



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

WESTERN AUSTRALIAN MINERAL AND PETROLEUM

STATISTICS DIGEST

2012–13



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

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Welcome to the Mineral and Petroleum Statistics Digest for 2012–13. This publication brings together a range of statistical information to provide a comprehensive overview of Western Australia's mineral and petroleum industry.

The statistics in this Digest show that the value of mineral and petroleum sales from Western Australia was \$102 billion in 2012–13. This was four per cent less than the previous financial year.

The value of the mineral and petroleum industry remains high despite global economic conditions which resulted in lower commodity prices for the period. It also demonstrates the resilience of Western Australian mineral and petroleum producers who for the most part of the year contended with a strong Australian dollar.

The State's resources industry has grown considerably over the past decade with the value of mineral and petroleum sales increasing on average by 14 per cent each year. This expansion has been driven by rapid industrialisation in Asia which has underpinned steady demand for Western Australia's commodity exports. In 2012–13, mineral and energy exports contributed a dominant 89 per cent share of the State's merchandise exports earnings.

Western Australia is one of the great mineral provinces of the world. It hosts an impressive 523 commercial mineral projects, embracing 1032 operating mine sites which produce over 50 different minerals. The resources industry continues to play a key role in the economic development and prosperity of the State and the nation.

Whilst not immune to external economic conditions, the State's mineral and petroleum industry is globally competitive and is in a very strong position as shown by near-record sales in 2012–13 and huge investment in resource projects. 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 (BREE), Australian Bureau of Statistics (ABS) and the Western Australian Department of Treasury for their cooperation in compiling this Digest.

Richard Sellers
Director General
Department of Mines and Petroleum

1. EXPLORATION AND MINERAL TITLES

1.1 MINERALS EXPLORATION

In 2012–13, mineral exploration expenditure in Western Australia fell sixteen per cent to \$1.8 billion from the previous year's record high of \$2.1 billion. This result for 2012–13 was 40 per cent higher than five years ago.

Nationally, mineral exploration metres drilled fell by 26 per cent to 8.4 million metres from the previous year, whilst expenditure fell by 23 per cent to \$3.06 billion in 2012–13. Most of this drilling occurred in areas of existing deposits which accounted for 67 per cent, with the remaining 33 per cent on new ground. Weaker commodity prices have seen a re-evaluation of exploration expenditure over the past year.

The bulk of Australia's mineral exploration activity occurs in Western Australia. The State accounted for 58 per cent (\$1763 million) of national mineral exploration expenditure in 2012–13. The following list shows the order of State and Territory share of national expenditure on mineral exploration:

■ Western Australia	58%
■ Queensland	22%
■ South Australia	8%
■ New South Wales	6%
■ Northern Territory	4%
■ Victoria	1%
■ Tasmania	1%

In 2012–13, the majority of Western Australia's mineral exploration expenditure was spent on existing deposits which accounted for around 67 per cent or \$1190 million. The remaining 33 per cent, or \$573 million, was spent on greenfield areas.

In terms of expenditure by mineral, in 2012–13, iron ore dominated once again and accounted for 52 per cent, or \$922 million, of Western Australian mineral exploration expenditure. This was a ten per cent fall on 2011–12. Gold exploration was also down by 16 per cent to \$467 million, with nickel also falling by 39 per cent to \$157 million on the previous year. Other base metals exploration expenditure fell 16 per cent to \$93 million, whilst uranium fell by over half to 22 per cent to \$35 million.

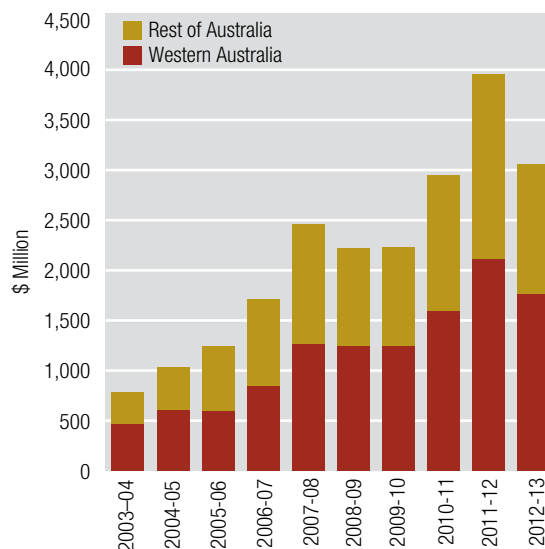


Figure 1 | Mineral Exploration Expenditure
Source: ABS

Together, iron ore, gold and nickel accounted for 88 per cent or \$1.5 billion of total mineral exploration expenditure in Western Australia in 2012–13.

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% of direct drilling costs for innovative drilling programs through a competitive application system. Since the start of the program, co-funding has been offered to 377 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 2012–13, petroleum exploration expenditure in Western Australia was a record \$3.3 billion (an increase of 56 per cent on last year) and represented 69 per cent of the total national petroleum exploration expenditure.

At the national level, in contrast to minerals, expenditure on petroleum exploration rose by 50 per cent to a record \$4.8 billion in 2012–13. Western Australia attracted the largest share with 69 per cent of national petroleum exploration expenditure, up three per cent from 2011–12.

The following list shows the State and Territory share of national expenditure on petroleum exploration in 2012–13:

- Western Australia _____ 69%
- Queensland _____ 14%
- South Australia _____ 8%
- Northern Territory _____ 6%
- New South Wales _____ 1%
- Victoria _____ n/a
- Tasmania _____ n/a
- Not available for publication _____ 2%

Offshore basins continue to attract the majority of petroleum exploration expenditure in Australia and accounted for 72 per cent of total spending in 2012–13. The proportion of petroleum exploration expenditure spent onshore in Australia rose to 28 per cent in 2012–13.

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.

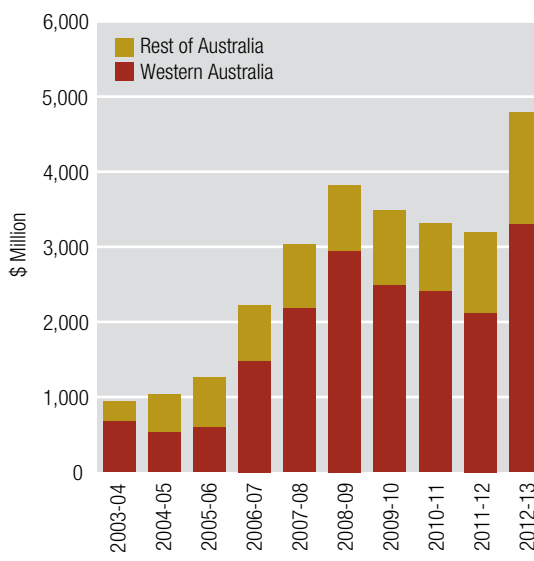


Figure 2 | **Petroleum Exploration Expenditure**
Source: ABS

1.3 MINERAL TITLES

In 2012–13, the total amount of land covered by mineral tenements in force in Western Australia fell by 10 per cent to 61.7 million hectares.

Exploration Licences covered the majority of mineral tenements (86 per cent) and this is where the largest fall occurred. The actual number of Exploration Licences fell by seven per cent from 6969 to 6503, whilst the area fell by 12 per cent from 60 million hectares to 53 million hectares.

Mining Leases accounted for only four per cent (2.5 million hectares) of the total area. This is an increase of seven per cent over the previous period, rising from 2.285 million hectares in 2011–12 to 2.415 in 2012–13. The number of Mining Leases in force rose by five per cent from 5897 to 6195.

TABLE 1. MINERAL TENEMENTS IN FORCE 1978 ACT

	2008–09		2009–10		2010–11		2011–12		2012–13	
	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha
Prospecting Licences	7,110	913	7,032	890	7,106	897	7,265	910	6,834	851
Exploration Licences	4,959	42,367	5,297	44,123	6,050	52,205	6,969	60,396	6,503	52,895
Mining Leases	5,618	2,065	5,764	2,125	5,845	2,233	5,897	2,285	6,195	2,451
Other	2,512	3,477	2,884	4,541	2,995	4,926	3,157	5,323	3,377	5,486
Mineral Claims & Other 1904 Act	186	21	186	21	186	21	186	21	186	21
Total	20,385	48,843	21,163	51,700	22,182	60,282	23,474	68,935	23,095	61,704

Source: DMP

1.4 PETROLEUM TITLES

In June 2013, the total area covered by petroleum titles in force under Western Australia State legislation was 308 thousand square kilometres.

