Government of **Western Australia**
Department of **Mines and Petroleum**

WESTERN AUSTRALIAN MINERAL AND PETROLEUM

STATISTICS DIGEST 2013–14

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Government of **Western Australia**
Department of **Mines and Petroleum**

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FOREWORD

Welcome to the Western Australian Mineral and Petroleum Statistics Digest for 2013–14. This publication brings together a range of statistical information to provide a comprehensive overview of the State's mineral and petroleum industry.

The value of the State's resources sector in 2013–14 increased 20 per cent on the previous financial year to reach a record $121.6 billion.

This increase in value is largely attributed to a 30 per cent increase in the value of iron ore, which rose from $56.1 billion in 2012–13 to a record $73.7 billion, due to continued strong demand from China and a weakening Australian dollar.

Growth in other parts of the resources sector also contributed to the overall result, through increased outputs of gold, copper, lead, salt and diamonds, and a significant rise in the value of petroleum sales.

Western Australia also remained the nation's leading mining investment destination, attracting 52 per cent, or $46.8 billion, of total national capital expenditure.

By the end of the year, however, it was evident that continued uncertain global economic conditions were likely to result in weaker commodity prices and a more challenging operating environment for producers in coming years.

The Department is focused on ensuring that Western Australia remains a destination of choice for responsible resource exploration and development.

It is not possible to prepare such a comprehensive range of information without assistance from outside this Department. I would like to thank the various resource companies, Bureau of Resources and Energy Economics, the Australian Bureau of Statistics and the Western Australian Department of Treasury for their cooperation in compiling this Digest.

Richard Sellers
Director General
Department of Mines and Petroleum

1.1 MINERALS EXPLORATION

Weaker commodity prices and increasing costs resulted in the resources sector re-evaluating exploration expenditure for minerals in 2013–14.

Nationally, mineral exploration expenditure fell by 32 per cent to $2.07 billion from the previous financial year and the number of metres drilled fell by 24 per cent to 6.4 million metres.

Western Australia remains the country's most preferred jurisdiction for mineral exploration, with its share of national expenditure remaining by far the largest of all Australian jurisdictions:

- Western Australia _____ 57%
- Queensland _____ 22%
- New South Wales _____ 7%
- Northern Territory _____ 6%
- South Australia _____ 6%
- Victoria _____ 1%
- Tasmania _____ 1%

In line with the national trend, mineral exploration expenditure in Western Australia fell 33 per cent from the previous year to $1.18 billion. This represents the lowest level of expenditure since 2007–08.

Expenditure on exploration for iron ore, gold and nickel accounted for 83 per cent or $1 billion of total mineral exploration expenditure.

Iron ore continued to dominate expenditure, accounting for 50 per cent, or $594 million, of the total, even though total expenditure was reduced by 36 per cent compared to 2012–13. Gold exploration was reduced by 37 per cent to $295 million, and nickel fell 40 per cent to $95 million. Base metals exploration expenditure fell 22 per cent to $72 million, and uranium fell by 36 per cent to $23 million.

The majority of mineral exploration expenditure was spent on projects to expand existing mining operations which accounted for around 68 per cent or $799 million of total expenditure.

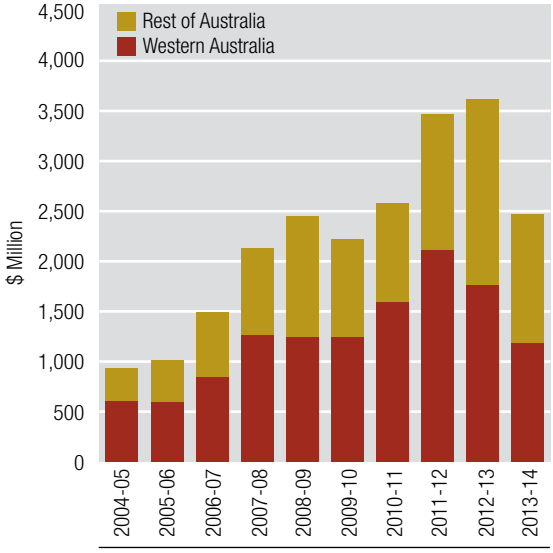


Figure 1 **Mineral Exploration Expenditure**
Source: ABS

EXPLORATION INCENTIVE SCHEME

The cornerstone of growth in the mining industry is exploration and investment. In 2009, the Western Australian Government announced its four-year, $80 million Exploration Incentive Scheme (EIS), an initiative that aims to encourage exploration in under-explored greenfield regions of the State.

The flagship program of the EIS is the Co-funded Drilling program which offers refunds of up to 50 per cent of direct drilling costs, capped at $150,000, or $200,000 for innovative drilling programs, through a competitive application system. Since the start of the program, co funding has been offered to 466 exploration drilling projects.

The success of EIS has prompted the State Government to extend funding beyond the initial four years to the end of the 2016–17 financial year, by which time $130.6 million will have been allocated to the EIS.

Further details on the initiative's six programs can be found on the Department's website at www.dmp.wa.gov.au/EIS.

1.2 PETROLEUM EXPLORATION

In contrast to minerals, expenditure on petroleum exploration at the national level rose marginally by two per cent to a record $4.8 billion in 2013–14. Combined, Western Australia's onshore and offshore areas and adjacent Commonwealth offshore areas attracted the largest share with 62 per cent of national petroleum exploration expenditure:

- Western Australia _____ 62%
- Queensland _____ 13%
- South Australia _____ 11%
- Northern Territory _____ 10%
- New South Wales _____ 3%
- Victoria _____ 0.7%
- Tasmania _____ 0.3%

In 2013–14, petroleum exploration expenditure in Western Australia fell by eight per cent to $3 billion.

Offshore basins continue to attract the majority of petroleum exploration expenditure in Australia and accounted for 73 per cent of total spending in 2013–14.

Further information on petroleum exploration activity in Western Australia can be found in the publication 'Petroleum in Western Australia' which is produced by the Department of Mines and Petroleum. This publication contains a comprehensive overview of petroleum exploration activities in this State, together with details on the award of petroleum exploration permits.

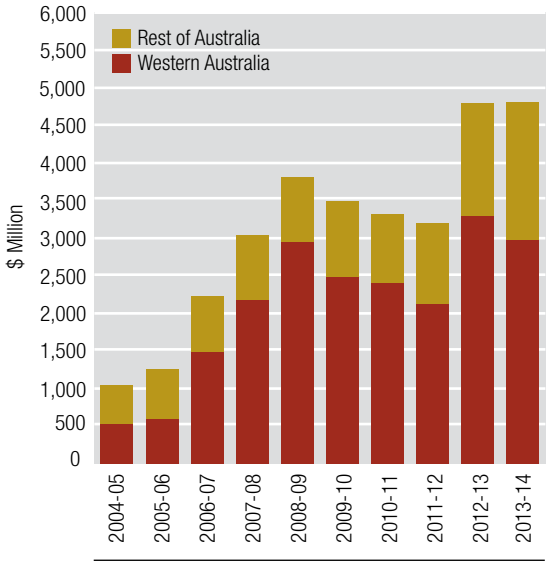


Figure 2 | **Petroleum Exploration Expenditure**
Source: ABS

1.3 MINERAL TITLES

In 2013–14, the total amount of land covered by mineral tenements in force in Western Australia fell by 12 per cent to 54.2 Mha.

Exploration licences covered the majority of mineral tenements (83 per cent) and this is where the largest fall occurred. The actual number of exploration licences fell by 12 per cent from 6503 to 5723, whilst the area fell by 15 per cent from 53 to 45 Mha.

Mining leases accounted for only four per cent (2.4 Mha) of the total area. This area is only 51,000 ha lower than the 2012–13 year. The number of mining leases in force fell by three per cent from 6195 to 6020.

TABLE 1. MINERAL TENEMENTS IN FORCE 1978 ACT

	2009–10		2010–11		2011–12		2012–13		2013–14	
	Number	**000 ha**	**Number**	**000 ha**	**Number**	**000 ha**	**Number**	**000 ha**	**Number**	**000 ha**
Prospecting Licences	7,032	890	7,106	897	7,265	910	6,834	851	6,605	825
Exploration Licences	5,297	44,123	6,050	52,205	6,969	60,396	6,503	52,895	5,723	45,059
Mining Leases	5,764	2,125	5,845	2,233	5,897	2,285	6,195	2,451	6,020	2,400
Other	2,884	4,541	2,995	4,926	3,157	5,323	3,377	5,486	3,507	5,857
Mineral Claims & Other 1904 Act	186	21	186	21	186	21	186	21	186	21
Total	**21,163**	**51,700**	**22,182**	**60,282**	**23,474**	**68,935**	**23,095**	**61,704**	**22,401**	**54,162**

Source: DMP

1.4 PETROLEUM TITLES

In June 2014, the total area covered by petroleum titles in force under Western Australian State legislation was 308,000 km^2.

State petroleum titles are administered under three different Acts:

1. The *Petroleum (Submerged Lands) Act 1982*, which generally applies to the State's territorial sea to the three nautical mile mark, including the territorial sea around State islands.

   A total of 45 titles covering 5400 km^2 were in force under this Act in 2013–14. Pipeline licences accounted for 25 of these titles, production licences ten, retention leases five and exploration permits five.

2. The *Petroleum and Geothermal Energy Resources Act 1967*, which generally covers all onshore areas of the State, including its islands.

   A total of 138 titles covering 303,000 km^2 were in force under this Act, comprising 78 exploration permits covering 224,000 km^{2}and 33 geothermal exploration permits covering 55,000 km^2. Sixteen production licences covered 3000 km^2, five retention leases (412 km^2) and the remaining six comprise other miscellaneous licences/authorities.

3. The *Petroleum Pipelines Act 1969*, which applies to petroleum pipelines on land within the State.

   A total of 90 pipeline licences covering 6000 km^2 were in force under this Act.

TABLE 2. PETROLEUM TITLE AREAS – BY TITLE TYPE

Legislation	Title Type	Area	Blocks	Number of Titles
Petroleum (Submerged Lands) Act, 1982		**5,392.6421 km^2**	**102**	**45**
	Exploration Permit	2,290.1500 km^2	53	5
	Pipeline Licence	614.9500 km		25
	Production Licence	2,018.8048 km^2	29	10
	Retention Lease	1,083.6873 km^2	20	5
Petroleum and Geothermal Energy Resources Act 1967		**302,666.0576 km^2**	**3,973**	**138**
	Access Authority to Deviated Well	0.0000 km^2	0	3
	Drilling Reservation	223.1000 km^2	3	1
	Exploration Permit	223,788.3618 km^2	2,866	78
	Geothermal Exploration Permit	55,425.6294 km^2	782	33
	Petroleum Lease	260.1000 km^2	9	1
	Production Licence	2,973.3664 km^2	48	16
	Retention Lease	411.8900 km^2	8	5
	Special Prospecting Authority with Acreage Option	19,583.6100 km^2	257	1
Petroleum Pipelines Act 1969		**6,002.3263 km**		**90**
	Pipeline Licence	6,002.3263 km		90
		308,058.6997 km^2	**4,075**	**273**

2.1 OVERVIEW

The value of the State's resources sector in 2013–14 increased 20 per cent on the previous financial year to reach a record $121.6 billion.

This increase in value was primarily the result of a 31 per cent increase in the value of iron ore to a record $73.7 billion and a weakening Australian dollar that more than compensated for lower US dollar commodity prices during 2013–14.

Iron ore remained the State's highest value commodity, accounting for 78 per cent of total mineral sales in 2013–14. Project expansions, together with continuing strong demand led by China, saw iron ore achieve record levels of export quantities. This resulted in 631 Mt being exported which was an increase of 23 per cent on the previous financial year.

Other key mineral commodities included gold ($8.8 billion), alumina ($4.2 billion) and nickel ($3.5 billion). The value of gold produced declined two per cent compared to the previous financial year due to lower US and Australian dollar prices, despite a nine per cent increase in production. The value of alumina rose ten per cent, essentially due to higher prices in Australian dollar terms while production remained steady. A nine per cent decrease in the quantity of nickel produced was also offset by higher Australian dollar prices with the overall value declining by just four per cent.

The petroleum sector, which includes crude oil, condensate, LNG, natural gas and LPG (butane and propane), was valued at $26.5 billion, an increase of nine per cent on the previous year. This increase was largely attributed to LNG and to a lesser extent natural gas.

Mineral and petroleum exports comprised around 90 per cent of the State's total merchandise exports, representing the major contribution to Western Australia's 48 per cent of the nation's total merchandise exports. China remains our major trading partner, taking 54 per cent of merchandise exports and is followed by Japan at 18 per cent then South Korea at eight per cent.

ABS figures showed that investment activity in Western Australia fell during 2013–14, with the State's mining industry investing $46.8 billion, a three per cent decrease compared to 2012–13. This result was not unexpected as large investment in mine expansions and new projects transition from construction to production.

Western Australia remained the nation's leading mining investment destination, attracting 52 per cent of total national capital spending valued at $90 billion. Fuelled by strong demand for resource commodities from Asia, new capital expenditure by the State's mining industry has grown at an annual rate of 15 per cent during the five years to 2013–14.

The dominance of the resources sector in the nation's economy is expected to continue given the number of projects which have been expanded or developed, in particular iron ore and LNG. However, investment levels in the State's resources industry will decline as many projects which were under construction will transition to the operational phase. Recent falls in commodity prices have also caused some mining companies to re-evaluate their investment positions.

As at September 2014, Western Australia had an estimated $160 billion worth of resource projects under construction or in the committed stage of development. A further $108 billion has been identified as being allocated to planned or possible projects in coming years.

HIGHLIGHTS IN 2013–14

Iron ore remains the State's most valuable sector of the mining industry, accounting for $73.7 billion (78 per cent) of the mineral sector's total sales. Sales were 31 per cent higher than 2012–13 due to an increased output of 23 per cent (119 Mt) and higher average prices in Australian dollar terms. In total, 631 Mt were sold in 2013–14.

Gold was the second most valuable mineral sector, with total sales of $8.8 billion, representing nine per cent of the mineral sector's total sales. The gold price fell 19 per cent to average US$1296/oz and nine per cent in Australian dollar terms to average A$1412/oz. The quantity sold rose from 6.3 Moz in 2012–13 to 6.9 Moz, an eight per cent increase.

Alumina was the third most valuable mineral in 2013–14 at $4.3 billion, an increase of ten per cent over the previous year. The quantity sold was up marginally by one per cent to 13.7 Mt. Alumina prices fell by around three per cent in US dollar terms, however the weakening Australian dollar negated this fall to achieve a ten per cent increase in Australian dollar terms.

Nickel was the State's fourth most valuable mineral sector. US dollar prices were negatively impacted for the first half of the year, however a combination of rising prices and the weakening Australian dollar resulted in an increase price of around two per cent to producers. The quantity of nickel sales fell by nine per cent to 209,000 t, however the total value fell by four per cent, from $3.6 billion in 2012–13 to $3.5 billion this financial year.

The overall value of **base metals** (copper, lead and zinc) increased by 18 per cent to just under $1.9 billion in 2013–14. Copper dominates this group with total sales of $1.6 billion, up seven per cent on the previous financial year. Sales of lead increased from $35 million to $202 million due to a full year's sales by the Paroo Station project. Zinc output levels fell by three per cent, with the total value of sales rising from $104 million in 2012–13 to $112 million in 2013–14.

The total value of **mineral sands** sales fell a massive 42 per cent to $469 million. Sales revenues were impacted by lower tonnages due to a weakening market for these products.

The value of **salt** sales rose by nine per cent to $416 million in 2013–14 while volumes rose by five per cent to 13 Mt.

In 2013–14, the volume of **diamonds** sold rebounded by 21 per cent to 11.6 Mct. Increased tonnages and higher grades from the Argyle underground mine accounted for this improvement.

Coal prices remained static whilst output and values were both lower by 15 per cent to reach 6.4 Mt and $264 million respectively.

Output for **cobalt**, as a by-product of nickel mining, fell by nine per cent to 5832 t and higher prices translated into a ten per cent increase in sales value which reached $177 million.

Petroleum, which includes crude oil, condensate, LNG, natural gas and LPG (butane and propane) was valued at a record $26.5 billion, an increase of nine per cent. The rise can be attributed to LNG and domestic gas.

LNG was the most valuable petroleum product in the State in 2013–14 with output increasing marginally to reach a record 20 Mt. The sales value of LNG increased by 16 per cent to reach a record $14.4 billion. LNG production is forecast to grow in the period ahead with supply from new projects coming on stream including Gorgon and Wheatstone.

Production of **crude oil**, the second most valuable petroleum product in 2013–14, fell by four per cent to 46 MMbbl, with sale values falling to $5.7 billion. Crude oil is continuing its downward trend due to maturing fields, however the latest Apache find offshore in the Canning Basin could turn this trend around.

During the period, the value of **condensate** increased by three per cent to $4 billion whilst output fell nine per cent to 35 MMbbl.

In 2013–14, domestic **natural gas** sales increased by 12 per cent to 9.7 Bcm while the value of sales rose by 21 per cent to $1.7 billion. Output of **LPG (butane and propane)** decreased by 16 per cent with the sales value also decreasing to $586 million, down eight per cent on the previous financial year.

Western Australia's mineral and petroleum resources, in order of value for 2013–14, were:

Commodity	$A Billion
Iron Ore	73.7
LNG	14.4
Crude Oil and Condensate	9.8
Gold	8.8
Alumina	4.3
Nickel	3.5
Others	7.1
Total	**121.6**

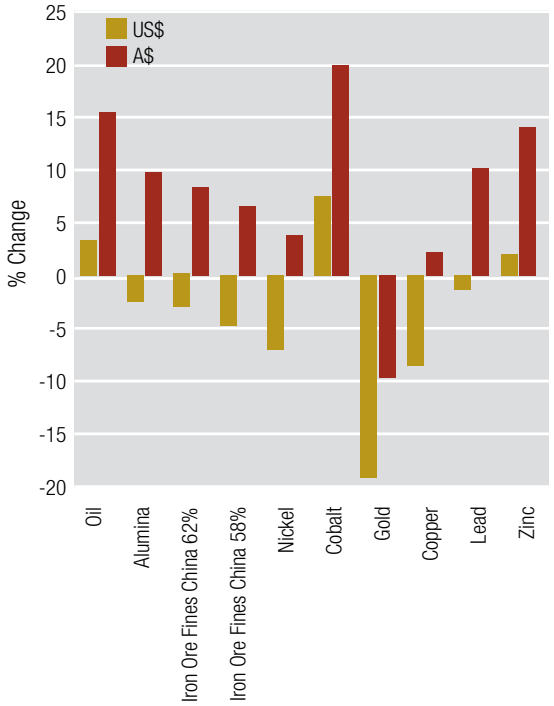


Figure 3 | **Average Price Comparison 2012–13 and 2013–14**
Source: LME, Kitco, Metal Prices, WATC and DMP

Figure 4 | **Exchange Rate Trade-Weighted Index (units of foreign currency per A$)**
Source: Reserve Bank of Australia

Definition: "Trade-weighted index" is the average value of A$ in relation to the currencies of Australia's major trading partners.

RESERVE BANK OF AUSTRALIA (RBA) COMMODITY PRICE INDEX

The Reserve Bank of Australia Commodity Price Index is based on the price of 20 major commodities exported by Australia. These commodities collectively account for around two-thirds of total commodity exports. The index is apportioned into three sections – rural, non-rural and base metals.

The non-rural section of the index comprises base metals (which consist of aluminium, copper, nickel, zinc and lead), as well as gold, coking coal, steaming coal, iron ore, alumina, crude oil and LNG. The index is compiled monthly and is expressed in US dollars, Australian dollars and Special Drawing Rights (SDR).

The RBA's index, expressed in US dollar terms, is useful because most commodities traded in world markets are in US dollars. However, such an index is subject to changes in the US dollar exchange rate (as it is based on spot prices). In this respect, the SDR index is a better indication of underlying supply and demand for commodities than the US dollar index.

SDR is a unit of account used by the International Monetary Fund (IMF). Its value is based on a basket of currencies comprising the euro, Japanese yen, English pound and US dollar. Weights are assigned to each of these currencies to reflect their relative importance in world terms. The RBA expresses the SDR component of its index in US dollar terms, with commodity prices derived from the London Metal Exchange and Bloomberg and converted to monthly averages of daily data.

Alternatively, the Australian dollar index is useful for gauging the domestic currency price received by Australian commodity exporters, as it reflects the interrelation between world commodity prices and the Australian exchange rate. For example, if prices in foreign currency terms remain unchanged but the Australian dollar depreciates, this will be recorded as a favourable upward shift in the index – which would not be evident in either the SDR or US dollar index.

The RBA index is a fixed-weight Laspeyres index, using 2008–09 as the base year. The index is re-based periodically in order to make long-run reliable comparisons, unlike the national accounts that are re-based annually to track short-run movements. Base-period weights indicate the relative importance given to individual commodities. These weights change over time to reflect changes in the composition of commodity exports. Movements in the index from one period to the next reflect underlying price movements and do not take into account changes in volumes.

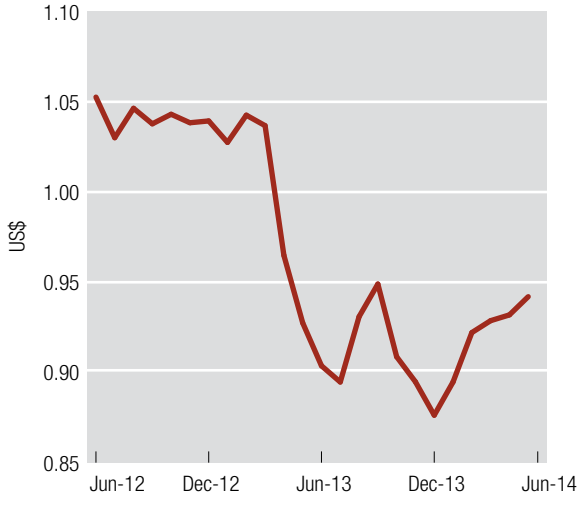


Figure 5 | **Exchange Rate US$/A$**
Source: Reserve Bank of Australia

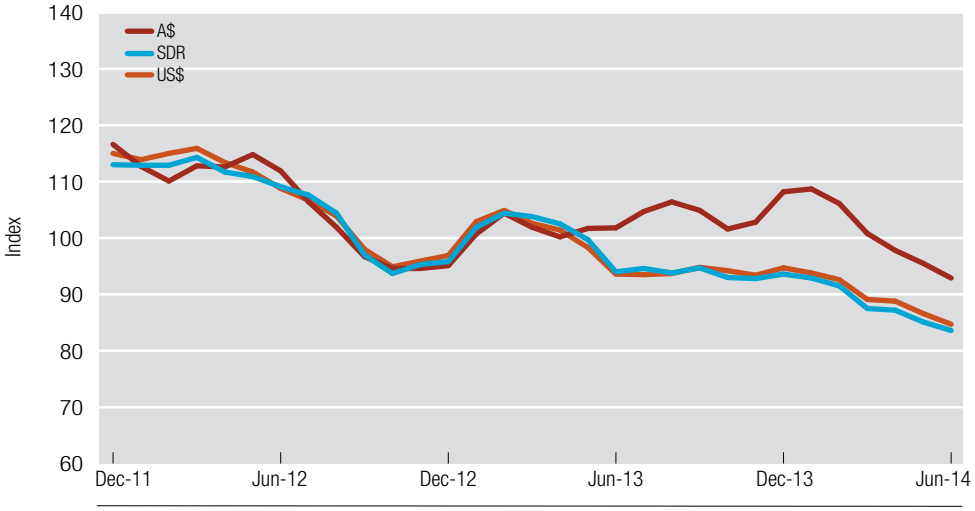


Figure 6 | **Non-rural Commodity Price Index (2012–13 = 100)** Source: Reserve Bank of Australia

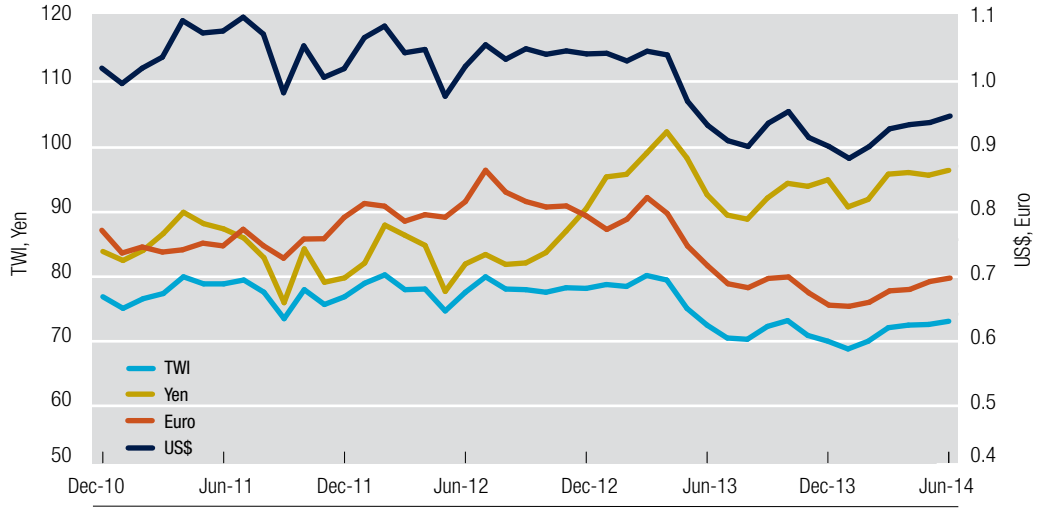


Figure 7 | **Australian Dollar Exchange Rate against Major Currencies (May 1970 = 100)**
Source: Reserve Bank of Australia

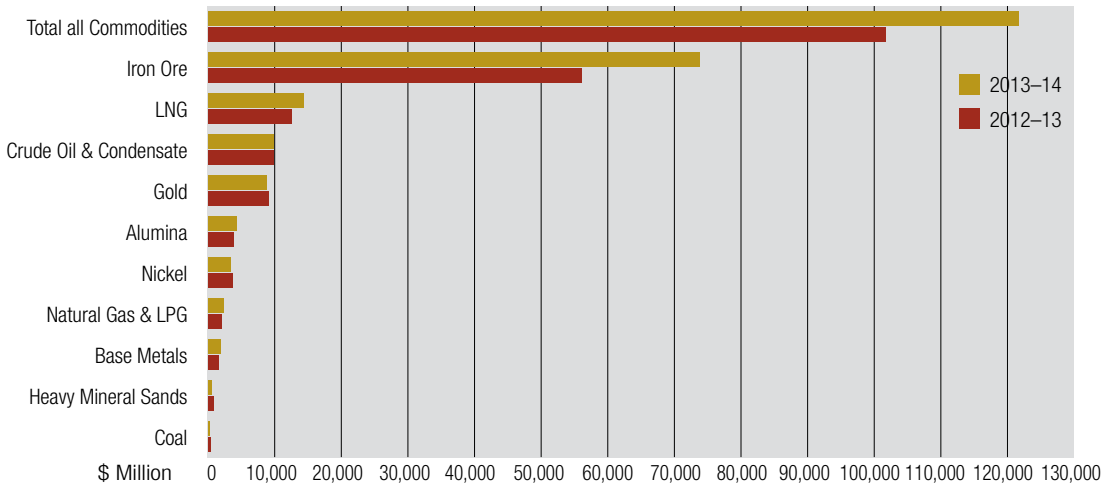


Figure 8 | **Major Commodities by Value** Source: DMP

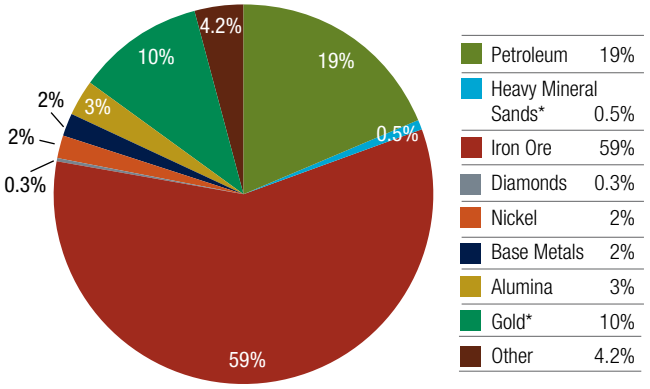


Figure 9 | **Western Australian Mineral and Petroleum Exports 2013–14 – Total Value $118.7 Billion** Source: DMP

** Includes $3.9 billion of gold and $151 million of heavy mineral sands refined/processed and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.*

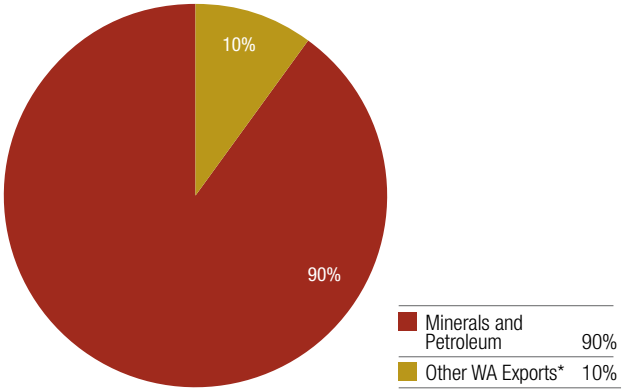


Figure 10 | **Western Australian Merchandise Exports 2013–14 $131.8 Billion** Source: DMP and ABS

** Other includes wheat, wool, wood chips, live animals, seafood, meat, pearls and other agricultural and manufactured items*

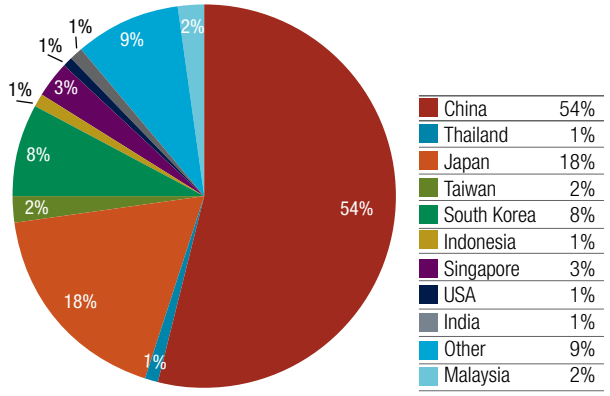


Figure 11 | **Western Australian Merchandise Exports by Country 2013–14 – $131.8 Billion** Source: ABS

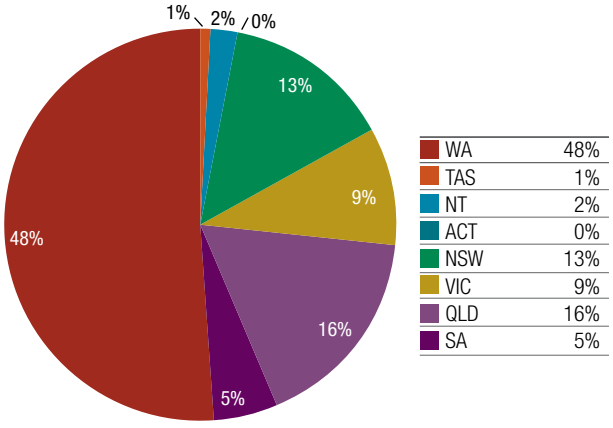


Figure 12 | **Australian Merchandise Exports 2013–14 $274.5 Billion** Source: ABS

Note: These percentages are based on data which includes $15.3 billion of re-exported goods and of no State origin available and account for around 6% of the total.

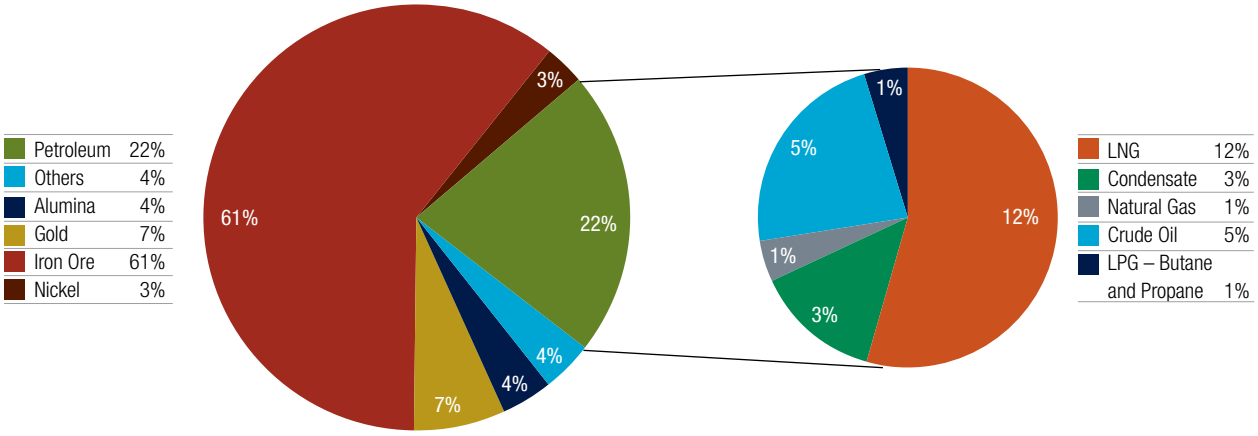


Figure 13 | **Value by Commodity 2013–14 – $121.6 Billion** Source: DMP

2.2 IRON ORE

Over the past ten years, the State's iron ore industry has experienced a period of unprecedented growth fuelled in the main by demand from China. On average, the annual growth in the value of sales during this period has been 30 per cent per annum whilst output has increased 12 per cent per annum.

