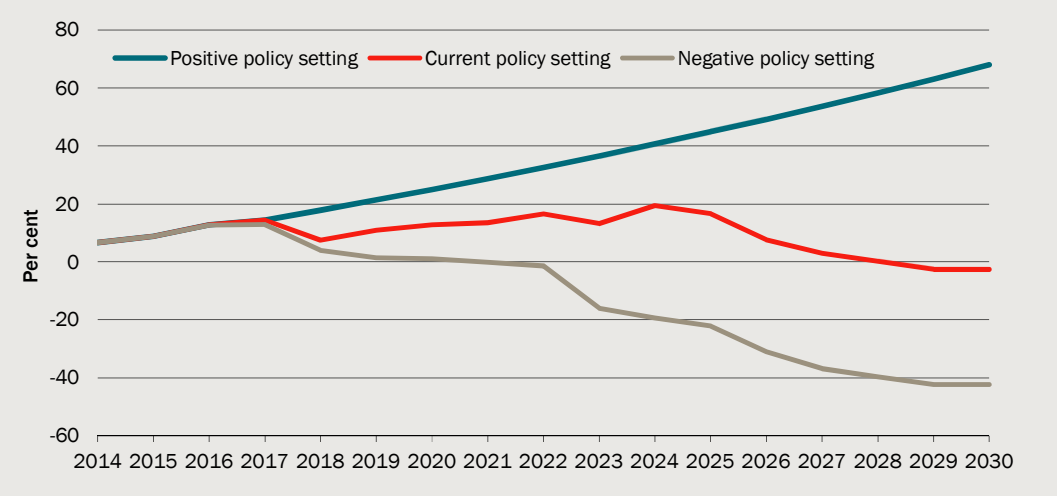
55 Australian Mining, 2014. 'Fraser Survey: Australian mining's place in the world', 11 March 2014.

### 4.9 Coal production scenarios to 2029-30




*Data source:* Developed for the NSW Minerals Taskforce, 2014, in consultation with NSW Trade and Investment and RFC Ambrian.

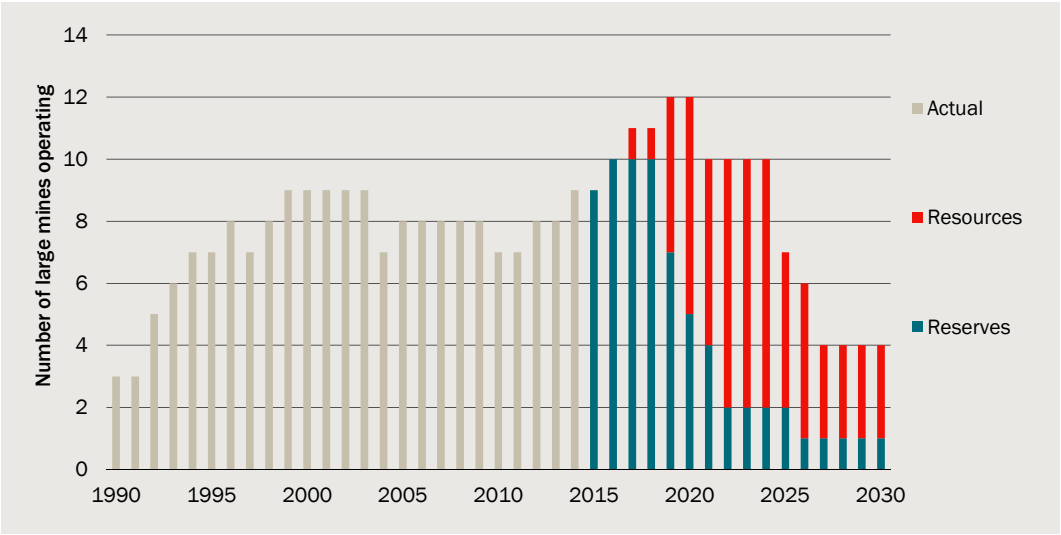
The trajectory of coal production for the three scenarios is shown in chart 4.9 (above). In adopting the production pathway shown in chart 4.9, the CIE allowed export demand to change to reach the production target implied by these projections after allowing for changes in the domestic consumption of coal (driven by domestic economic and population projections).

Supply and demand side factors affecting global economic growth are then fed into a general equilibrium model of the Australian economy, CIE-REGIONS, to produce state level economic growth projections including industrial output, value added and employment for both NSW and other jurisdictions. That is, economic growth in other states and territories is affected by the same global economic situation facing NSW.

The rate of extraction of non-coal minerals is projected to increase to 2020, however is highly uncertain between 2020 and 2030 due to the low rate of discovery of substantive non-coal deposits. The trajectory of non-coal mining production adopted in scenarios modelled is based on the work by MinEx Consulting with respect to the projected mines in operation based on Resources or Reserves (see chart 4.10). Given there is limited information on the relative size of the mines in operation at each year, we have to assume that the profile of mines (in terms of production) is similar across periods.

In practice, this may not be the case as production may be larger or smaller due to the size profile of remaining mines and the rate of success in exploration. However, the different scenarios illustrate the potential impact of the declining number of large mines (over 100 kt per annum of ore) if recent and near term exploration ventures are not successful.

**4.10 Non-coal mineral production (number of large scale mines by year)**




*Note:* The chart is limited to operations mining over 100 kt per annum of ore. The forecast figures are based on dividing the current Reserves and Resources by the production rate in 2013. The chart excludes coal and iron ore mines.

*Data source:* MinEx Consulting, 2014. Based on latest published Reserves and Resources at July 2014.

## *Positive policy setting (scenario 1)*[56]

The first scenario reflects the potential productivity growth for the NSW mining industry, based on previous levels of labour productivity growth and technological progress, based on positive policy settings for planning. Hence, a measure of the cost of production is built in to the model. However, this scenario does not accommodate changes in the relative competitiveness of NSW compared to other coal producing regions.

For coal production, the CIE uses New South Wales projections of *potential* coal production from 2014 to 2030, which results in average annual growth of around 2.9 per cent over the period. It should be noted that CIE modelling using BREE projections from 2011 to 2018 (with 3-4 per cent average growth in coal to 2018) [57] and US Energy Information Administration[58] projections to 2035 (shown in table 4.8) produced a similar average growth rate for the value of coal production (of around 2.7 per cent). Hence, the New South Wales projections of *potential* demand, relating to the positive policy setting scenario, appear reasonable given the information available from domestic and international projections.

For Other metal ores production, it is assumed that production grows to 2020 in line with Resources, and is maintained at 2020 levels until 2030.

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56 Note that our analysis is not an evaluation on the merits of the current planning requirements. Rather, it is intended to illustrate the potential benefits that can be achieved if altered policy settings can reduce the time taken to approve mining projects.

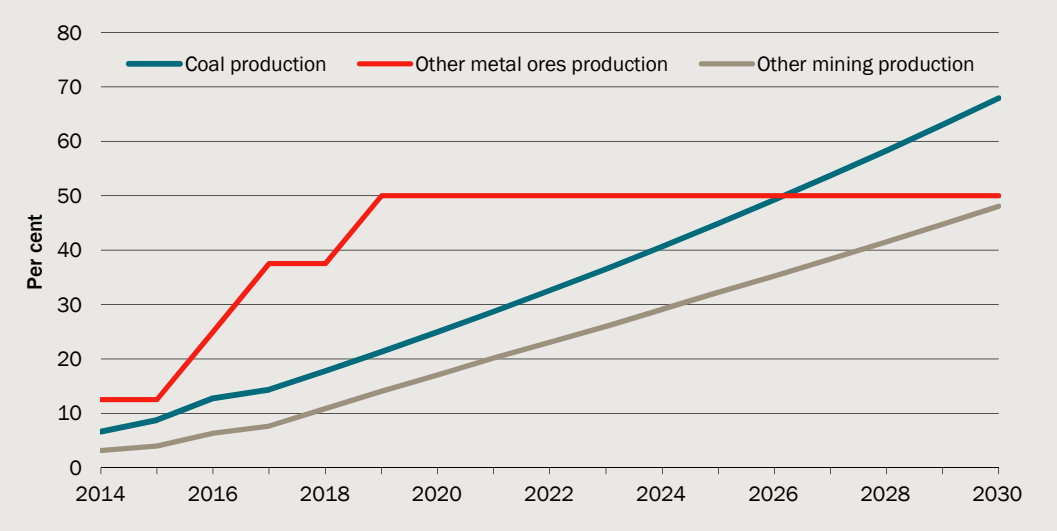
57 Bureau of Resources and Energy Economics (BREE), 2014. *Resources and Energy Quarterly*, March Quarter.

58 United States Energy Information Administration (EIA), 2013. *International Energy Outlook 2013: With projections to 2040*.

Other mining production is not exogenously assumed in the model, and growth in Other mining production reflects the scenarios for growth in coal and other metal ores production, which impact engineering services and exploration.

The growth trajectory for the three mining sectors, relative to 2013, is shown in chart 4.11

**4.11 Growth trajectory of production under scenario 1, compared to 2013**




*Data source:* The CIE.

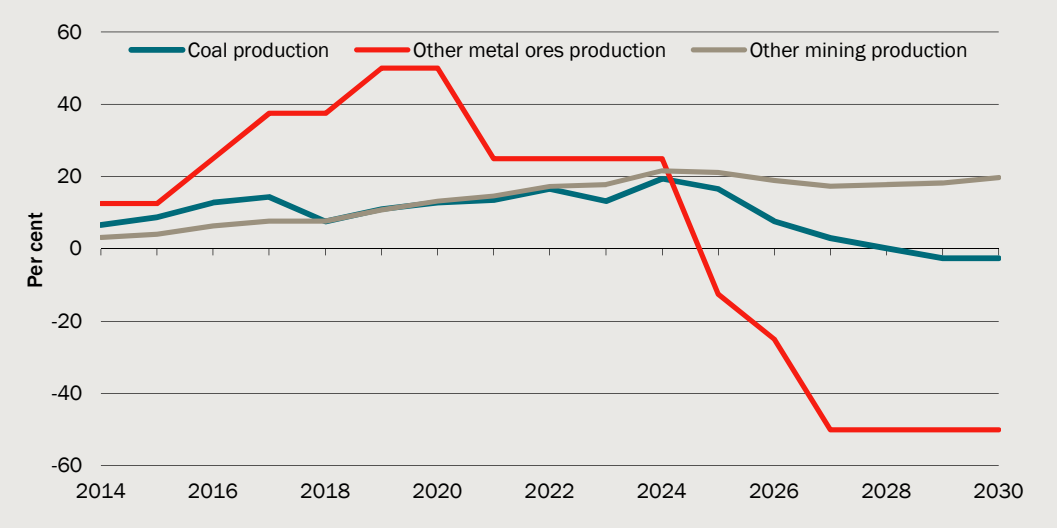
## *Current policy setting (scenario 2)*

The 'current policy setting' scenario adopts one view (based on discussions with DTI and representatives from the Taskforce) that long term growth in coal production in New South Wales will be constrained as a result of planning arrangements. In the immediate term, a reduction in coal prices and general oversupply in the international coal market keeps production increases low, although over time the international market is expected to self-correct. The potential for average growth in coal production over the period, based on macroeconomic projections, of 2.9 per cent is not achieved due to policy settings that constrain supply. In this scenario, we assume a moderate impact on coal produced in New South Wales, resulting in an average growth rate of approximately -1 per cent between 2016 and 2030.