The *Petroleum (Submerged Lands) Act 1982* titles totalled 45 covering 5.4 thousand square kilometres. Pipeline licences accounted for 25 of these titles, production licences ten, retention leases five and exploration permits five.

The *Petroleum and Geothermal Energy Resources Act 1967* titles totalled 138, covering 303 thousand square kilometres. This comprised 78 exploration permits covering 224 thousand square kilometres and 33 geothermal exploration permits covering 56 thousand square kilometres. 16 production licences covered three thousand square kilometres, five retention leases (412 square kilometres) and the remaining six are made up of other miscellaneous licences/authorities.

There were a total of 90 pipeline licences held under the *Petroleum Pipelines Act 1969* in June 2013, covering six thousand square kilometres.

TABLE 2. PETROLEUM TITLE AREAS – BY TITLE TYPE				
Legislation	Title Type	Area	Blocks	Number of Titles
Petroleum (Submerged Lands) Act, 1982		5,413.2000 km²	102	45
	Exploration Permit	2,290.1500 km ²	53	5
	Pipeline Licence	614.9500 km		25
	Production Licence	2,041.4300 km ²	29	10
	Retention Lease	1,081.6200 km ²	20	5
Petroleum and Geothermal Energy Resources Act 1967		302,642.2423 km²	3,973	138
	Access Authority to Deviated Well	0.0000 km ²	0	3
	Drilling Reservation	223.1000 km ²	3	1
	Exploration Permit	223,508.1964 km ²	2,866	78
	Geothermal Exploration Permit	55,651.8879 km ²	782	33
	Petroleum Lease	260.1000 km ²	9	1
	Production Licence	3,003.4580 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		6,001.5263 km		90
	Pipeline Licence	6,001.5263 km		90
		308,055.4423 km²	4,075	273

2.1 OVERVIEW

The value of Western Australia's mineral and petroleum industry in 2012–13 was \$102 billion. Although the value of the industry fell by 3.8 per cent from 2011–12, this value was the second highest on record and the third consecutive year above \$100 billion.

The strong Australian dollar maintained an average exchange rate in excess of US\$1 over this period. This played a part in lowering the received prices for Western Australian producers. Traditionally perceived as a commodity currency, the Australian dollar did not decrease in line with falling commodity prices and therefore did not shield producers from lower prices. It was not until May 2013 that the exchange rate fell below parity thus providing some relief to falling prices.

The value of sales overall, however, was maintained by an increase in quantities sold.

Iron ore and gold together accounted for \$65.3 billion (84 per cent) of all mineral sales in 2012–13.

Iron ore remained the State's highest value commodity, accounting for \$56.4 billion (73 per cent) of total mineral sales in 2012–13. With strong demand, led by China, the sector achieved record levels of export quantities. This resulted in 513 million tonnes being exported, an increase of 13 per cent on the previous financial year. However, lower prices resulted in a decrease of 7.3 per cent in the value of iron ore sales.

The gold price continued to climb in the first half of 2012–13, but started to weaken in December 2012 and continued its downward trend to June 2013. This resulted in total sales of just under \$9 billion for 2012–13, a fall of 4.6 per cent over the previous financial year.

The petroleum sector, which includes crude oil, condensate, LNG, natural gas and LPG (butane and propane), was valued at \$24.5 billion, an increase of 2.9 per cent on the previous year. This increase was due to the Pluto LNG project coming onstream, which countered falls in crude oil, LPG and domestic gas.

Mineral and petroleum exports comprised 89 per cent of the State's total merchandise exports, representing the major contribution to Western Australia's 47 per cent share of the nation's total merchandise exports. China remains our major trading partner, taking 47 per

cent of merchandise exports and is followed by Japan at 19 per cent.

ABS figures showed that investment activity in Western Australia strengthened during 2012–13, with the State's mining industry investing a record \$48 billion, a seven per cent increase compared to 2011–12. Western Australia remained the nation's leading mining investment destination, attracting 51 per cent of total national capital spending valued at a record \$95 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 23 per cent during the five years to 2012–13.

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 have begun to decline as major projects under construction now near completion and 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 2013, Western Australia had an estimated \$146 billion worth of resource projects under construction or in the committed stage of development. A further \$97 billion has been identified as being allocated to planned or possible projects in coming years.

HIGHLIGHTS IN 2012–13

Iron ore remains the State's most valuable sector of the mining industry, accounting for \$56.4 billion (73 per cent) of the mineral sector's total sales. Although this result was 7.3 per cent lower than the 2011–12 year, increased output of 13 per cent (58 million tonnes) helped to offset weaker prices and a strong Australian dollar. In total, 513 million tonnes were exported in 2012–13.

Gold was the second most valuable mineral sector, with total sales of just under \$9 billion, representing 12 per cent of the mineral sector's total sales. The gold price continued its upwards momentum in the first half of 2012–13; however, it started to weaken in December 2012 and continued a downward trend to June 2013. The quantity sold fell slightly from 5.8 million ounces in 2011–12 to 5.7 million ounces.

Alumina and **nickel** maintained their long-held positions as the State's third and fourth most valuable mineral sectors. Prices for both commodities were negatively impacted this financial year. The quantity of nickel sales increased by 9.5 per cent to a record 228 thousand tonnes; however, the total value decreased by 2.3 per cent, from \$3.7 billion in 2011–12 to \$3.6 billion this financial year. The total value of alumina decreased by 1.3 per cent to \$3.9 billion; however, the quantity sold increased by 8.9 per cent. The alumina price fell some nine per cent during the period.

The overall value of **base metals** (copper, lead and zinc) increased by 22 per cent to just under \$1.6 billion in 2012–13. This increase was due to the commencement of shipments from the Paroo Station lead project and Sandfire's DeGrussa–Doolgunna copper–gold project. Copper is by far the most significant base metal, with total sales of \$1.4 billion, up 24 per cent on the previous financial year. Sales of lead increased sharply from \$12.9 million to just under \$47 million. Zinc output levels fell by 12 per cent, with the total value of sales falling from \$121 million in 2011–12 to \$100 million in 2012–13.

The total value of **mineral sands** sales fell by just under 16 per cent to \$756 million. Sales revenues were impacted by lower sales tonnages in ilmenite, synthetic rutile and zircon.

The value of **salt** sales rose by around eight per cent to \$382 million in 2012–13, while volumes fell by three per cent to 12.4 million tonnes.

In 2012–13, **diamond** sales volumes rebounded by 10.6 per cent to 9.6 million carats. Increased tonnages and higher grades from the Argyle underground mine accounted for this improvement.

Coal prices remained static, whilst output and values increased by a little over seven per cent to reach 7.5 million tonnes and \$311 million respectively.

Output for **cobalt**, as a by-product of nickel mining, increased by 31 per cent to 6383 tonnes, but weaker prices translated into only a ten per cent increase in sales value which reached \$160 million.

Petroleum, which includes crude oil, condensate, LNG, natural gas and LPG (butane and propane), was valued at a record \$24.5 billion. The increase can be attributed to the Pluto LNG project coming onstream, which countered falls in crude oil, LPG and domestic gas.

LNG was the most valuable petroleum product in the State in 2012–13, with output increasing by almost 29 per cent to reach a record 19.8 million tonnes. The value of sales increased by 25 per cent to a record \$12.5 billion. LNG production is forecast to grow in the period ahead due to increased demand from Asia and supply from new projects including Wheatstone and Gorgon.

Production of **crude oil**, the second most valuable petroleum product in 2012–13, decreased by 24 per cent to 54 million barrels, with sales values decreasing to \$6 billion. Crude oil is continuing its downward trend due to maturing fields.

The value of **condensate** increased by two per cent to \$3.9 billion and output rose by four per cent to 38 million barrels. Most of this increase can be attributed to Pluto and North Rankin.