In 2013–14, iron ore sales output increased by 119 Mt, or 23 per cent, from 2012–13 to reach a record 631 Mt. The value of sales increased 31 per cent to reach a record $73.7 billion. As a result, iron ore continued to be the most valuable resource sector in Western Australia, accounting for 61 per cent of the total value of the State's mineral and petroleum sales.

China continued to receive the majority of Western Australia's iron ore exports, accounting for 77 per cent or $54 billion of the total amount shipped in 2013–14. Other major markets included Japan (12 per cent), South Korea (eight per cent) and Taiwan (two per cent).

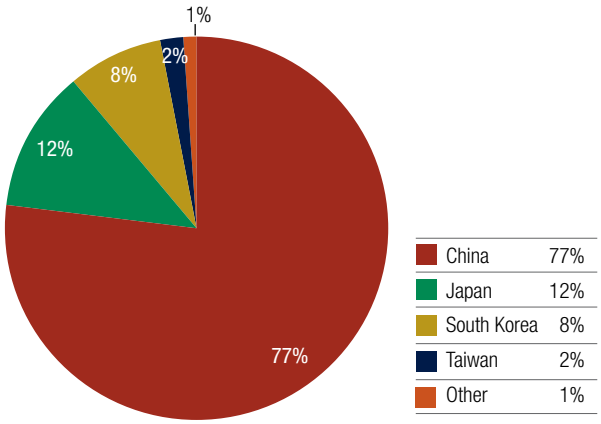


Figure 14 | **Iron Ore Exports – Total Value $70.2 Billion**
Source: DMP

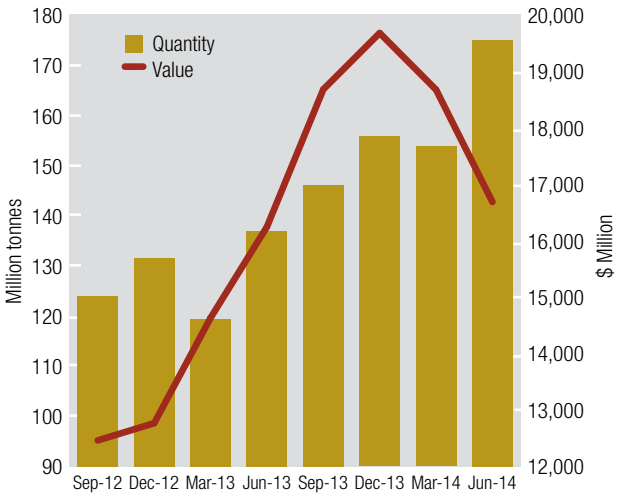


Figure 15 | **Iron Ore Quantity and Value by Quarter**
Source: DMP

Iron Ore Producers

Direct Shipped Ore (DSO)

Whilst the larger iron ore operations and nine smaller mines are based in the Pilbara region of Western Australia, there are also five mines in the Mid West region, three in the Kimberley region and two in the Wheatbelt. Ninety-five per cent of production comes from the Pilbara region.

BHP Billiton Limited and Rio Tinto Limited (together with various joint venture partners) accounted for around 76 per cent of the sales value of the State's iron ore in 2013–14.

Rio Tinto is the largest iron ore producer in the Pilbara region and is the second largest supplier to the world's iron ore trade. Its wholly owned subsidiary Hamersley Iron Pty Ltd owns eight mines, comprising Brockman 2–Nammuldi, Brockman 4, Marandoo, Western Turner Syncline, Mt Tom Price, Paraburdoo and Yandicoogina.

Hamersley also operates several other mines through joint ventures:

- Channar (60 per cent – a joint venture with an Australian subsidiary of the China Iron & Steel Trade Group);
- Eastern Range (54 per cent – a joint venture with Shanghai Boasteel Group Corporation);
- Hope Downs (50 per cent – a joint venture between Rio Tinto Iron Ore and Hancock Prospecting Pty Ltd); and
- Robe River Iron Ore Operation (53 per cent – a joint venture with Robe River Iron Associates) which includes Mesa A–Warramboo, Mesa J and West Angelas.

BHP Billiton is the State's second largest iron ore producer, operating seven mine sites including one of the biggest single-pit open cut iron ore mines in the world – the massive Mt Whaleback mine, which was established in 1968. It is more than 5 km long and nearly 1.5 km wide. Nearby are the smaller orebodies 29, 30 and 35. Smaller satellite mines Wheelarra and orebodies 18, 23, 24 and 25 are outside the town of Newman. Other mines include Jimblebar, Yandi, Mining Area C and Yarrie.

Fortescue Metals Group (FMG), with its Chichester Ranges Cloud Break and Christmas Creek mines and the Solomon Firetail mine, is the third-largest mining company in the Pilbara. FMG exports ore through its Herb Elliott port at Port Hedland.

Other DSO producers comprise:

- Cliffs Natural Resources, which operated the Koolyanobbing mine (50 km north of Southern Cross in the Wheatbelt region).
- Atlas Iron Limited, which operated five iron ore mines during 2013–14 in the Pilbara region: Pardoo, Wodgina, Abydos, Mt Dove (now closed) and Mt Webber. These operations use road haulage and ship through Port Hedland.
- Karara Mining Ltd (a joint venture between Gindalbie Metals Limited and Anshan Iron and Steel Group Corporation), which operated the Karara DSO and magnetite project (200 km east of Geraldton).
- Mineral Resources Limited, which operated three mines: Carina (100 km north of Southern Cross), Poondano (30 km southeast of Port Hedland) and Phils Creek (100 km northwest of Newman).
- Sinosteel Midwest Corporation Limited, which operated two open pits at Koolanooka (160 km southeast of Geraldton) which are now closed and two open pits at Blue Hills–Mungada (approximately 70 km east of Koolanooka).
- Mount Gibson Mining Ltd, which operated the Tallering Peak mine 175 km east of Geraldton, the Extension Hill mine 260 km east-southeast of Geraldton and the Koolan Island hematite mine, located in Yampi Sound off the Kimberley coast.
- BC Iron Ltd, which operated the Nullagine project (a 75:25 joint venture with FMG) that utilises FMG's rail infrastructure, located 50 km south of the mine, to export its product through FMG's Herb Elliott port.
- Pluton Resources Limited and Wise Energy Group Company Limited (50:50 joint venture), which operated the Cockatoo Island project 200 km north of Broome in the Kimberley region. The Cockatoo Island mine is only accessible by sea and air, and produces high-grade, low impurity ore (greater than 66 per cent Fe) and is the only known subsea mining operation in the world.
- Kimberley Metals Group Pty Ltd, which operated Ridges iron ore project (165 km south of Wyndham in the Kimberley region). KMG commenced shipping out of Wyndham in July 2011 and plans to export 1.5 Mt/a over a five-year period.
- Moly Mines Ltd, which operated one of the smaller operations – the Spinifex Ridge molybdenum–copper project (located 170 km east of Port Hedland) that produced around 1 Mt/a of iron ore fines.
- Atlantic Limited, which operated the Windimurra vanadium mine, (located 70 km east-southeast of Mt Magnet) that produced small quantities of high titanium iron ore, but ceased operations in the December quarter of 2013 due to weak market conditions.

DSO Expansions/New Projects in the Pilbara Region

Over the past ten years, both Rio Tinto and BHP Billiton have significantly expanded their Western Australia Pilbara operations. With the completion of the majority of this development, they have now moved into an increased output stage of their operations.

BHP Billiton's expansion plans to increase annual capacity to 220 Mt was achieved during 2013–14 ahead of schedule. This included:

- developing Orebody 24 (approximately 10 km northeast of Newman);
- expansion of the Jimblebar mine;
- expansion of the Port Hedland Inner Harbour; and
- development of port-blending and railyard facilities to optimise resources and enhance efficiency across the supply chain.

Rio Tinto's expansions:

- phase-one expansion of the Pilbara mines, ports and railways from 230 Mt/a to 290 Mt/a was completed in May 2014; and
- rail duplication and track work for phase-two of the expansion to 360 Mt/a was completed, and critical port infrastructure is expected to be completed by June 2015.

FMG's operations were expanded to 155 Mt/a during 2013–14. Expansions included additional infrastructure at Herb Elliott port, 120 km of mainline rail duplication and a new 130 km rail spur to the new Kings mine at Solomon. The Kings mine was commissioned at the end of 2013.

Development of the 55 Mt/a Roy Hill iron ore project (277 km south of Port Hedland) continued, with plans to commence exporting by 2015. Ownership of the project is 70 per cent Hancock Prospecting Pty Ltd and 30 per cent a consortium comprising POSCO, Marubeni Corporation and China Steel Corporation. Roy Hill will feature a remote-operations centre based in Perth.

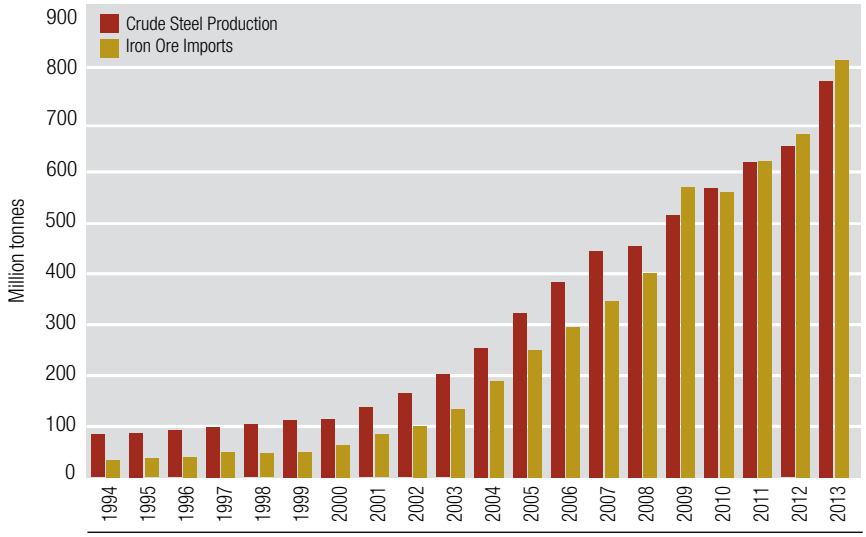


Figure 16 | **China's Crude Steel Production and Iron Ore Imports**
Source: TEX Report and Interfax China Ltd

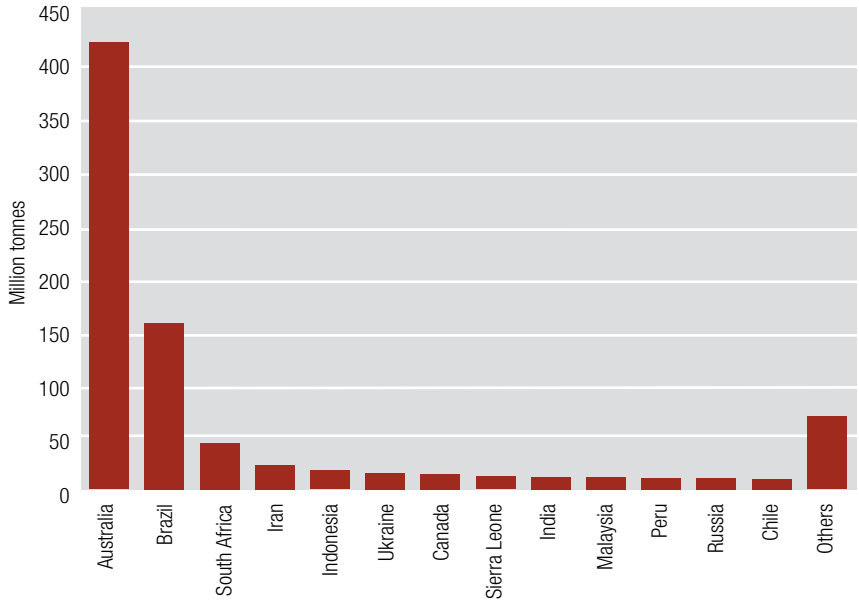


Figure 17 | **China's Iron Ore Imports by Country for 2013** Source: TEX Report

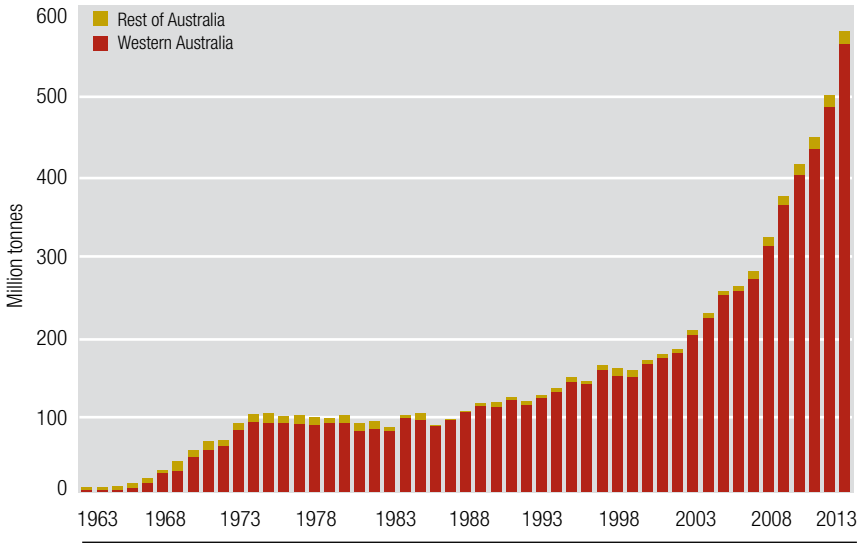


Figure 18 | **Iron Ore Quantity** Source: DMP and BREE

Magnetite Ore

Prior to 2013, all iron ore mined in Western Australia had been in the form of hematite (also known as 'direct shipped' ore, as it can be fed directly into iron-making blast furnaces).

While hematite does not have to undergo costly concentration to make it saleable, Chinese steel producers have well-established technology for producing steel with magnetite. This, combined with Western Australia's extensive reserves of magnetite, has seen Chinese producers supporting the development of a number of magnetite projects.

The first shipment of magnetite ore from Western Australia departed Geraldton in January 2013 bound for China. This ore was produced by Gindalbie Metals Ltd (operator) and Anshan Iron and Steel Group Corporation (a 48:52 joint venture) from the Karara magnetite operation. The site is located 140 km southwest of Mt Magnet and ore is shipped out of the Geraldton Port. By July 2013, Gindalbie announced the production of its first-ever batches of premium quality (68 per cent Fe) magnetite concentrate.

After encountering several technical setbacks, CITIC Pacific Limited's Sino magnetite mine commenced shipments out of the new Cape Preston port in the December quarter of 2013. CITIC originally planned to have first shipments commence in early 2009 with exports of 27.6 Mt/a (a mixture of high-grade iron ore concentrate and pellets) over a period of 25 years.

CITIC Pacific Ltd is the largest specialist steelmaker in China and acquired mining rights from Mineralogy for two billion tonnes of magnetite, with rights and options for a further four billion tonnes.

Supply and Demand

Western Australian iron ore sales increased significantly in 2013–14 to 631 Mt (up by 119 Mt, or 23 per cent, on the previous financial year) as new projects and expansions became operational.

In 2013, the international iron ore trade totalled 1339 Mt, an increase of nine per cent on the previous year. Trade has been dominated by demand from China, which accounted for 61 per cent (820 Mt) of total world imports. Other major global importers were Japan with 136 Mt and South Korea with around 63 Mt.

Western Australia contributed 51 per cent of China's iron ore imports in 2013 and, in 2013–14, China accounted for over three-quarters, or $53 billion, of the total iron ore shipped from Western Australia.

Chinese steel demand is driven by consumption in the infrastructure sector and will continue to play an important role in the future of the Western Australian iron ore industry. New home prices in China fell in July 2014, in almost all cities that the government tracks, boosting concerns that economic growth is faltering. This sector accounts for about 67 per cent of seaborne ore.

Plentiful supply also weighed on ore prices, and forced low-grade producers from China and less traditional suppliers to curtail production. It is forecast that about 125 Mt of high-cost iron ore output will exit the market in 2014–15.

The uncertain economic outlook resulted in Western Australian producers, (and potential producers) reassessing expansion and development plans. In the main, the two largest producers have maintained their expansion programs whilst ensuring costs are kept to a minimum. Cost pressures and long-term commodity prices will undoubtedly affect existing and new capacity coming into production.

Iron Ore Prices

Iron ore prices softened in the June quarter reflecting a slowdown in Chinese growth and increases in worldwide production, putting downward pressure on record high prices. Iron ore prices peaked at US$194/t for lump and US$189/t for fines in 2011.

The Australian dollar fell below parity with the US dollar in May 2013 and averaged 92 cents for the 2013–14 year. Compared to the previous year, the Steel Index (TSI) US dollar price for 62 per cent fines spot CFR China fell by a little over three per cent to average US$123/t. In Australian dollar terms, however, the price increased by over eight per cent to average A$134/t.

By the end of the June quarter, indications that the increases in supply and pressures on demand for steel became evident. TSI prices for 62 per cent fines spot CFR China continued a downward trend that commenced in December 2013, reaching A$99 for the first time since late 2012.

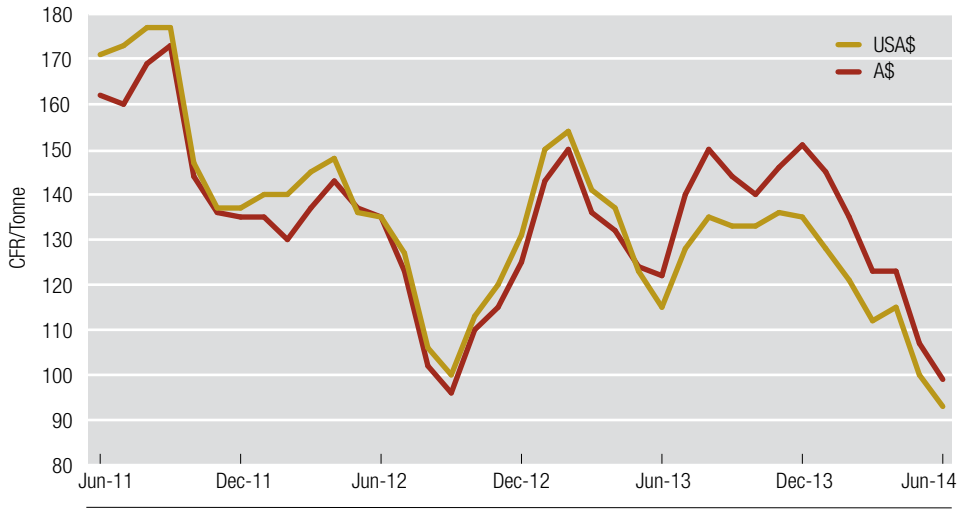


Figure 19 | **Iron Ore Fines (Average TSI price 62% Fines CFR China)**
Source: Metalprices

2.3 PETROLEUM

The value of petroleum products produced in State areas (onshore and offshore) and in adjacent Commonwealth offshore areas amounted to a record $26.5 billion in 2013–14. These areas combined represented 22 per cent of the total value of resource sales for Western Australia, placing petroleum as the second most valuable resource sector after iron ore.

At a national level, Western Australia remains the nation's premier petroleum producer, accounting for 65 per cent of natural gas production (including natural gas, coal seam methane and LNG feedstock) and 62 per cent of crude oil and condensate production.

Reduced outputs of crude oil, LPG and condensate, as well as falling oil prices, were offset by increases in LNG and domestic gas output and a weakening Australian dollar. This resulted in an increase of nine per cent in the overall value of petroleum sales in 2013–14 compared to the previous year

LNG was the major contributor to petroleum sales, accounting for 54 per cent of the total value. This was followed by crude oil and condensate with 22 per cent and 15 per cent respectively. Together these commodities accounted for 91 per cent of total sales. The remainder comprised natural gas (seven per cent) and LPG (two per cent).

A total of $22 billion of the petroleum produced was exported, with Japan taking the largest share at 60 per cent. China followed with $2.5 billion (11 per cent) and South Korea $2.3 billion (ten per cent). Thailand and Singapore followed with five per cent each. The remaining nine per cent was shared between countries including Malaysia, Taiwan and Papua New Guinea.

Over the past ten years, the value of petroleum sales has increased, on average, by ten per cent each year. This impressive record of growth is set to continue as large gas projects are developed off the State's northwest coast to meet Asia's growing energy needs. It is forecast that Australia will become the largest LNG exporter after Qatar by 2016.

Liquefied Natural Gas (LNG)

LNG is currently produced from the North West Shelf Joint Venture project and Woodside's Pluto project, commissioned in mid-2012. While these projects are located in Commonwealth offshore areas, the North West Shelf Joint Venture project is unique in that Western Australia receives a 65 per cent grant from royalties collected by the Commonwealth via a long-standing agreement.

In 2013–14, reported LNG output rose marginally by one per cent to a record 20 Mt. The value of output rose by 16 per cent to reach $14.4 billion. This increase

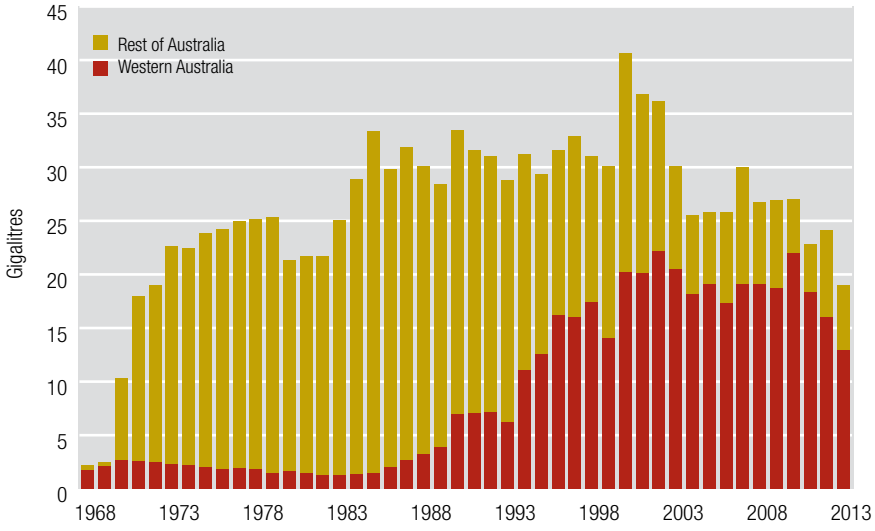


Figure 20 | **Crude Oil and Condensate Quantity** Source: DMP, BREE and EnergyQuest

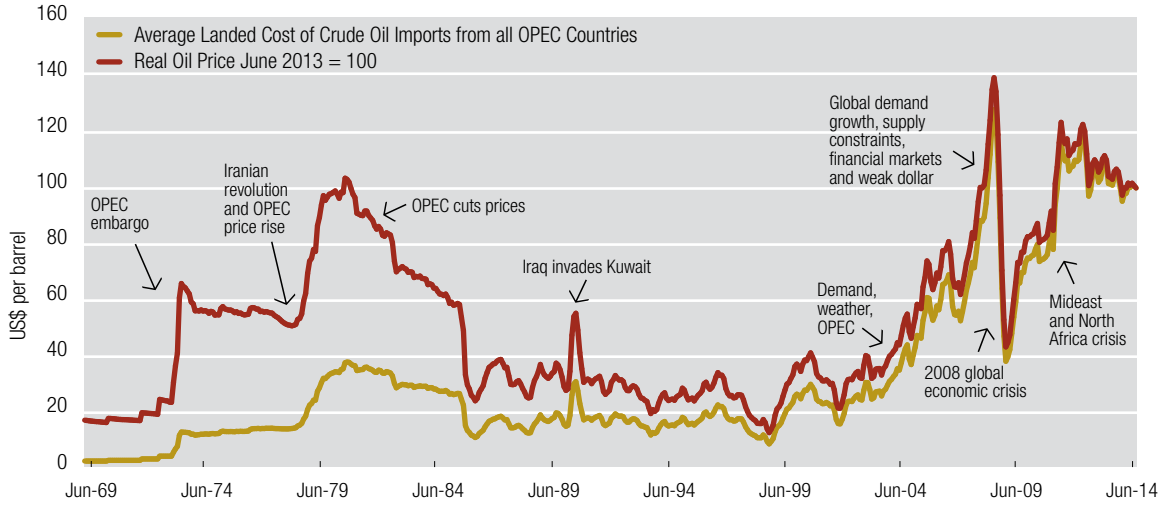


Figure 21 | **Historic Oil Prices** Source: Energy Information Administration, US Department of Energy, DMP

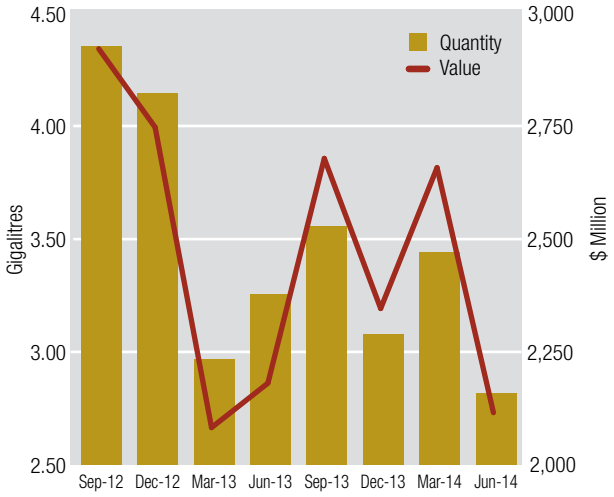


Figure 22 | **Crude Oil and Condensate Quantity and Value by Quarter** Source: DMP

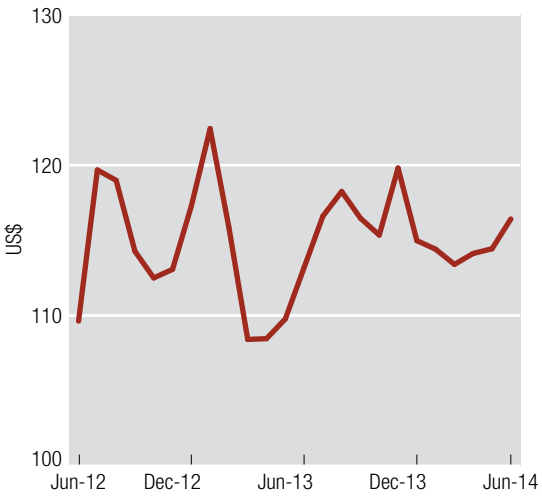


Figure 23 | **Tapis Crude Oil Price US$/bbl** Source: WA Treasury Corporation

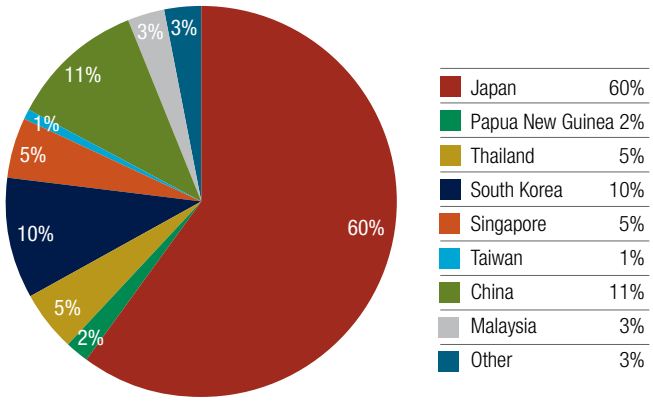


Figure 24 | **Petroleum Exports – Total Value $22 Billion** Source: DMP and ABS

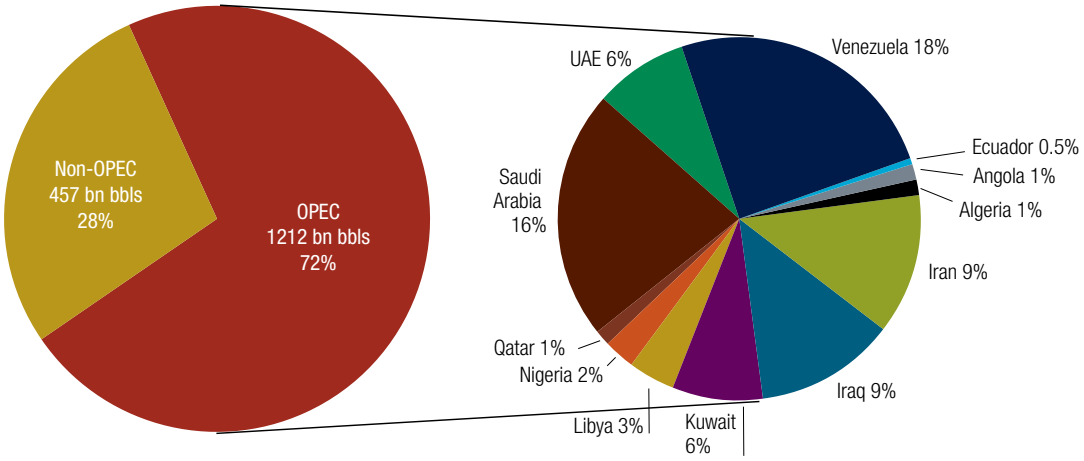


Figure 25 | **OPEC Share of World Crude Oil Reserves 2013** Source: BP World Energy Statistics 2014

was due to slightly higher oil prices (a large portion of LNG contracts are benchmarked to the oil price), in US dollar terms, and a weaker Australian dollar. In addition, a portion of sales occurred at new prices following price reviews.

On a smaller scale, Wesfarmers Ltd utilises these gas resources at its small-scale LNG plant in Kwinana. Opened in 2009, the LNG plant has the capacity to produce 175 t/d and supports Australia's largest fleet of LNG road tankers.

The North West Shelf Joint Venture LNG quantity published in the Digest is sourced from Woodside's quarterly Australian Stock Exchange reports. A value is obtained by multiplying this quarterly figure by an LNG price using Woodside's published share of LNG sales revenue.

Crude Oil and Condensate

The value of crude oil sales fell from $6 billion in 2012–13 to $5.7 billion in 2013–14, a decrease of four per cent. In volume terms, crude oil output fell by 15 per cent to 46 MMbbl or 7.3 million kL. This decrease was mainly attributable to a general decline in maturing fields. However, with Apache's recent oil find in the offshore Canning Basin, this trend could reverse.

Over the course of 2013–14, the price of oil based on a combination of Brent, West Texas Intermediate (WTI) and Tapis averaged US$108.72/bbl. This represented a three per cent increase compared to the equivalent average price in 2012–13.

ORGANISATION OF PETROLEUM PRODUCING COUNTRIES

OPEC is a permanent intergovernmental organisation of twelve oil-exporting developing nations that coordinates and unifies the petroleum policies of its member countries.

There are currently 12 member countries of OPEC comprising Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela.

Most OPEC oil is produced for export, whereas many non-OPEC countries, such as the United States, produce oil primarily to meet their domestic demand for petroleum.

Non-OPEC countries account for less than a quarter of the world's proven oil reserves, but produce 41 per cent of the world's oil. They also possess the majority of the world's capacity for refining crude oil into petroleum products such as gasoline and heating oil.

Producers (State areas)

- AWE Energy Ltd – Dongara
- Buru Energy Ltd – Ungani
- Empire Oil & Gas NL – Red Gully
- Chevron Australia's Barrow Island (which has been producing oil since 1967) and Thevanard Island
- Apache Energy Ltd's Harriet (40 per cent Commonwealth share)

Producers (Commonwealth areas)

The major crude oil producers in 2013–14 were located in the Carnarvon Basin off the northwest coast, with other operations located in the Perth and Canning Basins.

Carnarvon Basin producers include Australia's largest oil project in the last decade, the BHP Billiton-operated Pyrenees development. Pyrenees extracts crude from the Ravensworth, Crosby and Stickle fields and is located around 45 km off the coast of Exmouth. BHP Billiton also operates the Stybarrow project.

The next-largest crude oil producer is the Woodside-operated North West Shelf Joint Venture which includes the Cossack, Hermes and Wanaea fields. Woodside also operates the Enfield and Vincent projects in joint venture with Mitsui (40 per cent).

Other Carnarvon Basin operators include:

- Apache Energy Ltd's Stag and Van Gogh projects
- Vermillion Energy's Wandoo
- Santos Ltd's Mutineer Exeter (Fletcher Finucane)

Perth Basin operators include:

- Roc Oil's Cliff Head

Overall, volumes were generally down in 2013–14, mainly due to oilfield natural decline. The main exception was the Fletcher Finucane oil project, which commenced in May 2013 and is tied-back to the Mutineer–Exeter facilities.

Against a background of declining production from maturing fields, exploration will play a key role in supporting future output of crude oil in both State and Commonwealth areas.

As a by-product from natural gas fields, nearly all condensate production comes from fields located on the North West Shelf. In 2013–14, a total of 35 MMbbl, or 5.6 million kL, of condensate was sold, representing a fall of nine per cent. In sales-value terms, this was worth $4.1 billion, an increase of three per cent from the previous year.