The rate of growth assumed for non-coal resources in this scenario is based on the extraction of non-coal minerals across the estimated number of mines based on current Resources. As shown in chart 4.12, the rate of growth is negative from 2020, and falls off a sharp cliff from 2025 on, pertaining to the lack of significant Resources to support large non-coal mines from 2025 onwards.

The trajectory of mineral resource production under this scenario for each year from 2014 to 2030, compared to 2013, is shown in chart 4.12.

### 4.12 Growth trajectory of production under scenario 2, compared to 2013




*Data source:* The CIE.

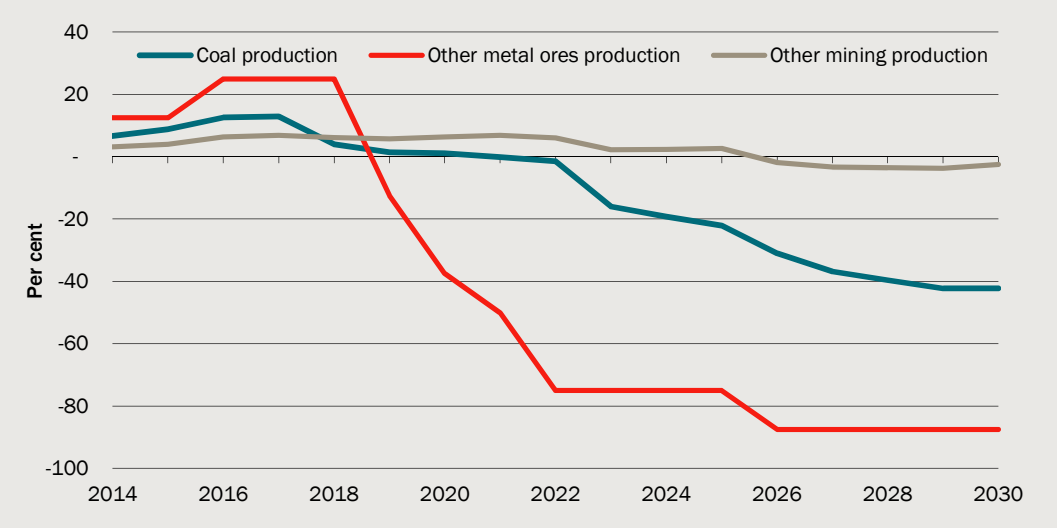
## *Negative policy setting (scenario 3)*

The negative policy setting scenario assumes that existing planning constraints have a significantly negative impact on the rate of production that could otherwise be achieved in the coal industry. Under this scenario, the average growth in coal production between 2018 and 2030 is negative, with the rate of decline of more than 4 per cent each year, on average, over this period.

Under this scenario, the extraction of non-coal minerals is based on estimates of the number of large mines in future, compared to at present, based on the current level of Reserves. That is, there is no further production resulting from new discoveries of large deposits and no production resulting from current Resources.

Chart 4.13 shows the growth trajectory for production over the forecast period, compared to 2013, assumed under the negative policy setting scenario.

### 4.13 Growth trajectory of production under scenario 3, compared to 2013

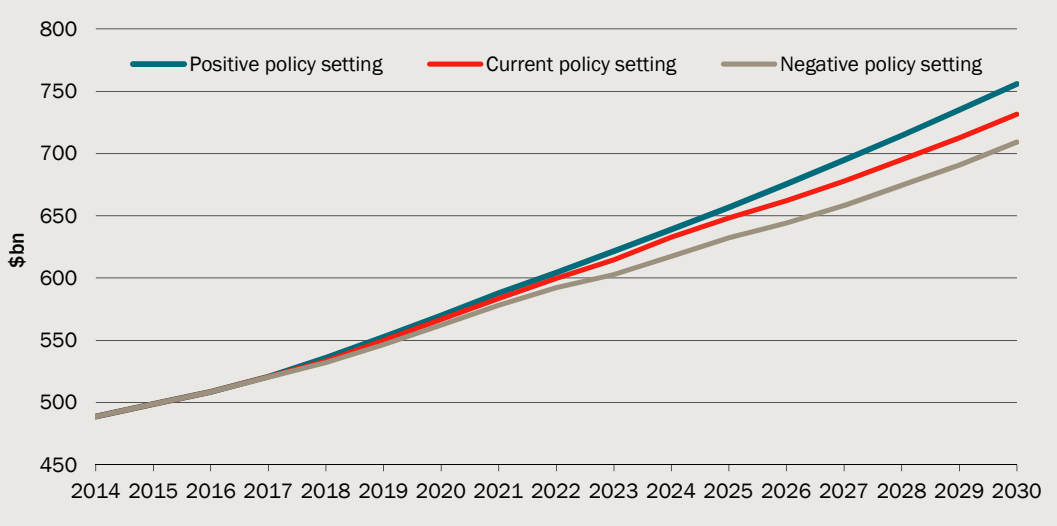



*Data source:* The CIE.

## *Model projections to 2030*

The change in Gross State Product (GSP) out to 2030, relative to 2013, under the three scenarios is shown in chart 4.14.

### 4.14 Gross State Product (per cent change relative to 2013), by scenario




*Data source:* The CIE.

In 2030, under the positive policy setting scenario, Gross State Product could be 59 per cent larger than 2013. However, if the growth in mining production was constrained such as due to current planning issues GSP would grow by only 49 per cent under the negative policy setting scenario and 53 per cent under the current policy setting scenario.

In 2013 dollar terms, the difference between scenarios 1 and 3 of $46.8 billion in Gross State Product by 2030 illustrates the potential cost of planning constraints to New South Wales. That is, if mining production were significantly constrained due to government policy and planning arrangements then this could reduce the size of the NSW economy substantively.

The reduction in mining industry growth has a larger than proportionate impact on GSP.

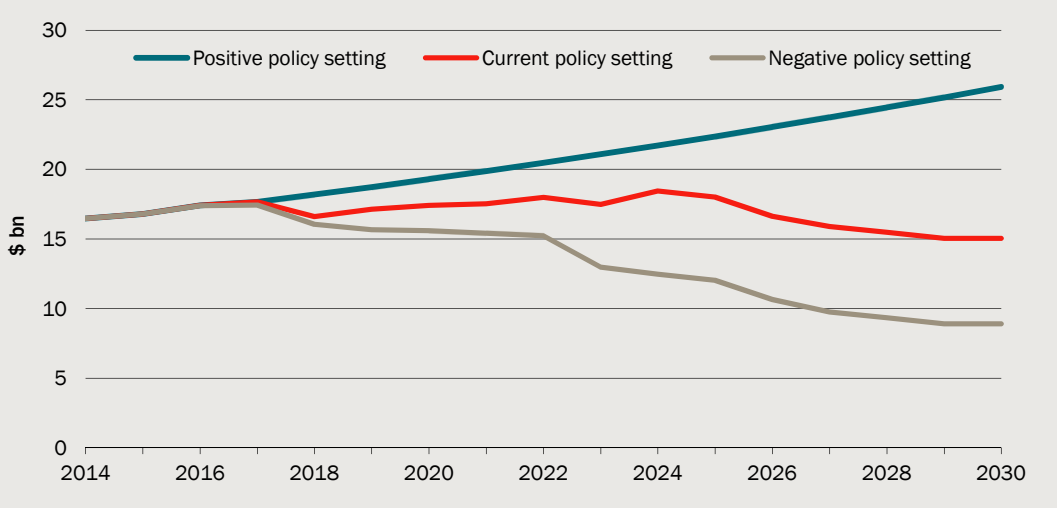
- **The direct impact of a smaller mining industry in value added terms by 2030 is $13.4 billion each year.**
- **Gross State Product reduces by $46.8 billion each year as a result of direct and indirect impacts. That is, GSP could be 6.6 per cent larger in 2030 under the positive policy setting scenario, compared to the negative policy setting scenario.**

That is, the indirect impacts of a smaller mining sector are significant.

### *Coal sector GVP and GVA*

Coal sector GVP could be significantly lower in 2030 than in 2014 if potential supply is constrained by planning arrangements. Chart 4.15 shows that, depending on whether supply is constrained, the impact on revenue could be as large as $17.0 billion each year by 2030. Assuming a more modest impact of current policy settings (scenario 2), the impact of such constraints could be to reduce coal sector revenue by approximately $10.9 billion per year by 2030.

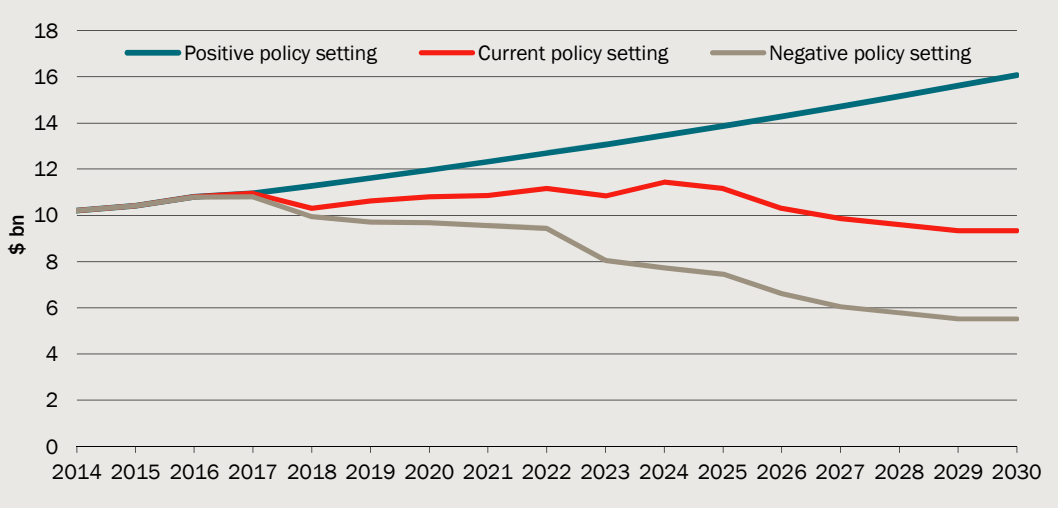
**4.15 Coal sector GVP by scenario – gains from planning reform**




*Data source:* The CIE.

The impact of constraints to growth on GVA by 2030 could be as large as $10.6 billion each year under scenario 3, and under more modest assumptions $6.7 billion (see chart 4.16).