In 2012–13, domestic **natural gas** sales decreased by four per cent to 8.7 billion cubic metres, while the value of sales was steady at \$1.4 billion. Output of **LPG (butane and propane)** decreased by ten per cent, with the sales value decreasing to \$639 million, down 13 per cent on the previous financial year.

Western Australia's mineral and petroleum resources, in order of value for 2012–13, were:

Commodity	\$A Billion
Iron Ore	56.4
LNG	12.5
Crude Oil and Condensate	9.9
Gold	9.0
Alumina	3.9
Nickel	3.6
Others	6.5
Total	101.8

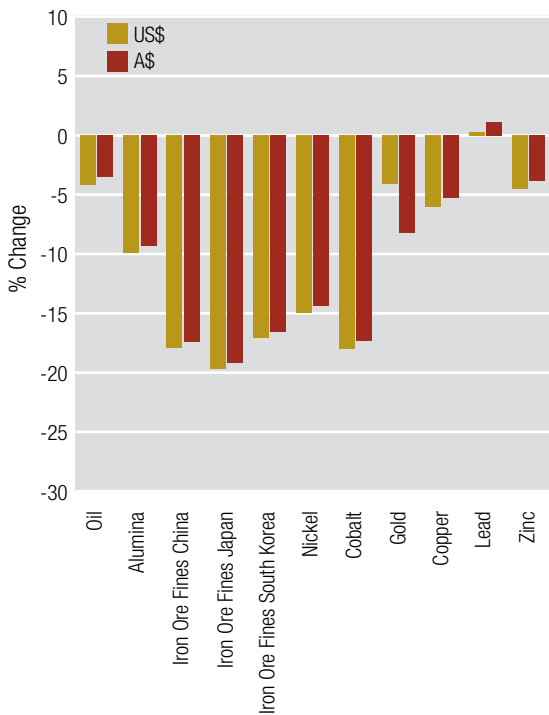


Figure 3 **Average Price Comparison 2011–12 and 2012–13**
Source: LME, Kitco, Metal Prices, WATC and DMP

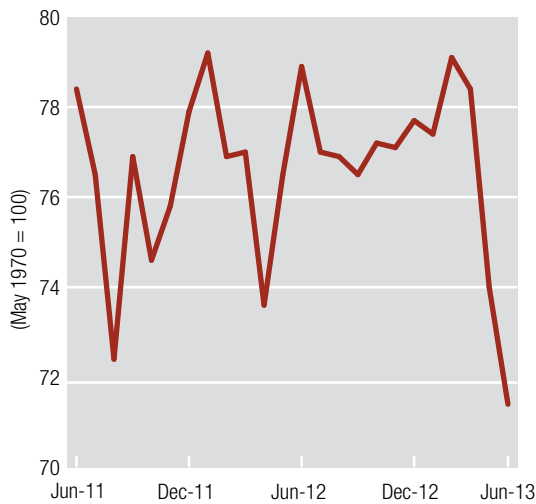


Figure 4 **Exchange Rate Trade-Weighted Index (units of foreign currency per A\$)**
Source: Reserve Bank of Australia

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

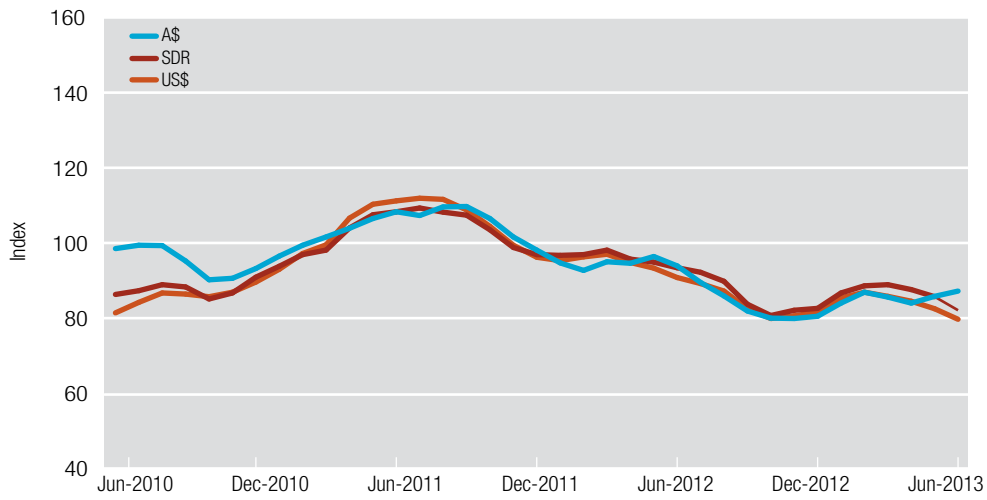


Figure 6 | **Non-rural Commodity Price Index (2011-12 = 100)** Source: Reserve Bank of Australia

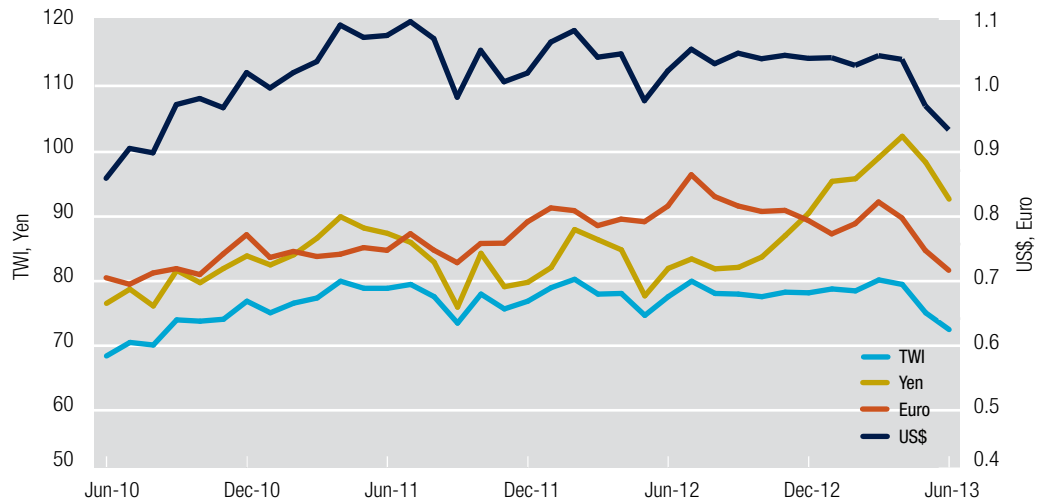


Figure 7 | **Australian Dollar Exchange Rate against Major Currencies (May 1970 = 100)** Source: Reserve Bank of Australia