The North West Shelf Joint Venture (Angel, Athena, Goodwyn, Hermes, North Rankin and Wanaea) accounted for 87 per cent of the total in 2013–14. Woodside's Pluto and Apache's John Brookes, Reindeer and Halyard projects, Origin Energy Resources Ltd's Beharra Springs and Empire Oil & Gas NL's Red Gully contributed the remaining 13 per cent.

The volume of LPG (butane and propane) sold in 2013–14 fell by 16 per cent to 630,636 kL, with the total value of LPG sales falling by eight per cent to $586 million.

Domestic Natural Gas Supply

The quantity of natural gas supplied into the domestic market in 2013–14 rose by 12 per cent to 9.7 Bcm compared to the previous year. The value of domestic gas sales, based on the summation of total domestic gas sales values at the point of entry into the Dampier To Bunbury Natural Gas Pipeline (DBNGP), Parmelia pipeline and Goldfields pipeline, increased by 21 per cent to reach $1.7 billion.

The graph included showing the price of domestic gas in Western Australia is calculated on this value and the aforementioned total volume of sales.

The average price of gas sold into the DBNGP in Western Australia rose by eight per cent in 2013–14 and averaged $4.69/GJ.

Producers

The North West Shelf Joint Venture (Angel, Cossack, Goodwyn, Hermes, North Rankin and Wanaea) accounted for 47 per cent (4.7 Bcm) of domestic gas in 2013–14.

Apache Energy Ltd (East Spar, Harriet, John Brookes and Reindeer) was the second-largest producer of domestic gas in 2013–14.

BHP Billiton's Macedon field which opened in September 2013 followed in third place.

Empire Oil & Gas NL (Red Gully), AWE Exploration Ltd (Corybas and Dongara), and Origin Energy Resources Ltd (Beharra Springs) made up the balance.

Devil Creek Domestic Gas Project (Reindeer field)

The Devil Creek project is a joint venture between Apache (55 per cent) and Santos (45 per cent). The Devil Creek gas plant is located approximately 45 km southwest of Dampier and has the capacity to supply up to 215 TJ/d into the domestic market. The Reindeer field supplies gas to the Devil Creek facility at a rate of around 110 TJ/d and produces around 500 bbl/d of condensate.

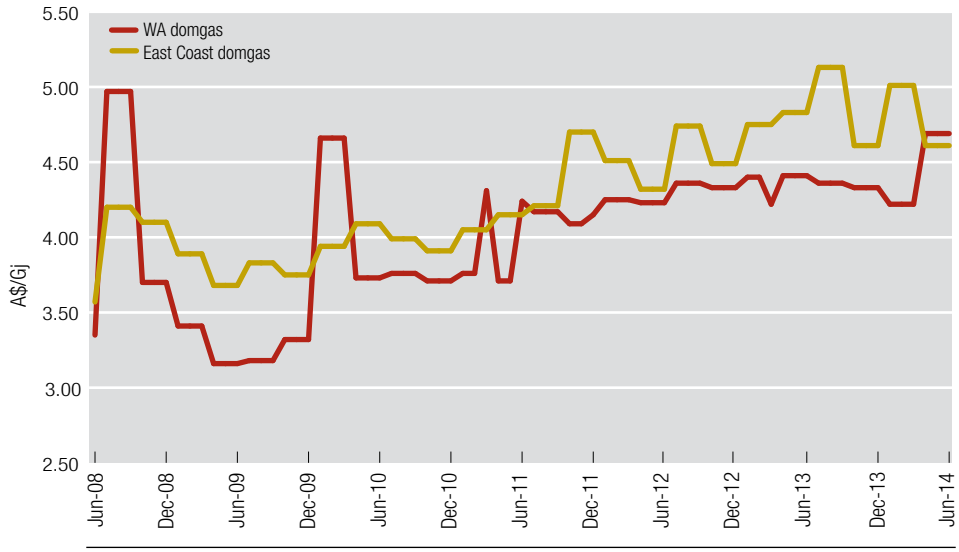


Figure 26 | **Average Natural Gas Prices** Source: EnergyQuest and DMP

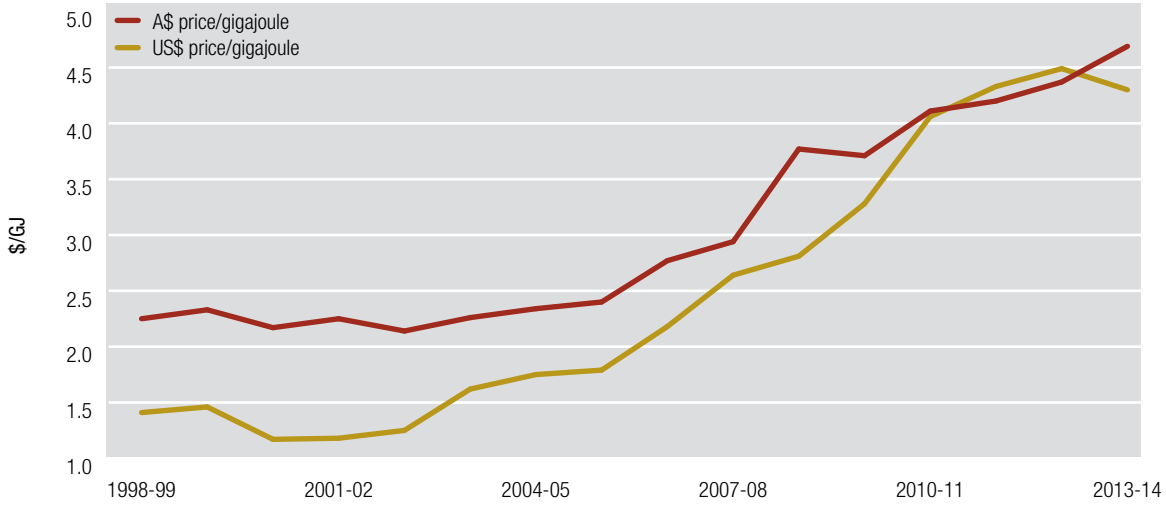


Figure 27 | **Western Australian Average Domestic Natural Gas Price** Source: DMP
The value of Western Australian domestic gas sales is based on the summation of total domestic gas sale values as at the point of entry into the Dampier To Bunbury Natural Gas Pipeline (DBNGP) or where applicable, the Parmelia pipeline and Goldfields pipeline.

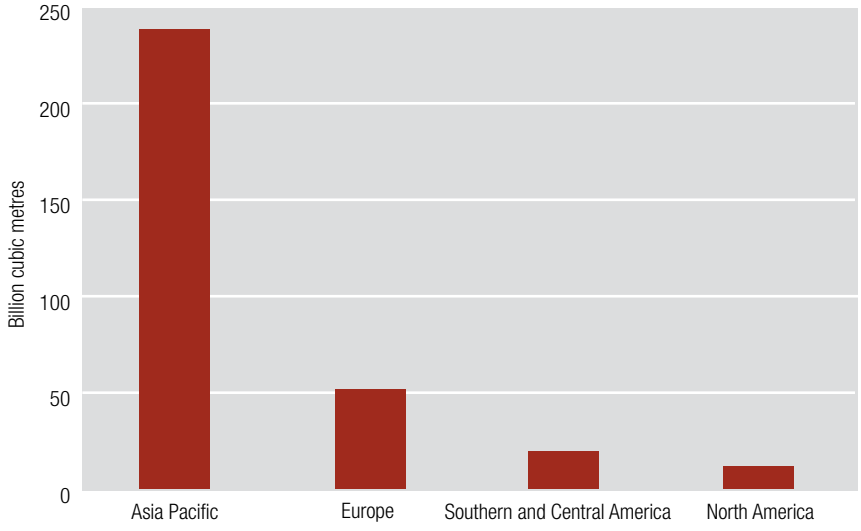


Figure 28 | **World LNG Imports by Region 2013**
Source: BP World Energy Statistics 2014

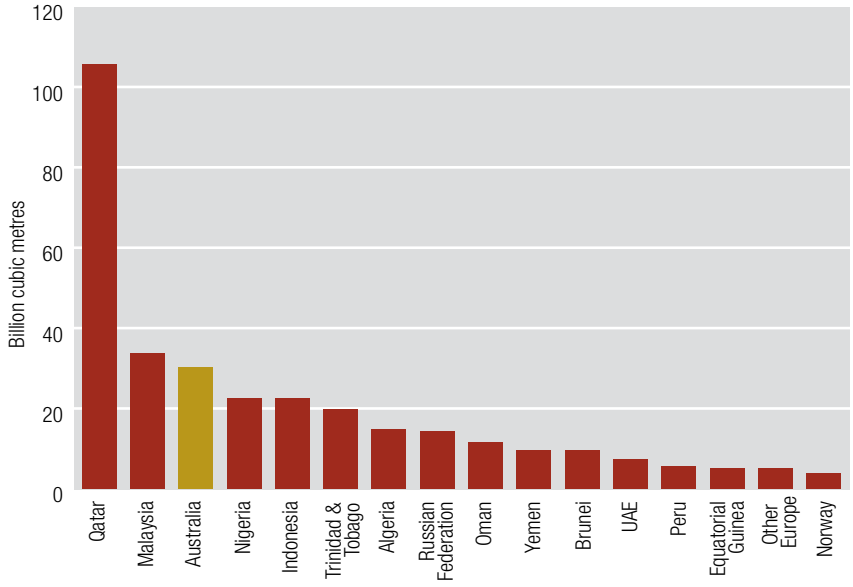


Figure 29 | **World LNG Rankings 2013**
Source: BP World Energy Statistics 2014

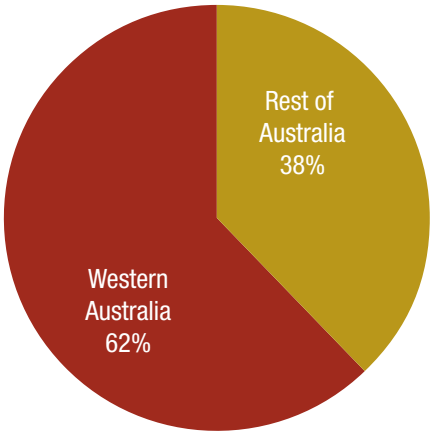


Figure 30 | **Crude Oil and Condensate Production 2013–14**
Source: EnergyQuest

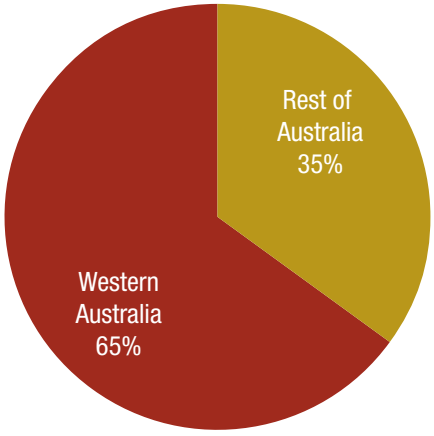


Figure 31 | **Natural Gas Production 2013–14**
Source: EnergyQuest

Petroleum Development Projects

Gorgon

The Gorgon Project is operated by Chevron. It is a joint venture of the Australian subsidiaries of Chevron (approximately 47.3 per cent), ExxonMobil (25 per cent), Shell (25 per cent), Osaka Gas (1.25 per cent), Tokyo Gas (1 per cent) and Chubu Electric Power (0.42 per cent).

The US$54 billion project is developing the Gorgon and Jansz–Io gasfields, located within the Greater Gorgon area, around 130 km off the northwest coast of Western Australia. The Greater Gorgon area gas fields are Australia's largest-known conventional gas resource and contain approximately 40 Tcf of gas.

The project will comprise three LNG trains, a domestic gas plant, condensate handling facilities, carbon dioxide injection facilities and associated utilities. Constructed on Barrow Island, the LNG trains will have the capacity to produce a combined 15 Mt of LNG per year, with the first LNG expected to be exported in mid-2015.

Under the *Barrow Island Act 2003*, the joint venturers are required to reserve 2000 PJ of gas for the domestic gas market. A domestic gas plant will progressively supply up to 300 TJ/d, starting from 2015.

The Gorgon development will also be required to implement geosequestration as a means of reducing carbon emissions from the project. As a result, the Gorgon project will include the world's largest commercial-scale greenhouse-gas storage site. Successful implementation of this would make the Gorgon project one of the first projects worldwide to implement geosequestration commercially.

Wheatstone

Construction on the US$29 billion Wheatstone project at Ashburton North, 12 km west of Onslow on the Pilbara coast, began in late 2011. The Chevron-led project includes a two-train, 8.9 Mt/a LNG facility and a domestic gas plant. The project is planned to eventually comprise five LNG processing trains producing up to 25 Mt of LNG per year.

The Wheatstone project is a joint venture between Australian subsidiaries of Chevron (64.14 per cent), Apache (13 per cent), Kuwait Foreign Petroleum Exploration Company (KUFPEC) (13.4 per cent), Kyushu Electric Power Company (1.46 per cent), and PE Wheatstone Pty Ltd (part-owned by TEPCO, eight per cent).

Eighty per cent of the Wheatstone project's foundation two-train capacity will be supplied by natural gas from the Wheatstone and Iago fields, which are operated by Chevron Australia in joint venture with Australian subsidiaries of KUFPEC and Kyushu Electric Power Company, together with PE Wheatstone Pty Ltd. The remaining 20 per cent of gas will be supplied from the Apache and KUFPEC Julimar and Brunello fields.

The Wheatstone project is expected to produce its first LNG in early 2016.

Julimar and Brunello

Apache, in joint venture with KUFPEC (35 per cent), is developing its Julimar and Brunello fields which will supply gas to the Chevron-operated Wheatstone LNG project. This will be a phased development over 20 years, with first gas expected in late 2016. Julimar and Brunello will produce approximately 1.65 Mt/a of LNG, 36 TJ/d of gas for the domestic market and 1.8 MMbbl of condensate per year.

Prelude and Concerto

In May 2011, Shell took a final investment decision to building the world's first floating liquefied natural gas (FLNG) facility for their Prelude project which is located in the Browse Basin and anticipates operations will commence in early 2017.

The FLNG facility will be the largest floating structure ever built at 488 m long and 74 m wide. Once constructed, the facility will be towed to the Prelude field where it will be permanently moored for its 25 year project lifespan. The proposed FLNG is expected to have a capacity to produce around 3.6 Mt/a of LNG as well as LPG and condensate for export. The Concerto field will also be developed as part of this project.

Prelude and Concerto have approximately 3 Tcf of liquids-rich gas.

The drilling development program will be supported out of Broome whilst the supply base will be located in Darwin.

Shell is supporting and working with education providers and universities in Western Australia to improve research and education in offshore engineering. The Global FLNG Training Consortium in Western Australia is a partnership between Shell, The Challenger Institute and Curtin University.

Parties with an interest in the project include Shell Development Australia Pty Ltd (67.5 per cent), INPEX Corporation (17.5 per cent), Korea Gas Corporation (ten per cent) and CPC Corporation (five per cent).

Browse Joint Venture
Woodside, as operator, in partnership with Shell Development (Australia) Pty Ltd, BP Developments Australia Pty Ltd, Japan Australia LNG (MIMI Browse) Pty Ltd, and PetroChina International Investment (Australia) Pty Ltd is aiming to develop the three Browse gas and condensate fields, of Brecknock, Calliance and Torosa. Combined, these fields contain an estimated 15.9 Tcf of dry gas and 436 MMbbl of condensate.

A recent marine survey of the Leveque Shelf (a sub-basin of the Browse Basin) by Geoscience Australia in collaboration with the Australian Institute of Marine Science identified additional areas which could potentially change Commonwealth and State marine boundaries for the Browse gas and condensate project.

The joint venture participants have elected to use Shell's FLNG technology and Woodside's offshore development expertise as the concept to commercialise the three Browse gas fields. The joint venture plans to be in a position to consider the commencement of front-end engineering and design (FEED) in the second half of 2014 and then a final investment decision is targeted for the second half of 2015.

Coniston–Novara
Apache, in joint venture with INPEX Corporation (47 per cent), is developing its Coniston–Novara oilfields which are located in the Exmouth Sub-basin and lie just north of the Van Gogh field. The two fields will be tied back to infrastructure already in place for Van Gogh and will utilise the Ningaloo Vision Floating Production, Storage and Offloading vessel (FPSO). Coniston reserves are estimated at 15.7 MMbbl and it is expected to be producing in the third quarter of 2014.

Balnaves
Another development by Apache, in joint venture with KUFPEC 35 per cent, is the isolated Balnaves field. Reserves are estimated at 17 MMbbl of oil and 30 Bcm of gas. The site is located in the northern Carnarvon Basin around 180 km northwest of Dampier and is on track to be producing in the third quarter of 2014.

Greater Western Flank
The NWS Joint Venture is developing the first phase of the Greater Western Flank (GWF) project which is the next major development in the North West Shelf project.

The broader GWF area consists of 16 fields located to the southwest of the Goodwyn A platform and is estimated to hold up to 3 Tcf of recoverable gas and up to 100 MMbbl of recoverable condensate.

The GWF first phase will develop the Goodwyn GH and Tidepole fields, via a subsea tie-back to the existing Goodwyn A platform, at an estimated cost of $2.5 billion with project start-up expected early in 2016.

Ichthys
The Ichthys field in the Browse Basin has an estimated resource of 12.8 Tcf of gas and 527 MMbbl of condensate. In September 2008, INPEX, and its joint venture partner Total, selected Middle Arm Peninsula at Blaydin Point in Darwin Harbour as the preferred site for development for Ichthys' onshore infrastructure. The project's total cost has been estimated at more than $20 billion.

The joint venture partners for the Ichthys LNG project are INPEX (66.070 per cent), Total (30 per cent), Tokyo Gas (1.575 per cent), Osaka Gas (1.2 per cent), Chubu Electric (0.735 per cent) and Toho Gas (0.42 per cent).

Scarborough
ExxonMobil and BHP Billiton, in a 50:50 joint venture, are studying the development of the huge Scarborough and Thebe fields located in the Carnarvon Basin, 220 km northwest of Exmouth in 900 m of water. Scarborough is estimated to hold approximately 10 Tcf of gas. Thebe (100 per cent owned by BHP Billiton) is estimated to contain between 2 and 3 Tcf of gas.

It is one of the most remote of the Carnarvon Basin gas resources. The focus for the development of the Scarborough field is an FLNG plant. ExxonMobil has commenced the environmental referral process for a FLNG and further engineering and design work is being undertaken before a final concept decision is made.

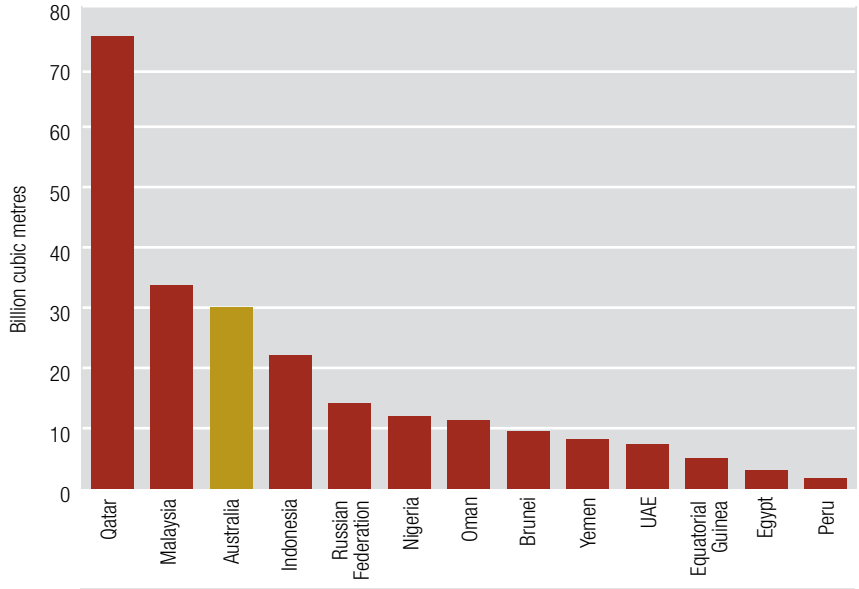


Figure 32 | **Asia–Pacific Region LNG Imports 2013 by Exporting Country**
Source: BP World Energy Statistics 2014

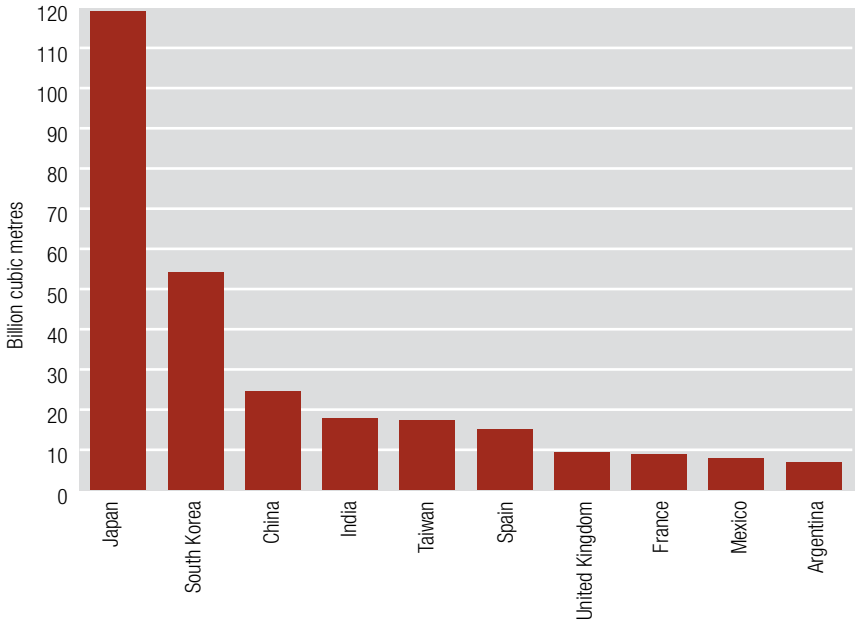


Figure 33 | **Countries Importing LNG in 2013**
Source: BP World Energy Statistics 2014

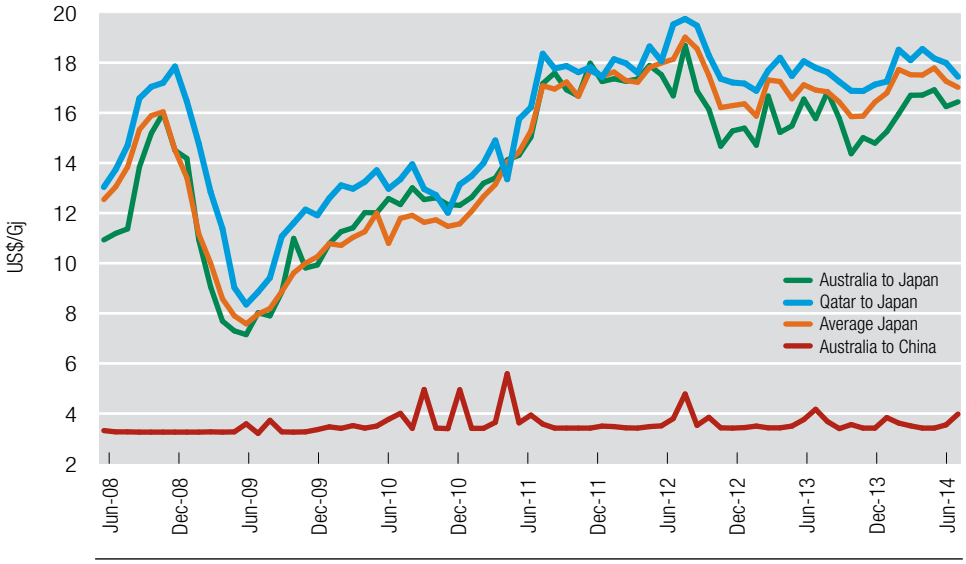


Figure 34 | **LNG Import Prices** Source: Argus Monthly LNG (Prices include freight and regassing)

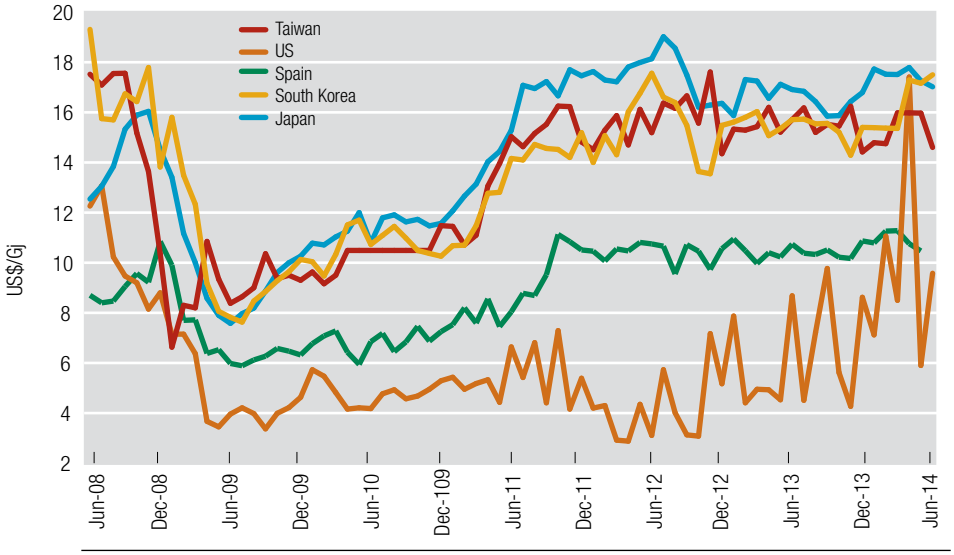


Figure 35 | **Average LNG Import Prices** Source: Argus Monthly LNG (Prices include freight and regassing)

2.4 GOLD

Western Australia is the country's major gold producer, accounting for around 70 to 75 per cent of total gold production and seven per cent of all mineral and petroleum sales in Western Australia in 2013–14.

While output increased by nine per cent on the previous financial year to 6.3 Moz (195 t), the total value of sales, at $8.8 billion, was two per cent lower.

The gold price averaged US$1296/oz in 2013–14, representing a 19 per cent decrease from 2012–13. In Australian dollar terms, the gold price averaged $1422/oz, which was nine per cent lower than the previous year.

Gold has a dual character as both a commodity and a monetary asset. Over the past ten years the gold price has risen on average 13 per cent per year, reaching an all-time record of US$1895/oz in early September 2011.

In general, forecasts indicate that gold prices will remain relatively high for some time in comparison to historic levels. The average US dollar gold price just prior to the global financial crisis in 2007–08 was just $823/oz.

Western Australia's ten largest projects accounted for 63 per cent of total output:

- Boddington (Newmont Boddington Gold Pty Ltd) – 22 t
- Golden Mile (Kalgoorlie Consolidated Gold Mines Pty Ltd) – 20.5 t
- Telfer Gold (Newcrest Mining Limited) – 18 t

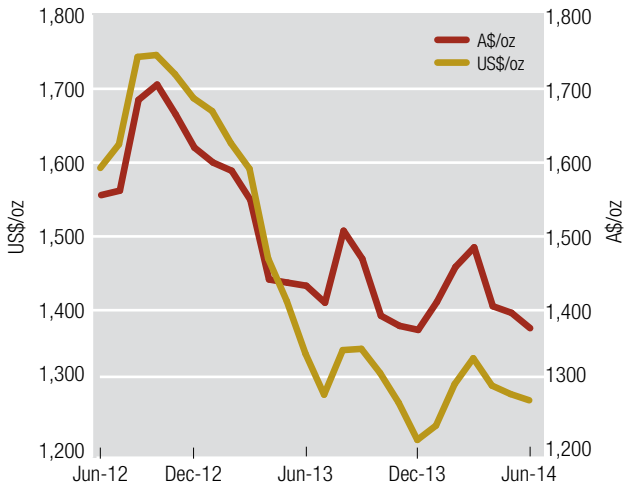


Figure 36 | **Gold Price** Source: Perth Mint and London Fix

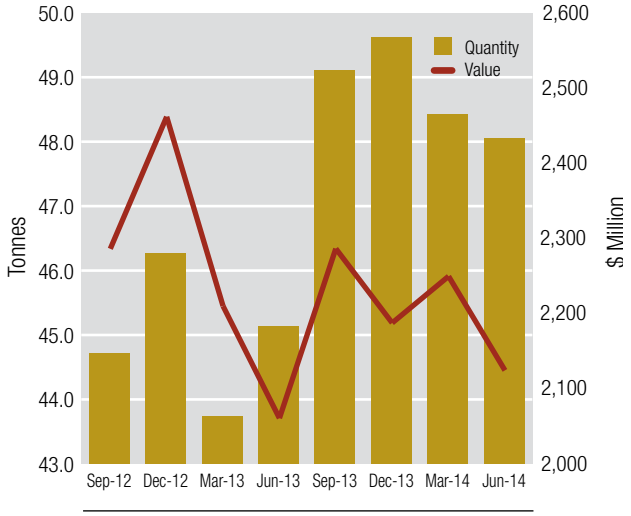


Figure 37 | **Gold Quantity and Value by Quarter** Source: DMP

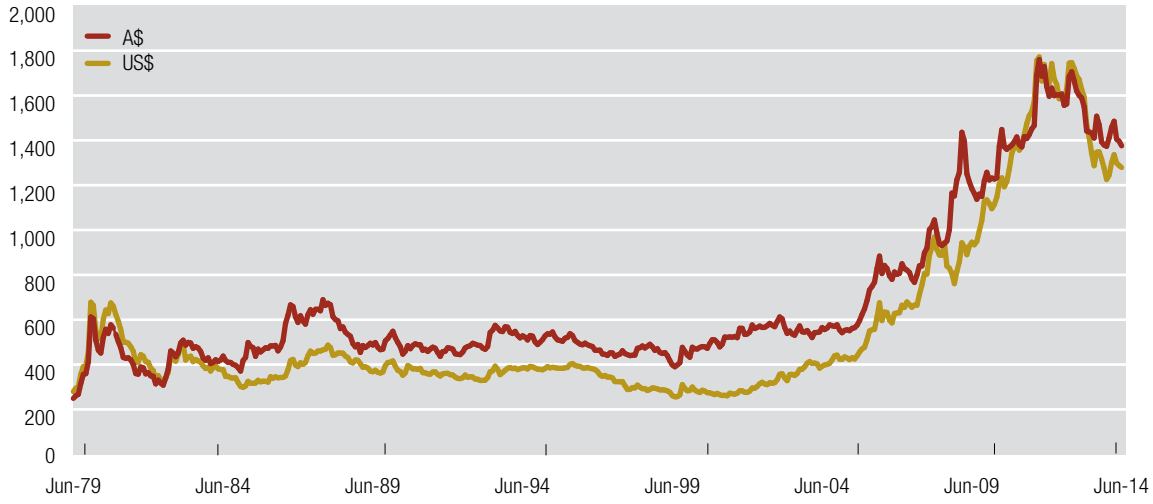


Figure 38 | **Historic Gold Price, per Ounce** Source: Perth Mint and London PM Fix

- St Ives (Gold Fields Ltd) – 11.7 t
- Tropicana (AngloGold Ashanti Limited) – 10.7 t
- Granny Smith (Gold Fields Ltd) – 9.6 t
- Sunrise Dam (AngloGold Ashanti Limited) – 9.2 t
- Jundee–Nimary (Newmont Mining Corp) – 8.4 t
- Gwalia–Leonora (St Barbara Limited) – 6.6 t
- Agnew (Gold Fields Ltd) – 5.4 t
- Higginsville (Metals X Limited) – 5.2 t

The AngloGold Ashanti Limited/Independence Group NL joint venture of the Tropicana Gold Mine commenced the commissioning of its mine in the June quarter of 2013. This low-cost mine, commenced production in the December 2013 quarter. Tropicana is located 330 km east-northeast of Kalgoorlie and is projected to produce approximately 470,000 oz/a.

Gold exports from the State totalled $12.7 billion in 2013–14; however, only 70 per cent of this amount ($8.8 billion) is attributable to Western Australian mines (see Gold Export Update 2013–14 in this section).

China dominated gold exports from Western Australia, accounting for 64 per cent of total gold exports. Singapore was second with 18 per cent, followed by the United Kingdom at five per cent. Other destinations included Thailand and Turkey (four per cent each) and a host of other countries made up the balance.

In the second half of 2011, the high gold price encouraged producers to expand existing mines and exploit previously non-commercially viable deposits. It also resulted in an increase in exploration expenditure in Western Australia, however, with softer gold prices exploration expenditure in 2013–14 fell by 37 per cent to $295 million compared to 2012–13. With the easing of the gold price and rising costs, several producers have re-evaluated their operations or, in some cases, closed.

GOLD EXPORT UPDATE 2013–14

The Australia Bureau of Statistics (ABS) released Western Australian export trade data which show exports of gold that are significantly higher than gold produced in this State. This apparent increase in gold exports from Western Australia is due to a restructuring of Australia's gold-refining industry in the late 1990s through to October 2002. Gold export data published by the ABS must therefore be interpreted with some caution.

Gold Corporation or, as it is more commonly known, The Perth Mint, operates Australia's only London Bullion Market Association (LBMA) accredited gold refinery. It refines gold produced in other Australian states and territories, gold from surrounding countries and also secondary gold, mainly from Asia, which is refined and exported from Western Australia.

This export figure for Western Australia is therefore larger than Western Australia's own level of gold production.