### 4.16 Coal sector GVA by scenario – gains from planning reform



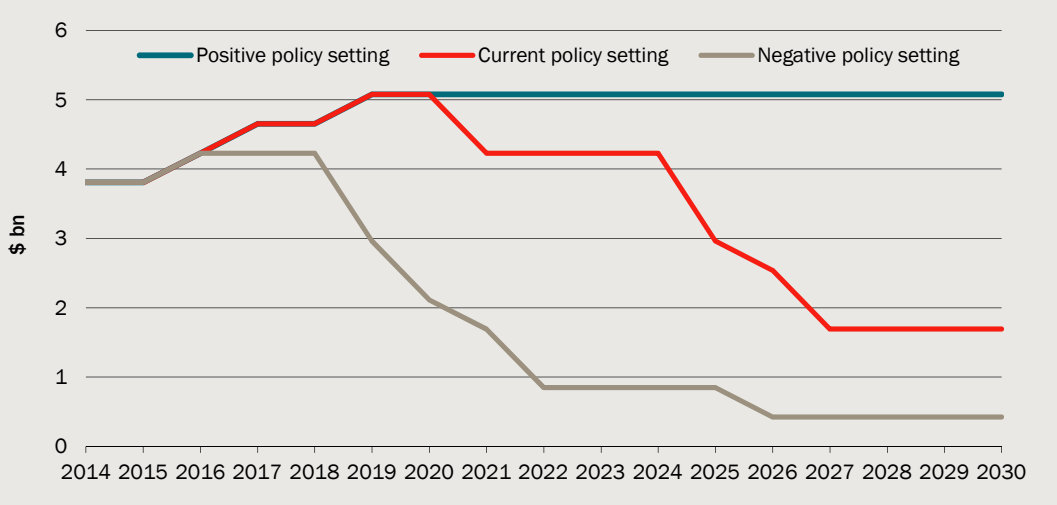

*Data source:* The CIE.

## *Other metal ores*

The Other metal ores sector is impacted significantly by the different assumptions around the rate of discovery and development of existing Resources. As illustrated in chart 4.17, the positive policy setting scenario assumes continuation of growth in production based on available Resources, which peak in 2020, and assuming discoveries sustain the rate of non-coal mineral extraction for the remainder of the period. Under this scenario, where production is unconstrained by supply side constraints, the industry's revenue stream could potentially be $5.1 billion, or approximately $1.7 billion (50 per cent) more than it was worth in 2013. If no further Resources are discovered to enable the rate of extraction to continue beyond 2020, the decline in sectoral output would be rapid from 2025 onwards with the value of GVP estimated to be approximately $1.7 billion per year in 2030.

If current Resources are not able to be developed, such as due to planning constraints which impose barriers on investment, the impact is more severe. Utilising MinEx Consulting estimates of the number of large mines operating based on current Reserves, and assuming no further development of Resources, the industry would decline in value steeply from 2020 onwards. Under this negative policy setting scenario, the value of Other metal ores sector GVP may be less than half of one billion per year in 2030.

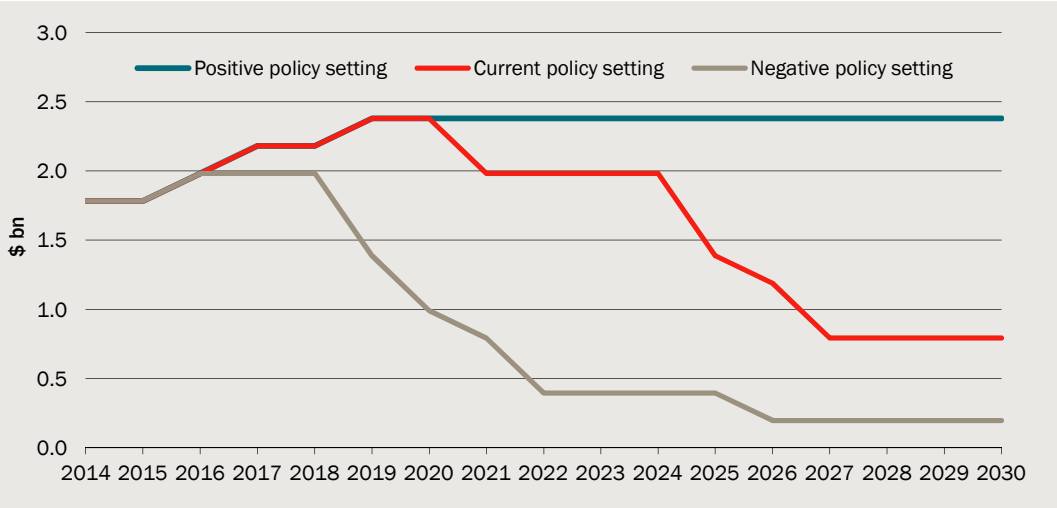
### 4.17 Other metal ores sector GVP by scenario – gains from planning reform




*Data source:* The CIE.

The same scenarios are shown in chart 4.18 which measures the potential impact in Gross Value Added terms. The potential gains from planning reform to the Other metal ores sector are illustrated by the difference between the positive policy setting and negative policy setting scenarios of over $2 billion in value added per year by 2030.

### 4.18 Other metal ores sector GVA by scenario – gains from planning reform




*Data source:* The CIE.

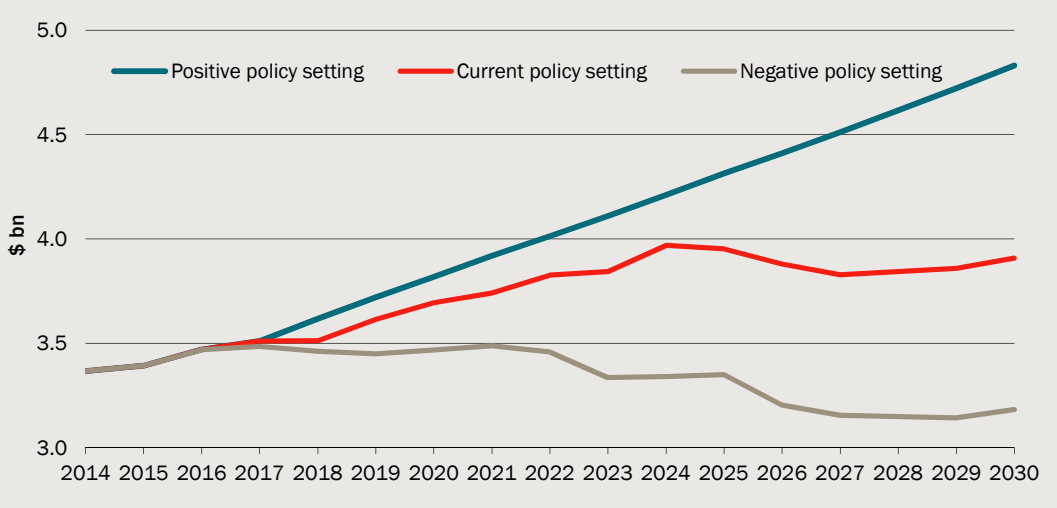
## *Other mining*

Other mining sector GVP is treated as exogenous in the model. That is, we do not model any specific drivers/constraints to sectoral growth. The impact of the different scenarios for coal and non-coal (Other metal ores) mining on the Other mining sector is shown in chart 4.19.

The lower production of coal and other metal ores leads to lower sectoral growth, which has a flow on effect particularly to exploration expenditure and mining services demand (which are the components of this sector).

By 2030, the impact of constraints to growth in coal and other metal ores mining on the Other mining sector is to reduce sectoral GVP by $1.6 billion each year by 2030. Under the current policy setting scenario, reflecting more moderate impacts of planning constraints, the impact would be to lower Other mining GVP by $0.9 billion each year by 2030.

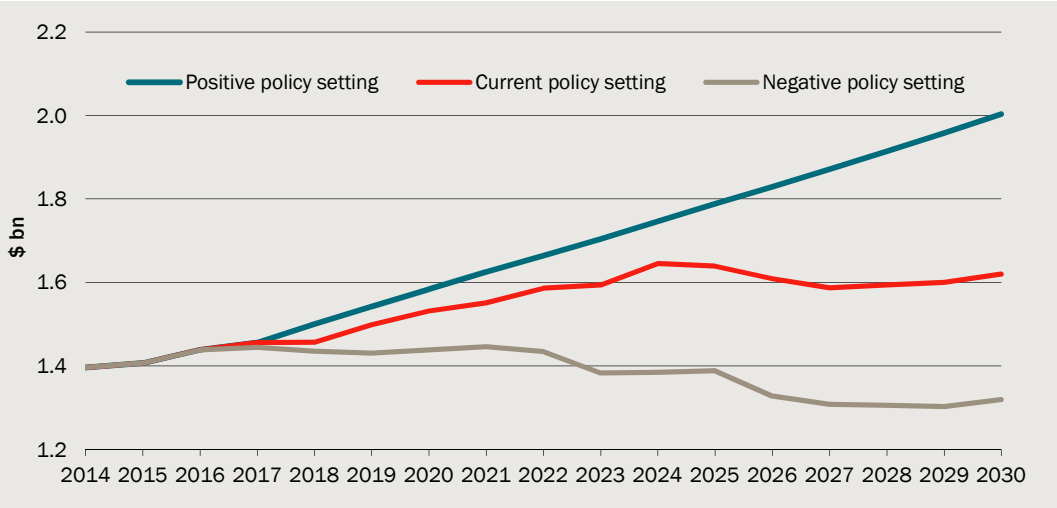
### 4.19 Other mining sector GVP by scenario – gains from planning reform




*Data source:* The CIE.

This translates to a reduction in sectoral GVA of up to $0.7 billion each year by 2030.

### 4.20 Other mining sector GVA by scenario – gains from planning reform




*Data source:* The CIE.

## *Impact on employment*

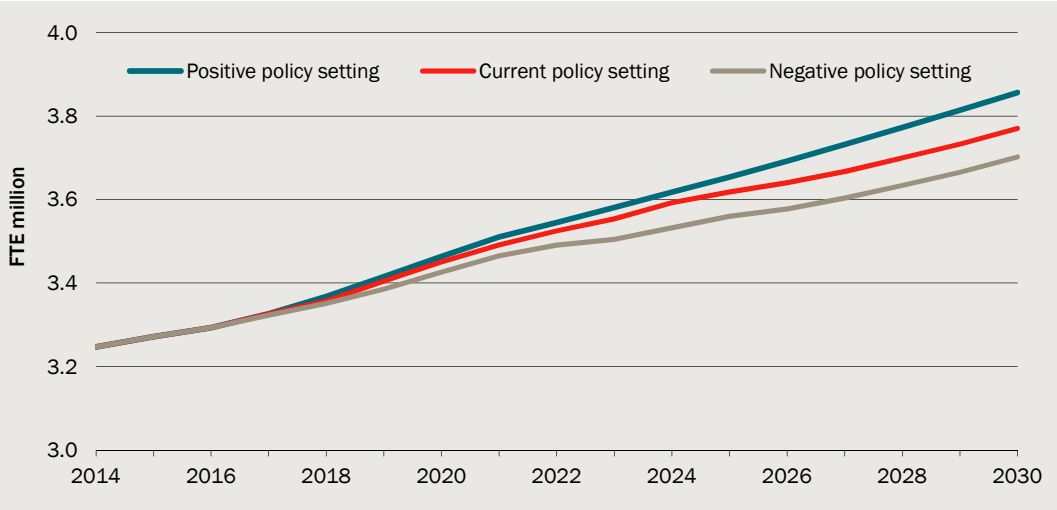
The consequences of constraining development through poor planning arrangements that discourage investment extend to lower employment levels.