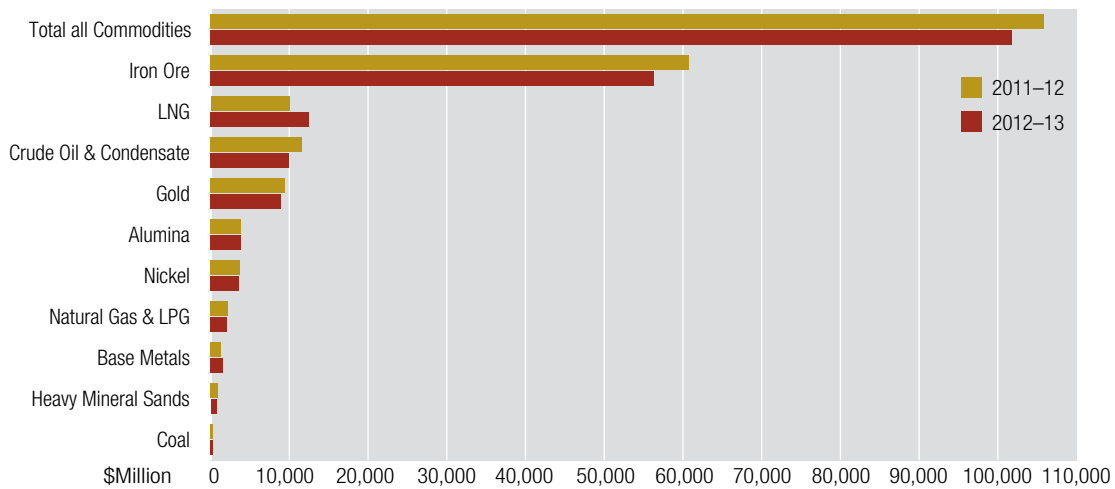


Figure 8 | **Major Commodities by Value** Source: DMP

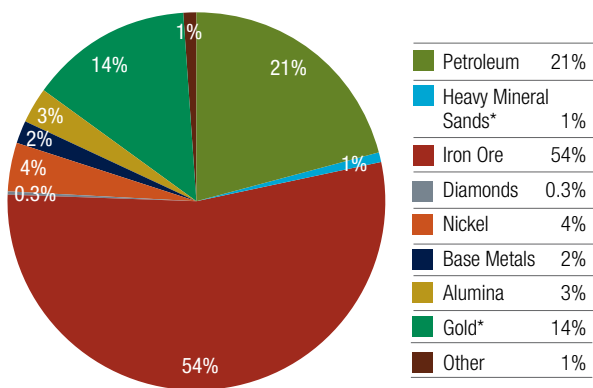


Figure 9 | Western Australian Mineral and Petroleum Exports 2012-13 – Total Value \$103.6 Billion Source: DMP
** Includes \$6.2 billion of gold and \$86 million of heavy mineral sands refined/processed and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.*

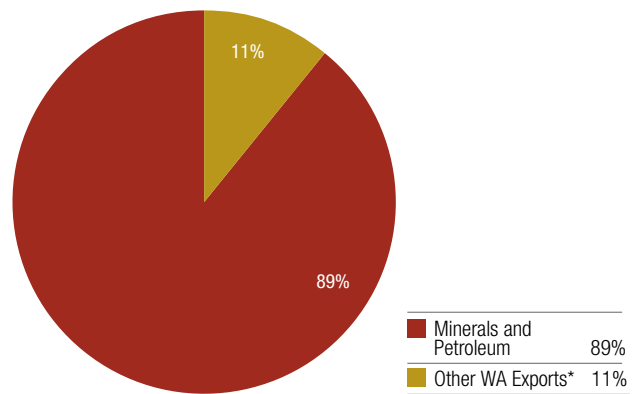


Figure 10 | Western Australian Merchandise Exports 2012-13 \$116.1 Billion Source: DMP and ABS
** Other includes wheat, wool, wood chips, live animals, seafood, meat, pearls and other agricultural and manufactured items*

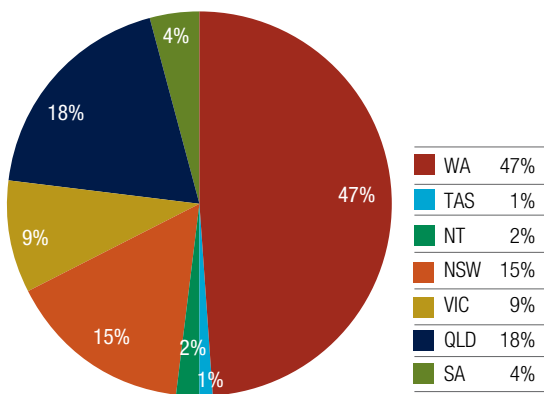


Figure 11 | Australian Merchandise Exports 2012-13 \$248 Billion Source: ABS
Note: These percentages are based on data which includes \$8.6 billion of re-exported goods and of no State origin available and account for around 4% of the total.

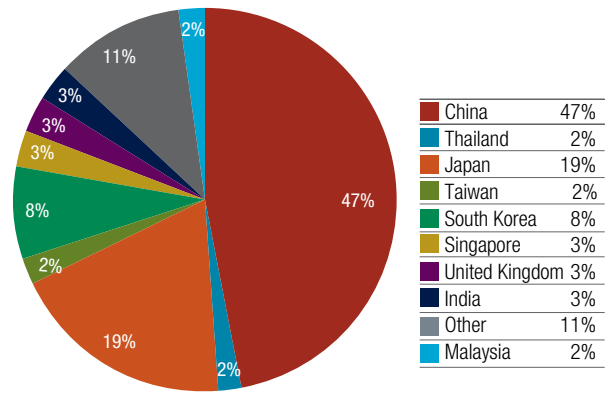


Figure 12 | Western Australian Merchandise Exports by Country 2012-13 – \$116 Billion Source: ABS

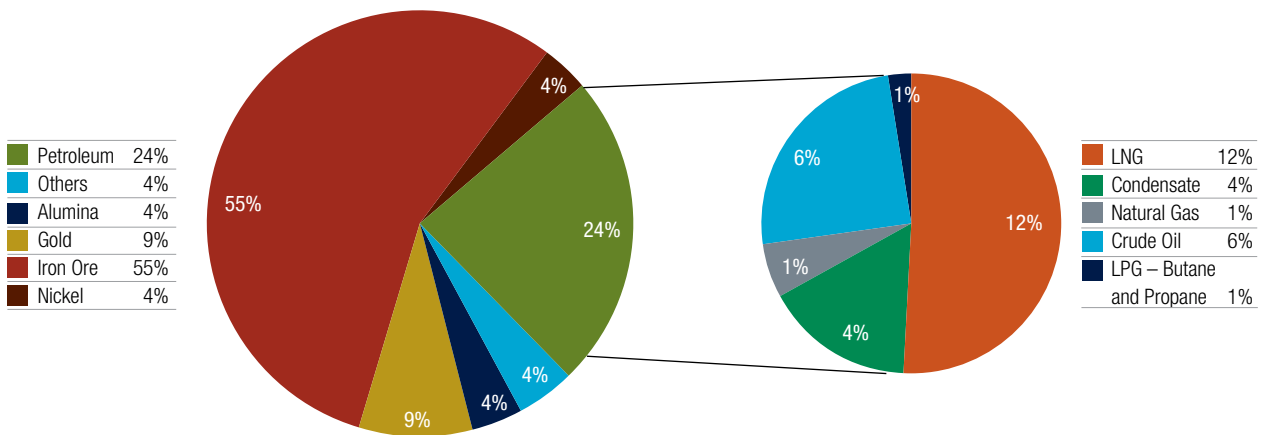


Figure 13 | Value by Commodity 2012-13 – \$101.8 Billion Source: DMP

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 China's demand. On average, the annual growth in the value of sales from Western Australia's iron ore industry during this period has been 27 per cent per annum whilst output has increased 11 per cent per annum.

In 2012–13, iron ore sales output increased by 58 million tonnes or 13 per cent from 2011–12 to reach a record 513 million tonnes, whilst the value of sales was down to \$56 billion (a seven per cent decrease). As a result, iron ore continued to be the most valuable resource sector in Western Australia, accounting for 55 per cent of the total value of the State's mineral and petroleum sales.

China continued to dominate Western Australia's iron ore exports, accounting for 74 per cent or \$42 billion of the total amount shipped in 2012–13. Other major markets included Japan (15 per cent), South Korea (nine per cent) and Taiwan (two per cent).

Iron Ore Producers

Whilst the larger iron ore operations and seven 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. A total of 95 per cent of production comes from the Pilbara region.

BHP Billiton Limited (BHPB) and Rio Tinto Limited (together with various joint venture partners) dominate the industry in Western Australia and accounted for around 80 per cent of the sales value of the State's iron ore in 2012–13.

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

Hamersley also operates several other mines in joint ventures, which are:

- Channar (60% – a joint venture with an Australian subsidiary of the China Iron & Steel Trade Group).
- Eastern Range (54% – a joint venture with Shanghai Baosteel Group Corporation).