The Victorian refinery still refines silver and jewellery products.

The ABS estimates that gold exports from Western Australia in 2013–14 amounted to approximately $12.7 billion. Approximately 70 per cent or $8.8 billion was gold produced in Western Australia. The remaining 30 per cent (approximately $3.9 billion) can be attributed to gold refined and exported from Western Australia, but produced from mining operations elsewhere in Australia and overseas.

Overseas imported gold also includes scrap which is refined in Western Australia and exported.

Supply and Demand

In 2013–14, overall world gold demand reached 3905 t, a fall of 15 per cent over the previous financial year. This then translated into a 32 per cent decline in overall value to US$163 billion in 2013–14. Jewellery demand fell by five per cent whilst technology (electronics, dentistry and other industrial uses) was down two per cent.

In 2009, the central banks became a net buyer of gold for the first time in 21 years, signalling the end of an era in which the central banks had been a source of significant supply to the gold market. Central bank purchases in 2013–14 fell 12 per cent to reach 428 t from 485 t in 2012–13.

Total bar and coin demand fell by 26 per cent, with India and China dominating consumer demand in 2013–14, together accounting for 54 per cent of the global jewellery, bar and coin demand.

The lower gold price impacted on the supply side of recycled gold primarily due to consumers holding onto their stocks of old gold as the profit motive waned along with the gold price. In the period 2013–14, recycled gold fell 17 per cent from 1463 to 1218 t.

The World Gold Council reported that world mine production reached 3097 t (up six per cent). China is ranked at the top of the list of world mine production at 15 per cent, with Australia holding second place at nine per cent. The Russian Federation is now in third place at 8.3 per cent and the United States is fourth with 7.7 per cent. South Africa and Peru follow both with six per cent.

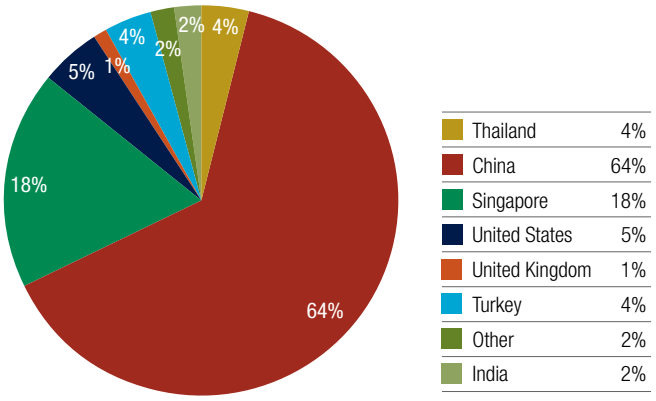


Figure 39 | **Gold Exports – Total Value $12.7 Billion** Source: ABS and DMP

Note: Includes gold refined/processed and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.

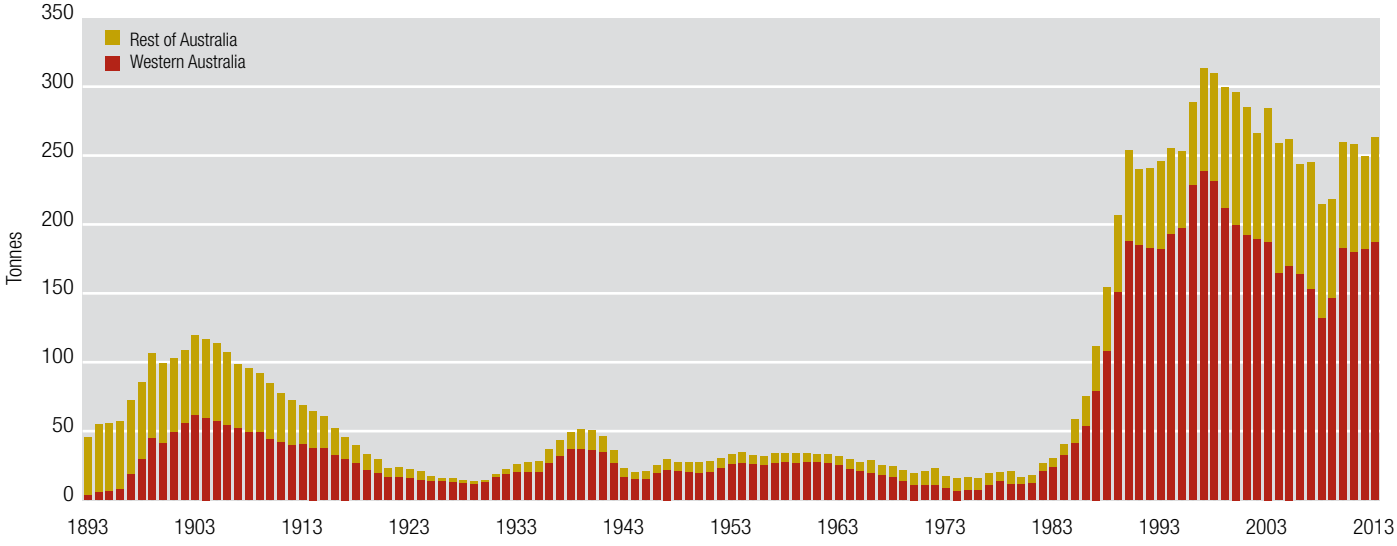


Figure 40 | **Gold Production** Source: DMP and BREE

2.5 ALUMINA

The total value of alumina sales in Western Australia amounted to $4.3 billion in 2013–14, which was an increase of ten per cent on 2012–13. As one of the State's key value-added products, alumina was Western Australia's fourth-largest sector in terms of value after iron ore, petroleum and gold, accounting for almost four per cent of all mineral and petroleum sales.

In 2013–14, the total quantity of alumina produced in Western Australia increased marginally from the previous year to a record 13.7 Mt. The State's alumina production has increased steadily over the past ten years at a modest annual growth rate of two per cent.

In Australian dollar terms, the alumina price during 2013–14 rose by ten per cent from the previous year to an average of $310/t. Alumina prices in US dollar terms averaged US$285/t in 2013–14, down three per cent.

Alumina (aluminium oxide) is a white granular material produced from the refining of bauxite. Around 90 per cent of the world's alumina is smelted to produce aluminium metal. Around two tonnes of alumina is required to produce one tonne of aluminium.

Aluminium has become the second most used metal in the world after steel. Its unique combination of properties makes it suitable for many applications, most notably with respect to the automotive industry, due to its high strength-to-weight ratio. It is also unique in that it is 100 per cent recyclable, with nearly three-quarters of all aluminium produced remaining in use today.

Aluminium prices averaged US$1763/t in 2013–14, a fall of nine per cent on the previous year.

Australia is the world's largest bauxite producer and the second-largest producer of alumina. In 2013–14, Western Australia produced 62 per cent of the country's total alumina output. The State's bauxite reserves are estimated to be capable of sustaining more than 50 years of alumina production at current levels.

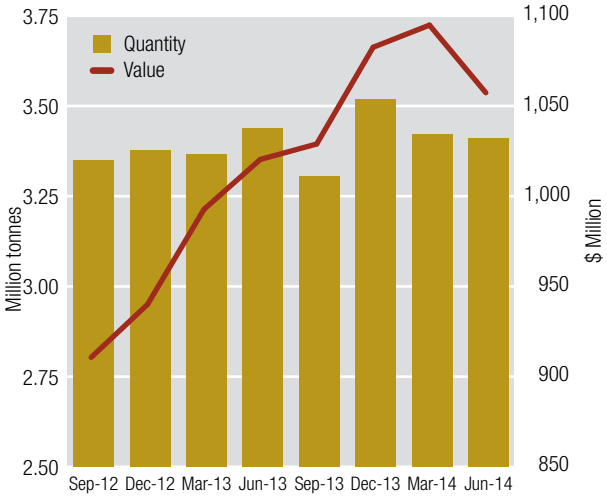


Figure 41 | **Alumina Quantity and Value by Quarter** Source: DMP

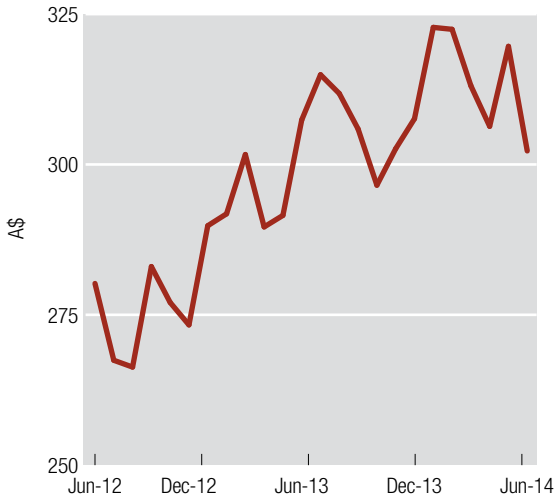


Figure 42 | **Alumina Price – A$/tonne** Source: ABS

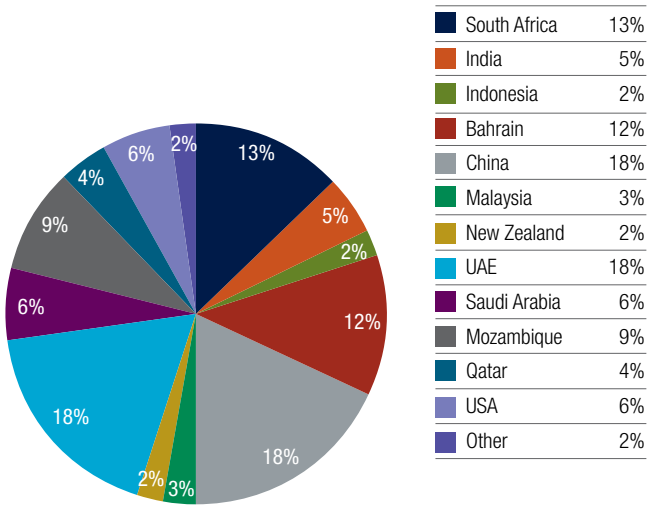


Figure 43 | **Alumina Exports – Total Value $3.4 Billion** Source: DMP

Current production of alumina is focused in the South West region of the State, with the Darling Scarp containing considerable deposits of bauxite. The 13.7 Mt of alumina sold in 2013–14 was accounted for by two producers: Alcoa World Alumina and Worsley Alumina Pty Ltd. Both producers' refineries are located within close proximity to their bauxite mines and shipping facilities, which allows economical processing of relatively low-grade bauxite.

Alcoa's first bauxite mine at Jarrahdale opened in 1963 to supply the Kwinana alumina refinery and produced 168 Mt before closing in 1998. The company currently has two operating bauxite mines, Huntly and Willowdale. Huntly was established in early 1976 to supply bauxite to Alcoa's alumina refineries in Kwinana and Pinjarra and is currently the largest bauxite mine in the world. Willowdale was established in 1984 to supply bauxite to the Wagerup refinery. Combined, the three refineries have a production capacity of around 14 Mt of alumina per year.

In May 2012, Alcoa was granted a five-year extension by the State Government to expand its Wagerup alumina refinery to a maximum production capacity of 4.7 Mt/a. The planned expansion was suspended in November 2008 due to the global financial crisis.

Worsley Alumina Pty Ltd established its bauxite mine and alumina refinery in the early 1980s. The mine is located near Boddington and the bauxite is transported 51 km by conveyor belt to the refinery at Worsley. Alumina is then transported 50 km by rail and exported through the port of Bunbury.

The US$3.4 billion expansion and efficiency upgrade of the Worsley alumina refinery reached nameplate capacity during the year from 3.5 to 4.6 Mt/a.

Around 80 per cent of the alumina produced in Western Australia was exported in 2013–14, with the remainder shipped by Alcoa to its aluminium smelter in Victoria. The State's main export markets in 2013–14 were China and the United Arab Emirates which both took 18 per cent of the total amount exported. South Africa and Bahrain both took 12 per cent and Mozambique nine per cent. The United States and India took five per cent and the balance went to a host of other destinations. China is the world's largest consumer and a major producer of aluminium.

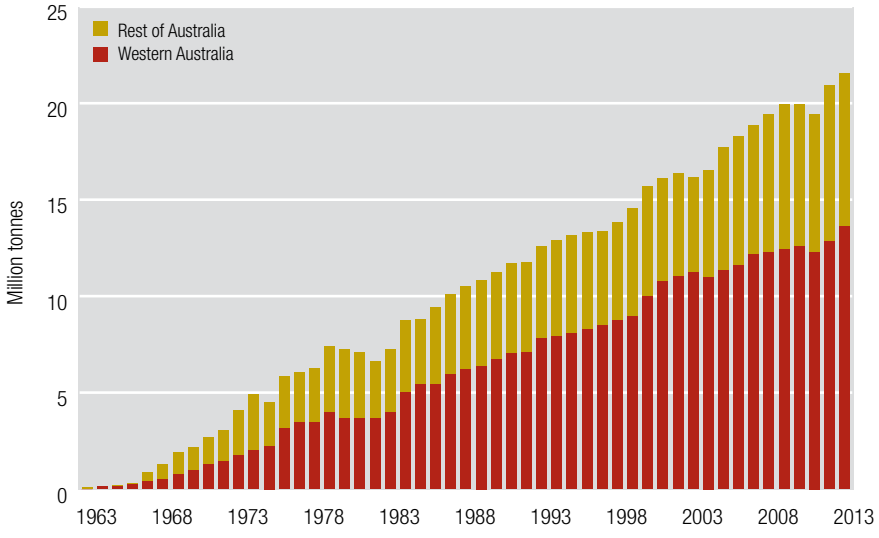


Figure 44 | **Alumina Quantity** Source: DMP and BREE

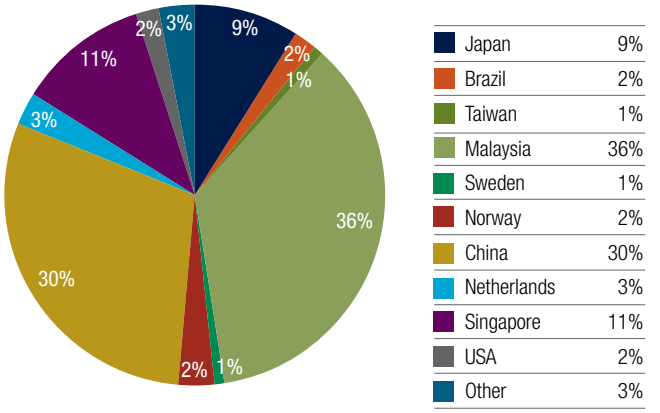


Figure 45 | **Nickel Exports – Total Value $2.6 Billion** Source: DMP

2.6 NICKEL

Australia holds 35 per cent of worldwide economic nickel resources amounting to 24 Mt. Western Australia has the largest proportion of Australia's economic nickel resources and is the sole producer, with sales of 209,000 t in 2013–14. This was a fall of 20,000 t, or nine per cent, on the 229,000 t sold in 2012–13.

The economic nickel resources in Western Australia consist of both sulphide and lateritic deposits; however, most production comes from nickel sulphide mines, which accounted for 61 per cent of total production. The balance was sourced from the two laterite mines of Murrin Murrin and First Quantum Minerals' Ravensthorpe mine, which restarted in late 2011.

The value of Western Australian nickel sales fell four per cent from $3.6 billion in 2012–13 to $3.5 billion in 2013–14. Nickel prices averaged A$16,587/t throughout the year, up four per cent from A$15,974/t in 2012–13. In US dollar terms, prices fell seven per cent from US$16,397 to US$15,233/t.

Nickel production in Western Australia came from the following operations in 2013–14:

- BHP Billiton Nickel West, which is the largest producer of nickel in Western Australia. This is a fully integrated mine-to-market business comprising an open cut mine and concentrator at Mt Keith; two underground mines and a concentrator at Leinster; a nickel concentrator and smelter at Kalgoorlie; and the Kwinana refinery.
- Mincor Resources NL operates the Miitel, Mariners, McMahon and Otter Juan sulphide mines in the Kambalda area. McMahon and Otter Juan reached the end of their mine life in early 2014 and have been placed on care and maintenance.
- Western Areas NL operates the Forrestania complex, which consists of the high grade nickel mines Flying Fox and Spotted Quoll as well as the Cosmic Boy concentrator.
- Panoramic Resources owns and operates the Savannah and Lanfranchi underground nickel sulphide mines in Western Australia.
- Independence Group NL owns and operates the Long nickel sulphide mine located at Kambalda.

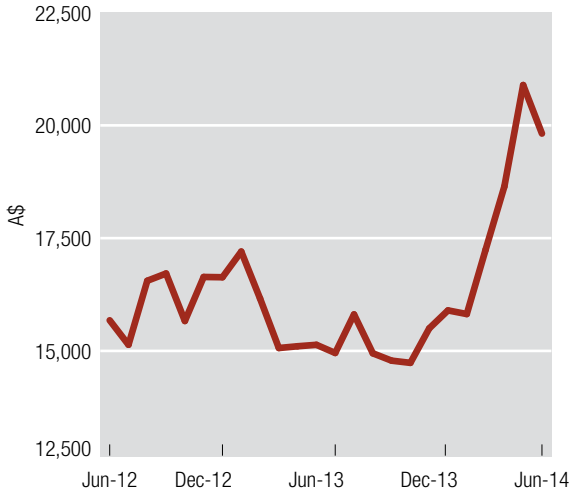


Figure 46 **Nickel Price A$/tonne**
Source: LME Cash, Monthly Average

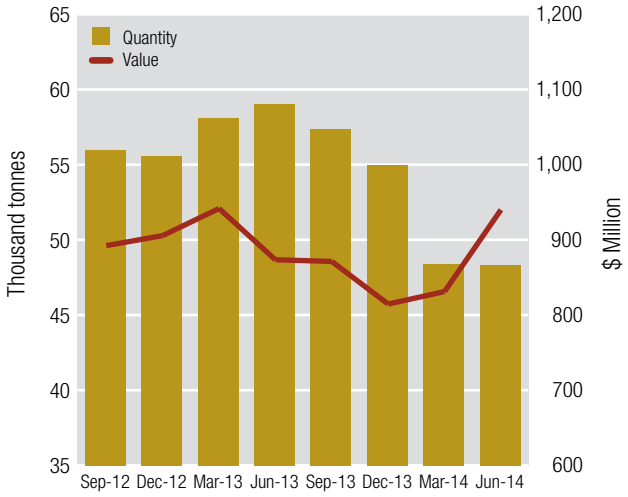


Figure 47 | **Nickel Quantity and Value by Quarter**
Source: DMP

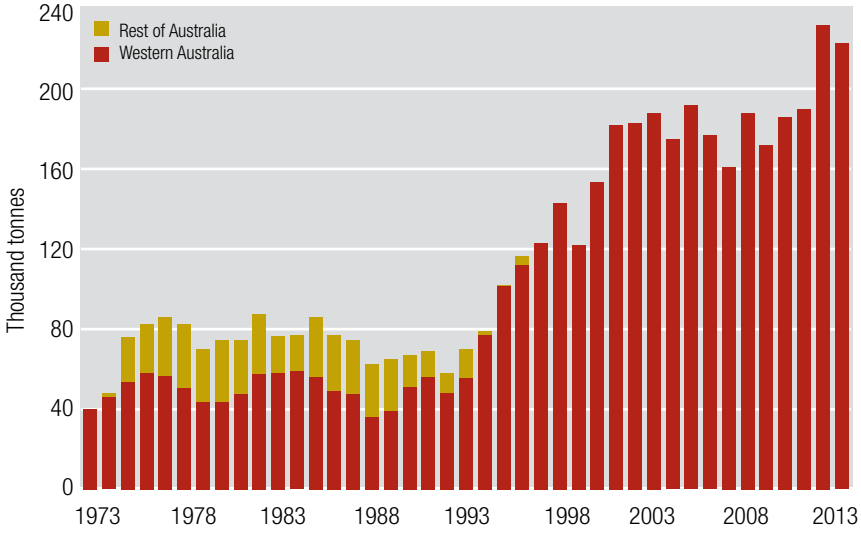


Figure 48 | **Nickel Quantity** Source: DMP and BREE

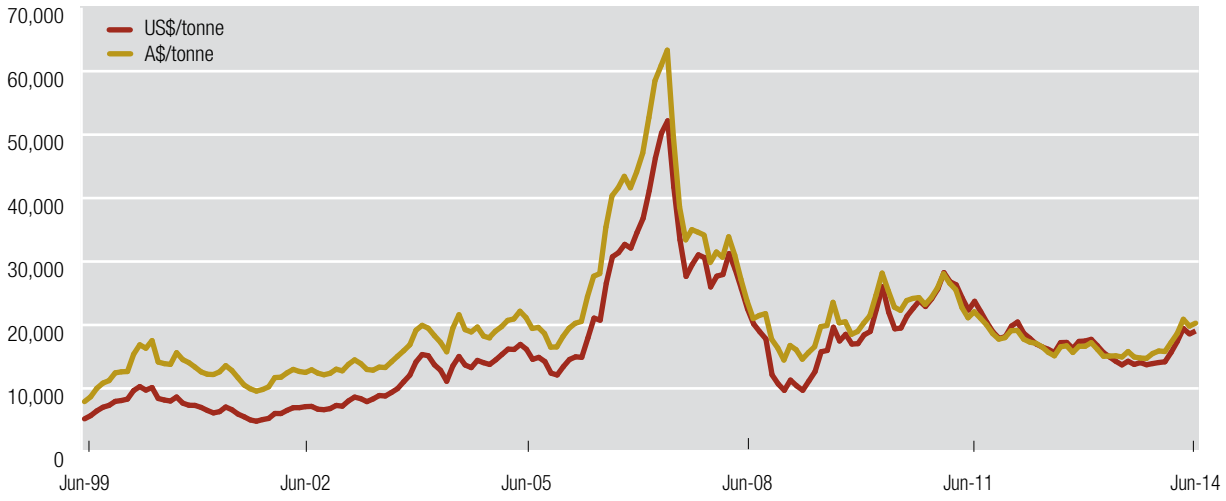


Figure 49 | **Historic Nickel Price per tonne** Source: LME

- Norilsk Nickel Lake Johnston sulphide mine was placed on care and maintenance in September 2013.
- Glencore operates the Murrin Murrin open pit laterite nickel operation located between Leonora and Laverton in the northeastern Goldfields of Western Australia.
- Glencore ceased mining at its Sinclair sulphide operation in May 2013, as the mine had reached the end of its expected life. Stockpiled ore continued to be processed into the September quarter of 2013.
- First Quantum Minerals Ltd operates the Ravensthorpe laterite nickel mine, which was acquired as a decommissioned nickel operation from BHP Billiton in February 2010. It includes an open cut mine and processing plant.

A number of nickel sulphide producers also have toll treatment and concentrate purchase agreements in place with Nickel West, trucking ore to be concentrated at the Nickel West Kambalda concentrator. In 2013–14, these operations included:

- Independence Group NL's Long nickel operation
- Mincor Resources' Miitel and Mariners projects
- Panoramic Resources Ltd's Lafranchi Tramways Operation

Market

The nickel market is dominated by the purchasing patterns of the stainless steel industry and China is the world's top consumer of nickel. Around 65 per cent of nickel is used to manufacture stainless steel, 20 per cent in non ferrous (including 'super') alloys, nine per cent is used for plating and six per cent in other uses including coins and a variety of nickel chemicals.

Western Australia's largest export market for nickel in 2013–14 was Malaysia at 36 per cent. China followed with 30 per cent, then Singapore (12 per cent) and Japan (9 per cent). Other export markets included the United States, Norway, Brazil, Taiwan, Sweden, Norway and the Netherlands.

For eight years nickel producers faced strong competition from Chinese nickel pig iron (NPI) producers. NPI has been produced in China since 2005 and production has been rising rapidly. NPI is a low-purity ferro nickel with 1.8 to 8 per cent nickel grade being produced from blast furnaces and 10 to 25 per cent nickel grade from electric furnaces, with iron accounting for the balance (much lower than conventional ferro-nickel, which averages 25 to 40 per cent nickel content).

Over time technical innovations pushed the break-even cost for NPI produced in China via rotary kiln electric furnaces (RKEF) down to around US$12,000/t. Considering the nickel price peaked at US$51,800/t in May 2007, this made NPI very competitive and demand took off in China as steel mills sought to reduce costs. Around 30 per cent of the whole supply of China's NPI comes from RKEF.

China sourced most of its ore to produce NPI from Indonesia. In January 2014, the Indonesian Government introduced a ban on the export of unprocessed minerals in a bid to promote domestic processing. Chinese importers stockpiled material ahead of the ban and once these stockpiles have been exhausted it is expected the price of nickel will rise as the availability of NPI declines. The Philippines, however, may provide an alternative source of ore for Chinese imports.

The first NPI plant outside China went into production in the second half of 2012. Operated in Indonesia by PT Indoferro, the plant will service stainless steel producers and nickel casting foundries in the Asian and European markets. It remains to be seen how many similar plants will come into operation in the future. Data from the Indonesian Energy and Mineral Resources Ministry indicated that seven nickel pig iron smelters were planned to be finished in 2014.

In 2013–14, the price of nickel fell by seven per cent to average US$15,233/t, pushed down from US$16,397/t in 2012–13. With the export ban imposed by Indonesia in January 2014, the nickel price actually increased by over 30 per cent for the six months to the end of June 2014.

Whilst China continues to grow at around seven per cent of GDP per year it will drive demand for Western Australian nickel resources. High operating costs in Western Australia mean nickel producers will need to address costs and improve productivity to maintain the advantage currently existing with Indonesia's ban on unprocessed minerals and NPI output declining.

It is projected that global supply of nickel will exceed demand in 2014 however it will shift to a deficit in 2015 (the first annual shortfall since 2010).

2.7 BASE METALS

For the purposes of the Statistics Digest base metals refers to copper, lead and zinc.

The value of base metals produced in Western Australia in 2013–14 increased by 18 per cent on the previous year to slightly under $1.9 billion. Base metals accounted for less than two per cent of all mineral and petroleum sales in Western Australia in 2013–14.

Copper is the largest contributor to Western Australia's base metals sector, accounting for 83 per cent of the total value of base metals produced.

A full year of lead production at Invernia's Paroo Station mine resulted in an increase in sales from 17,000 t in 2012–13 to 89,000 t in 2013–14. Sales of lead were valued at $202 million and accounted for 11 per cent of total base metals. Zinc accounted for the remaining six per cent.

In US dollar terms, the trading price of copper finished nine per cent below 2012–13 levels, while lead recorded a slight decrease of just one per cent. Zinc was one of the few commodities to average an increase in US dollar terms of two per cent.

In 2013–14, Sandfire's DeGrussa mine maintained its predominance as the State's largest base metals producer, accounting for 25 per cent of the value of base metals in Western Australia. Minerals and Metals Group's copper–lead–zinc mine, Golden Grove, was the second-largest producer (17 per cent) and Aditya Birla's Nifty

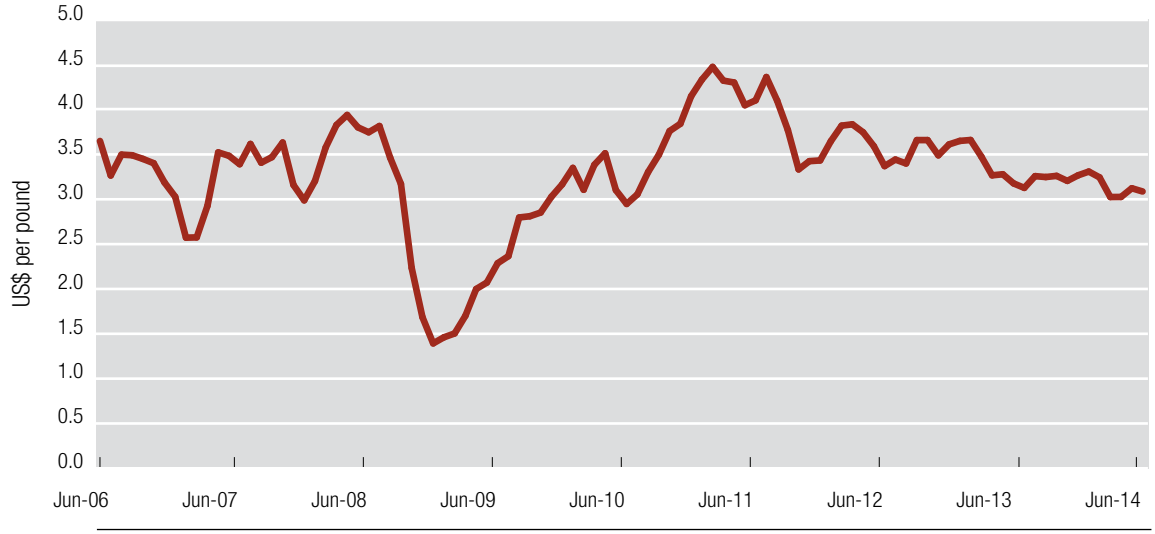


Figure 50 | **Copper Price** Source: Metalprices.com

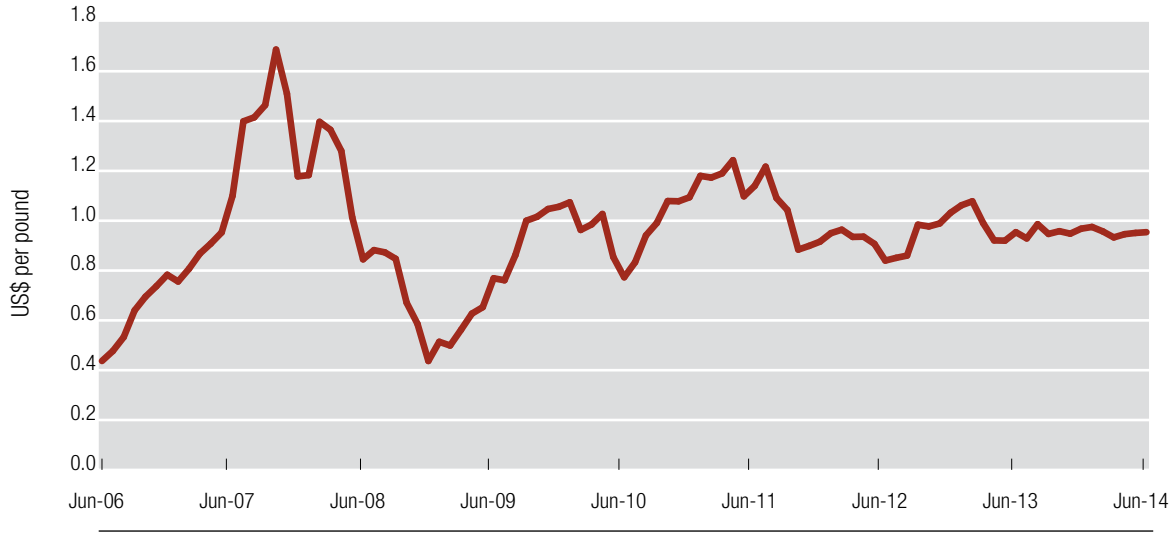


Figure 51 | **Lead Price** Source: Metalprices.com

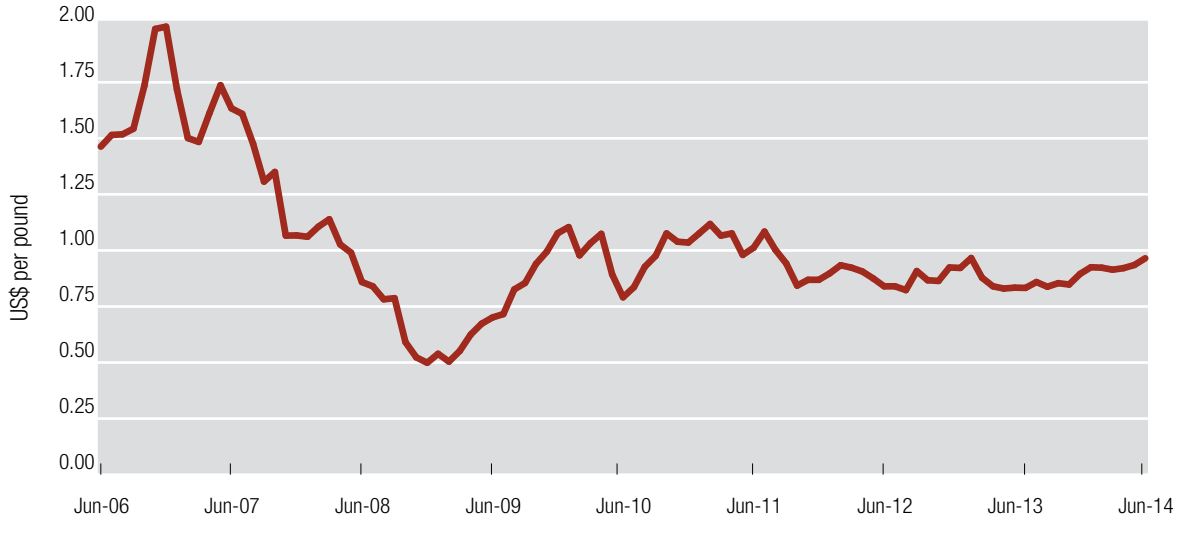


Figure 52 | **Zinc Price** Source: Metalprices.com

accounted for 15 per cent. Newmont's Boddington mine accounted for 12 per cent followed by Newcrest's Telfer and Invernia Inc.'s Paroo Station lead mine, both ten per cent. Independence Group NL's Jaguar and Venturex Resources Ltd's Whim Creek made up the remaining seven per cent from the base metal producers.