This is demonstrated in chart 4.21, with the employment outcomes at 2030:

- under the positive policy setting scenario, 3.86 million full time equivalent employed or 20.1 per cent higher than 2013
- under the current policy setting scenario, 3.77 million full time equivalent employed or 17.4 per cent higher than 2013
- under the negative policy setting scenario, 3.70 million full time equivalent employed or 15.3 per cent higher than in 2013.

That is, the positive policy settings scenario delivers an additional 85 800 full time equivalent jobs compared to the 'current policy setting' scenario.

**4.21 Total employment in NSW (FTE million)**




*Data source:* The CIE.

# 5 *Productivity shocks*

The CIE has undertaken a range of productivity 'shocks' to help inform the next stage of the NSW Minerals Taskforce agenda.[59] Two types of shock have been conducted:

- a one per cent productivity improvement in total production costs
- a one per cent productivity improvement in the use of factors of production (labour, capital, freight and construction).

## *Sectoral productivity shocks*

The first series of shocks to sectoral productivity are undertaken for Coal, Other metal ores and Other mining sectors and, to enable comparison, a number of other sectors of the NSW economy (Livestock, Crops, Freight and Construction). The productivity shocks predominantly reflect the size of each sector, but also the capacity for increased productivity to increase economic activity in the rest of the economy.

### 5.1 Impact of 1 per cent productivity shock in each sector on the state economy

| | | Coal | Other metal ores | Other mining | Livestock | Crops | Freight | Construction |
|---|---|---|---|---|---|---|---|---|
| GSP | $m | 2 281 | 424 | 493 | 761 | 286 | 2 466 | 6 594 |
| | % | 0.5 | 0.1 | 0.1 | 0.2 | 0.1 | 0.52 | 1.4 |
| Industry value added | $m | 2 039 | 379 | 441 | 681 | 256 | 2 205 | 5 896 |
| Net taxes | $m | 241 | 45 | 52 | 81 | 30 | 261 | 698 |
| Net employment | FTE | 11 034 | 2 294 | 2 618 | 4 611 | 1 910 | 14 440 | 33 837 |
| | % | 0.34 | 0.07 | 0.08 | 0.14 | 0.06 | 0.45 | 1.05 |
| Household consumption | % | 0.33 | 0.07 | 0.08 | 0.14 | 0.06 | 0.41 | 1.12 |
| Total exports | % | 2.1 | 0.4 | 0.4 | 0.4 | 0.2 | 2.4 | 4.0 |

*Source:* The CIE.

Table 5.2 shows the impact of a productivity shock in the sector, to each of the case study regions. The impact of the shock reflects the contribution of the sector to the regional economy.

[59] In this instance the 'shocks' refer to, for example, changes to the productivity levels that are expected to be achieved by industry.

### 5.2 Productivity shock in the Sector, by case study region

| | Central West | Illawarra | Hunter region | New England and North West |
|---|---|---|---|---|
| | Per cent | Per cent | Per cent | Per cent |
| **Change in aggregate NSW Gross State Product** | | | | |
| 1 per cent productivity shock to Coal | 0.96 | 0.73 | 1.21 | 0.50 |
| 1 per cent productivity shock to Other metal ores | 0.38 | 0.08 | 0.08 | 0.07 |
| 1 per cent productivity shock to Other mining | 0.21 | 0.13 | 0.18 | 0.11 |
| | | | | |
| **Change in aggregate NSW employment** | | | | |
| 1 per cent productivity shock to Coal | 0.51 | 0.44 | 0.62 | 0.33 |
| 1 per cent productivity shock to Other metal ores | 0.24 | 0.07 | 0.07 | 0.06 |
| 1 per cent productivity shock to Other mining | 0.14 | 0.10 | 0.12 | 0.08 |

*Source:* The CIE.

## *Productivity shocks to factors of production*

The CIE also examined the impact of shocks to factors of production on the Coal, Other metal ores and Other mining sectors. Table 5.3 provides an overview of the impact of a one per cent productivity improvement in each of the factors of production.

### 5.3 Productivity shock by factor of production

| | Capital | Labour | Freight | Construction |
|---|---|---|---|---|
| | Per cent | Per cent | Per cent | Per cent |
| **Change in aggregate NSW Gross State Product** | | | | |
| 1 per cent productivity shock to Coal | 0.164 | 0.070 | 0.051 | 0.007 |
| 1 per cent productivity shock to Other metal ores | 0.034 | 0.021 | 0.003 | 0.002 |
| 1 per cent productivity shock to Other mining | 0.027 | 0.043 | 0.015 | 0.003 |
| **Change in aggregate NSW employment** | | | | |
| 1 per cent productivity shock to Coal | 0.114 | 0.045 | 0.036 | 0.005 |
| 1 per cent productivity shock to Other metal ores | 0.025 | 0.014 | 0.002 | 0.002 |
| 1 per cent productivity shock to Other mining | 0.020 | 0.031 | 0.012 | 0.002 |

*Note:* Freight includes both the transport of inputs used in mining as well as the transport of output from the mines

*Source:* The CIE.

# A Applications of commodities mined in NSW

## A.1 Applications of significant commodities mined in NSW

| Type of mineral | | Uses |
|---|---|---|
| Energy minerals - coal | Thermal | Electricity generation for household and industrial use, both domestic and export market |
| | Metallurgical | Steel and iron production, both domestic and export markets |
| Metallic minerals and metals | Gold | Jewellery (most), as well as for industrial applications (computers, communications equipment, spacecraft, jet aircraft engines and others), and for holding as a currency |
| | Copper | Industrial applications (accounting for around three quarters of use) including power transmission/generation, building wiring, telecommunication, electronic products. |
| | Silver | Holding as currency, jewellery, and in industrial applications such as mirrors, electrical and electronic products. |
| | Zinc | Around three quarters is used as a metal, such as in coating to protect iron and steel from corrosion, alloy metal to make brass and bronze, zinc-based die casting alloy, and rolled product. Around one quarter is used as zinc compounds mainly by the rubber, chemical, paint and agricultural industries. |
| | Lead | Components for all types of lead-acid storage batteries, and as ammunition, oxide in glass and ceramics, casting metal and sheet lead, in solders, bearing metals, brass and bronze ingots, cable sheathing, caulking lead, extruded products. |
| Industrial minerals | Clays | Structural clay: Bricks, pipes and tiles<br>Kaolin; Bentonite: Filer/extender in paint, paper, ceramics and rubber, refractory uses; pelletising stockfeed and iron ore; drilling muds; sealant; filtering agent<br>Cement clays: additive for cement |
| | Construction materials | Coarse aggregates: Road base; concrete; riprap; railway ballast<br>Fine aggregates: Concrete; asphalt; fill |
| | Diatomite | Filter aid, pet litter, industrial absorbent |
| | Dimension stone | Building and decorative materials(Sandstone, Granite, Slate and Marble) |
| | Gemstones | Jewellery |
| | Gypsum | Plaster, agricultural uses |
| | Mineral sands | Ilmenite: pigment for paint; Zircon: ceramics, refractories and abrasives; Rutile: Pigment for paint, titanium metal |
| | Limestone | Cement, metallurgical flux, fillers in plastics and paints, agriculture |
| | Magnesite | Magnesium carbonate which is used in agriculture, cement, glass and steel manufacture, and in flooring and wallboards, mouldings and acoustic tiles. |
| | Silica | Glass, cement, ceramics, foundry sand, metallurgical flux, silicon metal, fused silica, a range of electronics, chemical and construction industry applications |

*Source:* NSW Trade and Investment, 2013: New South Wales: Coal Industry Profile, 2013. NSW Trade and Investment, 2013: *2013 New South Wales minerals industry profile*.

# *B Hunter region*

The Hunter Valley including Newcastle and Lake Macquarie statistical area had a resident population of around 664 255 in 2013.[60] The mining and manufacturing sectors are the largest sources of employment (outside of the services sector) and drive economic activity in the region. The growth in these traditional mining sectors is also supported by expansion of the service sector (health care and social assistance, accommodation and food services and education), in line with increasing demand from population growth and an ageing population.

## *Mining industry overview*

The largest coal producing area in NSW is the Hunter Coalfield. Recoverable resources exceed 18 *billion tonnes*, which when compared to the current annual raw production of 123.6 *million tonnes* in 2010-11, suggests considerable ongoing potential.[61] The Hunter Coalfield contains significant reserves of export quality low ash, high energy thermal coals and low ash soft coking coals.

The Hunter Coalfield does not contain large areas of urban development, however, major regional centres of Singleton and Muswellbrook and surrounding smaller settlements do have 'a significant impact on the potential coal development in the region'.[62] In addition, 'prime agricultural land associated with the Hunter River floodplain and protection of associated groundwater resources within alluvial deposits affect a significant percentage of the undeveloped coal resources in the region'.[63]

As shown in chart B.1, the Newcastle coalfield also intersects with the Hunter region. The Newcastle coalfield produced around 20.9 Mt of raw coal (17.8 Mt of saleable coal) in 2010-11, or around 13 per cent of the State's production.

The CIE understands that there is very little mining activity for other metal ores such as bauxite, copper ore, gold ore, mineral sands, or silver-lead-zinc ore mining.

However, the region does provide for Other mining activities to extract coarse aggregates and conglomerate such as for use as construction material.

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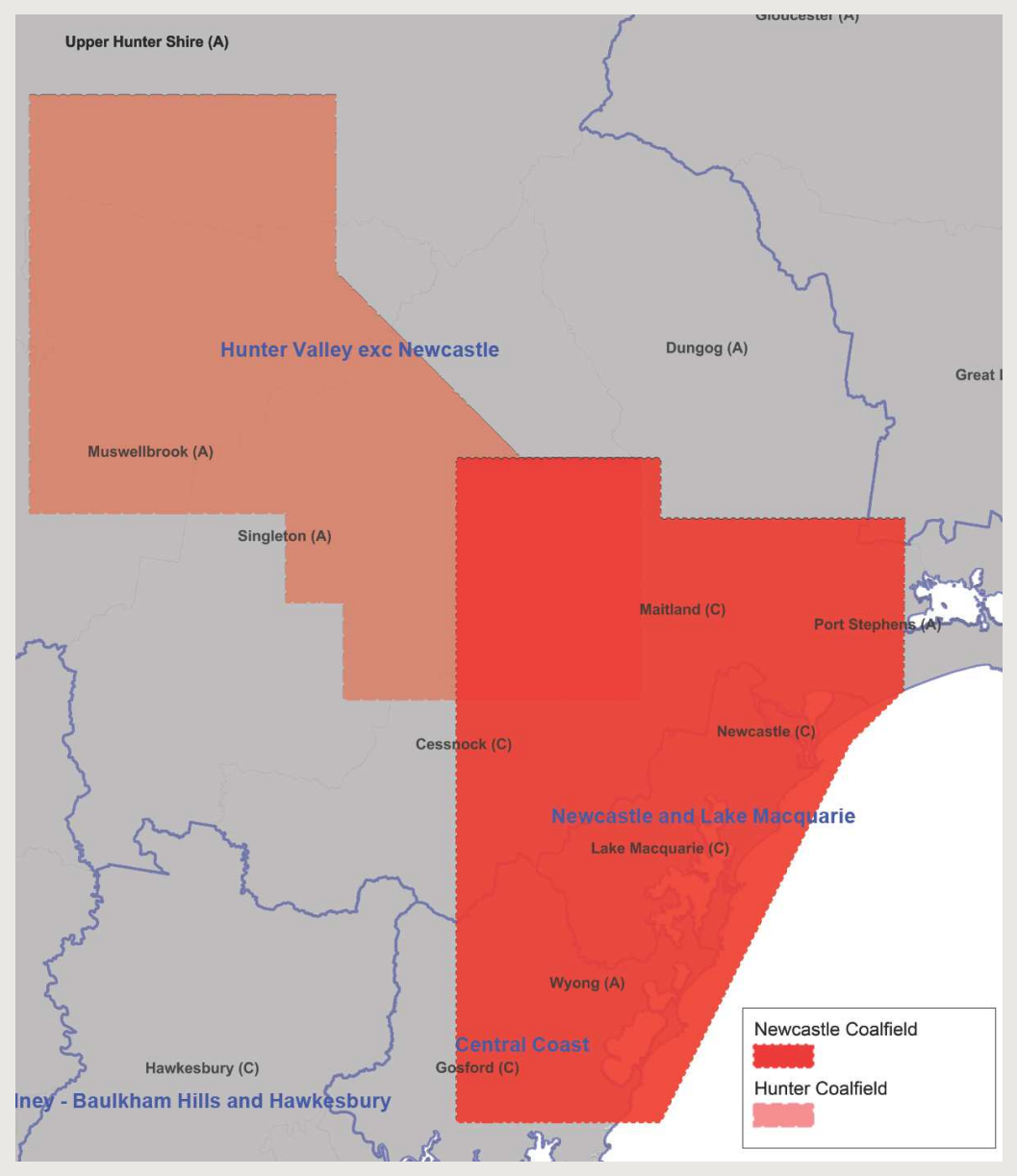
60 ABS, 2014. Catalogue 3218.0, Regional Population Growth, Australia. Table 1: Estimated Resident Population, Local Government Areas, New South Wales.