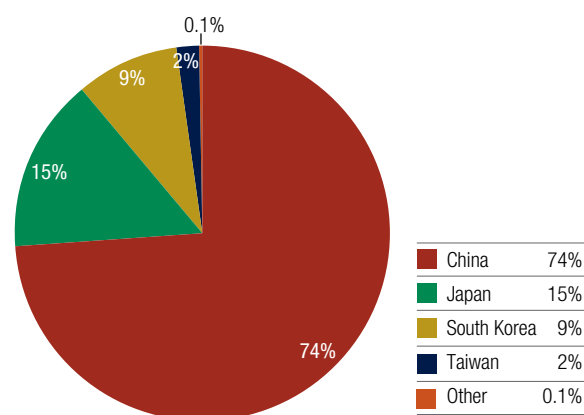


Figure 14 | **Iron Ore Exports – Total Value \$56.37 Billion**
Source: DMP

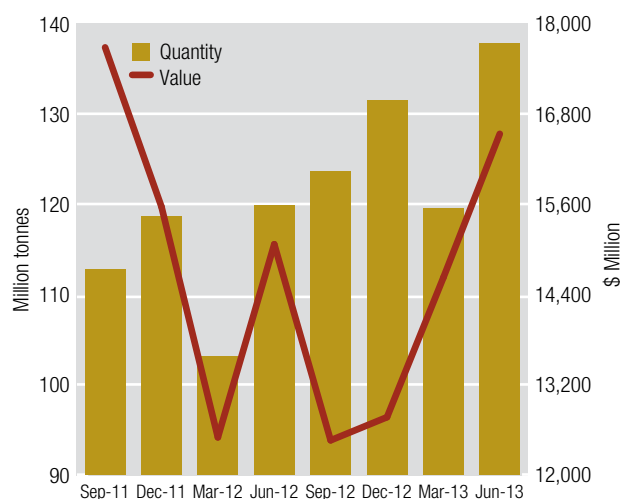


Figure 15 | **Iron Ore Quantity and Value by Quarter**
Source: DMP

- Hope Downs (50% – a joint venture between Rio Tinto Iron Ore and Hancock Prospecting Pty Ltd).
- Robe River Iron Ore Operation (53% – a joint venture with Robe River Iron Associates) which includes Mesa A – Waramboo, Mesa J and West Angelas.

BHP Billiton is the State's second largest iron ore producer and operates 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 five kilometres long and nearly 1.5 kilometres wide. Nearby are the smaller orebodies 29, 30 and 35. Smaller satellite mines Wheelarra and orebodies 18, 23, 24, 25 are outside the town of Newman. There is also Jimblebar, Yandi, Mining Area C and Yarrrie.

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

The smaller producers comprise:

- Cliffs Natural Resources operates the Koolyanobbing mine (50 kilometres north of Southern Cross in the Wheatbelt region).
- Atlas Iron Limited has three iron ore operations in the Pilbara region: Pardoo (approximately 75 kilometres east of Port Hedland), Wodgina (approximately 100 kilometres south of Port Hedland) and Mt Dove. These operations use road haulage and ship through Port Hedland.
- Karara Mining Ltd, (a 50:50 joint venture between Gindalbie Metals Limited and Anshan Iron and Steel Group Corporation), operates the Karara DSO and magnetite project (200 kilometres east of Geraldton).
- Mineral Resources Limited operates three mines: Carina (100 kilometres north of Southern Cross), Poondano (30 kilometres southeast of Port Hedland) and Phils Creek (100 kilometres northwest of Newman).
- Sinosteel Midwest Corporation Limited operates two open pits at Koolanooka (160 kilometres southeast of Geraldton) and two open pits at Blue Hills – Mungada (approximately 70 kilometres east of Koolanooka).
- Mount Gibson Mining Ltd operates the Tallering Peak mine 175 kilometres east of Geraldton, the Extension Hill mine 260 kilometres east-southeast of Geraldton and the Koolan Island hematite mine, located in Yampi Sound off the Kimberley coast.
- BC Iron Ltd's Nullagine project (a 50:50 joint venture with FMG). The operation utilises FMG's rail infrastructure, which is located 50 kilometres south of the mine, to export its product through FMG's Herb Elliott port.
- Cockatoo Island (200 kilometres north of Broome in the Kimberley region) was acquired from Cliffs Natural Resources in September 2012 by Pluton Resources Limited. The Cockatoo Island mine is only accessible by sea and air, produces high-grade ore (greater than 66 per cent iron) and is the only known subsea mining operation in the world.

- The Kimberley Metals Group Pty Ltd (KMG) Ridges iron ore project (165 kilometres 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's Spinifex Ridge molybdenum–copper project (located 170 kilometres east of Port Hedland) is one of the smaller operations, producing around 1.0 Mt/a of iron ore fines.

Expansions/New Projects in the Pilbara Region

Over the past ten years, both Rio Tinto and BHPB 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.

BHPB expansion plans to increase annual capacity to 220 million tonnes are ahead of schedule, with first production expected to be achieved in the December quarter 2013. This comprises:

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

Rio Tinto's expansions comprise:

- phase one expansion of the Pilbara mines, ports and railways from 230 Mt/a to 290 Mt/a commenced in September 2013; and
- phase two of the expansion of port, rail and power infrastructure to 360 Mt/a is currently underway. Options for mine capacity growth are under evaluation.

FMG expansion projects remain on schedule to achieve production at 155 million tonnes in the 2013–14 financial year. Expansions include additional infrastructure at Herb Elliott port, 120 kilometres of mainline rail duplication and a new 130 kilometre rail spur to a new mine at Solomon. The Kings development at Solomon is expected to be commissioned by the end of 2013.

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

Atlas Iron commenced operations in the March 2013 quarter at its Mt Dove mine (70 kilometres south of Port Hedland). It has expanded its Wodgina mine and is on track to bring into production its Abydos and Mt Webber mines (both south of Port Hedland). Mt Webber is a joint venture with Altura Mining Limited owning 30 per cent and Atlas Iron owning 70 per cent.

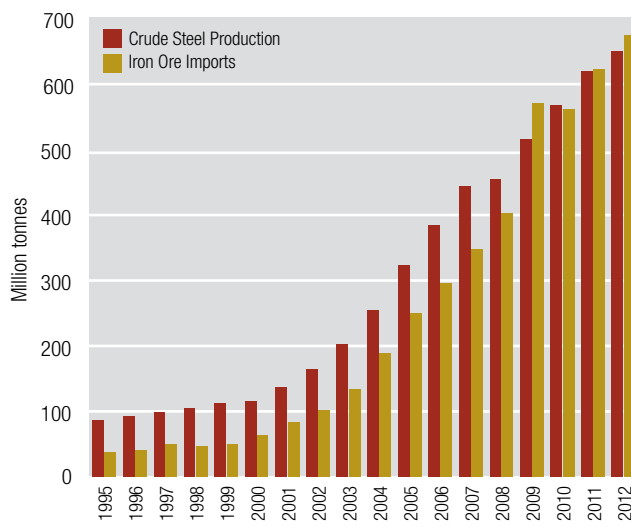


Figure 16 | **China's Crude Steel Production and Iron Ore Imports** Source: TEX Report and Interfax China Ltd