Some production of base metals also results as a by-product of nickel mining and in 2013–14 this accounted for four per cent of the total value of the State's base metal sales.

Copper

The average price for copper in 2013–14 fell to US$7014/t, representing a nine per cent decrease on 2012–13 levels. In Australian dollar terms, copper prices averaged $7647/t, an increase of two per cent from the 2012–13 average.

Copper is used in a wide range of products, making prices sensitive to shifts in the economic growth outlook, however, by July 2014, there were signs that the price of copper could fall further due to the supply and demand balance pointing to a surplus market in both 2014 and 2015.

The total quantity of copper sold out of Western Australia in 2013–14 was 208,193 t, representing an increase of five per cent. The total value of the copper sector rose by seven per cent from the previous year, to $1.6 billion.

Sandfire Resources' DeGrussa high-grade copper–gold mine, located 140 km northeast of Meekatharra, ramped-up production in 2013–14 to become the State's largest copper operation. DeGrussa produced 67,690 t of copper, with associated sales accounting for the bulk of the increase in the value of base metals production in Western Australia in 2013–14. The DeGrussa project also produced 33,893 oz of gold.

Nifty, located 350 km east of Port Hedland, is the State's second-largest copper mine. In 2013–14, it produced 44,017 t in concentrate from its large sulphide resource. The concentrate product is transported by truck to Port Hedland for shipping to Hindalco Copper's Dahej facility in India.

On 21 March 2014, the Nifty operations experienced a sinkhole incident and ground instability issues which necessitated a suspension of mining. Mining and production was expected to recommence in the second half of 2014.

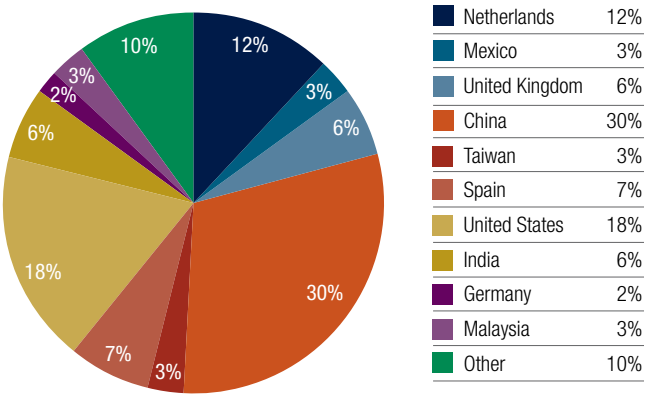


Figure 53 **Heavy Mineral Sands Exports – Total Value $620 Million**
Source: DMP
Note: Exports include titanium dioxide and product sourced from private land, overseas and other States and processed in Western Australia.

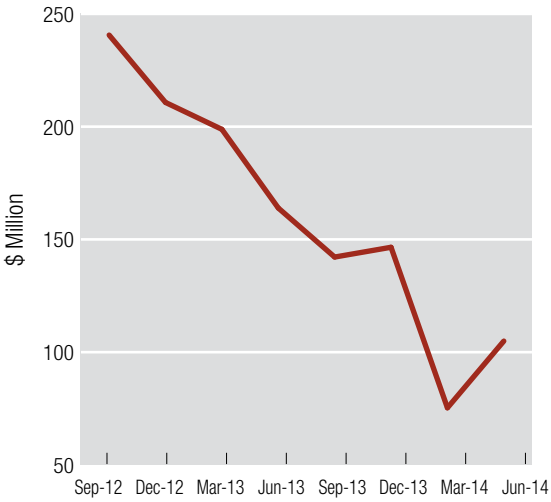


Figure 54 **Heavy Mineral Sands – Value by Quarter**
Source: DMP

The third-largest producer, MMG Limited's Golden Grove, located 55 km south of Yalgoo in the Mid West, produced 33,489 t, while Boddington, produced 29,500 t of copper in concentrate in 2013–14.

Newcrest Mining's Telfer mine, located 310 km northeast of Newman, produced 25,506 t of copper in concentrate, whilst Independence Group's Jaguar was the smallest copper producer with 7693 t.

Venturex Resources Ltd released an announcement in March 2014 that it had entered into an agreement with Blackrock Metals Pty Ltd for the reprocessing of the existing Whim Creek oxide copper heap leach pads at its Whim Creek site. A small amount of copper cathode was produced in the June quarter.

Copper was also produced as a by-product (approximately five per cent of the total copper sold) from a number of nickel operations, with eight mines selling 10,186 t. The largest of these producers was Panoramic Resources Limited's Savannah nickel mine, producing 5439 t of copper in concentrate.

Zinc

The total value of zinc sales in 2013–14 was $112 million, up by eight per cent on 2012–13. Zinc prices were one of the few commodities which increased in 2013–14 by two per cent to an average of US$1968/t.

Western Australia has two zinc producers: Independence Group's Jaguar project which is located 60 km north of Leonora and Minerals and Metals Group's Golden Grove mine.

During 2013–14, zinc production at Jaguar totalled 41,193 t of metal in concentrate, up from 33,810 t in 2012–13, whilst reported zinc production at Golden Grove amounted to 27,361 t of metal in concentrate, up from 21,182 t in 2012–13.

Lead

The value of Western Australian lead sales in 2013–14 reached $202 million and was dominated by Ivernia's Paroo Station which produced 73,700 t of lead in concentrate. Some additional sales from stockpiles were also shipped by Ivernia in 2013–14.

Paroo Station, the world's largest lead carbonate mine, was restarted in April 2013 after being on care and maintenance since March 2011.

Lead averaged US$2104/t for 2013–14 remaining relatively stable throughout the year. However, with the weakening Australian dollar the average price for the period was A$2294/t (ten per cent higher than 2012–13). Western Australia's only other lead producer, Golden Grove, produced 2343 t of lead in 2013–14, down from 2893 t in 2012–13.

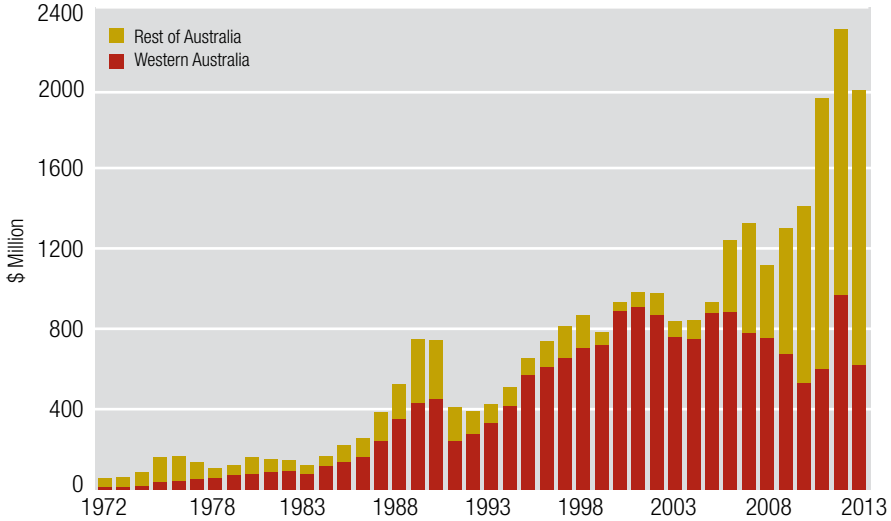


Figure 55 **Heavy Mineral Sands Value of Production**
Includes Ilmenite, Leucoxene, Upgraded Ilmenite, Rutile, Zircon and Monazite
Source: DMP and BREE

2.8 MINERAL SANDS

Production of mineral sands in Western Australia predominantly comprises titanium minerals (ilmenite, leucoxene, synthetic rutile and rutile) and zircon. Other products such as garnet sand and staurolite are also produced on a smaller scale and are used as commercial sandblasting abrasives.

The value of Western Australian mineral sands sales fell by 42 per cent from $814 million in 2012–13 to $469 million in 2013–14. Only products covered by the *Mining Act 1978* and relevant State Agreement Acts are included in these calculations. Products mined from land titled prior to 1 January 1899, other states and imported product are excluded.

The global titanium feedstock market (rutile and synthetic rutile) during 2013–14 was marked by oversupply and depressed pricing due to weak and sluggish conditions throughout the value chain and a slowing global economy.

Globally, the titanium dioxide pigment sector is dominated by large multinational corporations operating multiple plants in numerous countries. Five global producers – DuPont, Cristal Global, Tronox, Huntsman and Kronos – dominated global nameplate capacity.

Prices for titanium dioxide pigment averaged A$2783/t, which was marginally higher than the previous year.

Demand for zircon also remained subdued, with prices falling in Australian dollar terms. Some of this fall, however, can be attributed to high volume, low-grade shipments from Australia to China.

Overall prices received by Australian producers of mineral sands in 2013–14 were between 24 and 35 per cent down on the previous year. Zircon decreased 24 per cent and averaged $1224/t. Rutile fell 33 per cent and averaged $1437/t whilst ilmenite fell 36 per cent to an average of $170/t.

The largest contribution to mineral sands sales came from synthetic rutile, which was valued at $175 million, down by $199 million from 2012–13 ($374 million). Quantities sold decreased by 30 per cent to 198,751 t.

The value of zircon sold fell by 46 per cent to $102 million, with volumes decreasing by seven per cent to 201,695 t. Ilmenite sales suffered a similar fate and fell by 49 per cent in value to $37 million whilst sale volumes fell by 41 per cent to 160,134 t. Rutile actually increased output from the previous year by 25 per cent to reach 58,213 t; however, returns were down by 24 per cent to $60 million due to falling prices and low grade product. Leucoxene experienced a four per cent fall in output to reach 27,795 t and a 20 per cent fall in value to $25 million.

In 2013–14, Western Australia exported $620 million worth of mineral sands, including product mined from private land and/or imported from interstate and overseas. China and the United States were the State's major export markets, accounting for 13 per cent and 18 per cent respectively of total exports. Highlighting the diversity of export markets for these products, other major export destinations included the Netherlands (12 per cent), Spain (seven per cent) the United Kingdom and India (six per cent each).

Around 95 per cent of the titanium minerals produced globally is used as feedstock to produce titanium dioxide pigment. This is used in the manufacture of products such as paints, paper and plastics. A small proportion is also used in titanium metal, predominantly for the aerospace industry.

Zircon has a number of applications, principally in the manufacture of ceramic tiles and sanitary ware.

Mineral sands production in Western Australia is dominated by two producers, Iluka Resources and Tronox Management Pty Ltd, previously known as the Tiwest project. Together, these two producers accounted for around 77 per cent (by value) of all the State's mineral sands produced in 2013–14.

Iluka's Western Australian operations consist of mining activities, mineral processing plants and synthetic rutile production facilities in two main operational areas, at Eneabba and Narngulu in the Mid West, and Capel in the South West.

Iluka operates a mineral processing plant at Narngulu, located near Geraldton, which processes heavy mineral concentrate from the Jacinth–Ambrosia operation in South Australia and from mining operations at Eneabba and Tutunup South. Final product is exported through the Geraldton Port.

In February 2013, Iluka announced it would cut production and reduce costs in 2013 due to weak demand. This resulted in operations idling at Eneabba and Tutunup South in the second quarter of 2013. Several kilns at Capel and Narngulu ceased or delayed commencing operations, and mineral separation capacity was reduced at Narngulu.

Iluka's Eneabba mine produces ilmenite as a feed source for synthetic rutile capacity, as well as zircon and rutile. The mine can idle capacity or vary its output as the market dictates and thus provides Iluka with the production flexibility to enable it to respond to prevailing market conditions.

Iluka's South West operations include the Tutunup South mine near Capel, which was commissioned in June 2011 and supplies ilmenite as a feed source to its synthetic rutile operations. The ilmenite is processed at the company's Capel dry-separation plant, whilst non-magnetic materials including zircon and rutile are processed at the Narngulu mineral separation plant, depending on plant availability.

The Tronox project was established in 1988 and is the world's largest integrated titanium dioxide project. Its facilities include the Cooljarloo mineral sands mine situated approximately 170 km north of Perth; a dry mill and synthetic rutile plant 110 km to the south at Chandala; and a titanium dioxide pigment plant at Kwinana.

Most of the ilmenite produced is processed into synthetic rutile at the Chandala complex. Some of this synthetic rutile is exported, while the remainder is used as feedstock for the production of titanium dioxide pigment at Kwinana for both the Australian and international markets. Rutile, leucoxene, zircon and staurolite are also produced for export.

In 2013–14, other companies producing titanium minerals and zircon in Western Australia included Doral Mineral Sands Pty Ltd and Saudi Arabian-owned Cristal Global operating as Cable Sands (WA) Pty Limited. Both operations are located near Bunbury.

Additionally, MZI Resources has plans to develop the Keysbrook mineral sands project 70 km south of Perth. In April 2013, MZI and Doral signed a processing agreement under which mineral sand concentrate from Keysbrook will be treated at Doral's mineral separation plant. MZI is yet to finalise the financing process.

Western Australia also produces garnet through GMA Garnet Pty Ltd. GMA is a leading global producer of industrial garnet for blast-cleaning and water-jet cutting. GMA's mining operation is located in the Mid West and is the sole Western Australian producer. In addition, the company produces small quantities of mineral sands.

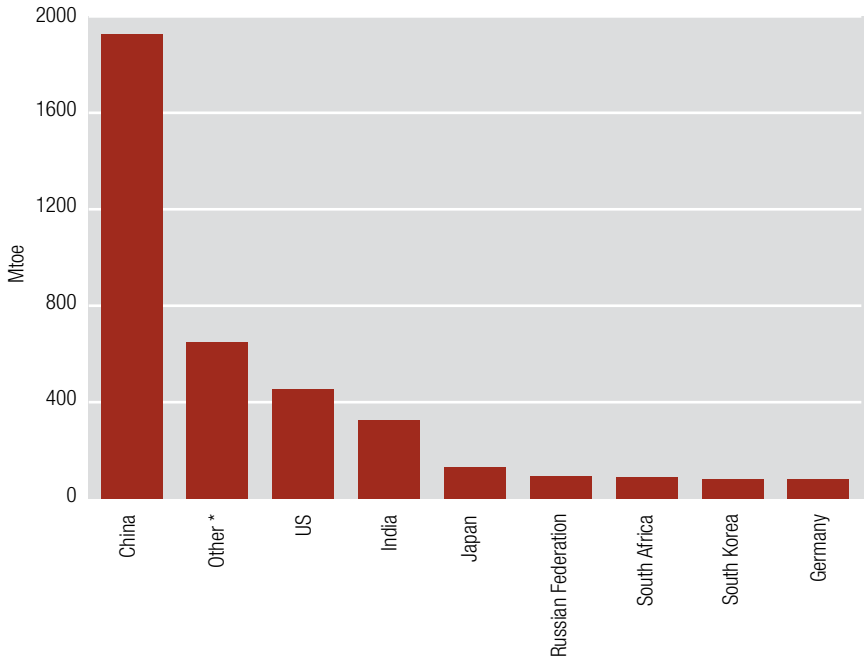


Figure 56 **World Coal Consumption 2013** Source: BP World Energy Statistics 2014
* Other consists of 50 countries including Australia

2.9 DIAMONDS

In 2013–14, Western Australian diamond sales volumes increased by 21 per cent, reaching 11.6 Mct.

Rio Tinto's Argyle mine, 112 km south-southwest of Kununurra, accounts for almost all the State's production of diamonds. The Argyle mine is one of the largest diamond mines in the world by volume, and the largest supplier of natural coloured diamonds, from exotic champagne diamonds to the remarkably rare pink diamonds.

In 2013–14, Argyle produced around 11.2 Mct, an increase of 17 per cent from the previous year. The rise can be attributed to Rio Tinto opening its underground mine in April 2013 to replace its open pit mine, which is in its final stages. The underground mine is a block-cave mine consisting of around 40 km of tunnelling. This development will extend the mine life to at least 2020 and allows a safe and economic way to access higher grades located deep in the ore body.

The only other producing diamond mine in Western Australia is Kimberley Diamonds Ltd's Ellendale mine, located 100 km east of Derby. In 2013–14, Ellendale produced 109,000 ct, down 25 per cent from the previous year.

Ellendale produces predominantly gem and near-gem quality diamonds and is the world's single-largest producer of rare fancy and vivid-yellow stones. The Ellendale mine has a long-term sales agreement with Tiffany and Co., spanning the economic life of the mine, for these rare diamonds.

Mining at the Ellendale E9 pipe continued whilst E4 was on care and maintenance. Kimberley Diamonds Ltd has plans to revisit the development of E4 in due course.

Supply and Demand

Large, commercial diamond mines are rare and there are only about 20 major mines in the world. These mines produce around 92 per cent (or around 125 Mct) of the world's production of diamonds.

Botswana and Russia are the two-largest producers and between the two constitute over half of the world's production. Australia, Angola, Canada, Namibia and South Africa make up the rest.

Gem Diamonds Ltd will ramp-up their Ghanghoo mine (located in Botswana) in the second half of 2014 and once in full production is estimated to produce 750,000 ct annually.

The next large diamond mine which is being developed by DeBeers is in Canada (the Gahcho Kue mine) and is anticipated to commence operations in 2015 with an estimated annual production of around 5 Mct.

Producers sell their rough diamonds to intermediaries who cut and polish them. On average, rough diamonds lose 50 to 60 per cent of their weight after polishing. Most cutting and polishing is done in Antwerp, Tel Aviv, New York and Russia. Smaller stones (less than three carats) are cut in India and China.

Industrial quality diamonds are mostly used for abrasive applications such as drill bits and saw blades and approximately 80 per cent are produced synthetically, primarily in India and China. The balance of industrial diamonds is produced as a by-product of gem-quality diamond mining. For a diamond mine to be economic, the majority of the value of production must come from gem quality diamonds.

Diamond demand is dictated by macro-economic trends. Diamonds are a luxury item and as such demand growth is expected to parallel GDP growth. Growing demand in the United States and the emerging markets of India and China, coupled with depleting mine inventories around the world, are predicted to cause a significant gap between supply and demand.

2.10 OTHER

Coal

Western Australia has two coal producers – Yancoal Australia Limited and Lanco Resources Australia Pty Ltd (Lanco). Both companies' mines are located at Collie in the South West of the State.

Yancoal Australia acquired Premier Coal at the end of 2011. The mine produces approximately 3.5 Mt of thermal coal each year.

In 2013–14, the quantity of coal sold from Collie fell by 15 per cent to 6.4 Mt and the value decreased a similar amount to $264 million.

Verve Energy, the State's major generator of electricity, purchases a major portion of the coal mined at Collie for use in its power stations. Coal fuels around 35 per cent of Western Australia's power generation. Gas represents around 60 per cent of the total fuel used, while fuel oil and renewable energy sources such as wind and land fill make up the remainder.

Around 90 per cent of Collie coal is used as thermal coal, mostly in power stations, but also to fire cement kilns in Perth. The majority of the remainder is used metallurgically by the mineral sands industry to transform ilmenite to synthetic rutile. A small quantity is used to reduce silica sand to silicon metal.

To date, the export of raw coal, through Kwinana port, has been minimal. However, a plan by Lanco to establish a 15 Mt/a coal export facility at the Bunbury port has received environmental approval.

Depressed prices and challenging international conditions in coal markets have dampened the prospects of further coal mines being developed in Western Australia in the near future.

Data published in BP World Energy Statistics 2014 showed that Australia's domestic coal consumption represented just 1.2 per cent of the total world's coal consumption. China accounted for around 62 per cent of consumption (50.3 per cent), followed by the United States (11.9 per cent).

Salt

Western Australia accounts for the majority of national salt production and is the country's dominant exporter. In 2013–14, the volume of Western Australian salt sales increased by five per cent to 13 Mt and sales values rose by nine per cent to $416 million.

Dampier Salt Limited has operations in Dampier and Port Hedland in the Pilbara, and Lake MacLeod in the Gascoyne. The company accounted for around 73 per cent of the total salt sold from Western Australia in 2013–14 and is the world's largest exporter of high-quality bulk, solar salt. Production involves solar evaporation of seawater (Dampier and Port Hedland) and underground brine (Lake MacLeod).

Onslow Salt Pty Ltd's operation at Onslow is the next-largest operation. The Shark Bay Joint Venture at Useless Loop (which commenced operations in 1968) and WA Salt Supply's Lake Deborah East (at Koolyanobbing) comprise the smaller producers.

Salt is primarily used as a feedstock for the production of chemicals, glass and plastic. There has also been recent increased demand from synthetic soda ash production, food processing and de-icing of roads.

In June 2010, Dampier Salt Limited signed a five-year contract to supply approximately 500,000 t/a of gritting salt to local authorities in the United Kingdom (UK). This allows the UK to be better prepared for unpredictable winter weather conditions and not to have to rely on emergency supplies from other European regions.

With anticipated growth in China and India, world demand for salt is projected to increase in the next three years from 290 Mt to around 327 Mt. Western Australian salt producers are well placed to take advantage of this growing market.

Lithium, Tin and Tantalum

Tantalum production in Western Australia has traditionally come from two mines; Greenbushes in the South West and Wodgina in the Pilbara region.

Global Advanced Metals owns both mines.

Due to weak market conditions, operations at Galaxy Resources Limited's Mt Cattlin tantalum–lithium mine were suspended in early 2013.

Tantalum is a rare, grey-blue metal used primarily in the electronics industry in the manufacture of capacitors and is therefore found in many everyday devices such as mobile phones, laptop computers and video cameras. Another increasing application for tantalum is as a 'superalloy' in the manufacture of turbine blades for power stations and jet engines.

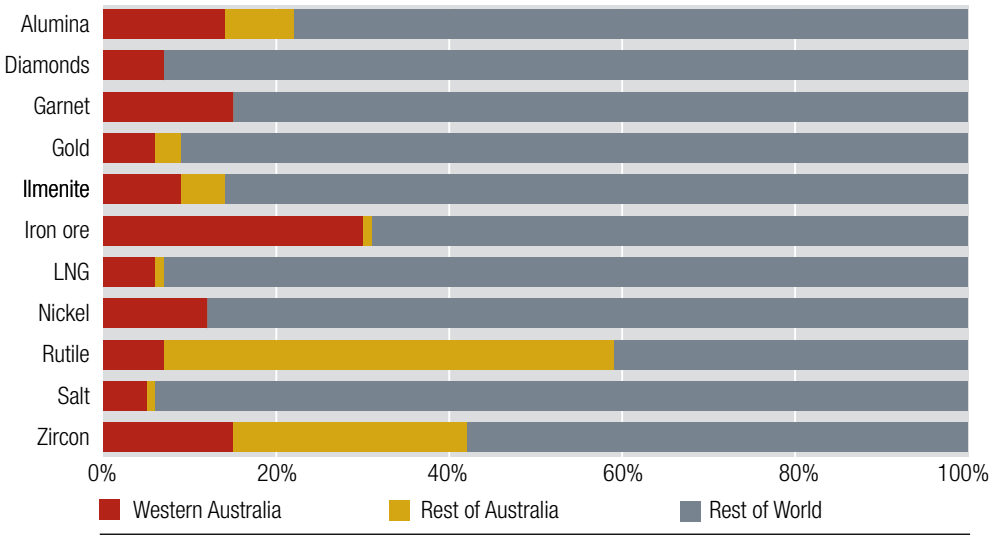


Figure 57 **Selected WA Commodities Relative to World Production Ending 2013 by Quantity**

Source: DMP, BREE, EnergyQuest and USGS

The latest comparable data show that the Western Australian share (by quantity) of the world's output of the following products was: alumina 14%, garnet 15%, gold 6%, ilmenite 9%, iron ore 30%, LNG (sea-borne trade) 6%, nickel 12%, rutile 7%, salt 5%, zircon 15% and 7% of diamonds (mainly industrial grade)

Occasionally Global Advanced Metals also produces small amounts of tin as a by-product from Greenbushes and this is all exported.

Greenbushes is also Western Australia's sole producer of lithium (spodumene). The lithium side of Greenbushes production is operated by Talison Lithium Australia Pty Ltd, which is owned by Chengdu Tianqi Industry Group Co. Ltd 51 per cent and Rockwood Holdings Inc. 49 per cent. Greenbushes has a nominal production capacity of approximately 260,000 t/a of lithium concentrate.

Greenbushes contains the largest hard-rock lithium mineral resource in the world and Talison is the world's largest producer of spodumene concentrate, accounting for one-quarter of global lithium supply.

Reed Resources Ltd (in joint venture with Mineral Resources Limited) is looking to develop its Mt Marion lithium project which is located approximately 35 km south of Kalgoorlie.

In June 2014, the median prices for battery-grade lithium hydroxide and lithium carbonate, CIF Europe and the US, were US$7500/t and US$6400/t respectively. During 2013–14, the average price for lithium rose from US$5500/t to US$6000/t.

Lithium is used in the glass and ceramics industry and increasingly in the production of lithium chemicals for the battery market, with a significant growth in demand forecast for the electric-vehicle market in China and around the world. Current estimated global end-use markets are:

- Ceramics and glass 35%
- Batteries 29%
- Lubricating greases 9%
- Continuous casting mold flux powders 6%
- Air treatment 5%
- Polymer production 5%
- Primary aluminium production 1%
- Other uses 10%

Lithium is the lightest of all metals. It does not occur as a pure element in nature, but is contained within stable minerals or salts found in a range of rock types, brine lakes and seawater. The contained concentration of lithium is generally low and there are only a few lithium-rich brine lakes and mineral deposits in the world where lithium can be economically extracted. Extraction of lithium from brine lakes requires a different method to hard-rock mining and is generally cheaper.

Global demand for lithium is expected to increase with growth underpinned by continuing use of rechargeable batteries in consumer electronics and increased market penetration for electric vehicles in commercial and private applications.

Manganese and Chromite

In 2013–14, the main producer of manganese in Western Australia was Pilbara Manganese Pty Ltd, a wholly-owned subsidiary of Ukraine-based Palmary Enterprises Ltd. Pilbara Manganese operates the Woodie Woodie mine and produces around 1.5 Mt/a with an average grade of around 45.5 per cent.

Woodie Woodie is recognised internationally as a supplier of reliable high-grade, low-impurity manganese ore. Located 400 km southeast of Port Hedland in the Pilbara region, the open cut mine was first established in 1954. It continued operating until 1982, but reopened again in 1989.

Another smaller producer, Process Minerals International Pty Ltd (PMI), a wholly-owned subsidiary of Mineral Resources Limited, has been retreating tailings from Woodie Woodie. PMI has long-term contracts with Boasteel Resources Co. Ltd of China for the supply of both lump and fines manganese.

Manganese ore is priced on a monthly basis using a specification grade of 45.5 per cent manganese grade. Received prices in Australian dollar terms for the 2013–14 year were around four per cent higher than for the previous year.

Consolidated Minerals was the State's sole producer of chromite ore in the form of lump and sands for use in the production of ferrochrome. Its Coobina mine is located 80 km southeast of Newman and has an operating capacity of around 250,000 t/a of high-grade ore. Mining at Coobina ceased in July 2013 and tenements have been transferred to Mineral Resources Ltd.

Globally, chromite production is dominated by South Africa, India, Kazakhstan, Turkey and Brazil, which together account for around 85 per cent of global production.

Rare Earth Elements

Lynas Corporation's Mt Weld rare earths project is located 18 km southeast of Laverton and commenced mining operations in 2007. The mine is expected to have at least a 20-year mine life.

The initial mining campaign was successfully completed in June 2008, with 773,300 t of ore at an average grade of 15.4 per cent rare earth oxide (REO) stockpiled. This provided sufficient stockpiled ore for the first two years of Lynas' downstream processing operation.

While the project was suspended in early 2009, due to the global financial crisis, improved economic conditions saw the project restart, feeding ore into the concentration plant in mid-May 2011.

With Phase-1 of the project completed, Lynas commenced construction of Phase-2 in May 2011 and its associated commissioning in March 2013.

Concentrate shipments to Lynas' Advanced Materials Plant in Malaysia (LAMP) commenced in the December quarter of 2012. The development of the LAMP operation in Malaysia encountered a number of delays and impacted upon Mt Weld operations which limited the output to accommodate Malaysia's start-up delays.

The Mt Weld plant will continue to operate on a campaign basis synchronised to demand from the LAMP.

The Mt Weld deposit comprises world-class REO and niobium–tantalum deposits. Rare earth ore is mined, crushed and blended at Mt Weld and transported by truck to Fremantle in containers for export to Malaysia.

Mt Weld, with its very high grade, contains light rare earth elements and is also high in europium, a heavy rare earth element, and is currently the only commercially viable resource of significant size outside China.

China supplies approximately 95 per cent of the global rare earth element market (with more than 70 per cent of light rare earth elements being supplied from one mine) and is the dominant processor and user of refined compounds. This has evolved as export curbs and inducements by government have encouraged international companies to establish operations in China.

As well as reducing export quotas since 2005, China has introduced export tariffs of 15 per cent on light rare earth elements and 25 per cent on heavy rare earth elements. The 2014 export quota of 30,610 tons is down 389 tons from the previous year. China has also introduced production control measures to reduce waste gasses which will reduce the industry to only a few large state-owned enterprises.

In March 2014 the World Trade Organisation (WTO) ruled against China's rare earth export policies and called for consolidation in the highly polluting sector. Under WTO rules, China can make an appeal within 60 days and the final ruling will come in three to four months.

China also holds 50 per cent of rare earth element reserves, countries comprising the former Soviet Union hold 17 per cent, the United States 12 per cent and Australia almost two per cent.

Rare earth elements are not found as free metals in the Earth's crust, rather within a mixed 'cocktail' of rare earth elements that need to be separated for their individual or combined commercial use. Despite their name, rare earth elements are relatively abundant in the Earth's crust; however, they are often of low quality and are rarely present in deposits large enough to support economically sustainable mining operations.

Rare earth elements have unique properties that make them indispensable for many technological applications. A range of unique chemical, catalytic, electrical, magnetic, metallurgical and optical properties enable them to play a major role in the advancement of materials technology.

Vanadium

The Windimurra vanadium project, located approximately 80 km from Mount Magnet, hosts one of the largest proven vanadium reserves in the world.

Atlantic Ltd acquired the Windimurra project in 2010 and commenced shipments of ferrovanadium in May 2012. Windimurra has a projected life of around 24 years and will also produce around 1.5 Mt/a of iron ore fines as a by-product.

Production of vanadium at Windimurra was suspended in February 2014 following a major fire causing extensive damage in the beneficiation plant. The plant has been demolished and will be rebuilt. The company has reviewed its mine plan, the crushing, milling and beneficiation circuit and the refinery. As a result it will revise the Windimurra process flow sheet.

The Windimurra vanadium project is based on a resource that was discovered in the 1960s. In its original form, the Windimurra project first commenced production towards the end of 1999. The project was a joint venture between Precious Metals Australia Limited and a subsidiary of Xstrata. The mine operated for around four years before closing after processing 7.2 Mt of ore and producing 13,000 t of high-quality vanadium pentoxide.

Vanadium is used to strengthen steel and titanium. Around 90 per cent is used in the high-performance steel industry.

3.1 EMPLOYMENT

Mining

Employment statistics maintained by the Department of Mines and Petroleum show that there were on average 108,975 persons directly employed in Western Australia's mining industry during 2013–14 (including 2314 people employed in mineral exploration). This represents an increase of seven per cent on the 101,498 persons employed in 2012–13.

In addition to employees directly involved in exploration and mining activities, these figures include employees engaged in activities such as construction of minesite infrastructure, mineral processing (including refining of nickel and production of alumina), and minesite surveying, transport and catering. The employment data includes sites under State Agreement Acts.

The Department of Mines and Petroleum collects mining employment data from monthly accident reports which are required to be submitted by all operating mines and companies carrying out exploration on mineral and mining leases under the *Mines Safety and Inspection Act 1994*. The Resources Safety Division's AXTAT reporting system identifies the number of direct employees and contractors (including exploration personnel) working on operating mining leases. In March 2008, legislation was introduced to capture exploration personnel working on greenfield sites. The data does not include personnel in administrative locations located outside operating sites.

Iron ore was the largest employment sector in the State's mining industry with 61,306 employees. Gold and nickel followed with 18,336 and 6447 persons respectively. Together the iron ore, gold and nickel sectors accounted for 73 per cent of total employment.