61 NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*.

62 Ibid. p 36.

63 Ibid. p 36.

## B.1 Hunter and Newcastle coalfields




*Data source:* ABS GIS Database and NSW Trade and Investment, 2014.

## *Contribution of mining to value added*

Mining industry value added directly contributes to approximately 18 per cent of the industry value added in the Hunter region (see table B.2).

- Around 94 per cent of mining industry value added is generated by the coal sector, while the remainder is predominantly attributed to Other mining.
- The value added of mining is estimated to have been $6.6 billion in 2012-13.

### B.2 Economic structure, Hunter (including Newcastle), 2012-13

| | Structure of Gross Regional Product | |
|---|---|---|
| | Per cent | $b |
| Industry value added | | 37.8 |
| Agriculture | 1.1 | 0.4 |
| **Coal** | **16.6** | **6.3** |
| Oil | 0.0 | 0.0 |
| Gas | 0.0 | 0.0 |
| Iron ore | 0.0 | 0.0 |
| **Other metal ores** | **0.1** | **0.0** |
| **Other mining** | **0.9** | **0.4** |
| Manufacturing | 9.6 | 3.6 |
| Utilities | 4.3 | 1.6 |
| Construction | 6.6 | 2.5 |
| Services | 60.9 | 23.0 |
| Net taxes | | 4.5 |
| **Gross Regional Product** | | **42.3** |

*Source:* The CIE using State Accounts.

## *Contribution of mining to employment*

Table B.3 provides the CIE's estimates of total employment in the Hunter region of around 275 200 full time equivalent (FTE) positions.[64] Other than the services sector, the coal and manufacturing sectors generate a significant share of employment, with around one third of manufacturing employment due to Other metals, metal products and iron and steel manufacturing. This suggests that, in addition to around 20 500 positions directly attributed to mining, an additional 12 000 people are employed in mining related employment.

The Other mining sector accounts for a modest 0.7 per cent of employment (approximately 2 000 jobs). In total, the mining industry (excluding manufacturing) directly accounts for around 7.4 per cent of employment.

64 This is based on 2011 Census data which provides an estimate of the share of employment by region. The CIE scaled up the employment numbers for each of the case study regions to account for the differential between 2011 Census data of persons employed and the ABS labour force data. The differential is most likely to be caused through incomplete responses to the survey, and to a lesser extent a rate of non-response.

### B.3 Employment by sector, Hunter (including Newcastle), 2012-13

| | Employment share in FTE terms (%) | Total employment (no.) | Full time equivalent |
|---|---|---|---|
| Regional employment | 100 | 314 723 | 275 203 |
| Agriculture | 1.9 | 5 682 | 5 255 |
| **Coal** | **6.7** | **16 918** | **18 312** |
| Oil | 0.0 | 21 | 23 |
| Gas | 0.0 | 31 | 34 |
| Iron ore | 0.0 | 18 | 21 |
| **Other metal ores** | **0.0** | **114** | **125** |
| **Other mining** | **0.7** | **1 930** | **2 055** |
| Manufacturing | 13.1 | 36 530 | 35 949 |
| Utilities | 2.0 | 5 486 | 5 374 |
| Construction | 8.3 | 22 890 | 22 784 |
| Services | 67.3 | 225 102 | 185 270 |
| **Total mining industry** | | **18 962** | **20 492** |

*Source:* The CIE, using 2011 Census data and ABS Catalogue 6202.0 labour force data for NSW.

## *Total effects of mining*

To understand the impact of mining on Gross Regional Product, we conduct a simulation of the impact of reducing state-wide coal production by $100 million.

A fall in production of this magnitude causes coal sector factor income to fall by around $48 million across NSW, with around 65 per cent of the fall in factor income (around $31 million of this fall) occurring in the Hunter region.

Given the importance of coal to the Hunter region's economy, the impact of a fall in production, for instance, due to a fall in demand for NSW coal may lead to a larger impact on other sectors in absolute terms than in other regions.

A fall in coal sector factor income of around $31 million may lead to a total fall in industrial factor income of $71 million, around 2.25 times larger than the impact to the coal sector. The fall in industrial factor income occurs across the economy, with notable falls in dwellings (construction), business and communication services, finance, rail freight and other freight/transport sectors and retail and wholesale trade. Hotels, cafes, health care, education, and a range of other services, as well as manufacturing, other mining and utilities sectors are also affected.

The Hunter region would not be particularly exposed by a fall in Other metal ores sector production. If production in the Other metal ores sector were to fall by around $100 million, causing a state-wide fall of $33 million in sectoral factor income, only two per cent of this fall would be attributed to the Hunter region.

The same scenario of a fall in production in the Other mining sector (such as to engineering services and construction materials mining) is expected to cause a fall of

around $35.5 million in sectoral factor income. State-wide, the total direct and indirect impacts due to linkages with other sectors are expected to be around 2.3 times as large.

- The Hunter region is expected to account for over one quarter of the impact.
- The total impact of a fall of this magnitude on production in the Other mining sector may be around $21.6 million (2.3 times the direct impact to the sector).

Table B.4 shows that employment and household consumption, which provide a measure of regional welfare, would be heavily impacted by a fall in coal production. The region would provide $15.0 million less in government revenue as a result.

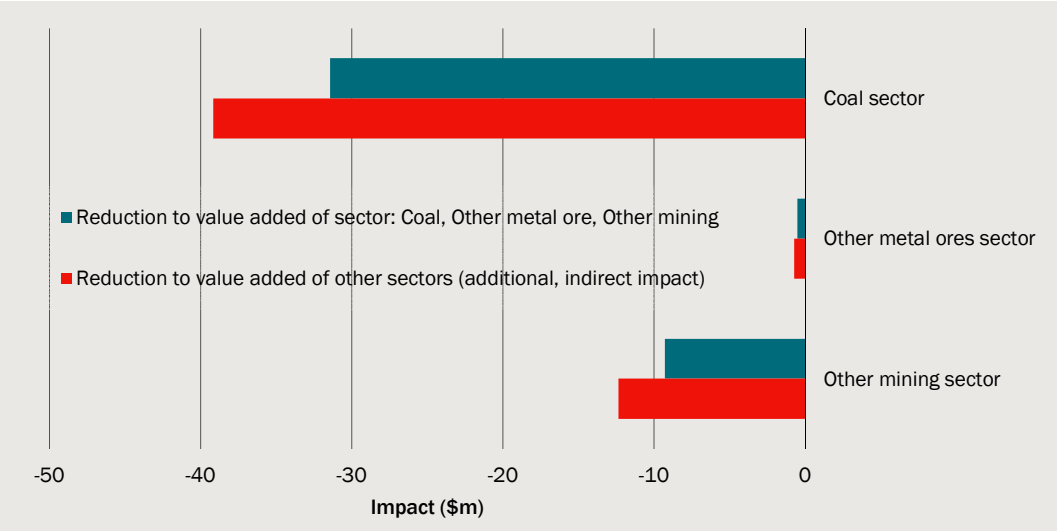
Chart B.5 summarises the impacts to the Hunter region of a reduction in State production in each sector.

## B.4 Regional impact of a state-wide mining shock, Hunter region

| | Units | Results of simulation to Coal sector production | Results of simulation to Other metal ores production | Results of simulation to Other mining production |
|---|---|---|---|---|
| Regional change in production | $m | 65.4 | 1.6 | 26.1 |
| Gross Regional Product | $m | -85.6 | -1.6 | -24.8 |
| **Industrial factor income** | **$m** | **-70.6** | **-1.3** | **-21.6** |
| **Industrial factor income for mining industry** | **$m** | **-31.4** | **-0.5** | **-9.3** |
| Household consumption | $m | -33.4 | -0.6 | -11.3 |
| Employment (FTE) | FTE | -309 | -6 | -153 |
| Government revenue | $m | -15.0 | -0.3 | -3.1 |

*Source:* The CIE.

## B.5 Impact to Hunter region of reduction in State production in each sector




*Note: Scenario tested is a $100 million reduction in state-wide production.*

*Data source:* The CIE.

# C New England and North West region

The New England and North West region is estimated to have had a population of approximately 185 280 in 2013.[65] The major towns in the region include Moree, Armidale, Tamworth and Inverell. Other than services (which support the broader economy), agriculture is the largest sector in value added terms and accounts for nearly one fifth of employment.