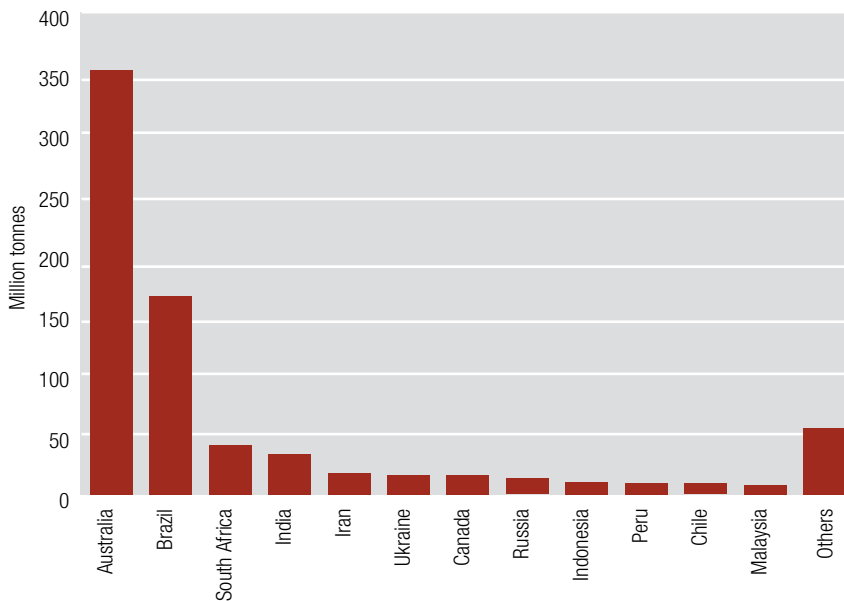


Figure 17 | **China's Iron Ore Imports by Country for 2012** Source: TEX Report

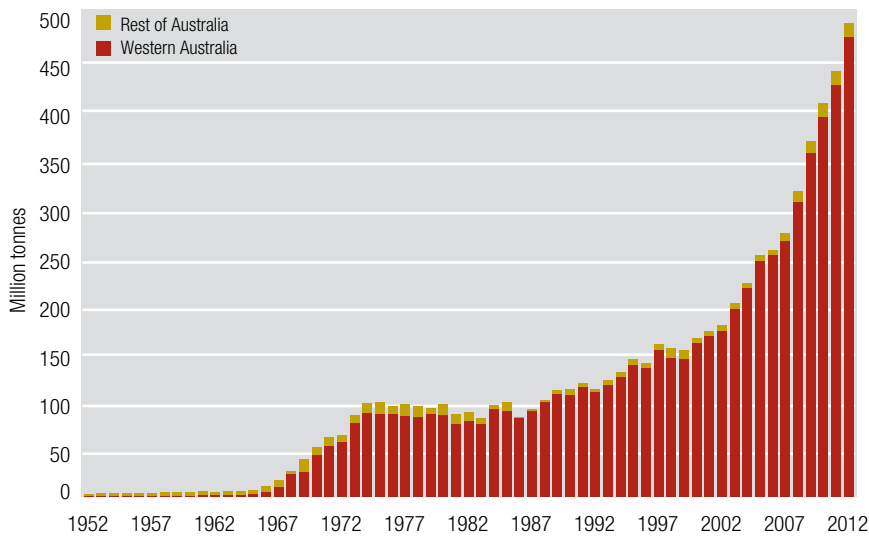


Figure 18 | **Iron Ore Quantity** Source: DMP and BREE

Magnetite

For the past 40 years, all iron ore mined in Western Australia has been hematite ore or direct shipped ore. However the State also has massive resources of magnetite ore.

Hematite ore does not have to undergo costly concentration to make it saleable. However, Chinese steel producers have long used magnetite with well-established technology and have led a push to develop a number of magnetite projects in Western Australia.

The first shipment of magnetite ore from Gindalbie Metals Ltd (operator) and Anshan Iron and Steel Group Corporation (a 50:50 joint venture) departed Geraldton in January 2013 bound for China. In July 2013, Gindalbie announced the production of its first-ever batches of premium quality 68% Fe magnetite concentrate. This is the first project to produce magnetite concentrate in Western Australia.

CITIC Pacific Mining Management (a subsidiary of CITIC Pacific Ltd which is the largest specialist steelmaker in China) acquired mining rights from Mineralogy for two billion tonnes of magnetite ore, with rights and options for a further four billion tonnes. Although CITIC's \$8-billion Cape Preston Sino magnetite mine commenced commissioning earlier this year, it has encountered several technical setbacks which have delayed ramping up to full production.

When operational, CITIC plans to export 27.6 Mt/a of a mixture of high-grade iron ore concentrate and pellets over a period of 25 years.

Supply and Demand

Western Australian iron ore sales increased significantly in 2012–13 to 513 million tonnes (up by 58 million tonnes or 13 per cent) as new projects and expansions became operational.

In 2012, the international iron ore trade totalled 1131.7 million tonnes, a fall of one per cent on the previous year.

In 2012, China dominated world trade, accounting for 64 per cent (745.4 million tonnes) of total world imports, an increase of five per cent compared to 2011. Western Australia contributed 53 per cent of China's iron ore imports in 2012. Other major global importers were Japan with 132 million tonnes (up three per cent) and South Korea with 66 million tonnes (up two per cent).

China will continue to play an important role in the future of the Western Australian iron ore industry. In 2012–13, it accounted for 74 per cent, or \$42 billion, of the total iron ore shipped from Western Australia.

The recent downturn from record prices and the uncertain economic outlook have seen producers and potential producers reassessing expansion and development plans. In the main, the two larger producers are maintaining their expansion programs, albeit in a modified format, to ensure costs are kept to a minimum. Cost pressures and long-term commodity prices could affect new capacity coming into production.

Iron Ore Prices

Iron ore prices softened in 2012–13 amid a worsening economic outlook for Europe, a slowdown in Chinese growth and increases in worldwide iron ore production putting downward pressure on record high prices. A strong Australian dollar also impacted returns to Western Australian producers. It was not until the June quarter of 2013 that the Australian dollar fell below parity.

In September 2012, the price for iron ore fines with 62 per cent iron content slid to below US\$87 per tonne. Prices recovered relatively quickly; however, they have not returned to their peak of US\$194 per tonne for lump and US\$184 per tonne for fines in 2011–12.

Since the move away from the annual benchmark pricing system in 2010, there is little official information around contract prices actually agreed to by identified parties (although the prices applied appear relatively widely known). The practices for price setting vary significantly,

with a large number of published prices and indices, each with a different product specification. There are three competing price indices (Metal Bulletin, Platts and the Steel Index), with other prices published on an informal basis.

Across all grades and markets, Western Australian producers achieved an average free-on-board (FOB) price of A\$122 per tonne for lump and A\$110 per tonne for fines in 2012–13.

Cost and freight (CFR) spot prices to China for the period for 62 per cent Fe fines peaked at around US\$159 per tonne.

From a historical perspective, iron ore prices are still high. Just prior to the global financial crisis, Western Australian producers were receiving around US\$64 per tonne for lump and US\$50 per tonne for fines.

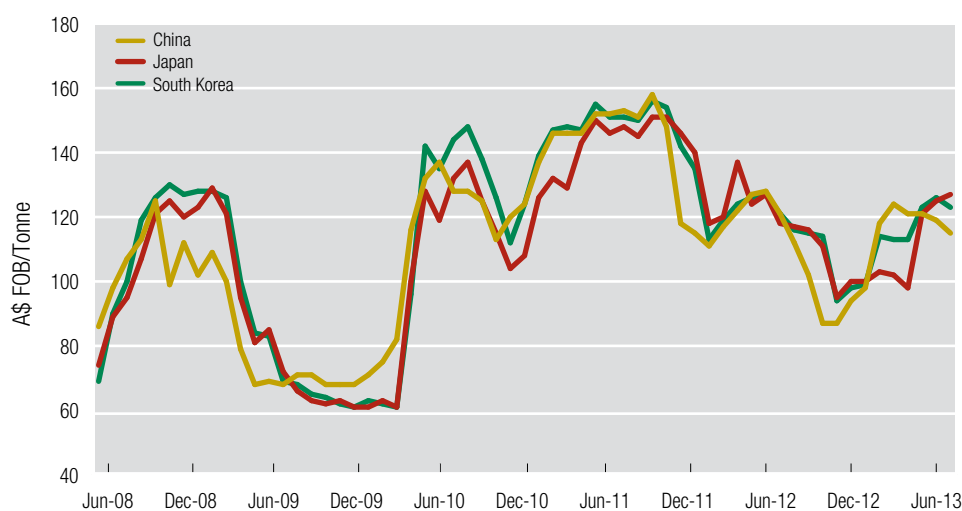


Figure 19 | **Average Price Iron Ore Fines (all grades)**
Received by Western Australian Producers | Source: DMP

2.3 PETROLEUM

The value of Western Australian petroleum sales amounted to a record \$24.4 billion in 2012–13. This represented 25 per cent of the State's total value of resource sales, placing petroleum as the second most-valuable resource sector after iron ore.

Reduced output of crude oil, LPG and domestic gas, as well as falling oil prices, were offset by increases in LNG and condensate output. This resulted in a modest three per cent increase in the overall value of Western Australian petroleum sales in 2012–13.