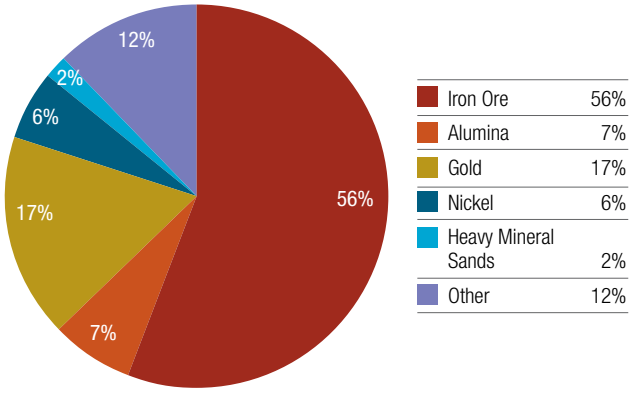


Figure 58 | **WA Minerals Employment 2013–14**
Source: DMP

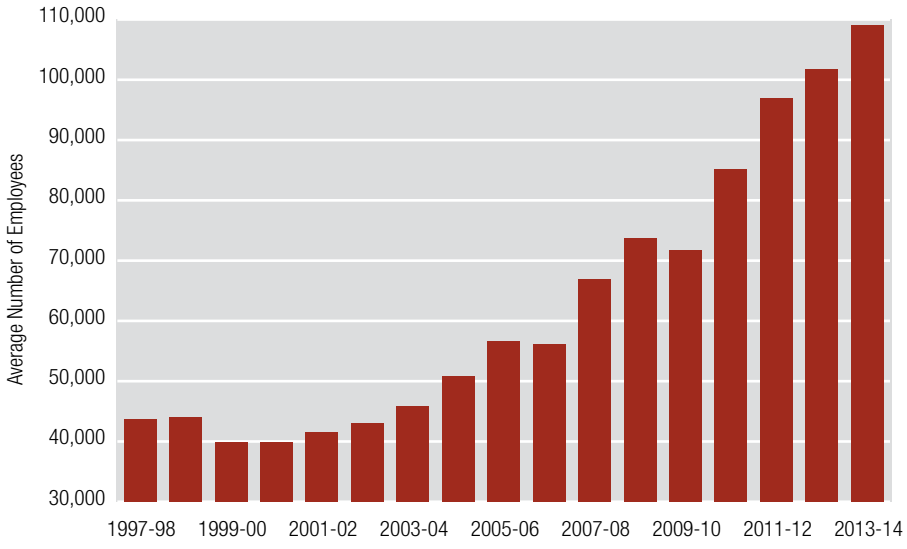


Figure 59 | **WA Mining Employment 1997-98 to 2013-14**
Source: DMP Resources Safety Division AXTAT Reporting System.
Does not include petroleum data.

As the mining industry moves from a construction phase to an operational phase, it is expected that employment figures will begin to decrease. Many investment-related activities, such as construction, are significantly more labour-intensive that resource extraction and processing.

The high level of construction activity in the mining industry has generated an increase in workforce numbers by over 60 per cent since 2007–08, when numbers totalled 66,850. As these development and expansion projects move into their production phases, the levels of employment will decline as construction personnel are no longer required. This fall in numbers will start to take effect as a number of projects are completed throughout 2014 and into 2015.

Petroleum

Employment data published in this Statistics Digest for the petroleum industry is limited to operations subject to State petroleum legislation, and includes petroleum facilities and pipelines both onshore and in coastal waters. It does not include LNG and land-based service facilities.

The total number of employees in the State's petroleum industry during 2013–14 was 2113. This data represents the average number of persons employed at operating sites, including contractor employees.

The data is provided in petroleum operators' monthly safety reports submitted to the Department of Mines and Petroleum. Similar data for operations in Commonwealth offshore areas adjacent to State areas was no longer available to the Department of Mines and Petroleum following the transfer of administrative responsibility from the State to the Commonwealth on 1 January 2012.

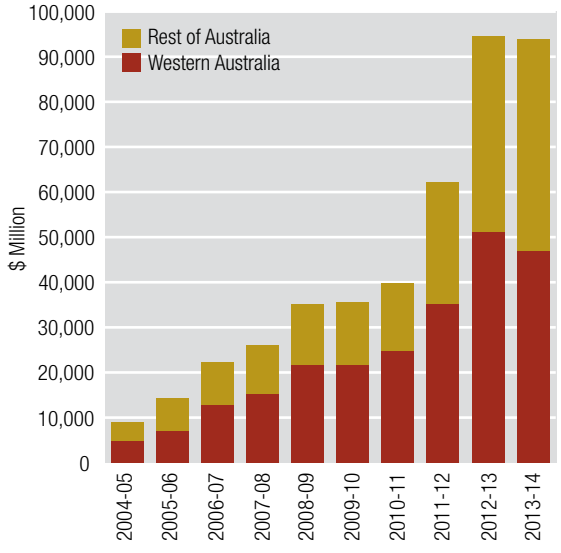


Figure 60 | **Mining Investment** Source: ABS

ABS EMPLOYMENT DATA

Employment data collected and published by the Australian Bureau of Statistics (ABS) is classified using reference to the Australian and New Zealand Standard Industrial Classification (ANZSIC). This data is therefore not directly comparable with that collected by DMP.

Under ANZSIC guidelines not all mining employment is reflected in ABS's Mining industry classification (refer to Chapter 1, paragraph 2: "An individual business entity is assigned to an industry based on its widest sense to include any organisation undertaking productive activities, including companies, non-profit organisations, government departments and enterprises"). For example:

- Contract catering personnel working on mine sites are reflected in the Accommodation and Food Services classification and transport personnel (truck and train drivers) working on mine sites are reflected in the Postal and Warehousing industries.
- Contractors employed in site preparation and removing overburden at a mine site on a contract or fee basis are listed under Site Preparation Services.
- Employees engaged in production of pig iron, hot briquetted iron, alumina, the smelting and refining of metals are included in Manufacturing.
- Employees providing geophysical surveying services on a contract or fee basis are included in Surveying and Mapping Services.

3.2 INVESTMENT

Fuelled by strong demand for resource commodities from Asia, new capital expenditure by the State's mining industry has grown at an annual rate of 15 per cent during the five years to 2013–14.

The Australian Bureau of Statistics' (ABS) private new capital expenditure statistics indicate that investment in the State's mining industry in 2013–14, at $46.8 billion, was three per cent lower compared to the previous financial year. This decrease was the result of mine expansions and new projects transitioning from construction to production.

Western Australia remained the nation's leading mining investment destination, with the level of investment representing 52 per cent of the total of $90 billion invested in the Australian mining industry as a whole. The reduction in expenditure in Western Australia was also less that the reduction in national expenditure, which fell five per cent from the previous period.

More broadly, in 2013–14, new capital expenditure in Western Australia by mining, manufacturing and other selected industries fell by four per cent to $56 billion and accounted for 35 per cent of the Australian total ($158 billion). The majority of this investment is attributed to the mining industry, which represented 84 per cent of the State's total private new-capital expenditure in 2013–14.

It is important to note that the figures reported above from the ABS do not capture all mining investment. The ABS uses classifications specified in the 2006 edition of the Australian and New Zealand Standard Industrial Classification (ANZSIC) (ABS catalogue number 1292.0). Accordingly, mining is broadly defined as the extraction of minerals occurring naturally as solids such as coal and ores, and liquids such as crude petroleum and natural gas. Downstream mining activities such as smelting of minerals or ores (other than preliminary smelting of gold) or refining are classified as manufacturing activities under the ANZSIC. Products such as coke and alumina are also included in the ANZSIC manufacturing category.

In monitoring resource investment activity in Western Australia, the Department of Mines and Petroleum also collects information on mineral and petroleum projects to estimate actual and possible investment. Where available, information is collated relating to expected capital expenditure, project timing and employment during both construction and operation phases.

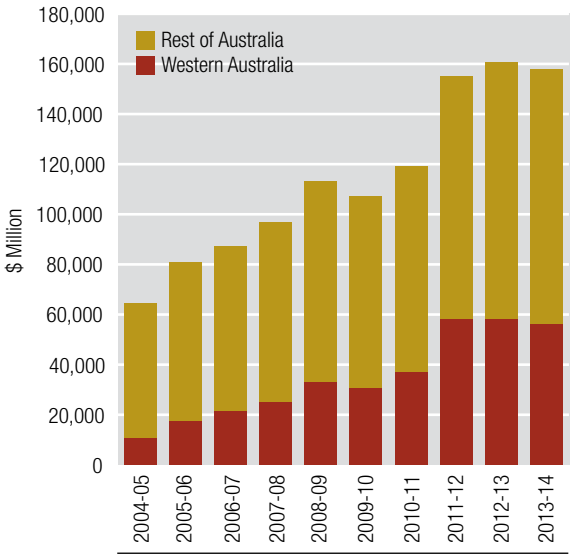


Figure 61 | **New Capital Investment**
Source: ABS

Information is obtained from various sources including the list of major mineral and energy projects published by the Bureau of Resources and Energy Economics, Deloitte Access Economics' Investment Monitor, the REPS Major WA Projects List published by the Western Australian Chamber of Commerce and Industry, online company research consultancy systems, media announcements and company websites. Currently, information on mineral and petroleum projects comprises approximately 102 projects.

Projects are ranked according to their understood project potential and level of advancement towards production. Mineral and petroleum projects are categorised as follows:

- *Projects under construction* are those actually under construction at the time of updating the estimates of total capital expenditure.
- *Committed projects* have company commitment including a final investment decision (FID), but are waiting for approvals to proceed with construction.
- *Planned projects* encompass those undergoing advanced feasibility studies, including definitive and bankable feasibility studies. For oil and gas projects, the planning phase typically involves detailed engineering design which is also referred to as Front End Engineering and Design (FEED).
- *Possible projects* comprise those raising capital and not yet as advanced as those projects conducting definitive and bankable feasibility studies, as well as projects on hold for various reasons.

Based on information available up to 30 September 2014, a summary of total capital expenditure by commodity is provided in the table below. It should be noted that investment in a number of the projects is publicly reported in US dollar terms and the data may therefore vary over time in line with movements in the US$/A$ exchange rate.

In September 2014, the value of resource projects under construction or in the committed stage of development in Western Australia was estimated at $160 billion. A further $108 billion was identified for planned or possible projects in coming years.

The total value of major projects under construction or committed as at 30 September 2014 has risen by around $11 billion compared to estimates made in March 2014. This was due to the 10.5 per cent weakening of the Australian dollar relative to the US dollar and an increase in new projects coming on-stream. New projects include CITIC Pacific's Sino Iron production lines three to six ($2 billion), Rio Tinto's Western Turner–Brockman 4 stage-2 ($1.5 billion) and APA's Eastern Goldfields Pipeline extension to the Tropicana gold mine ($140 million).

Investment in the State is currently led by major export-orientated iron ore and LNG projects under construction or expansion.

Major iron ore investment projects include:

- Hancock Prospecting's Roy Hill mine ($11 billion)
- Rio Tinto's Cape Lambert port expansion to 360 Mt/a ($6.4 billion)
- Rio Tinto expansion of its existing mines, Marandoo, Nammundi, Yandicoogina and West Angelas ($6.7 billion). These mines will supply additional iron ore for the expanded infrastructure.

Major LNG investment projects include:

- Chevron Gorgon (US$54 billion) and Wheatstone (US$29 billion)
- INPEC Ichthys (US$34 billion)
- Woodside Greater Western Flank Phase-1 (A$2.5 billion)
- Apache Julimar plant (US$4 billion)

These projects are expected to be completed in 2015-16.

Capital expenditure for petroleum and mineral projects reported here are shown as the total estimated project capital cost. Therefore, as the larger projects are completed and commissioned, there will be a considerable drop-off in the overall value of investment.

Investment in Major Projects

(as at September 2014)

MAJOR PROJECTS	CAPEX MILLIONS $	
Commodity	Committed/ Under Construction	Planned/ Possible
Gold	110	3,547
Iron Ore	19,481	20,006
Nickel	28	3,823
Other Minerals and Infrastructure	8,889	19,342
Sub-Total	**28,508**	**46,718**
Crude Oil and Condensate	585	953
Gas	2,903	117
LNG	127,043	59,926
Pipelines and Infrastructure	413	635
Other	300	
Sub-Total	**131,244**	**61,631**
Total Forecast Investment	**159,752**	**108,349**

Source: Department of Mines and Petroleum

3.3 ROYALTIES

Over the past ten years, royalties received by the Western Australian Government from the State's mineral and petroleum producers have increased, on average, 21 per cent per annum since 2003–04 when just over $1 billion was received to a record $6.98 billion in 2013–14.

The royalties are paid into the Government's Consolidated Revenue Fund for all minerals and petroleum produced on State land and in State waters.

The Commonwealth also provides a grant to the State of approximately 65 per cent from the North West Shelf project royalties which is collected by the Commonwealth.

The bulk of collections for 2013–14 came from iron ore (76 per cent), whilst petroleum accounted for 16 per cent.

TABLE 3. ROYALTY RECEIPTS 2012–13 AND 2013–14				
COMMODITY	2012–13 Total A$	2013–14 Total A$	2013–14 Growth A$	%
ALUMINA	65,114,004	70,419,138	5,305,135	8
DIAMONDS	15,966,746	20,482,859	4,516,113	28
GOLD	220,130,464	215,830,725	-4,299,738	(2)
HEAVY MINERAL SANDS	27,514,333	16,393,497	-11,120,836	(40
IRON ORE	3,654,716,731	5,307,520,551	1,652,803,820	45
NICKEL	92,813,250	78,290,452	-14,522,799	(16)
PETROLEUM *	18,187,507	11,493,467	-6,694,039	(37)
OTHER	142,104,143	150,136,596	8,032,453	6
TOTAL ROYALTY RECEIPTS	**4,236,547,176**	**5,870,567,285**	**1,634,020,109**	**39**
NORTH WEST SHELF GRANTS	**1,019,886,602**	**1,106,892,595**	**87,005,992**	**9**
TOTAL REVENUE	**5,256,433,779**	**6,977,459,880**	**1,721,026,101**	**33**

Note: All royalty revenue shown above is paid into the State's Consolidated Revenue Fund. Added to the table, shown separately, is the State's share of the North West Shelf project royalty payments to the Commonwealth (which are provided as a grant from the Commonwealth to the State).

* Includes the Commonwealth's share of royalties collected under the *Western Australian Petroleum Submerged Land Act* (PSLA).

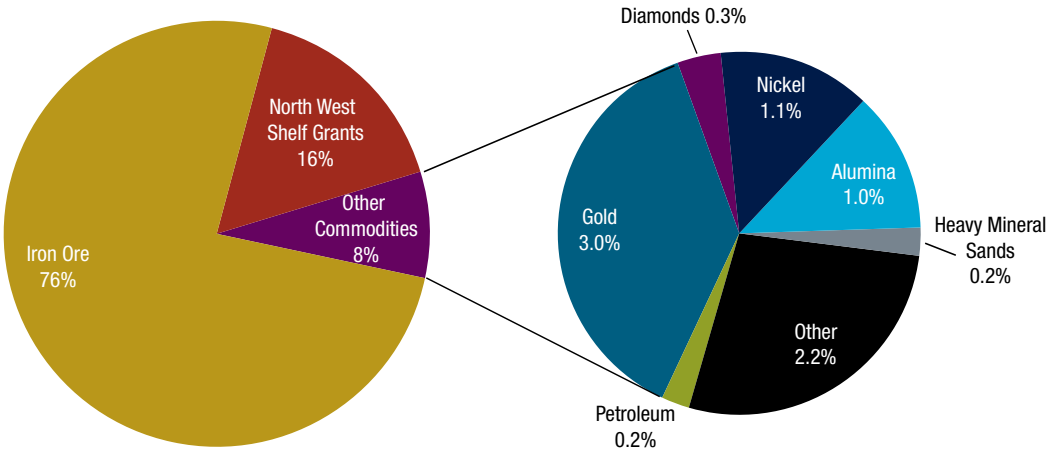


Figure 62 | **Royalty Receipts 2013–14 and North West Shelf Grants $6.98 Billion**
Source: DMP and WA Treasury

TABLE 4. QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY	UNIT	FINANCIAL YEAR 2012–13		FINANCIAL YEAR 2013–14	
		QUANTITY	VALUE	QUANTITY	VALUE
ALUMINA	t	13,530,752	3,856,406,212 (r)	13,654,870	4,256,287,394
BASE METALS					
Copper Metal	t	197,579 (r)	1,449,297,701 (r)	208,193	1,556,670,782
Lead Metal	t	16,639 (r)	35,093,965 (r)	88,740	202,225,661
Zinc Metal	t	55,848 (r)	103,867,913 (r)	54,305	112,438,163
TOTAL BASE METALS			1,588,259,579 (r)		1,871,334,606
CHROMITE	t	196,623 (r)	n/a	66,540	n/a
CLAYS		42,021 (r)	1,227,980 (r)	35,686	1,176,041
COAL	t	7,494,280	310,812,885 (r)	6,365,459	263,541,605
CONSTRUCTION MATERIALS					
Aggregate	t	4,391,376 (r)	148,775,764 (r)	5,669,923	205,432,583
Gravel	t	561,135 (r)	3,947,125 (r)	195,114	3,893,726
Rock	t	1,109,761 (r)	27,142,818 (r)	1,281,291	21,453,349
Sand	t	5,415,504 (r)	62,093,160 (r)	7,383,267	88,145,815
TOTAL CONSTRUCTION MATERIALS			241,958,866 (r)		318,925,474
DIAMONDS	ct	9,610,436 (r)	350,174,880 (r)	11,610,631	397,663,034
DIMENSION STONE		4,196 (r)	1,221,243 (r)	5,021	1,365,020
GEM & SEMI-PRECIOUS STONES	kg	218,058 (r)	250,480 (r)	310,673	400,681
GOLD	kg	179,838 (r)	9,012,057,007 (r)	195,199	8,841,305,780
GYPSUM	t	406,872 (r)	7,474,188 (r)	533,747	10,660,653
HEAVY MINERAL SANDS					
Garnet	t	317,336	n/a	360,266	n/a
Ilmenite	t	270,770 (r)	72,680,425 (r)	160,134	36,785,210
Leucoxene	t	29,071 (r)	31,524,237 (r)	27,795	25,218,920
Zircon	t	216,238 (r)	189,970,553 (r)	201,695	102,035,448
Other			519,870,203 (r)		304,878,446
TOTAL HEAVY MINERAL SANDS			814,045,418 (r)		468,918,024
IRON ORE	t	511,738,942 (r)	56,098,517,209 (r)	630,884,173	73,732,803,865
LIMESAND-LIMESTONE-DOLOMITE	t	4,657,077 (r)	38,240,469 (r)	5,115,618	72,634,490
MANGANESE ORE	t	649,695 (r)	n/a	689,922	n/a
NICKEL INDUSTRY					
Cobalt	t	6,385 (r)	160,191,390 (r)	5,832	176,949,906
Nickel	t	228,709 (r)	3,606,658,311 (r)	209,065	3,450,608,524
Palladium and Platinum By-Product	kg	658	15,047,084	1,015	28,523,097
TOTAL NICKEL INDUSTRY			3,781,896,785 (r)		3,656,081,527

TABLE 4. QUANTITY AND VALUE OF MINERALS AND PETROLEUM					
COMMODITY	**UNIT**	**FINANCIAL YEAR 2012–13**		**FINANCIAL YEAR 2013–14**	
		QUANTITY	**VALUE**	**QUANTITY**	**VALUE**
PETROLEUM *					
Condensate	kl	6,116,968	3,922,032,524	5,559,221	4,051,148,891
Crude Oil	kl	8,609,185	5,971,891,930	7,330,800	5,746,477,916
LNG	t	19,804,916	12,468,223,400	20,049,826	14,409,473,141
LPG – Butane and Propane	t	752,910	639,209,578	630,636	586,349,207
Natural Gas	'000m^3	8,713,949	1,434,550,772	9,736,820	1,734,960,459
TOTAL PETROLEUM			24,435,908,205		26,528,409,614
SALT	t	12,390,185	381,664,353	12,991,837	416,047,668
SILICA-SILICA SAND	t	498,232	16,886,756	449,587	15,847,051
SILVER	kg	123,744 (r)	106,533,561 (r)	140,477	98,250,268
TIN-TANTALUM-LITHIUM	t	n/a	199,285,246 (r)	n/a	122,899,632
OTHER (Includes Vanadium, Manganese, Rare Earths, Spongolite and Talc)			448,587,563 (r)		536,084,241
TOTAL VALUE			101,691,408,884 (r)		121,610,636,668

Note: Quantities used in this table only apply to Minerals and Petroleum covered by the *Mining Act 1978*, the *Petroleum and Geothermal Energy Resources Act 1967*, the *Petroleum (Submerged Lands) Act 1982*, the *Offshore Petroleum Act 2006* and relevant State Agreement Acts.

(r) Revised from previous edition

n/a Breakdown of chromite, garnet, manganese, rutile, spodumene, tin and tantalite not available.

* Includes fields under both federal and state jurisdiction.

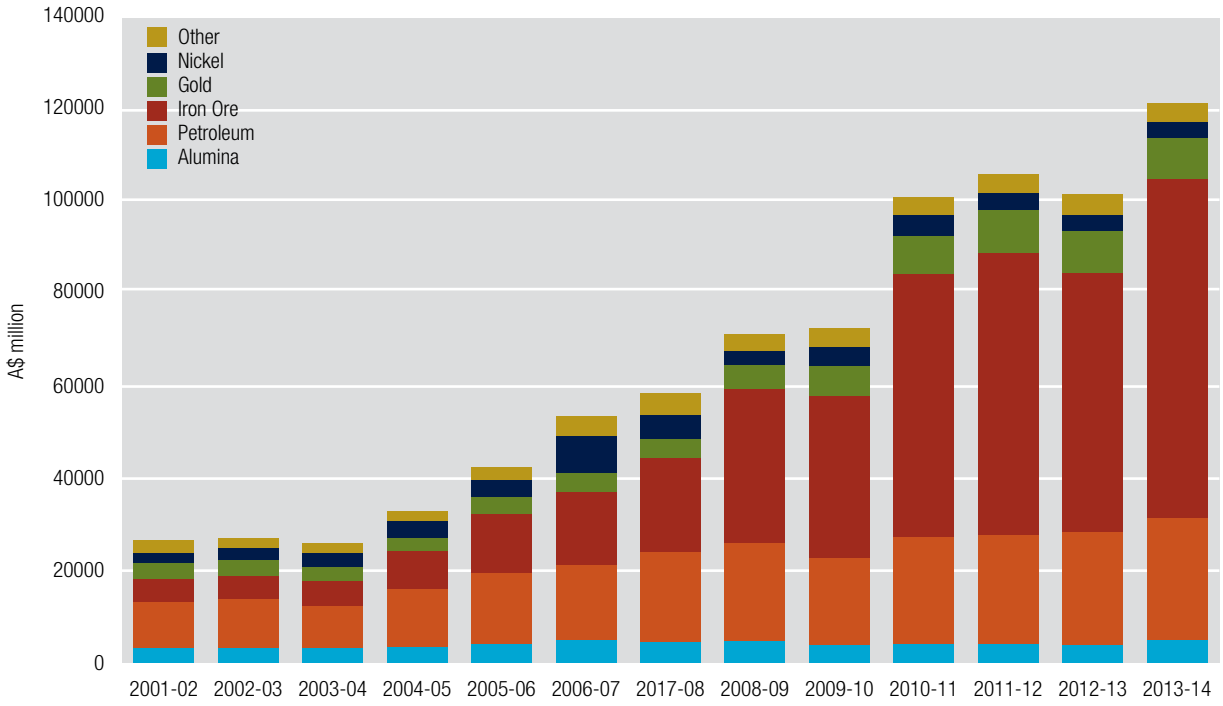


Figure 63 | **Value of Minerals and Petroleum by Commodity** Source: DMP

TABLE 5. QUANTITY AND VALUE OF SELECTED MAJOR COMMODITIES

		2004–05		2005–06		2006–07		2007–08	
	Unit	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M
ALUMINA	Mt	11.16	3,461.63	11.47	4,111.25	11.98	4,847.03	12.31	4,522.14
BASE METALS									
Copper Metal	kt	61.93	243.73	81.20	559.85	115.98	1,052.48	124.53	1,080.56
Lead Metal	kt	2.32	0.31	58.74	86.55	70.47	146.07	25.71	81.39
Zinc Metal	kt	48.40	42.42	110.52	336.65	142.18	675.75	197.13	578.31
TOTAL BASE METALS			286.46		983.05		1,874.31		1,740.27
COAL	Mt	6.28	271.72	6.71	297.37	6.02	271.52	6.23	270.42
COBALT	kt	4.50	202.38	5.02	183.98	4.70	275.28	5.09	448.53
DIAMONDS	M ct	22.80	467.8	29.26	693.80	18.22	435.3	27.97	610.67
GOLD	t	167.35	3,016.38	166.17	3,715.05	161.77	4,222.91	141.48	4,136.28
HEAVY MINERAL SANDS									
Ilmenite	Mt	0.71	79.55	590.24	65.92	0.82	90.90	0.73	83.74
Rutile	kt	101.71	63.02	n/a	n/a	n/a	n/a	n/a	n/a
Upgraded Ilmenite (Synthetic Rutile)	kt	652.94	336.37	n/a	n/a	n/a	n/a	n/a	n/a
Zircon	kt	420.04	298.37	402.42	357.34	323.56	282.18	262.63	204.76
Other HMS			23.58		442.71		414.98		381.90
TOTAL HEAVY MINERAL SANDS			800.89		865.97		788.06		692.48
IRON ORE	Mt	233.15	8,302.34	242.63	12,699.09	257.64	15,732.60	291.00	21,949.80
MANGANESE ORE	kt	606.94	116.32	888.43	117.97	902.05	153.32	373.47	382.75
NICKEL	kt	180.42	3,503.20	183.56	3,815.11	173.66	8,059.38	172.36	5,141.53
PETROLEUM									
Condensate	Gl	5.63	2,203.11	5.63	2,791.73	5.86	2,970.82	6.19	3,971.79
Crude oil	Gl	12.80	5,146.61	11.16	5,935.12	13.99	7,398.31	12.77	8,697.92
LNG	Mt	11.04	3,953.10	11.68	4,625.22	12.21	4,481.79	12.15	5,105.96
LPG – Butane and Propane	kt	77.17	421.74	871.98	654.42	898.61	605.08	818.39	683.35
Natural Gas	Gm^3	7.64	678.72	7.71	703.28	8.71	919.49	9.16	1,025.20
TOTAL PETROLEUM			12,403.29		14,709.77		16,375.49		19,484.22
SALT	Mt	11.58	221.25	10.83	229.85	10.42	236.15	10.59	232.93
OTHER			820.06		1,113.02		866.73		1,454.29
TOTAL			**33,405.91**		**42,841.48**		**53,702.78**		**60,072.89**

2008–09		2009–10		2010–11		2011–12		2012–13		2013–14	
Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M
12.27	4,563.99	12.64	3,810.17	12.28	3,976.89	12.42	3,907.18	13.53	3,856.41	13.65	4,256.29
127.33	654.34	149.81	1,156.69	148.76	1,290.07	155.08	1,165.53	197.58	1,449.30	208.19	1,556.67
25.20	42.12	26.09	61.59	40.72	97.73	6.55	12.87	16.64	35.09	88.74	202.23
142.06	231.27	87.56	210.12	70.54	162.11	63.50	120.74	55.85	103.87	54.30	112.44
	927.72		1,428.40		1,549.91		1,299.14		1,588.26		1,871.33
6.98	332.57	6.71	325.86	7.23	296.26	6.99	289.63	7.49	310.81	6.37	263.54
4.71	220.20	4.36	190.32	3.73	145.59	4.89	145.16	6.39	160.19	5.83	176.95
9.19	261.5	16.28	304.33	10.12	303.0	8.69	343.29	9.61	350.17	11.61	397.7
136.61	5,226.84	163.83	6,548.81	183.80	8,186.21	180.39	9,402.60	179.84	9,012.06	195.20	8,841.31
0.45	64.19	0.51	68.52	0.39	52.77	0.43	92.12	0.27	72.68	0.16	36.79
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
255.64	231.44	347.75	287.24	298.50	200.93	180.82	219.26	216.24	189.97	201.69	102.04
	414.01		315.28		219.63		586.88		551.39		330.10
	728.87		695.87		473.33		898.27		814.05		468.92
316.54	33,633.37	384.97	35,325.94	397.56	57,579.92	454.40	60,799.07	511.74	56,098.52	630.88	73,732.80
417.70	n/a	730.30	382.99	735.13	386.77	769.03	n/a	649.70	n/a	689.92	n/a
178.39	2,996.72	180.15	4,041.29	192.45	4,649.91	208.54	3,711.53	228.71	3,606.66	209.07	3,450.61
12.94	3,108.79	7.42	3,501.19	6.88	3,987.53	5.89	3,842.11	6.12	3,922.03	5.56	4,051.15
13.96	7,659.58	11.84	6,385.07	13.92	8,436.21	11.27	7,791.46	8.61	5,971.89	7.33	5,746.48
866.53	8,524.45	15.72	6,922.56	17.01	8,658.08	15.37	9,958.13	19.80	12,468.22	20.05	14,409.47
866.53	750.83	975.75	647.35	923.76	774.20	835.27	734.48	752.91	639.21	630.64	586.35
8.60	1,232.18	9.36	1,320.80	8.86	1,364.59	9.11	1,454.46	8.71	1,434.55	9.74	1,734.96
	21,275.82		18,776.97		23,220.61		23,780.65		24,435.91		26,528.41
10.52	386.25	10.97	417.46	12.23	366.94	12.81	353.78	12.39	381.66	12.99	416.05
	698.13		363.89		437.61		964.10		1,076.71		1,206.77
	71,252.03		**72,612.30**		**101,572.94**		**105,894.41**		**101,691.41**		**121,610.64**

TABLE 6. VALUE OF MINERALS AND PETROLEUM BY REGION BY COMMODITY

REGION	2013–14 Value
Pilbara Region	
Iron Ore	70,128,948,129
Gold and Silver	1,061,073,949
Manganese and Salt	625,463,505
Copper	463,335,771
Other	256,687,504
Total	**72,535,508,858**

Offshore Petroleum	
Crude Oil and Condensate	9,773,230,922
Liquefied Natural Gas	14,409,473,141
Natural Gas	1,685,856,084
LPG Butane and Propane	586,349,207
Total	**26,454,909,354**

Goldfields–Esperance Region	
Gold	5,773,290,636
Nickel, Platinum and Palladium	2,847,534,350
Silver and Rare Earths	171,817,902
Cobalt	163,193,699
Copper and Zinc	150,334,542
Gypsum and Limesand	16,010,230
Construction Materials	10,210,026
Other	19,100
Total	**9,132,410,485**

Peel Region	
Alumina	4,256,287,394
Gold.Silver and Copper	1,244,596,543
Total	**5,500,883,937**

Mid West Region	
Iron ore	1,269,935,906
Copper, Lead and Zinc	986,218,705
Gold	893,334,378
Heavy Mineral Sands	131,769,505
Nickel, cobalt and Vanadium	56,942,294
Talc and Chromite	48,786,675
Natural Gas	37,251,539
Silver	30,065,671
Gypsum and Limesand	4,734,014
Construction Materials and other	1,177,552
Crude Oil and Condensate	612,792
Total	**3,460,829,031**

REGION	2013–14 Value
Wheatbelt Region	
Iron ore	1,765,672,721
Nickel, Copper and Salt	468,160,774
Gypsum and Heavy Mineral Sands	313,038,575
Gold and Silver	110,834,660
Other	31,896,611
Total	**2,689,603,341**

Kimberley Region	
Iron Ore	568,247,109
Diamonds and Crude Oil	415,378,742
Nickel, Copper and Cobalt	189,178,049
Gold, Gems and Silver	1,129,802
Construction Materials	9,497,739
Total	**1,183,431,441**

South West Region	
Coal	263,541,605
Clay, Limesand/Limestone and Spodumene	121,696,001
Heavy Mineral Sands	30,203,144
Total	**415,440,750**

Gascoyne Region	
Salt and Gems	134,136,926
Gypsum and Limesand-Limestone	3,690,331
Construction Materials	514,375
Total	**138,341,632**

Perth Metropolitan Region	
Construction Materials, Silica Sand and Limesand-Limestone	**94,511,423**

Great Southern Region	
Spongolite, Silica Sand and Limesand	**4,766,416**

TABLE 7. VALUE OF MINERALS AND PETROLEUM BY REGION BY LOCAL GOVERNMENT AREA

REGION	2013–14 Value
Pilbara Region	
East Pilbara	37,715,390,112
Ashburton	33,668,507,256
Port Hedland and Marble Bar	965,502,127
Roebourne and Karratha	186,109,363
Total	**72,535,508,858**
Offshore Petroleum	**26,454,909,354**
Goldfields-Esperance Region	
Coolgardie	2,573,992,689
Kalgoorlie–Boulder	2,378,187,340
Leonora	1,535,724,444
Laverton	1,702,319,858
Ravensthorpe	716,792,151
Menzies and Esperance	192,042,204
Dundas	33,351,799
Total	**9,132,410,485**
Peel Region	
Waroona	2,853,259,446
Boddington	2,647,624,491
Total	**5,500,883,937**
Mid West Region	
Meekatharra and Morawa	936,164,663
Yalgoo and Carnamah	759,750,550
Wiluna and Three Springs	641,224,264
Cue, Coorow and Geraldton	633,102,521
Mullewa and Mt Magnet	336,216,844
Northampton and Perenjori	113,367,167
Irwin and Murchison	41,003,022
Total	**3,460,829,031**
Wheatbelt Region	
Yilgarn	1,775,833,329
Dalwallinu and Kondinin	459,934,230
Dandaragan	309,501,843
Lake Grace and Westonia	112,754,280
Gingin and Koorda	25,275,723
Moora and Wyalkatchem	5,844,006
Northam and Kellerberrin	459,930
Total	**2,689,603,341**