## Mining industry overview

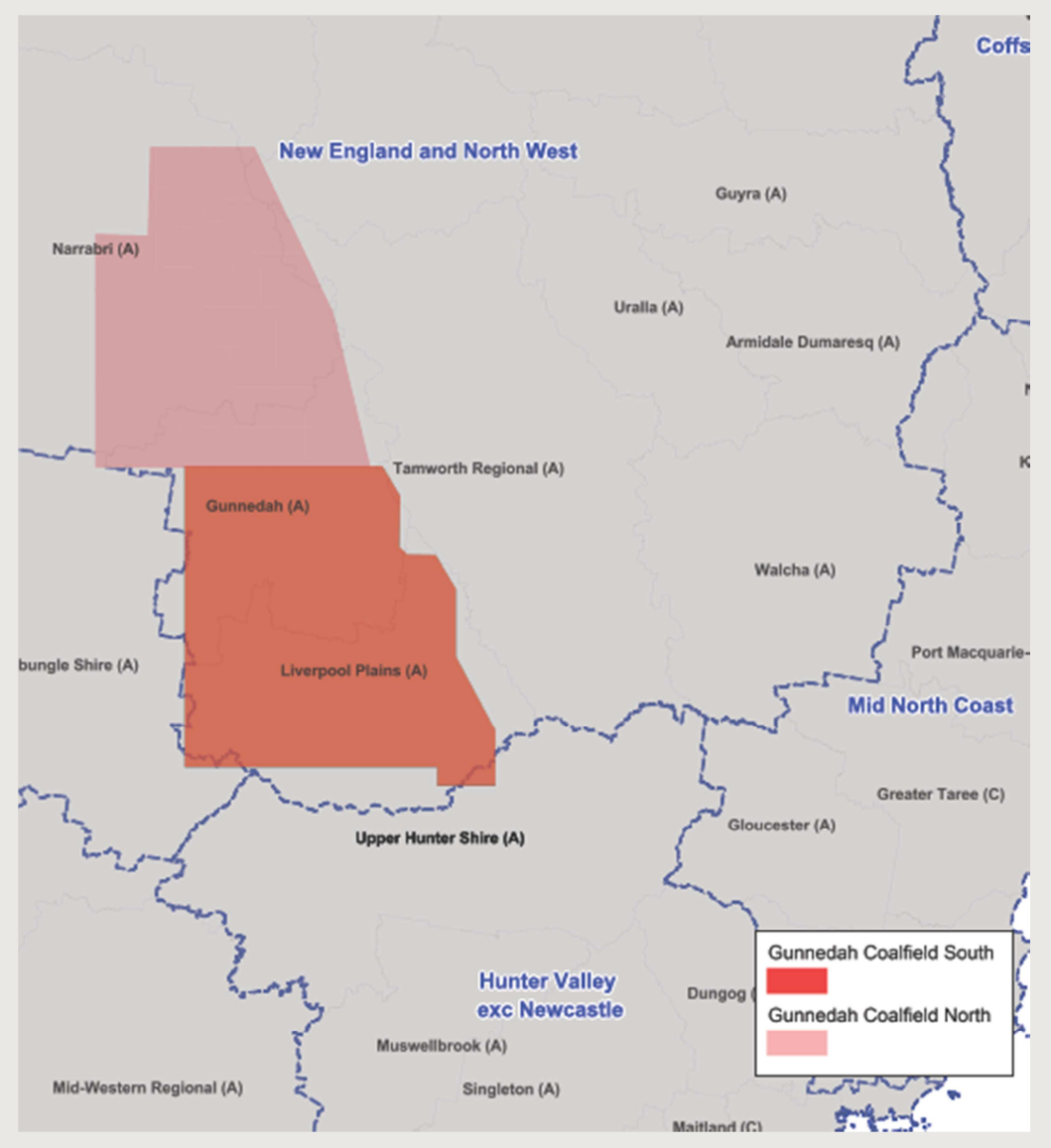
At present, mining does not play a significant role in the region and accounts for only 4 per cent of mining industry value added in NSW. Despite producing only around 8 Mt of coal each year, the Gunnedah coalfields in the Gunnedah Basin has the third largest reserves, behind the Hunter and Western coalfields, with estimated recoverable coal reserves of 2 055 Mt.

Around one quarter of approved projects or projects under construction in 2012 were from the Gunnedah coalfields. In addition, around one quarter of potential new projects were located in the Gunnedah coalfields. Hence, coal may play a more important role in the regional economy in the future.

The intersection between the Gunnedah coalfields and the New England and North West region is shown in chart C.1.

[65] ABS, 2014. Catalogue 3218.0, Regional Population Growth, Australia. Table 1: Estimated Resident Population, Local Government Areas, New South Wales.

## C.1 Gunnedah coalfields




*Data source:* ABS GIS Database and NSW Trade and Investment, 2014.

## *Contribution of mining to value added*

As shown in table C.2, the value added derived by coal mining is approximately 3.3 per cent of industry value added in the New England and North West statistical area. A further 0.6 per cent of value added is derived from Other mining, which includes mining for construction materials. In total, the current contribution of the mining sectors to industry value added is modest at around 3.9 per cent. There is minimal Other metal ores sector activity.

### C.2 Economic structure, New England and North West, 2012-13

| | Structure of Gross Regional Product | |
|---|---|---|
| | Per cent | $b |
| Industry value added | | 9.3 |
| Agriculture | 13.4 | 1.2 |
| **Coal** | **3.3** | **0.3** |
| Oil | 0.1 | 0.0 |
| Gas | 0.1 | 0.0 |
| Iron ore | 0.0 | 0.0 |
| **Other metal ores** | **0.0** | **0.0** |
| **Other mining** | **0.6** | **0.1** |
| Manufacturing | 6.9 | 0.6 |
| Utilities | 2.8 | 0.3 |
| Construction | 5.7 | 0.5 |
| Services | 67.1 | 6.2 |
| Net taxes | | 1.1 |
| **Gross Regional Product** | | **10.4** |

*Source:* The CIE using State Accounts.

## *Contribution of mining to employment*

The CIE estimates that in 2013 there were more than 80 700 full time equivalent positions in the New England and North West statistical area.

### C.3 Employment by sector, New England and North West, 2012-13

| | Employment share in FTE terms (%) | Total employment (no.) | Full time equivalent |
|---|---|---|---|
| Regional employment | 100 | 90 681 | 80 743 |
| Agriculture | 19.6 | 15 436 | 15 800 |
| **Coal** | **1.1** | **779** | **897** |
| Oil | 0.0 | 17 | 19 |
| Gas | 0.0 | 24 | 27 |
| Iron ore | 0.0 | 0 | 0 |
| **Other metal ores** | **0.0** | **0** | **0** |
| **Other mining** | **0.4** | **328** | **342** |
| Manufacturing | 7.7 | 6 353 | 6 206 |
| Utilities | 1.1 | 866 | 860 |
| Construction | 6.0 | 4964 | 4 824 |
| Services | 64.1 | 61 915 | 51 769 |
| **Total mining industry** | **1.5** | **1 107** | **1 239** |

*Source:* The CIE, using 2011 Census data and ABS Catalogue 6202.0 labour force data for NSW.

Coal mining is expected to account for around 1.1 per cent of employment and the Other mining sector 0.4 per cent, on a full time equivalent basis.

## *Total effects of mining*

Given the low share of the State's mining activity that is currently undertaken in this region, a reduction in mining production is unlikely to cause a large fall in sectoral factor income in the region. However, any reduction in mining production would lead to a reduction in the size of factor income generated by other sectors.

Table C.4 shows that if state-wide production of coal fell by $100 million, this would impact the New England and North West region by approximately $3.5 million from both direct and indirect impacts.

A similar impact to the region is expected in the event of a reduction in state-wide production of Other mining.

### C.4 Regional impact of state-wide mining shock, New England and North West

| | Units | Results of simulation to Coal sector production | Results of simulation to Other metal ores production | Results of simulation to Other mining production |
|---|---|---|---|---|
| Regional change in production | $m | -3.2 | 0.0 | -4.4 |
| Gross Regional Product | $m | -4.2 | 0.0 | -4.1 |
| **Industrial factor income** | **$m** | **-3.5** | 0.0 | **-3.6** |
| **Industrial factor income for mining industry** | **$m** | **-1.5** | 0.0 | **-1.5** |
| Household consumption | $m | -1.6 | 0.0 | -1.9 |
| Employment (FTE) | FTE | -15 | 0.0 | -25 |
| Government revenue | $m | 0.7 | 0.0 | -0.5 |

Source: The CIE.

# *D Illawarra region*

The ABS estimates that around 340 370 people resided in the Illawarra statistical area in 2013.[66] The region includes Port Kembla, a major export terminal for the region and the region's coal production. The major population centre of the Illawarra region is Wollongong where over 205 000 people are estimated to have resided in 2013.[67]

## *Mining sector overview*

The mining industry in the Illawarra region is concentrated around coal mining in the Southern Coalfield. Total production of coal in the Southern Coalfield in 2010-11 was around 11.6 Mt, which represents a reversal to the trend of slightly declining production over the past five years.[68]

The expansion of the Bulli Seam Operations Project was given approval by the Government in 2011. The expansion project proposes increasing longwall mining to a maximum of 10.5 Mtpa raw coal production for a period of 30 years. The primary product of the Bulli Seam Operations Project would be coking coal. The approval of the mine is a major development for the Southern Coalfield, and should ensure continuing production from the region over the medium and potentially the long term.[69]

In addition, the Berrima Colliery continues to be an important source of employment and investment, and has sought to continue this role in the future through renewing its existing licences. There have also been new commitments made at the Wongawilli mine (south west of Wollongong), NRE No.1 and the Tahmoor mine.[70]

Chart D.1 shows the overlap between the Southern Coalfield and the Illawarra statistical area and other statistical areas.

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66 ABS, 2014. Catalogue 3218.0, Regional Population Growth, Australia. Table 1: Estimated Resident Population, Local Government Areas, New South Wales.

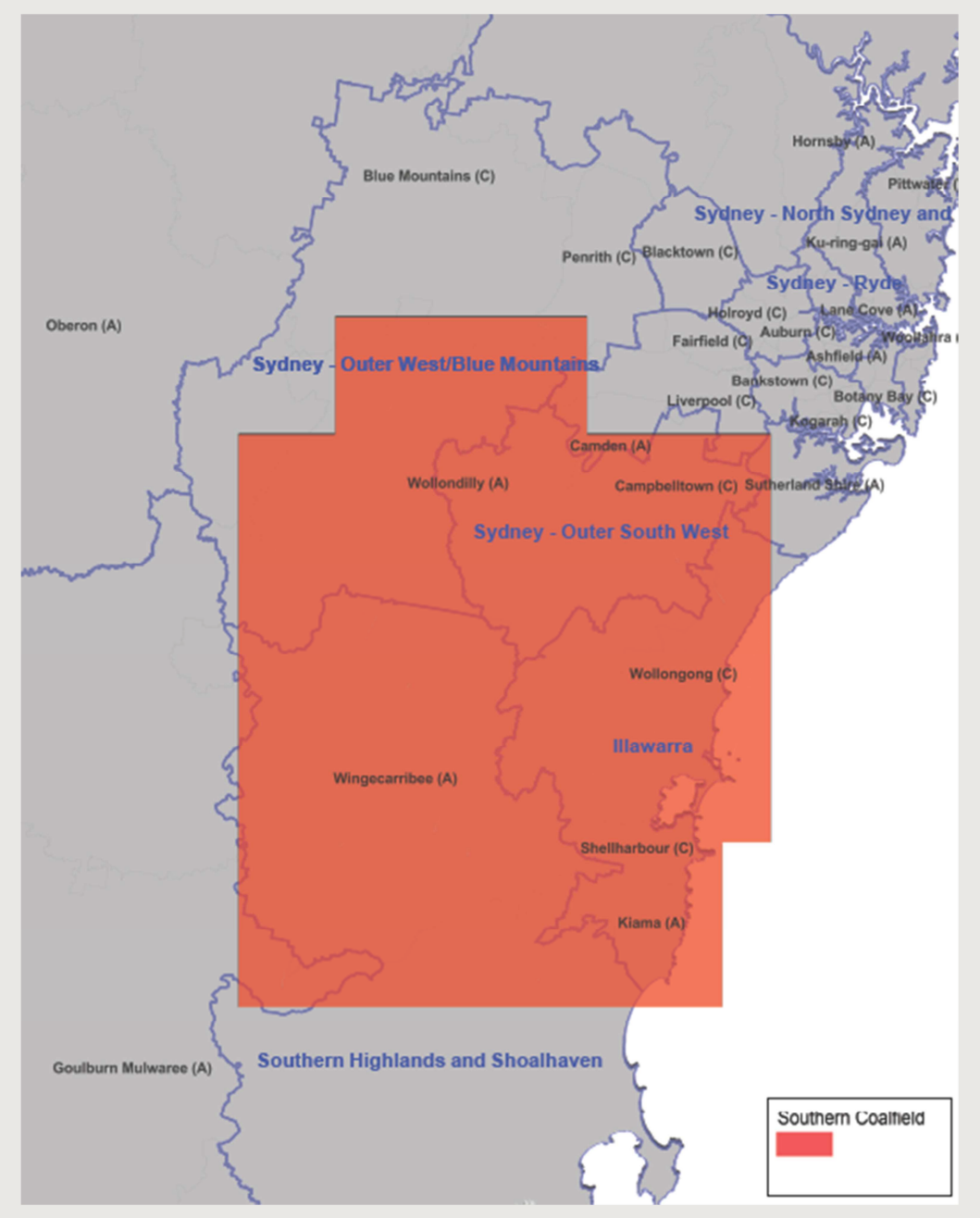
67 Ibid.