As the nation's premier petroleum producer, Western Australia accounted for 65 per cent of conventional natural gas (including LNG feedstock but excluding coal seam methane) and 73 per cent of crude oil and condensate production in 2012–13.

LNG was again the major contributor to petroleum sales, accounting for 51 per cent of its value. This was followed by crude oil and condensate with 25 per cent and 16 per cent respectively. Together these commodities accounted for 92 per cent of the State's petroleum sales. The remainder comprised natural gas (6%) and LPG (2%).

Over the past ten years, the value of Western Australia's petroleum sales has increased on average by nine 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. These projects include Woodside Energy's Pluto which commenced mid-2012 and the recently commissioned Macedon project of BHP Billiton. Chevron's \$52-billion Gorgon and \$29-billion Wheatstone LNG and domestic gas projects (which are under construction) are expected to come onstream in 2015 and 2016 respectively.

Oil and Condensate

The value of crude oil sales from Western Australia fell from \$7.8 billion in 2011–12 to \$6 billion in 2012–13, a decrease of 23 per cent. In volume terms, crude oil output fell by 24 per cent in 2012–13 to 54.2 million barrels or 8.6 million kilolitres. This decrease was mainly attributable to a general decline in maturing fields.

Over the course of 2012–13, the price of oil based on a combination of Brent, West Texas Intermediate (WTI) and Tapis averaged US\$105.16 per barrel. This represented a four per cent decrease compared to the equivalent average price in 2011–12.

The Tapis oil price averaged US\$114.20 a barrel, peaking at US\$125.17 a barrel in February 2013. Overall, oil prices remained relatively high and helped to offset the strong Australian dollar which weighed on petroleum export earnings.

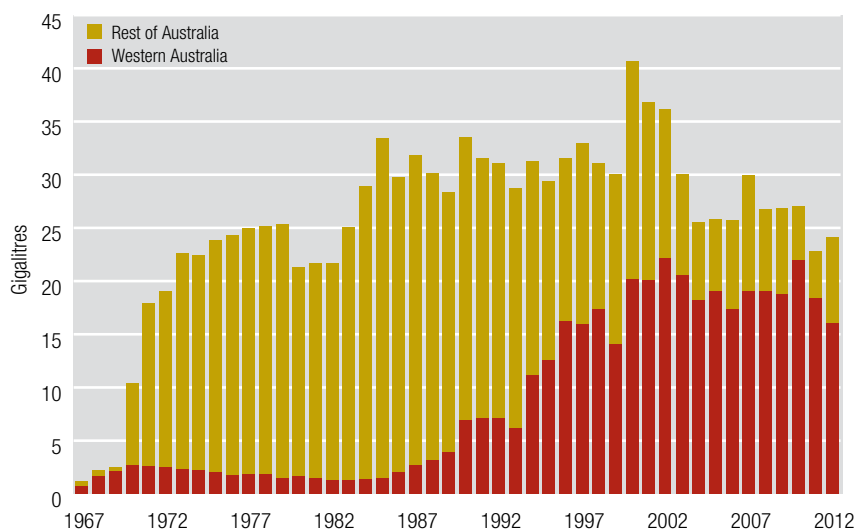


Figure 20 | Crude Oil and Condensate Quantity Source: DMP and BREE

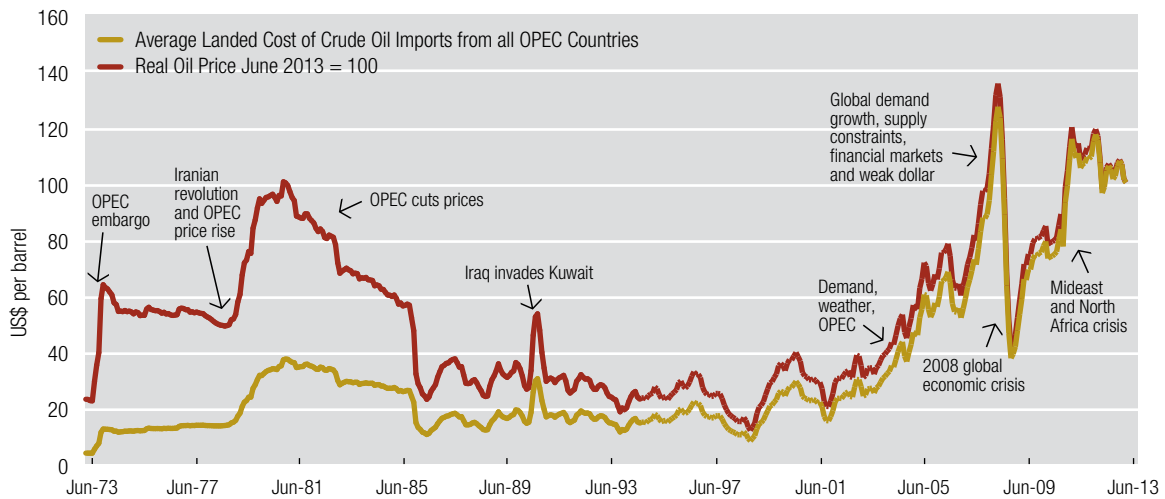


Figure 21 | **Historic Oil Prices** Source: Energy Information Administration, US Department of Energy, DMP

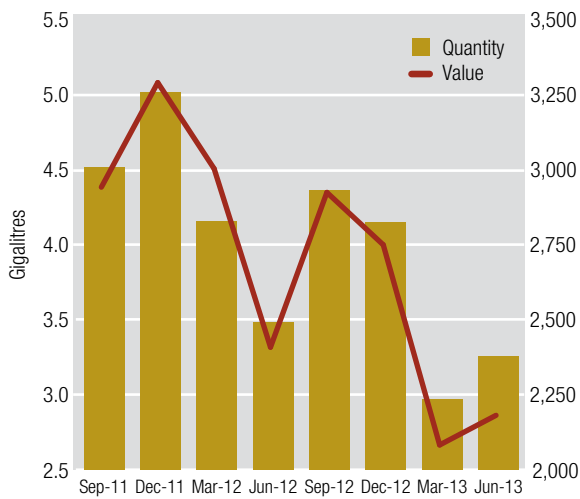


Figure 22 | **Crude Oil and Condensate Quantity and Value by Quarter** Source: DMP

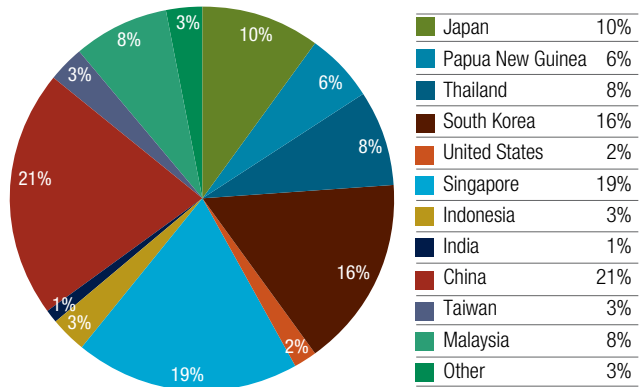


Figure 23 | **Crude Oil and Condensate Exports – Total Value \$9.3 Billion** Source: DMP and ABS



Figure 24 | **Tapis Crude Oil Price US\$/bbl** Source: WA Treasury Corporation

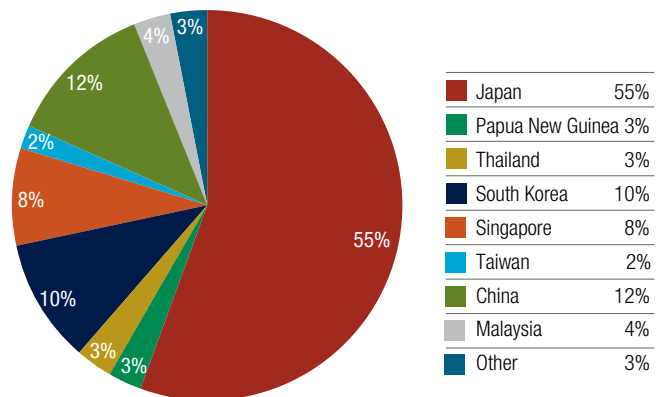


Figure 25 | **Petroleum Exports – Total Value \$22.4 Billion** Source: DMP and ABS