REGION	2013–14 Value
Kimberley Region	
Derby–West Kimberley	521,187,289
Wyndham–East Kimberley	465,484,385
Halls Creek	190,307,852
Broome	6,451,915
Total	**1,183,431,441**
South West Region	
Bridgetown–Greenbushes, Capel and Collie	385,220,482
Bunbury, Dardanup, Manjimup and Donnybrook	30,220,268
Total	**415,440,750**
Gascoyne Region	
Carnarvon	97,896,049
Exmouth, Shark Bay and Upper Gascoyne	40,445,583
Total	138,341,632
Perth Metropolitan Region	
Kalamunda, Swan and Wanneroo	48,640,180
Cockburn, Kwinana and Rockingham	45,871,243
Total	**94,511,423**
Great Southern Region	
Albany, Denmark and Plantagenet	**4,766,416**

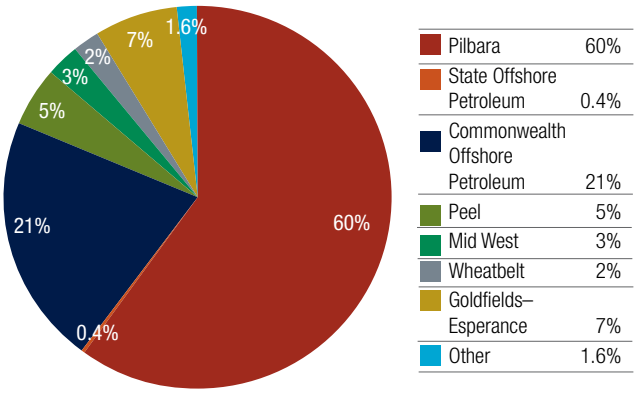


Figure 64 **Value of Minerals and Petroleum by Region 2013–14 Total $121.6 Billion** Source: DMP

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY			
MINERAL/Company	**Operating Site**	**2012–13**	**2013–14**
BAUXITE – ALUMINA			
Alcoa World Alumina Australia	Huntly	957	903
	Kwinana Alumina Refinery	1,303	1,305
	Pinjarra Refinery	1,588	1,619
	Wagerup Alumina Refinery	998	1,034
	Willowdale	318	333
Doral Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	80	82
Worsley Alumina Pty Ltd	Boddington Bauxite	328	371
	Worsley Refinery	1,906	1,843
TOTAL BAUXITE – ALUMINA		**7,478**	**7,490**
BASE METALS			
Aditya Birla Minerals Ltd	Nifty Copper Operation	761	591
Blackrock Metals Pty Ltd	Whim Creek Copper Mine	0	6
Jabiru Metals Ltd	Jaguar	348	345
Minerals and Metals Group	Golden Grove	999	880
Rosslyn Hill Mining Pty Ltd	Paroo Station Mine	51	129
Sandfire Resources NL	DeGrussa Mine	703	692
Venturex Pilbara Pty Ltd	Whim Creek Copper Mine	20	6
TOTAL BASE METALS		**2,882**	**2,649**
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja Open Cut	211	422
Premier Coal Ltd	Premier	207	216
TOTAL COAL		**418**	**638**
DIAMONDS			
Argyle Diamond Mines Pty Ltd	Argyle Diamond Mine	2,097	1,311
Kimberley Diamond Company NL	Ellendale/Kimberley Diamond	335	258
Merlin Diamonds Ltd	Wangara Laboratory	3	3
TOTAL DIAMONDS		**2,435**	**1,572**
GOLD			
Agnew Gold Mining Company Pty Ltd	Agnew-Emu	519	542
Andy Well Mining Pty Ltd	Andy Well	38	81
AngloGold Ashanti Australia Ltd	Sunrise Dam	1,030	880
	Tropicana Gold Mine	636	445
Apex Gold Pty Ltd	Wiluna Group	222	0
Avoca Resources Ltd	Higginsville Gold Project	628	507
Barrick Gold of Australia Ltd	Darlot Gold Mine	481	203
	Granny Smith	994	223
	Kalgoorlie Operations/Northern Star	836	371
	Lawlers	502	216
	Plutonic	601	282
Beacon Minerals Ltd	Halleys East	0	9
Blue Tiger Mining Pty Ltd	Burbanks	0	3
	Gunga West Open Pit	7	5
Bullabulling Operations Pty Ltd	Bullabulling	8	5
Central Norseman Gold Corporation Ltd	Central Norseman Group	178	97
Dacian Gold Ltd	Mt Morgans Gold Mine	15	19

MINERAL/Company	Operating Site	2012–13	2013–14
GOLD Continued			
Darlot Mining Company Pty Ltd	Darlot Gold Mine	0	198
Evolution Mining Ltd	Edna May Gold Project	199	176
Focus Minerals Ltd	Laverton Gold Project	137	19
	The Mount	60	0
	Three Mile Hill	133	18
	Tindals	110	10
FMR Investments Pty Ltd	Burbanks	2	0
	Greenfields Mill	72	31
	Gordon Sirdar Project	29	7
GMK Exploration Pty Ltd	Meekatharra Gold Operations	96	46
Golden Iron Resources Ltd	Gwendolyn East Cutback Project	0	5
GSM Mining Company Pty Ltd	Granny Smith	0	514
Hanking Gold Mining Pty Ltd	Southern Cross Operations	0	22
Haoma Mining NL	Bamboo Creek	14	10
HBJ Minerals Pty Ltd	South Kal Operations / Dioro	255	145
Integra Mining Ltd	Randalls	91	0
Jinka Minerals Ltd	Burnakura	35	0
Kaituna Mining	North Bullfinch Gold Project	0	3
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile – Super Pit	1,844	1,774
Kalgoorlie Mining Company (Bullant) Pty Ltd	Bullant Mine	10	2
Kalnorth Gold Mines Ltd	Lindsays – Eastern	15	5
Kentor Minerals (WA) Pty Ltd	Burnakura	91	1
La Mancha Resources Australia Pty Ltd	Frogs Leg Group	239	264
	White Foil	19	278
Millennium Minerals Ltd	Nullagine Gold Operations	187	213
Minjar Gold Pty Ltd	Minjar Gold Project	13	251
MKO Mines Pty Ltd	Bronzewing Gold Project	0	2
Monument Gold Operations Pty Ltd	Burnakura	0	4
Mount Magnet South NL	Kirkalocka	6	2
Mt Magnet Gold Pty Ltd	Mt Magnet	163	137
	Western Queen South	9	36
Navigator (Bronzewing) Pty Ltd	Bronzewing	183	0
Newcrest Australia Ltd	Telfer Gold Mine	2,692	1,886
Newmont Boddington Gold Pty Ltd	Boddington Gold	3,045	2,744
Newmont Yandal Operations Ltd	Jundee Gold Mine	588	445
Nex Metals Explorations Ltd	Orient Well	7	0
	Kookynie Gold Project	0	4
Northern Star Resources Ltd	Jundee Gold Mine	0	38
	Kalgoorlie Operations/Northern Star	0	175
	Paulsens	296	307
	Plutonic Gold Mine	0	193
Northwest Nonferrous Australia	Indee Gold	10	0
Northwest Resources Ltd	Blue Spec – Golden Spec Mine	7	1
Paddington Gold Mine Pty Ltd	Paddington Gold	559	700
	Binduli	152	23

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY Continued			
MINERAL/Company	**Operating Site**	**2012–13**	**2013–14**
GOLD Continued			
Phoenix Gold Ltd	Blue Funnel Project	0	12
Ramelius Milling Services Pty Ltd	Burbanks Treatment Plant	36	47
Ramelius Resources Ltd	Coogee Project	0	30
	Wattle Dam	19	0
Reed Resources Ltd	Sand Queen	1	1
Regis Resources Ltd	Duketon	146	172
	Garden Well	411	542
	Rosemont Gold	0	103
Silver Lake Resources Ltd	Daisy-Milano	216	180
	Lakewood – Fimtails Plant	49	43
	Murchison Operations	259	160
	Randalls	86	138
Saracen Gold Mines Pty Ltd	Carosue Dam	270	216
St Barbara Mines Ltd	Southern Cross – Marvel Loch and Hercules mines	150	0
	Leonora Operations – Sons of Gwalia	558	554
	King of the Hills Underground	189	170
St Ives Gold Mining Company Pty Ltd	Kambalda/St Ives	1,582	1,239
Stone Resources Aust Ltd	Brightstar Beta-Mikado	10	5
Swan Gold Mining Ltd	Carnegie Gold	7	6
	Mt Ida	4	2
Tanami Gold NL	Coyote Minesite	181	21
The Perth Mint	Perth Mint	100	101
Western Mining Pty Ltd	Cue Victory Project	0	2
Other	Various	12	15
TOTAL GOLD		**22,349**	**18,336**
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	8	7
Cristal Mining Australia Ltd	North Shore (Bunbury)	168	146
Doral Mineral Sands Pty Ltd	Dardanup	567	258
Mintech Chemical Industries Pty Ltd	Rockingham Zirconia Plant	71	85
GMA Garnet Pty Ltd	Narngulu Garnet Plant	42	91
	Port Gregory	37	70
Iluka Resources Limited	Capel	503	305
	Eneabba	161	60
	Narngulu Synthetic Rutile Plants	209	266
	Gingin/Iluka	13	9
Tronox Management Pty Ltd	Chandala-Muchea	351	600
	Cooljarloo	253	475
	Bunbury Port	12	16
TOTAL HEAVY MINERAL SANDS		**2,395**	**2,388**
IRON ORE			
Air Liquide WA Pty Ltd	Hismelt Demolition	0	1
Atlas Iron Ltd	Abydos DSO Project	91	190
	Mt Dove	54	55
	Mt Webber	0	201

MINERAL/Company	Operating Site	2012–13	2013–14
IRON ORE Continued			
	Pardoo RSD Group	77	48
	Wodgina	173	208
BC Iron Limited	Nullagine	432	497
BHP Billiton Iron Ore Pty Ltd	Boodarie HBI Plant	17	31
	Eastern Ridge	0	1,935
	Jimblebar Hub	1,328	1,301
	Mining Area C	2,064	3,298
	Mt Newman Orebody 25	771	0
	Mt Whaleback	2,279	4,401
	Nelson Point	1,574	3,515
	Orebody 18 – Wheelarra	0	48
	RGP4/5 Port Hedland Pace Project	1,745	0
	Yandi – Marillana Creek	1,795	4,506
	Yarnima Power	187	545
	Yarrie Group	170	246
Calibre Projects Pty Ltd	Brockman 4 – Phase 2	192	6
	Orebody 24 Rail	0	40
	West Angelas Deposit B Project	0	42
	Western Turner Syncline	471	449
Citic Pacific Mining Management Pty Ltd	Sino Iron	1,955	2,254
Cliffs Natural Resources Pty Ltd	Koolyanobbing	1,292	1,187
Crosslands Resources Ltd	Cuddingwarra	1	0
	Geraldton Port Storage Facility	3	0
	Jack Hills	16	6
Downer EDI Works Pty Ltd	Warramboo Project	4	0
Fast JV (Flour and SKM Team)	Eastern Ridge Orebody 24 Construction	0	90
Forge Resources Ltd	Balla Balla	4	0
Fortescue Metals Group Ltd	Anderson Point Port Expansion AP5	0	57
	Anderson Point Port Facility	1,121	1,525
	Christmas Creek	3,847	4,331
	Cloudbreak	3,526	3,756
	Kings Resources Group	1,705	0
	Rail Ballast Quarry	16	0
	Solomon Construction Project	1,068	715
GHD Pty Ltd	Jimblebar Non Process Infrastructure	788	131
Hamersley HMS Pty Ltd	Hope Downs 1-3 Group	1,158	849
	Hope Downs 4 Operations	432	868
Hamersley Iron Pty Ltd	Brockman 2 – Detritals Group	688	1,190
	Brockman 4 – Resources Safety Group	1,212	1,408
	Dampier Port Operations	1,904	1,638
	Dampier Power Plant	17	0
	Hismelt Kwinana	80	0
	Marandoo	534	813
	Nammuldi Below Water Table	0	750
	Paraburdoo/Channar/Eastern Range	1,753	1,057

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY Continued			
MINERAL/Company	**Operating Site**	**2012–13**	**2013–14**
IRON ORE Continued			
	Tom Price	1,891	1,731
	Yandicoogina	1,195	996
Henry Walker Eltin Cockatoo Pty Ltd	Cockatoo Island	45	0
Hismelt (Operations) Pty Ltd	Hismelt Operations	0	78
IB Operations Pty Ltd	North Star Hematite	0	139
Karara Mining Limited	Karara – Blue Hills Group	940	650
	Karara Export Terminal	46	61
Kellogg Brown & Root Pty Ltd	Parker Point Fuel Farm	0	28
	West Angelas Fuel Hub	0	80
Kimberley Metals Group Pty Ltd	Ridges Iron Ore Project	141	155
Leighton Contractors Pty Ltd	Solomon Operations	0	3,048
Lycopodium Minerals Pty Ltd	Marandoo Phase 2 – Construction	423	258
MacMahon Holdings Pty Ltd	Orebody 18 – Wheelarra	422	366
Mine and Port Developments JV	Jimblebar Construction Site	0	841
	RGP 4/5 Port Hedland Pace Project	0	820
Mt Gibson Mining Ltd	Extension Hill	70	95
	Geraldton Port Storage Facility	33	47
	Koolan Island	529	615
	Perenjori Iron Ore Siding	103	111
	Ruvidini Rail Terminal	83	89
	Tallering Peak	234	215
Ngarda Civil and Mining Pty Ltd.	Yarrie Nimingarra	236	0
Pluton Resources Ltd	Cockatoo Island – Homer (and Seawall)	62	103
	Phils Creek	28	72
	Poondano	73	32
Polaris Metals Pty Ltd	Carina Iron Ore Mine	200	179
Rio Tinto Iron Ore Pty Ltd	Cape Lambert Power Station	18	0
	Cape Lambert Expansion	12	1,410
	Dampier Fuel Wharf	17	0
	Kangaroo Hill Village	37	29
	West Angelas Power Plant	99	79
	West Pilbara Village	11	62
Robe River Mining Co. Pty Ltd	Cape Lambert Port Operations and Power Plant	1,259	1,289
	Pannawonica	673	871
	West Angelas Plant	1,697	1,673
Roy Hill Iron Ore Pty Ltd	Roy Hill	250	790
Rutila Resources Ltd	Balla Balla	0	6
Sinosteel Midwest Corporation Ltd	Koolanooka	58	0
	Blue Hills Iron Ore Project	0	71
Top Iron Pty Ltd	Mummaloo Iron Ore Project	0	29
TOTAL IRON ORE		**47,429**	**61,306**
MANGANESE			
Pilbara Manganese Pty Ltd	Woodie Woodie	588	533
Process Minerals International	Woodie Woodie Tailings Treatment Plant	31	31
TOTAL MANGANESE		**619**	**564**

MINERAL/Company	Operating Site	2012–13	2013–14
NICKEL			
BHP Billiton (Nickel West)	Cliffs Nickel Project	219	217
	Kalgoorlie Nickel Smelter	622	449
	Kambalda Nickel Concentrator	120	129
	Kwinana Refinery	428	315
	Leinster	976	680
	Mt Keith	914	729
Consolidated Nickel Pty Ltd	Beta-Hunt Nickel Group	5	2
First Quantum Minerals (Australia) Pty Limited	Ravensthorpe	1,019	963
Focus Minerals Ltd	Nepean	1	0
Fox Resources Pty Ltd	Radio Hill	22	8
Independence Long Pty Ltd	Long Shaft	211	130
Lake Johnston Pty Ltd	Lake Johnston Operations	228	25
	Mincor Operations – Miitel	147	183
	Otter Juan	77	31
Norilsk Nickel Avalon Pty Ltd	Avalon-Bulong Plant	8	6
	Black Swan	15	10
	Cawse	10	13
	Waterloo	8	6
Murrin Murrin Operations Pty Ltd	Murrin Murrin	1,349	1,384
Panoramic Resources Limited	Lanfranchi	245	296
	Savannah Group	356	325
Poseidon Nickel Ltd	Windarra Group	32	9
Salt Lake Mining Pty Ltd	Beta-Hunt	0	28
Western Areas NL	Forrestania	507	495
Xstrata Nickel Australasia Operations Pty Ltd	Cosmos	68	4
	Sinclair	77	10
TOTAL NICKEL		**7,664**	**6,447**
SALT			
Dampier Salt Ltd	Dampier	319	249
	Lake MacLeod	217	229
	Port Hedland	211	214
WA Salt Supply Koolyanobbing Pty Ltd	Lake Deborah	9	10
Onslow Solar Salt Pty Ltd	Onslow	272	290
Shark Bay Salt JV	Useless Loop	108	78
Western Salt Refinery Pty Ltd	Pink Lake	1	1
TOTAL SALT		**1,137**	**1,071**
TIN, TANTALUM AND LITHIUM			
Galaxy Resources Ltd	Mt Cattlin (Spodumene)	56	12
Global Advanced Metals Greenbushes Pty Ltd	Greenbushes	11	11
	Wodgina	55	53
Nagrom and Co.	Kelmscott	98	79
Talison Lithium Aust Pty Ltd	Greenbushes	216	234
TOTAL TIN, TANTALUM AND LITHIUM		**436**	**389**
TOTAL CHROMITE		**76**	**23**
TOTAL CLAYS		**110**	**111**

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY Continued			
MINERAL/Company	**Operating Site**	**2012–13**	**2013–14**
TOTAL CONSTRUCTION MATERIALS		**918**	**1,055**
TOTAL DIMENSION STONE		**102**	**107**
TOTAL GYPSUM		**18**	**33**
TOTAL INDUSTRIAL PEGMATITE MINERALS		**20**	**20**
TOTAL LIMESTONE – LIMESAND		**218**	**222**
TOTAL MINERAL EXPLORATION		**2,779**	**2,314**
TOTAL PHOSPHATE		**176**	**175**
TOTAL RARE EARTHS		**183**	**131**
TOTAL SILICA – SILICA SAND		**445**	**668**
TOTAL SILVER		**60**	**44**
TOTAL TALC		**39**	**47**
TOTAL TUNGSTEN AND MOLYBDENUM		**92**	**128**
TOTAL VANADIUM		**151**	**139**
TOTAL VARIOUS PORTS		**962**	**809**
ALL OTHER MATERIALS		**107**	**99**
TOTAL		**101,698**	**108,975**

PETROLEUM (onshore facilities and pipelines covered under *Petroleum Pipelines Act 1969, Petroleum (Submerged Land) Act 1982, Petroleum (Submerged Lands) Act 1982* and *Petroleum Geothermal Energy Resources Act 1967)*

APA Group	various laterals and pipelines		182
Apache Energy Ltd	Devil Creek, Varanus and Burrup Fertilisers Lateral		162
APT Parmelia Pty Ltd	Mondarra Gas Storage Facility		219
ARC Energy Ltd	Dongara and Hovea Production Facilities, Mt Horner, Woodada and Well Intervention Activities		22
Barrick Gold	Plutonic Lateral		8
BHP Billiton Petroleum	Macedon Gas Project		62
Buru Energy	includes Ungani and Blina Fields and Pipelines		40
Calenergy Resources (Aust) Ltd	Whicher Range-4 ST1		10
Chevron (Aust) Pty Ltd	Gorgon, WA Oil Asset and Drilling and Wheatstone		815
DBNGP (WA) Transmission Pty Ltd	Dampier-Bunbury Natural Gas Pipeline		246
Empire Oil Company (WA) Ltd	Red Gully Pipeline and Processing Facility		8
Goldfields Gas Transmission Pty Ltd	Goldfields Gas Pipeline		153
Midwest Joint Venture	Mid West Pipeline		11
Newgen Neerabup Partnership	Neerabup Pipeline-PL75		13
Newmont Yandal Operations Pty Ltd	Jundee Lateral		5
Norilsk	Cawse Lateral		4
Norwest Energy NL	P00084		3
Origin Energy	Cockburn Lateral, Jingemia and Beharra Springs		18
Pilbara Iron	Cape Lambert and Paraburdoo Gas Laterals		12
Redback Pipeline Pty Ltd	Magellan Lateral		7
Robe River Iron Ore Associates	West Angelas Petroleum (Gas) Pipelines and Stations		53
Roc Oil	Arrowsmith Stabilisation Facility		15
Southern Cross Pipelines Aust Pty Ltd	Mt Keith, Parkeston, Kambalda and Leinster Laterals		25
Other	various laterals and pipelines		23
TOTAL WA ONSHORE AND COASTAL WATERS			**2,113**

SOURCE: AXTAT Reporting System, Resources Safety Division, Department of Mines and Petroleum for minerals data and monthly status reports submitted to the department for Western Australia onshore petroleum facilities and pipelines data. Figures include employees as well as contractors.

TABLE 9. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS (EFFECTIVE SEPTEMBER 2014)

BASE METALS

Copper–Lead–Zinc

Aditya Birla Minerals Ltd,
Level 3, 256 Adelaide Terrace,
Perth WA 6000,
(08) 9366 8800,
Nifty.
www.adityabirlaminerals.com.au/aboutusoverview.asp

BHP Billiton Nickel West Pty Ltd,
Level 41, City Square,
125 St George's Terrace,
Perth WA ,
(08) 6321 0000,
Kambalda.
www.bhpbilliton.com

MMG Golden Grove Pty Ltd,
Level 23,
28 Freshwater Place,
Southbank Vic 3001,
(03) 9288 0888,
Golden Grove.
www.mmg.com

Independence Group NL,
Level 5, South Shore Centre,
85 South Perth Esplanade,
South Perth WA 6151,
(08) 9238 8300,
Teutonic Bore – Jaguar.
www.igo.com.au

Newcrest Mining Ltd,
193 Great Eastern Highway,
Belmont WA 6104,
(08) 9270 7070,
Telfer.
www.newcrest.com.au

Newmont Boddington Pty Ltd,
388 Hay Street,
Subiaco WA 6008,
(08) 9423 6100,
Boddington Gold
www.newmont.com

Rosslyn Hill Mining Pty Ltd,
Suite 1D, 21 Teddington Road,
Burswood WA 6100,
(08) 9267 7000,
Paroo Station Lead.
http://rosslynhillmining.com.au/

Sandfire Resources NL,
Level 1, 31 Ventnor Avenue,
West Perth WA 6005,
(08) 6430 3800,
DeGrussa–Dulgunna.
http://www.sandfire.com.au/

BAUXITE–ALUMINA

Alumina

Alcoa of Australia Limited,
181–205 Davy Street,
Booragoon WA 6154,
(08) 9316 5111,
Willowdale, Huntly–Del Park.
www.alcoa.com/australia

Worsley Alumina Pty Ltd,
PO Box 344,
Collie WA 6225,
(08) 9734 8311,
Worsley.
www.bhpbilliton.com.au

CLAY

Attapulgite

Hudson Resources Ltd,
2 Kemp Street, Narngulu,
Geraldton WA 6530,
(08) 9923 3604,
Lake Nerramyne.
www.hudsonresources.com

Clay Shale

Wesfarmers Premier Coal Ltd,
Premier Road,
Collie WA 6225,
(08) 9780 2222,
Collie.
www.wesfarmers.com.au

Saponite

Watheroo Minerals Pty Ltd,
PO Box 353,
Dunsborough WA 6281,
0418 140 929,
Watheroo Clays.
www.bentonitewa.com.au

COAL

Griffin Coal Mining Company Pty Limited,
1sr Floor, 677 Murray Street,
West Perth WA 6005,
(08) 6188 2200,
Collie.
www.griffincoal.com.au

Premier Coal Limited,
Premier Road,
Collie WA 6225,
(08) 9780 2222,
Collie.
www.premiercoal.com.au

CONSTRUCTION MATERIALS

Aggregate

Boral Resources (WA) Ltd,
63–69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Various.
www.boral.com.au

Hanson Construction Materials,
123 Burswood Road,
Burswood WA 6100,
(08) 9311 8811,
Turner River.
www.hanson.com.au

Holcim (Australia) Pty Ltd,
Technology Park,
18–20 Brodie–Hall Drive,
Bentley WA 6102,
(08) 9212 2000,
Burrup–Dampier, Newman, Turner River.
www.holcim.com.au

Northwest Quarries Pty Ltd,
PO Box 828,
Karratha WA 6714,
0419 873 357,
Pippingarra.
http://northwestquarries.com.au/

TABLE 9. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS Continued (EFFECTIVE SEPTEMBER 2013)

Gravel

Hanson Construction Materials,
123 Burswood Road,
Burswood WA 6100,
(08) 9311 8811,
Turner River.
www.hanson.com.au

NTC Contracting,
Lot 550 Onslow Road,
Onslow WA 6710,
(08) 9184 6025
Onslow.
www.ntc.net.au

WA Limestone Co.,
401 Spearwood Avenue,
Bibra Lake WA 6163,
(08) 9434 7777,
Pickering Brook.
www.walimestone.com

Sand

Boral Resources (WA) Ltd,
63–69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Gnangara, Grosmont.
www.boral.com.au

Rocla Quarry Products,
130 Fauntleroy Avenue,
Redcliffe WA 6104,
(08) 9475 2500,
Various sites.
www.rocla.com.au

Holcim (Australia) Pty Ltd,
Technology Park,
18–20 Brodie–Hall Drive,
Bentley WA 6102,
(08) 9212 2000,
Various sites.
www.holcim.com.au

Tuma Holdings Pty Ltd,
Unit 16, 32 Jubilee Street,
South Perth WA 6152,
Mobile: 0408 923 801,
Chidlow.

DIAMONDS

Argyle Diamonds Ltd,
1 William Street,
Perth WA 6000,
(08) 9482 1166,
Argyle.
www.argylediamonds.com.au

Kimberley Diamonds Ltd,
Level 38 Australia Square Tower,
264-278 George Street,
SYDNEY NSW 2000,
(02) 8243 7500,
Ellendale.
www.kdc.com.au

DIMENSION STONE

Granite

Fraser Range Granite NL,
Eyre Highway,
Norseman WA 6443,
(08) 9039 3442,
Fraser Range Granite

Marble

Stone Dimensions Australia Pty Ltd,
PO Box 342,
South Perth WA 3951,
(08) 9474 3355, or
(08) 9943 0704 minesite
Nanutarra Marbles.
www.stonemarble.com.au

GOLD

Agnew Gold Mining Co Pty Ltd,
PMB 10,
Leinster WA 6437,
(08) 9088 3822,
Agnew.
www.goldfields.co.za

AngloGold Ashanti Australia Limited,
Level 13, St Martins Tower,
44 St Georges Terrace,
Perth WA 6000,
(08) 9425 4600,
Sunrise Dam, Tropicana.
www.anglogoldashanti.com

Alacer Gold Corp,
Level 3, 18 Parliament Place,
West Perth WA 6005,
(08) 9226 0625,
Higginsville, South Kal Mines.
www.alacergold.com.

Barrick (Australia Pacific) Limited,
Level 10, 2 Mill Street,
Perth WA 6000,
(08) 9212 5777,
Super Pit Gold Operation.
www.barrick.com.

Doray Minerals Limited,
Level 3, 41–43 Ord Street,
West Perth WA 6005,
(08) 9226 0600,
Andy Well.
www.dorayminerals.com.au

Evolution Mining Limited,
Level 3, 1 Altona Street,
West Perth WA 6005,
(08) 6216 9700,
Edna May.
www.evolutionmining.com.au

Gold Fields Australia Pty Ltd,
Level 5, 50 Colin Street,
West Perth WA 6005,
(08) 9211 9200,
Agnew (08) 9088 3822,
Darlot (08) 9080 3500,
Granny Smith (08) 9088 2105,
St Ives (08) 9088 1111.
www.goldfields.com.au

Kalgoorlie Consolidated Gold Mines Pty Ltd,
Private Mail Bag 27,
Kalgoorlie WA 6433,
(08) 9022 1100,
Super Pit Gold Operation.
www.superpit.com.au

La Mancha Resources Inc.,
Level 1, 12 St Georges Terrace,
Perth WA 6000,
(08) 9268 4000,
Mungari East, Frogs Leg, White Foil.
www.lamancha.ca/en/home

Millennium Minerals Limited,
10 Kings Park Road,
West Perth WA 6005,
(08) 9216 9011,
Nullagine.
www.millenniumminerals.com.au

Northern Star Resources Limited,
Level 1, 1 Puccini Court,
Stirling WA 6021,
(08) 6188 2100,
Paulsens, East Kundana, Jundee,
Kanowna Belle, Plutonic.
www.nsrltd.com

Newcrest Mining Limited,
193 Great Eastern Highway,
Belmont WA 6104,
(08) 9270 7070,
Telfer.
www.newcrest.com.au

Newmont Mining Corporation,
Level 1, 388 Hay Street,
Subiaco WA 6008,
(08) 9423 6100,
Boddington, Jundee, Kalgoorlie.
www.newmont.com

Paddington Gold Pty Ltd,
PO Box 1653,
Kalgoorlie WA 6430,
(08) 9080 6800,
Paddington, Navajo–Chief.
www.nortongoldfields.com.au

Ramelius Resources Limited,
Level 1, 130 Royal Street,
East Perth WA 6004,
(08) 9202 1127,
Mt Magnet.
www.rameliusresources.com.au

Regis Resources Limited,
Level 1, 1 Alvan Street,
Subiaco WA 6008,
(08) 9442 2200,
Moolart, Garden Well.
www.regisresources.com.au

Sandfire Resources NL,
Level 1, 31 Ventnor Avenue,
West Perth WA 6005,
(08) 6430 3800,
DeGrussa–Dulgunna.
http://www.sandfire.com.au/

Saracen Mineral Holdings Limited,
Level 4, 89 St Georges Terrace,
Perth WA 6000,
(08) 9229 9100,
Porphyry.
www.saracen.com.au

Silver Lake Resources Limited,
Suite 4, Level 3,
85 South Perth Esplanade,
South Perth WA 6151,
(08) 6313 3800,
Mt Monger, Murchison, Randalls.
www.silverlakeresources.com.au

St Barbara Limited,
1205 Hay Street,
West Perth WA 6005,
(08) 9476 5555,
King of the Hills, Sons of Gwalia.
www.stbarbara.com.au

St Ives Gold Mining Co Pty Ltd,
PO Box 359,
Kambalda WA 6442,
(08) 9088 1111,
Kambalda–St Ives.
www.goldfields.co.za

Tanami Gold NL,
Level 2, 56 Ord Street,
West Perth WA 6005,
(08) 9212 5999,
Tanami Coyote.
www.tanami.com.au

GYPSUM

Dampier Salt Pty Ltd,
37 Belmont Avenue,
Belmont WA 6104,
(08) 9270 9270,
Lake MacLeod.
www.dampiersalt.com.au

Gypsum Industries,
Suite 1, 110 Robinson Avenue,
Belmont WA 6104,
1800 644 951,
Lake Cowcowing.
www.aglime.com.au

Lake Hillman Mining Pty Ltd,
PO Box 1,
Kalannie WA 6468,
(08) 9666 2045,
Lake Hillman.

Wandhill Gypsum,
626 Beckworth Road,
Esperance WA 6450,
(08) 9072 0055,
Scaddan.

Whitfield Minerals Pty Ltd,
PO Box 1363,
Mandurah WA 6210,
(08) 9535 9299,
Lake Cowan.

HEAVY MINERAL SANDS

Garnet Sand

GMA Garnet Pty Ltd,
Lot 122 Goulds Road,
Narngulu,
Geraldton WA 6532,
(08) 9923 6000,
Port Gregory.
www.garnetsales.com

Ilmenite, Leucoxene, Rutile and Zircon

Cristal Mining Australia Limited,
Koombana Drive, North Shore,
Bunbury WA 6230,
(08) 9721 0200,
Gwindinup Mine, Kemerton Plant.
www.bemax.com.au

Doral Mineral Sands Pty Ltd,
Lot 7, 1 Harris Road,
Picton WA 6229,
(08) 9725 5444,
Dardanup.
www.doral.com.au

TABLE 9. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS Continued (EFFECTIVE SEPTEMBER 2013)

Iluka Resources Ltd,
Level 23, 140 St Georges Terrace,
Perth WA 6000,
(08) 9360 4700.
Capel, Narngulu.
www.iluka.com

TiWest Pty Ltd,
Technology Park,
1 Brodie–Hall Drive,
Bentley WA 6102,
(08) 9365 1333,
Cooljarloo.
www.tiwest.com.au

IRON ORE

Atlas Iron Ltd,
Raine Square,
Level 18, 300 Murray Street,
Perth WA 6000.
(08) 6228 8000,
Abydos, Mt Dove, Pardoo, Wodgina.
www.atlasiron.com.au

BC Iron Limited,
Level 1, 15 Rheola Street,
West Perth WA 6005,
(08) 6311 3400,
Nullagine.
www.bciron.com.au

BHP Billiton Iron Ore (Goldsworthy) Ltd,
125 St Georges Terrace,
Perth WA 6000,
(08) 6224 4444,
Mining Area C.
www.bhpbilliton.com

BHP Billiton Iron Ore Pty Ltd,
125 St Georges Terrace,
Perth WA 6000,
(08) 6224 4444,
Jimblebar, Mt Whaleback,
Newman, Yarri, Mining Area C.
www.bhpbilliton.com

Channar Mining Pty Ltd,
152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2000,
Channar.