68 NSW Trade and Investment, 2013. *2013 New South Wales coal industry profile*.

69 Ibid p25.

70 Ibid p25.

## D.1 Southern coalfield




*Data source:* ABS GIS Database and NSW Trade and Investment, 2014.

## *Contribution of mining to value added*

The structure of the Illawarra economy is shown in table D.2. The share of industry value added comprised by mining in the Illawarra region is approximately 7.5 per cent, including predominantly coal mining and to a small extent Other mining.

The value added for manufacturing that is comprised by mining related products is significant.

- Around **two thirds** of manufacturing value added is made up by iron and steel, other metal ores and metal products manufacturing.
  - The largest share, around **56 per cent** of manufacturing, is comprised by iron and steel manufacturing.
- It is likely that without access to the local metallurgical coal supply, the iron and steel manufacturing sector would not be located within the Illawarra region.

Hence, the region is able to generate additional employment and value added from its location with respect to metallurgical coal mines.

### D.2 Economic structure, Illawarra, 2012-13

| | Structure of Gross Regional Product | |
|---|---|---|
| | Per cent | $b |
| Industry value added | | 13.4 |
| Agriculture | 0.2 | 0.0 |
| **Coal** | **7.0** | **0.9** |
| Oil | 0.0 | 0.0 |
| Gas | 0.0 | 0.0 |
| Iron ore | 0.0 | 0.0 |
| **Other metal ores** | **0.0** | **0.0** |
| **Other mining** | **0.5** | **0.1** |
| **Manufacturing** | **10.3** | **1.4** |
| Utilities | 2.1 | 0.3 |
| Construction | 6.6 | 0.9 |
| Services | 73.2 | 9.8 |
| Net taxes | | 1.6 |
| **Gross Regional Product** | | **15.0** |

*Source:* The CIE using State Accounts.

## *Contribution of mining to employment*

Total employment in the Illawarra Statistical Area is estimated to be over 102 500 in full time equivalent terms, based on 2012-13 estimates (shown in table D.3). Mining directly accounts for 3.1 per cent of employment, most of which is attributed to the coal sector.

Manufacturing is an important sector for the Illawarra region. Both in value added terms, and employment, iron and steel, other metals and metal products manufacturing account for around **two thirds** of manufacturing employment.

### D.3 Employment by sector, Illawarra, 2012-13

| | Employment share in FTE terms (%) | Total employment (no.) | Full time equivalent |
|---|---|---|---|
| Regional employment | 100 | 121 973 | 102 555 |
| Agriculture | 0.4 | 481 | 413 |
| **Coal** | **2.7** | **2 620** | **2 734** |
| Oil | 0.0 | 7 | 8 |
| Gas | 0.0 | 11 | 12 |
| Iron ore | 0.0 | 0 | 0 |
| **Other metal ores** | **0.0** | **5** | **7** |
| **Other mining** | **0.4** | **365** | **391** |
| **Manufacturing** | **13.6** | **14 203** | **13 966** |
| Utilities | 0.9 | 969 | 950 |
| Construction | 7.9 | 8 473 | 8 114 |
| Services | 74.1 | 94 839 | 75 961 |
| **Total mining industry** | **3.1** | **2 990** | **3 132** |

*Source:* The CIE, using 2011 Census data and ABS Catalogue 6202.0 labour force data for NSW.

## *Total effects of mining*

As shown in table D.4, the Illawarra region would bear around one tenth of the reduction in coal production, if state coal production were to fall. The regional economy would not contract if there were fluctuations in Other metal ores production, due to limited activity in this sector in the Illawarra region. In the event of a fall in Other mining output, the Illawarra is expected to account for around five per cent of this fall.

### D.4 Regional impact of state-wide mining shock, Illawarra

| | Units | Results of simulation to Coal sector production | Results of simulation to Other metal ores production | Results of simulation to Other mining production |
|---|---|---|---|---|
| Regional change in production | $m | -9.8 | -0.1 | -5.0 |
| Gross Regional Product | $m | -12.8 | -0.1 | -4.7 |
| **Industrial factor income** | **$m** | **-10.5** | **-0.1** | **-4.1** |
| **Industrial factor income for mining industry** | **$m** | **-4.7** | **-0.0** | **-1.8** |
| Household consumption | $m | -5.0 | -0.0 | -2.1 |
| Employment (FTE) | FTE | -46 | <1 | -29 |
| Government revenue | $m | -2.2 | 0.0 | -0.6 |

Source: The CIE.

# *E Central West region*

The ABS estimates that the resident population of the Central West region was approximately 225 680 people in 2013.[71] Major population centres in the region include Bathurst, Orange, Lithgow, Parkes and Cowra. The Central West region is one of the most agriculturally productive areas in NSW.

## *Mining industry overview*

Unlike other case study regions, in the Central West both coal and Other metal ores mining play an important role in the regional economy. The Central West region accounts for over half of state-wide Other metal ores industry value added. The Central West region has copper, gold, silver-lead-zinc and nickel-cobalt resources. The most significant increase in the value of NSW mineral production (metal ores) in recent years has occurred in copper. This has increased substantively from 2010-11, and is due to the development of the Cadia Valley Operations near Orange in the Central West region.[72]

The focus for new metallic mineral projects in NSW continues to be the Central West.[73] A number of copper-gold systems have been identified in the Lachlan Orogen, particularly around the Central West.

Recent mining developments include additional gold mining in Peak Hill, the commissioning of the Cadia East gold (copper) project to significantly extend mine life, the approval of gold mining at Cowal, the development of a copper-silver-lead-zinc deposit at Mineral Hill near to Condoblin, the Northparkes mine life extension, and the extension of gold mining at Hill End (north east of Orange).

The region also has coal mining operations, accounting for approximately 15 per cent of the State's coal mining value added. As shown in chart E.1, the Western coalfields intersect with the Central West statistical area. The Moolarben mine, the largest contributor to growth in coal production from the Western coalfields is located in the Central West. The Western coalfields coal reserves known at 2011 included reserves in the Moorlarben mine and other mines in the Central West such as the proposed Cobbora mine and the proposed Bylong project.

Coal mining activity in the Central West region occurs north of Lithgow. Significant coal mines include the Angus Place, Springvale, Clarence and Baal Bone underground mines.

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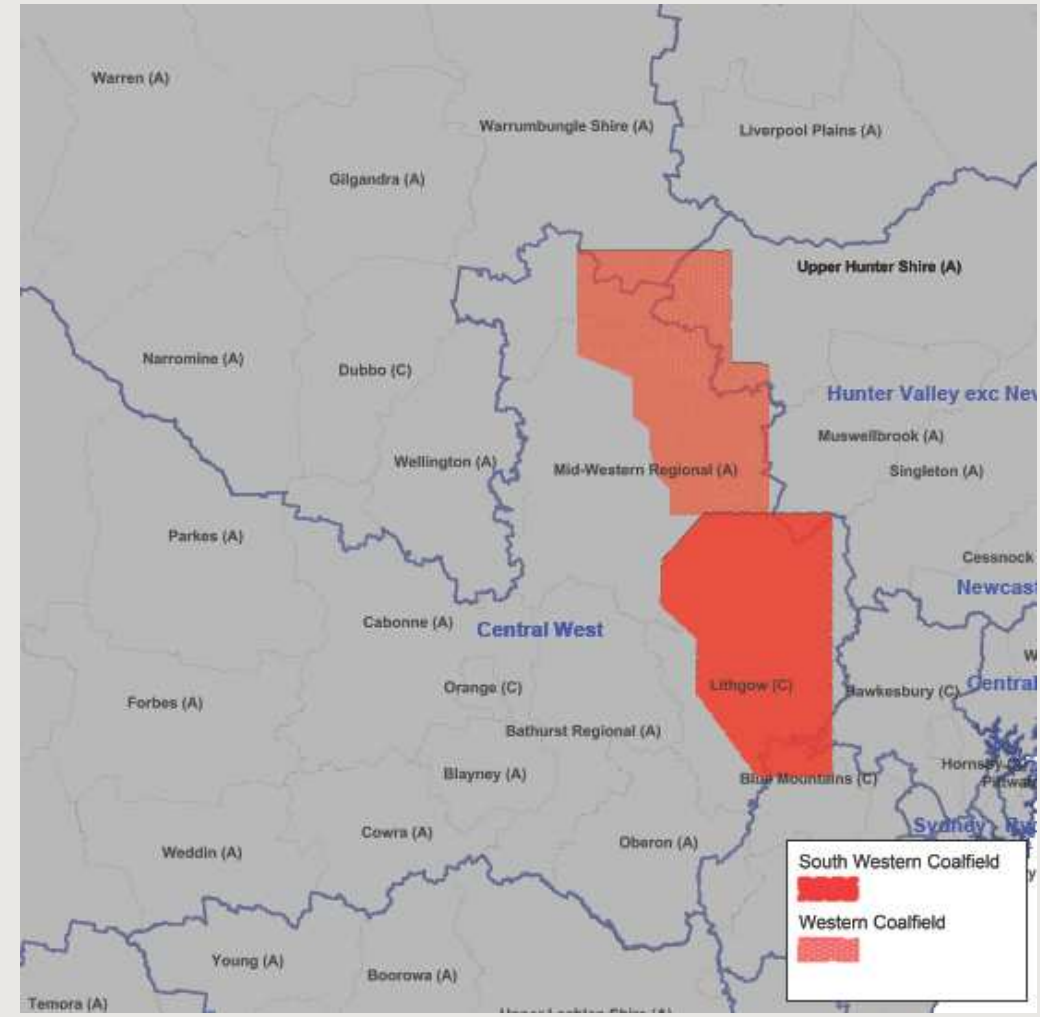
71 ABS, 2014. Catalogue 3218.0, Regional Population Growth, Australia. Table 1: Estimated Resident Population, Local Government Areas, New South Wales.

72 NSW Trade and Investment, 2013. *2013 New South Wales minerals industry profile*.

73 Ibid.

In addition, the Central West region also has important quarries.

### E.1 South Western and Western Coalfields




*Data source:* ABS GIS Database and NSW Trade and Investment, 2014.

## *Contribution of mining to value added*

In 2012-13, the coal sector in the Central West region was the highest contributor to industry value added ($1.4 billion), other than services (as shown in table E.2). The Other metal ores sector was also an important contributor ($0.8 billion) to value added. The Other mining sector contributed a more modest $0.2 billion to value added.

- The mining industry's direct contribution to industry value added in the Central West, in 2012-13, was approximately $2.4 billion or 19.6 per cent.
- In addition, a small share of manufacturing value added (around 15 per cent) for the region was comprised of metal products and iron and steel manufacturing, which represents a smaller share than other case study regions such as the Illawarra (at 67 per cent), and Hunter Valley and Newcastle (at around 32 per cent).

### E.2 Economic structure, Central West, 2012-13

| | Structure of Gross Regional Product | |
|---|---|---|
| | Per cent | $b |
| Industry value added | | 12.2 |
| Agriculture | 7.6 | 0.9 |
| **Coal** | **11.7** | **1.4** |
| Oil | 0.0 | 0.0 |
| Gas | 0.0 | 0.0 |
| Iron ore | 0.1 | 0.0 |
| **Other metal ores** | **6.6** | **0.8** |
| **Other mining** | **1.3** | **0.2** |
| Manufacturing | 8.0 | 1.0 |
| Utilities | 4.3 | 0.5 |
| Construction | 5.3 | 0.7 |
| Services | 54.9 | 6.7 |
| Net taxes | | 1.4 |
| **Gross Regional Product** | | **13.7** |

*Source:* The CIE using State Accounts.

## *Contribution of mining to employment*

The CIE estimates there were around 94 400 full time equivalent positions in the Central West in 2012-13 (see table E.3) and the mining industry directly accounted for approximately 9.7 per cent of employment in FTE terms. Around 4.4 per cent were in the coal sector, 4.3 per cent in the Other metal ores sector and an additional 1.0 per cent in Other mining.

### E.3 Employment by sector, Central West, 2012-13

| | Employment share in FTE terms (%) | Total employment (no.) | Full time equivalent |
|---|---|---|---|
| Regional employment | 100 | 104 874 | 94 415 |
| Agriculture | 12.5 | 11 881 | 11 833 |
| **Coal** | **4.4** | **3 779** | **4 183** |
| Oil | 0.0 | 6 | 5 |
| Gas | 0.0 | 9 | 8 |
| Iron ore | 0.1 | 50 | 55 |
| **Other metal ores** | **4.3** | **3 532** | **4 033** |
| **Other mining** | **1.0** | **806** | **902** |
| Manufacturing | 10.2 | 9 726 | 9 586 |
| Utilities | 1.9 | 1 800 | 1 777 |
| Construction | 6.3 | 6 026 | 5 947 |
| Services | 59.4 | 67 260 | 56 086 |
| **Total mining employment** | **9.7** | **8 116** | **9 118** |

*Source:* The CIE, using 2011 Census data and ABS Catalogue 6202.0 labour force data for NSW.

## *Total effects of mining*

Table E.4 shows the impact of a reduction in state-wide production of $100 million across each mining sector.

### E.4 Regional impact of state-wide mining shock, Central West

| | Units | Results of simulation to Coal sector production | Results of simulation to Other metal ores production | Results of simulation to Other mining production |
|---|---|---|---|---|
| Regional change in production | $m | -14.9 | -50.8 | 11.5 |
| Gross Regional Product | $m | -19.5 | -50.3 | -10.9 |
| **Industrial factor income** | **$m** | **-16.1** | **-40.6** | **-9.5** |
| **Industrial factor income for mining sector** | **$m** | **-7.2** | **-16.9** | **-4.1** |
| Household consumption | $m | -7.6 | -20.8 | -4.9 |
| Employment (FTE) | FTE | -70 | -201 | -67 |
| Government revenue | $m | -3.4 | -9.7 | -1.4 |

Source: The CIE.

As shown above, a state-wide reduction in Other metal ores production in the order of $100 million may lead to a reduction in production of over $50 million in the Central West. This is due to the significant portion of sectoral output derived in this region. Employment and welfare would be most significantly affected, and tax revenue falls by the most under a reduction in Other metal ores production.

While the coal sector accounts for the largest share of industrial factor income of the mining sectors in this region, the share of total state production is less.

In each case, the loss in industrial factor income by the mining industry leads to a significantly larger loss in industrial factor income across the economy in the order of 2.2 to 2.4 times depending on the sector. That is, the net contribution of the mining sectors would be larger than $2.4 billion.

### E.5 Impact to Central West or reduction in State production in each sector


*Note: Scenario tested is a $100 million reduction in state-wide production.*

*Data source:* The CIE.

# *F CIE-REGIONS model*

CIE-REGIONS model is a general equilibrium model of the Australian economy. It was developed by the Centre for International Economics based on the publicly available MMRF-NRA model developed by the Productivity Commission (2006).[74]

Some of the key aspects that make this model especially suited for this task are that it:

- uses the latest input-output table
- provides a detailed account of industry activity, investment, imports, exports, changes in prices, employment, household spending and savings and many other factors;
  - identifies 58 industries and commodities (table F.1)
  - the industries which are particularly relevant to this task are construction and ownership of dwellings
- accounts for Australia's six states and two territories as distinct regions including specific details about the budgetary revenues and expenditures of each of the eight state and territory governments and the Australian Government (the government finances in CIE Regions align as closely as practicable to the ABS government finance data)
  - includes a detailed treatment of the fiscal effects of the Goods and Services Tax (GST)
  - specifically accounts for major taxes including land taxes, payroll taxes, stamp duties and others at the state level, as well as income taxes, tariffs, excise, the GST and other taxes at the federal level (table F.2)
  - traces out the impact of transfers between governments
- accounts for differing economic fundamentals in the states (for instance, the mining boom in WA and Queensland)
- can produce results on employment and value added at a regional level
- can be run in a static or dynamic mode. The dynamic version allows analysis to trace impacts over time as the economy adjusts, being particularly useful over the medium to longer terms.

The CIE has used CIE-REGIONS to analyse the impacts of a range of policy changes, including state tax reform, local infrastructure development, and industrial development strategies.

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74 Productivity Commission 2006, *Potential Benefits of the National Reform Agenda*, Report to the Council of Australian Governments.

## F.1 CIE-REGIONS industries/commodities and margin services

| Region | | | |
|---|---|---|---|
| 1 | Livestock | 30 | Electricity generation - hydro |
| 2 | Crops | 31 | Electricity generation - other |
| 3 | Forestry | 32 | Electricity supply |
| 4 | Fishing | 33 | Gas supply |
| 5 | Coal | 34 | Water and sewerage services |
| 6 | Oil | 35 | Construction |
| 7 | Gas | 36 | Wholesale trade |
| 8 | Iron ore | 37 | Retail trade |
| 9 | Other metal ores | 38 | Mechanical repairs |
| 10 | Other mining | 39 | Hotels, cafes and accommodation |
| 11 | Food, beverage and tobacco | 40 | Road passenger transport |
| 12 | Textiles, clothing and footwear | 41 | Road freight transport |
| 13 | Wood products | 42 | Rail passenger transport |
| 14 | Paper products | 43 | Rail freight transport |
| 15 | Printing | 44 | Pipeline transport |
| 16 | Petroleum products | 45 | Ports services |
| 17 | Chemicals | 46 | Transport services |
| 18 | Rubber and plastic products | 47 | Water freight transport |
| 19 | Other non-metal mineral products | 48 | Ship charter |
| 20 | Cement and lime | 49 | Air passenger transport |
| 21 | Iron and steel | 50 | Air freight transport |
| 22 | Other non-ferrous metals | 51 | Communication services |
| 23 | Metal products | 52 | Finance |
| 24 | Transport equipment | 53 | Business services |
| 25 | Other equipment | 54 | Ownership of dwellings |
| 26 | Other manufacturing | 55 | Government administration and defence |
| 27 | Electricity generation - coal | 56 | Education |
| 28 | Electricity generation - gas | 57 | Health |
| 29 | Electricity generation - oil | 58 | Other services |
| **Service** | | | |
| **Margin services** | | | |
| Gas supply (part of commodity 33) | | Pipeline transport (part of commodity 44) | |

| Service | |
|---|---|
| Wholesale trade (part of commodity 36) | Ports services (part of commodity 45) |
| Retail trade (part of commodity 37) | Water freight transport (part of commodity 47) |
| Hotels, cafes & accommodation (part of commodity 39) | Air freight transport (part of commodity 50) |
| Road freight transport (part of commodity 41) | Finance (part of commodity 52) |
| Rail freight transport (part of commodity 43) | |

*Source:* CIE-REGIONS database.

## F.2 Federal and state taxes

| Federal taxes | State, territory and local government taxes |
|---|---|
| Good and service tax (GST) | Payroll tax |
| Sales taxes | Land tax |
| Excises and levies | Municipal rates |
| Labour income tax | Fire surcharges |
| Company income tax | Stamp duties on |
| Non-residents income tax | - insurance |
| Import duties | - financials |
| Export taxes | - motor vehicle |
| | - residential property |
| | - non-residential property |
| | - non-residential non-real estate |

*Source:* CIE-REGIONS database.

## F.3 CIE-REGIONS from the input side

The first component of the value of production is the intermediate inputs, or goods and services which are utilised in the production process and sourced across the economy.

In the CIE-REGIONS model there are 53 sectors specified from which intermediate inputs are sourced for the production process. In order to dissect the nature of intermediate inputs sourced for the sector, these have been aggregated to:

- materials – such as from other mining products, food and drink supplies, chemicals, petrol products, iron and steel sourced for the mine, rubber and plastics products, office supplies and clothing
- services – spanning across a range of activities from construction services, business services, finance, mechanical repairs, hotels and cafes and forestry services
- energy – which is sourced from either gas or electricity suppliers, or the gas sector
- machinery and equipment – which includes transport equipment, 'other equipment' and other manufacturing
- water
- transport, which ranges from road and rail freight to ports and transport services
- wholesaling and retailing costs such as the cost of marketing or advertising carried out in the course of production.

In addition to intermediate inputs of goods and services, CIE-REGIONS identifies the value added components, which represent the returns to labour, capital and other components. The returns to each of the factor inputs are not the same as the amount paid to the factor input, because there are additional taxes paid.

- Labour value added incorporates labour costs and on-costs such as payroll tax, superannuation and pay as you earn taxation (personal income taxation).
- Capital value added includes payments to capital such as to investors or interest on borrowings, gross of depreciation, plus property tax and company tax
- Other value added primarily reflects other indirect taxes, which in the case of mining is largely made up of royalties paid, as well as payments for working capital (such as cash flow).

A smaller, additional component that is captured in the model is 'Other margins' which estimate the margins for transportation.

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