Citic Pacific Mining Management Pty Ltd,
99 St Georges Terrace,
Perth WA 6000,
(08) 9226 8888,
Sino Iron.
www.citicpacificmining.com

Cliffs Natural Resources Pty Ltd,
Level 12, 1 William Street,
Perth WA 6000,
(08) 9426 3333,
Koolyanobbing.
www.cliffsnaturalresources.com

Fortescue Metals Limited,
Level 2, 87 Adelaide Terrace,
East Perth WA 6004,
(08) 6218 8888,
Cloud Break, Christmas Creek,
Firetail, Nullagine.
www.fmgl.com.au

Gindalbie Metals Ltd,
Level 9, London House,
216 St Georges Terrace,
Perth WA 6000,
(08) 9480 8700,
Karara–Blue Hills.
www.gindalbie.com.au

Hamersley Iron Pty Ltd,
152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2000,
Brockman, Namuldi, Mesa J,
Channar, Eastern Range,
Hope Downs, Marandoo,
Mesa A–Waramboo, Paraburdoo,
Tom Price, West Angelas,
Western Turner Syncline,
Yandicoogina.
www.hamersleyiron.com

Hope Downs Management Services Pty Ltd,
152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2000,
Hope Downs.
www.riotintoironore.com

Kimberley Metals Group,
Suite 4, 610 Murray Street,
West Perth WA 6005,
(08) 9225 3100,
Ridges.
www.kmetgroup.com

Mineral Resources Limited,
1 Sleat Road,
Applecross WA 6153,
(08) 9329 3600,
Poondano, Carina, Phils Creek.
www.mineralresources.com.au

Moly Mines Limited,
46-50 Kings Park Road,
West Perth WA 6005,
(08) 9429 3300,
Spinifex Ridge.
www.molymines.com

Mt Gibson Iron Limited,
Level 1, 2 Kings Park Road,
West Perth WA 6005,
(08) 9426 7500,
Mt Gibson Iron,
Koolan Island, Tallering Peak.
www.mtgibsoniron.com.au

Pluton Resources Limited,
Level 1, 5 Ord Street,
West Perth WA 6005,
(08) 6145 1800,
Cockatoo Island.
www.plutonresources.com

Robe River Iron Associates,
Level 22, Central Park,
152–158 St Georges Terrace,
Perth WA 6000,
(08) 9327 2000,
Pannawonica, West Angelas.
www.riotinto.com

Sinosteel Midwest Corporation Limited,
7 Rheola Street,
West Perth WA 6005,
(08) 9429 4888,
Koolanooka.
www.smcl.com.au

LIMESAND–LIMESTONE

Cockburn Cement Ltd,
Lot 242, Russell Road,
Munster WA 6163,
(08) 9411 1000,
Various sites.
www.cockburncement.com.au

Gypsum Industries of Australia,
Suite 1, 110 Robinson Avenue,
Belmont WA 6104,
1800 644 951,
Dongara–Denison,
Lancelin, Jurien.
www.aglime.com.au/

Limestone Resources Australia Pty Ltd,
25-29 Frobisher Street,
Osborne Park WA 6017,
(08) 9340 0011,
Wanneroo, Moore River, Carabooda.
www.limestone-resources.com.au

WA Limestone Co.,
401 Spearwood Avenue,
Bibra Lake WA 6163,
(08) 9434 7777,
Various sites throughout State.
www.walimestone.com/

MANGANESE

Pilbara Manganese Pty Ltd,
Lot 2524 North West Coastal Highway,
South Hedland WA 6722,
(08) 9172 0900,
Woodie Woodie.
www.consminerals.com.au

NICKEL

BHP Billiton (Nickel West),
125 St George's Terrace,
Perth WA 6845,
(08) 6321 0000,
Kambalda, Leinster, Mt Keith,
Kalgoorlie, Kwinana.
www.bhpbilliton.com

First Quantum Minerals (Australia) Pty Ltd,
Level 1, 24 Outram Street,
West Perth WA 6005,
(08) 9346 0100,
Ravensthorpe.
www.first-quantum.com

Independence Group NL,
Suite 4, Level 5, South Shore Centre,
85 South Perth Esplanade,
South Perth WA 6151,
(08) 9238 8300,
Long Nickel.
www.igo.com.au

Minara Resources Limited,
Level 10, 58 Mounts Bay Road,
Perth WA 6000,
(08) 9212 8400,
Murrin Murrin.
www.minara.com.au

Mincor Resources NL,
Level 1, 56 Ord Street,
West Perth WA 6005,
(08) 9476 7200,
Mariners, Miitel.
www.mincor.com.au

Panoramic Resources Ltd,
Level 9, 553 Hay Street,
Perth WA 6000,
(08) 6266 8600,
Savannah, Lanfranchi Tramways.
www.panoramicresources.com

Western Areas Limited,
Level 2, Kings Park Road,
West Perth WA 6005,
(08) 9334 7777,
Forrestania, Flying Fox,
Lounge Lizard, Spotted Quoll.
www.westernareas.com.au

PALLADIUM

BHP Billiton (Nickel West),
125 St George's Terrace,
Perth WA 6845,
(08) 6321 0000,
Kambalda.
www.bhpbilliton.com

PETROLEUM

Apache Energy Ltd,
Level 9, 100 St Georges Terrace,
Perth WA 6000,
(08) 6218 7100,
Various sites covering 16 production licenses.
www.apachecorp.com

AWE Ltd,
679 Murray Street,
West Perth WA 6005,
(08) 9480 1300,
Corbyas,Dongara.
http://www.awexp.com.au/irm/content/home.html

Buru Energy Limited,
Level 2, 88 William Street,
Perth WA 6000,
Freecall: 1800 337 330,
Ungani.
www.buruenergy.com.au

BHP Billiton Petroleum Pty Ltd,
Brookfield Place,
125 St Georges Terrace,
Perth WA 6000,
(08) 6321 0000,
Pyrenees, Stybarrow, Macedon.
www.bhpbilliton.com

Empire Oil & Gas NL,
229 Stirling Highway,
Claremont WA 6010,
(08) 9284 6422,
Red Gully.
www.empireoil.com.au

Chevron Australia Pty Ltd,
Level 24, QV1 Building,
250 St Georges Terrace,
Perth WA 6000,
(08) 9216 4000,
Barrow Island, Crest,
Roller–Skate, Saladin.
www.chevron.com

ENI Australia Limited,
ENI House,
266 Adelaide Terrace,
Perth WA 6000,
(08) 9320 1111,
Blacktip.

TABLE 9. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS Continued (EFFECTIVE SEPTEMBER 2013)

Origin Energy Resources Ltd,
34 Colin Street,
West Perth WA 6005,
(08) 9324 6111,
Beharra Springs.
www.originenergy.com.au

Roc Oil Company Limited,
Level 2, 201 Adelaide Tce,
East Perth WA 6004,
(08) 9219 7111,
Cliff Head.
www.rocoil.com.au

Santos Limited,
Level 1, 40 The Esplanade,
Perth WA 6000,
(08) 9333 9500,
Mutineer–Exeter.
www.santos.com.au

Vermilion Oil and Gas Australia Pty Ltd,
Level 5, 30 The Esplanade,
Perth WA 6000,
(08) 9215 0300,
Wandoo.
www.vermilionenergy.com/

Woodside Energy Ltd,
240 St Georges Terrace,
Perth WA 6000,
(08) 9348 4000,
Angel, Athena, Cossack, Goodwyn, Hermes, Pluto,North Rankin, Wanaea, Vincent, Enfield.
www.woodside.com.au

PLATINUM

BHP Billiton (Nickel West),
125 St George's Terrace,
Perth WA 6845,
(08) 6321 0000,
Kambalda.
www.bhpbilliton.com

RARE EARTHS

Lynas Corporation,
Level 1, 7 Tully Road,
East Perth WA 6004,
(08) 6241 3800,
Mount Weld.
www.lynascorp.com

SALT

Dampier Salt Ltd,
37 Belmont Avenue,
Belmont WA 6104,
(08) 9270 9270,
Dampier, Lake MacLeod, Port Hedland.
www.dampiersalt.com.au

Onslow Salt Pty Ltd,
Level 16, 2 The Esplanade,
Perth WA 6000,
(08) 9265 8000,
Onslow Salt.

Shark Bay Salt Joint Venture,
Level 16, 2 The Esplanade,
Perth WA 6000,
(08) 9265 8000,
Useless Loop.
www.mitsui.com/au/en/group/1197874_3954.html

WA Salt Supply Ltd,
Lot 102–103 Cockburn Road,
North Coogee WA 6163,
(08) 9431 9431,
Lake Deborah East.
www.wasalt.com.au

SILICA – SILICA SAND

Silica

Simcoa Operations Pty Ltd,
973 Marriott Road,
Wellesley WA 6233,
(08) 9780 6666,
Dalaroo, Kemerton.
www.simcoa.com.au

Silica Sand

Austsand Mining,
570 Mindijup Road,
Manypeaks WA 6328,
(08) 9846 1222,
Mindijup.

Kemerton Silica Sand Pty Ltd,
Suite 5, 363-367 Albany Highway,
Victoria Park WA 6100,
(08) 9355 0266,
www.ksspl.com.au.

Rocla Quarry Products,
3 Casella Place,
Kewdale WA 6105,
(08) 9353 9800,
Gnangara.
www.rocla.com.au

SPONGOLITE

Opalbase Nominees Pty Ltd,
Red Gum Pass,
Kendenup WA 6323,
(08) 9841 7549,
Red Gum Spongolite.

TALC

Luzenac Australia Pty Ltd,
Perenjori Road,
Three Springs WA 6519,
(08) 9954 3000,
Three Springs.
www.luzenac.com.au

IMI FABI (Australia) Pty Ltd,
9 Cleaver Street,
West Perth WA 6005,
(08) 9228 0255,
Mt Seabrook.

TIN–TANTALUM–LITHIUM

Spodumene

Talison Minerals Ltd,
Level 4, 37 St Georges Terrace,
Perth WA 6000,
(08) 9263 5555,
Greenbushes.
www.talison.com.au

Tantalum

Global Advanced Metals Pty Ltd,
Ground Floor,
76 Kings Park Road,
West Perth WA 6005,
(08) 6217 2500,
Greenbushes, Wodgina.
www.globaladvancedmetals.com

VANADIUM

Atlantic Ltd,
Bankwest Tower,
108 St Georges Terrace,
Perth WA 6000,
(08) 6141 7100,
Windimurra.
www.atlanticltd.com.au/

ABBREVIATIONS

A$	Australian dollar	Mct	million carats
ABS	Australian Bureau of Statistics	Mha	million hectares
bbl	barrels of oil	MMbbl	million barrels
bbl/d	barrels per day	Moz	million ounces
Bcm	billion cubic metres	Mt	million tonnes
BREE	Bureau of Resources and Energy Economics	Mtoe	million tonnes of oil equivalent
Btu	British Thermal Units	Mt/a	million tonnes per annum
ct	carat	OPEC	Organization of Petroleum Exporting Countries
GDP	Gross Domestic Product	oz	ounce
GJ	Gigajoule	oz/a	ounce per annum
Gm^3	billion cubic metres	PJ	petajoules
ha	hectares	RBA	Reserve Bank of Australia
kl	kilolitres	t	tonne
km	kilometres	t/a	tonnes per annum
km^2	square kilometres	Tcf	trillion cubic feet
kt	thousand tonnes	t/d	tonnes per day
LME	London Metal Exchange	TJ/d	terajoules per day
m	metre	US$	United States dollar
Mboe	millions of barrels of oil equivalent		

WEIGHTS AND MEASURES

kilo	10^3	1,000
mega	10^6	1,000,000
giga	10^9	1,000,000,000
tera	10^{12}	1,000,000,000,000
peta	10^{15}	1,000,000,000,000,000
exa	10^{18}	1,000,000,000,000,000,000
zetta	10^{21}	1,000,000,000,000,000,000,000
yotta	10^{24}	1,000,000,000,000,000,000,000,000

UNITS AND CONVERSION FACTORS

	Metric Unit	Symbol	Imperial Unit
Mass	1 gram	g	= 0.032151 troy (fine) ounce (oz)
	1 kilogram	kg	= 2.204624 pounds (lb)
	1 tonne	t	= 1.10231 United States short ton [1 US short ton = 2,000 lb]
	1 tonne	t	= 0.98421 United Kingdom long ton [1 UK long ton = 2,240 lb]
	1 tonne LNG	t	= 52,000,000 British Thermal Units (Btu)
Volume	1 kilolitre	kL	= 6.28981 barrels (bbl)
	1 cubic metre	m^3	= 35.3147 cubic feet (ft^3) [1 kilolitre (kl) = 1 cubic metre (m^3)]
Energy	1 kilojoule	kJ	= 0.94781 British Thermal Units (Btu)

	Energy Content	Prefix	
Coal	19.7 GJ/t	kilo (k)	10^3
Condensate	32.0 MJ/L	mega (M)	10^6
Crude oil	37.0 MJ/L	giga (G)	10^9
LNG	25.0 MJ/L	tera (T)	10^{12}
Natural gas	38.2 MJ/m^3	peta (P)	10^{15}
LPG-butane	28.7 MJ/L (1tonne LPG-butane = 1,720 litres)		
LPG-propane	25.4 MJ/L (1tonne LPG-propane = 1,960 litres)		

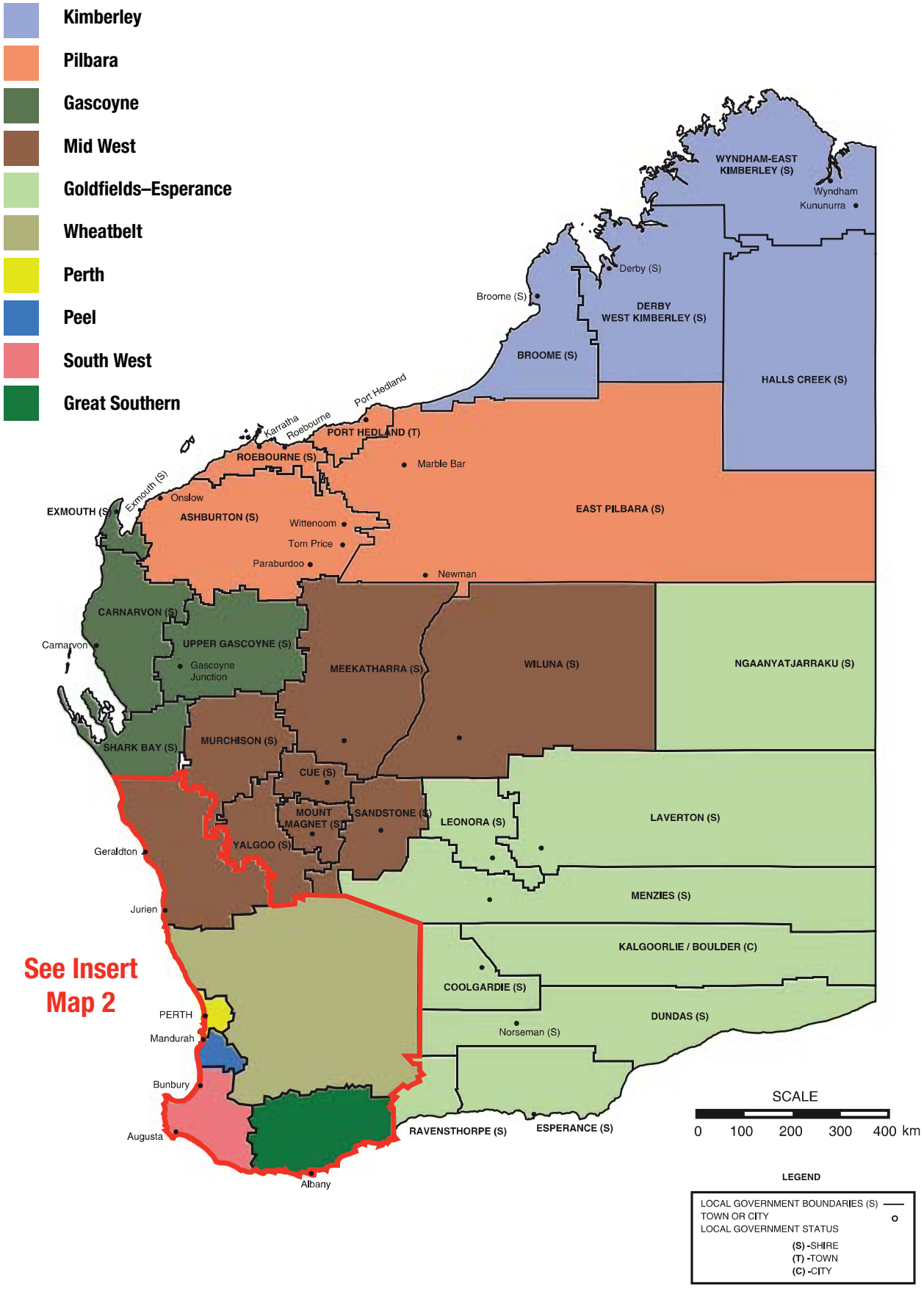
DATA SOURCES

Quantities and values for minerals and petroleum in this publication are collected from a variety of sources including:

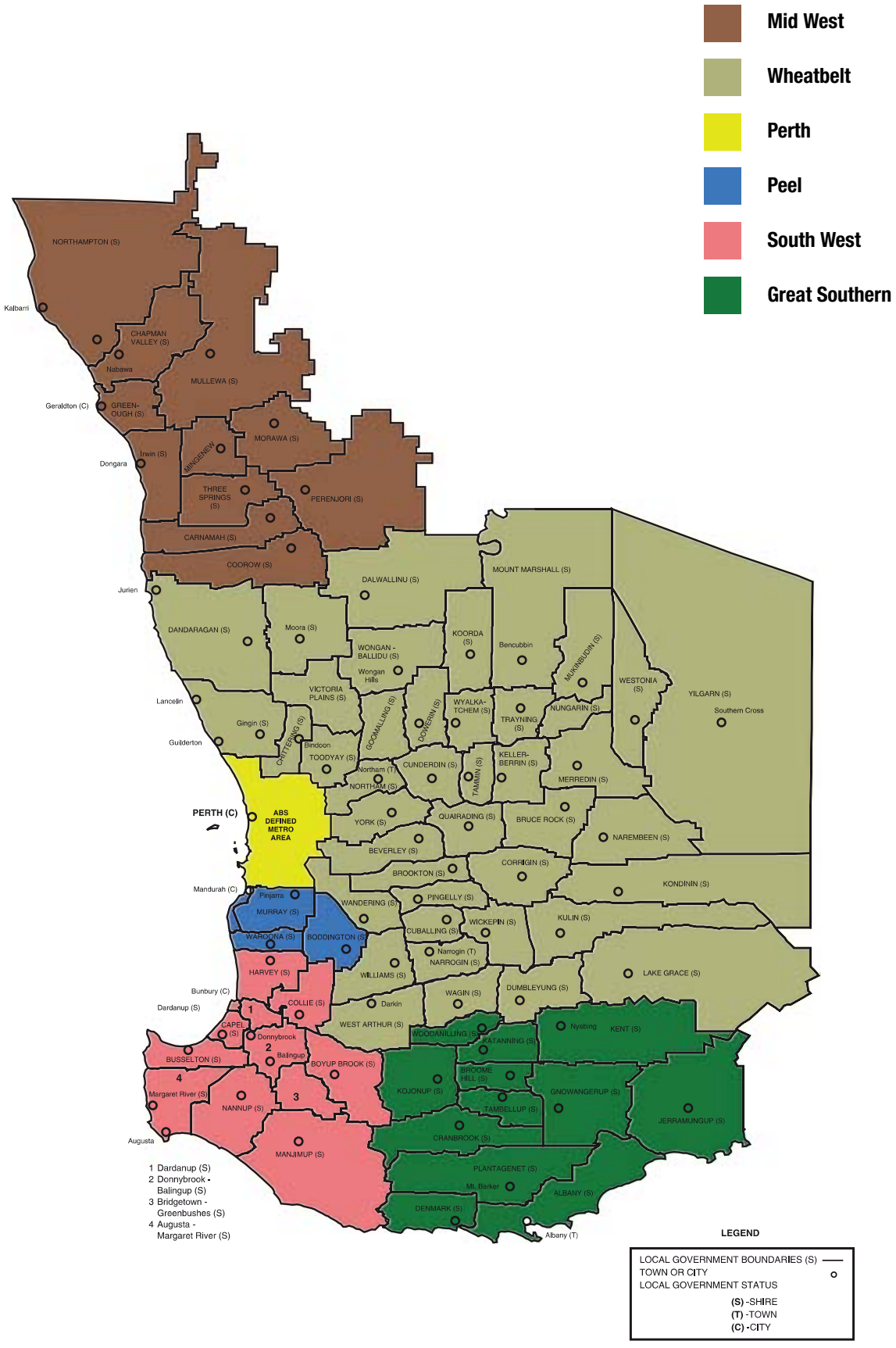
The Department's royalty returns, various company annual reports and quarterly Australian Stock Exchange reports, State port authority statistics, the ABS and BREE.

Quantities specified relate to either mine production or sales as listed below for each commodity.

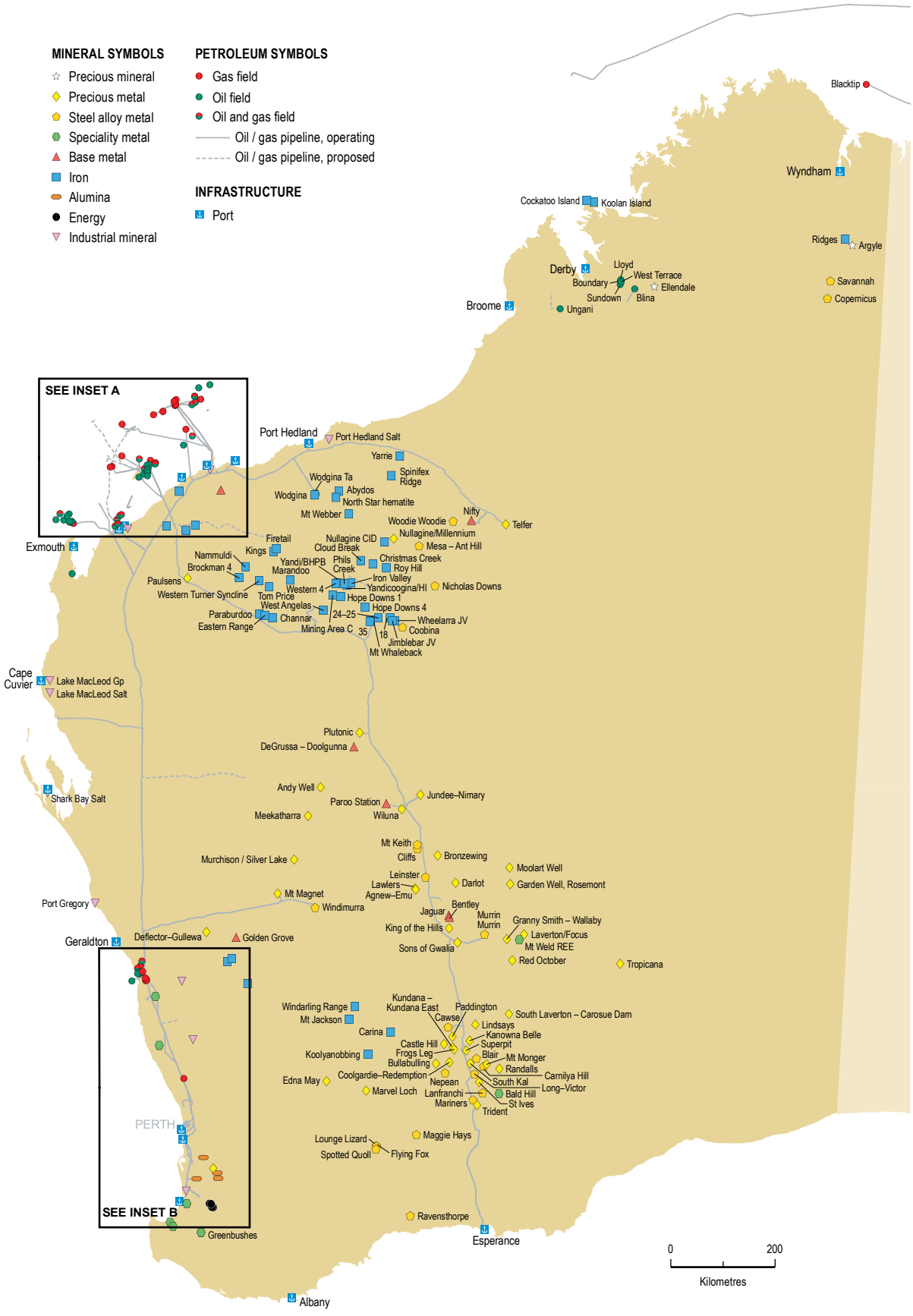
Mine Production
Clays
Coal
Construction Materials
Dimension Stone
Gold
Gypsum
Limesand–Limestone–Dolomite
Silica – Silica Sand
Talc
Sales
Alumina
Base Metals (Copper, Lead and Zinc)
Chromite
Diamonds
Gem and Semi-Precious Stones
Heavy Mineral Sands
Industrial Pegmatite Minerals
Iron Ore
Manganese
Nickel Industry (Nickel, Cobalt, Platinum and Palladium)
Petroleum
Pigments
Rare Earths
Salt
Silver
Spongolite
Tin–Tantalum–Lithium
Vanadium



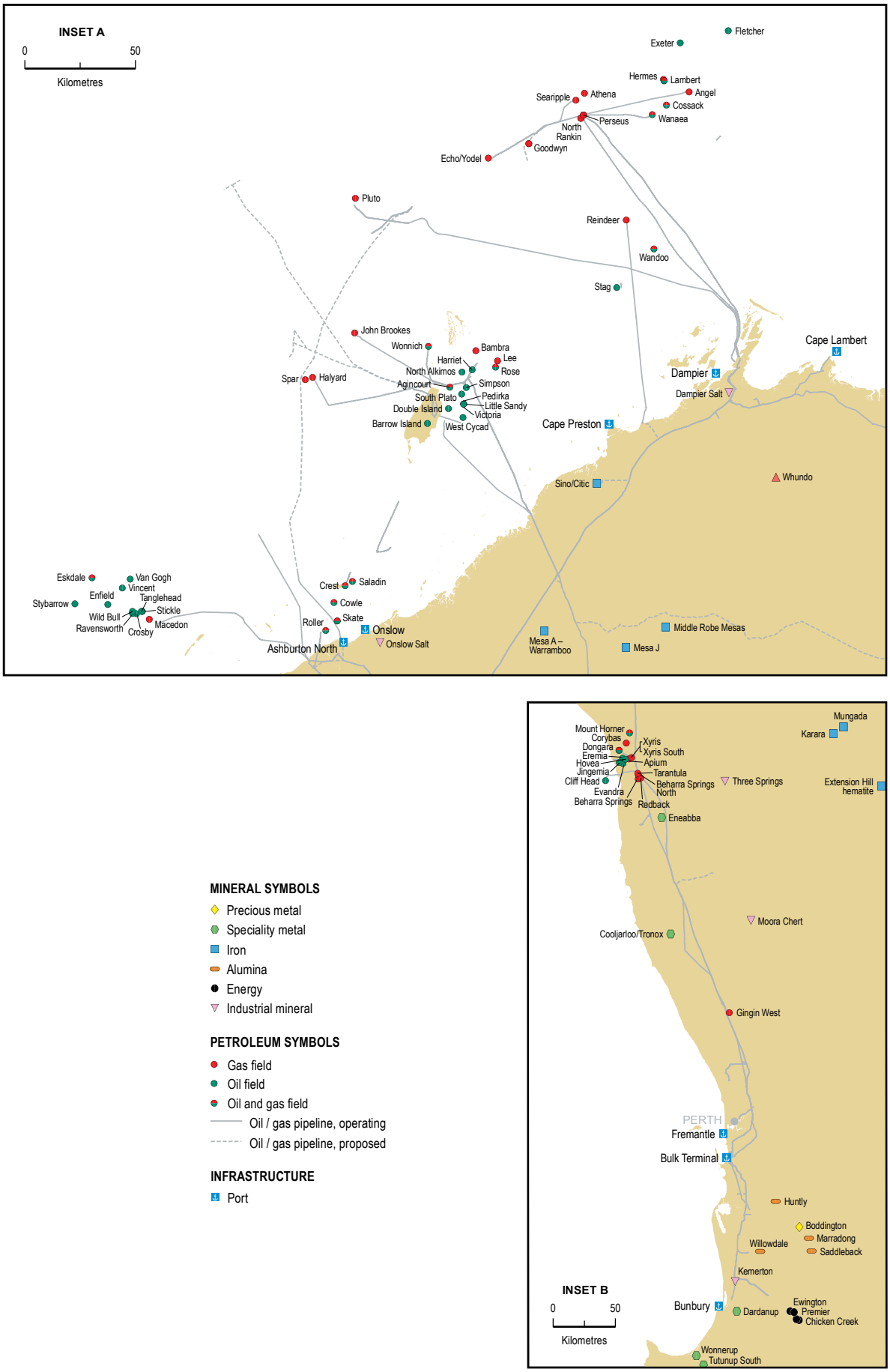
Map 1. Local Government and Regional Boundaries



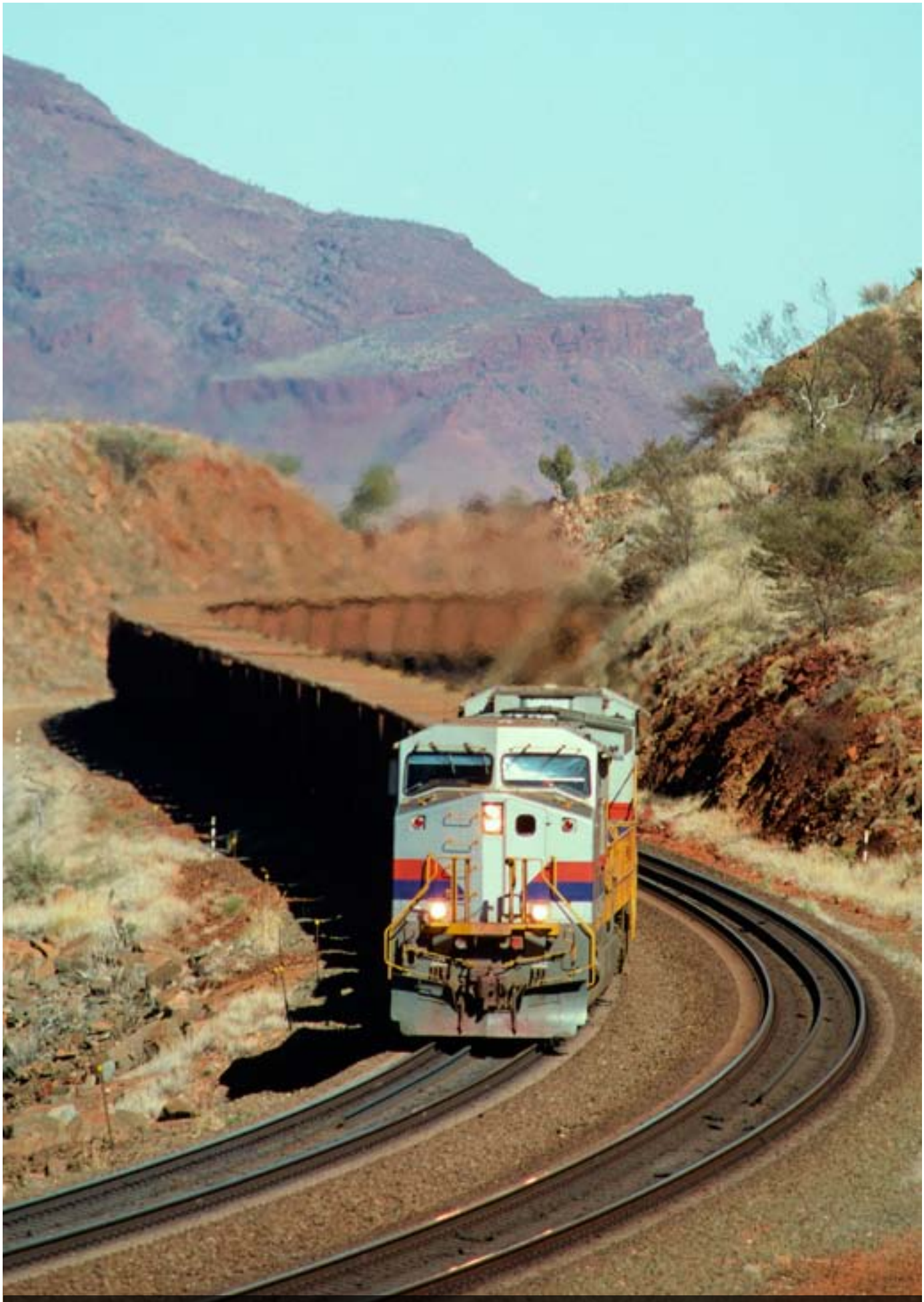
Map 2. Local Government and Regional Boundaries Insert



Map 3. Major Mineral and Petroleum Projects in Western Australia



Map 4. Major Mineral and Petroleum Projects in Western Australia Insert



Two powerful silver diesel trains travelling slowly uphill with a load of iron ore wagons in Australia's remote Pilbara region. The train is pictured winding around an S-curve with a spectacular mountain backdrop. The heat haze from the locomotives distorts the landscape where the red stony hills are covered with spiky spinifex grass.

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