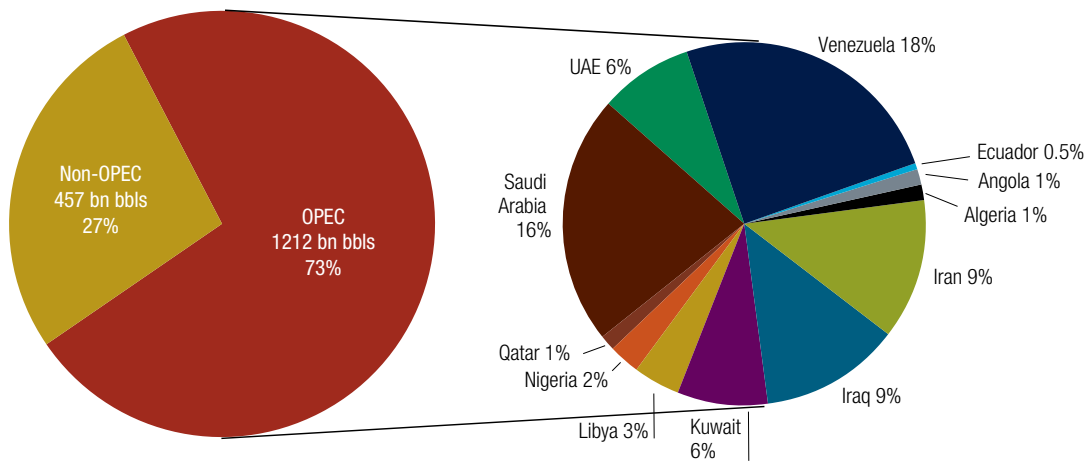


Figure 26 | **OPEC Share of World Crude Oil Reserves 2012** Source: BP World Energy Statistics 2013

The Organisation of the Petroleum Exporting 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 57 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

The major crude oil producers in Western Australia in 2012–13 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 (BHPB)-operated Pyrenees development. Pyrenees extracts crude from the Ravensworth, Crosby and Stickle fields and is located around 45 kilometres off the coast of Exmouth. BHPB also operates the Stybarrow project.

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

Other Carnarvon Basin operators include:

- Apache Energy Ltd's Harriet, Stag and Van Gogh projects
- Chevron Australia's Barrow Island (which has been producing oil since 1967) and Thevanard Island
- Vermillion Energy's Wandoo
- Santos Ltd's Mutineer Exeter.

Perth Basin operators include:

- Roc Oil's Cliff Head
- Origin Energy Resources Ltd's Jingemina
- AWE Energy Ltd's Dongara.

The remaining producer, Buru Energy Ltd's Blina-Lloyd and Ungani, is in the Canning Basin.

Overall, volumes were generally down in 2012-13, mainly due to oilfield natural decline as well as some scheduled maintenance. The exception to this downturn occurred with the completion of the \$1.8-billion NWS Oil Redevelopment project (Cossack, Hermes and Wanaea). These fields achieved an increased output of 112 per cent over the previous period.

Against a background of declining production from maturing fields, exploration will play a key role in supporting future output of crude oil in Western Australia.

As a by-product from natural gas fields, nearly all of the State's condensate production comes from fields located on the North West Shelf. In 2012-13, a total of 38.5 million barrels or 6.1 million kilolitres of condensate was sold by Western Australian producers, an increase of four per cent. In sales-value terms, this was worth \$3.9 billion, an increase of two per cent from the previous year.

The NWS Joint Venture (Athena, Goodwyn, Hermes, Angel, North Rankin and Wanaea) accounted for almost 90 per cent of the total in 2012-13. Woodside's Pluto and Apache's John Brookes, Reindeer and Halyard projects contributed the remaining ten per cent.

The volume of LPG (butane and propane) sold in 2012-13 fell by 10 per cent to 752,910 kilolitres, with the total value of LPG sales falling by 13 per cent to \$639 million.

Liquefied Natural Gas (LNG)

LNG is second only to iron ore in terms of sales value to the State. Currently, LNG from Western Australia originates from the NWS Joint Venture project and the Woodside Pluto project which was commissioned in mid-2012.

In 2012-13, reported LNG output rose by almost 30 per cent to a record 19.8 million tonnes. Much of this increase was due to a full year of Pluto production, which commenced in the June quarter of 2012. Several factors were responsible for the lower 2011-12 result.

This included refurbishment and maintenance programs, planned shutdowns and the North Rankin Redevelopment project activities together with cyclone activity in the first quarter of 2012. Other than adverse seasonal weather conditions, the 2012-13-year was able to operate at a much higher level.

The increased output over the period was offset by a fall in oil prices (which are benchmarked in LNG contracts), resulting in the value of LNG sales rising by only 25 per cent to \$12.5 billion when compared to the previous year.

On a smaller scale, Wesfarmers Ltd utilises Western Australia's gas resources at its small-scale LNG plant in Kwinana. Opened in 2009, the LNG plant has the capacity to produce 175 tonnes per day and supports Australia's largest fleet of LNG road tankers.

The NWS 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.

Domestic Natural Gas Supply

The quantity of natural gas supplied into the domestic market in 2012-13 fell by four per cent to 8.7 billion cubic metres (Bcm) compared to the previous year. The value of sales decreased marginally by just over one per cent to \$1.4 billion. This value of gas is based on the summation of total domestic gas sales values at the point of entry into the Dampier-to-Bunbury natural gas pipeline (DBNGP), or where applicable, the Parmelia pipeline and Goldfields pipeline.

The graph included (figure 34) 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 three per cent in 2012-13 and averaged \$4.33 per gigajoule.

Producers

The NWS Joint Venture (Angel, Cossack, Goodwyn, Hermes, Lambert, North Rankin and Wanaea) accounted for 55 per cent (4.8 Bcm) of domestic gas in 2012–13.

Apache Energy Ltd (East Spar, Harriet, John Brookes and Reindeer) was the second-largest producer of domestic gas in 2012–13.

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%) and Santos (45%). The Devil Creek gas plant is located on the Mardie Station pastoral lease approximately 45 kilometres southwest of Dampier and has the capacity to supply up to 215 terrajoules of gas per day (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 will produce around 500 barrels per day of condensate.

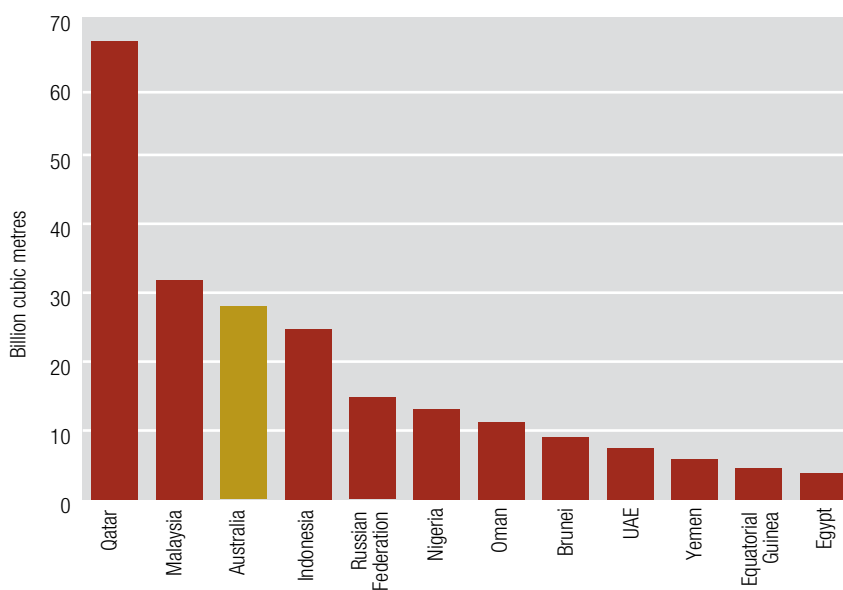


Figure 27 | **Asia-Pacific Region LNG Imports 2012 by Exporting Country**

Source: BP World Energy Statistics 2013

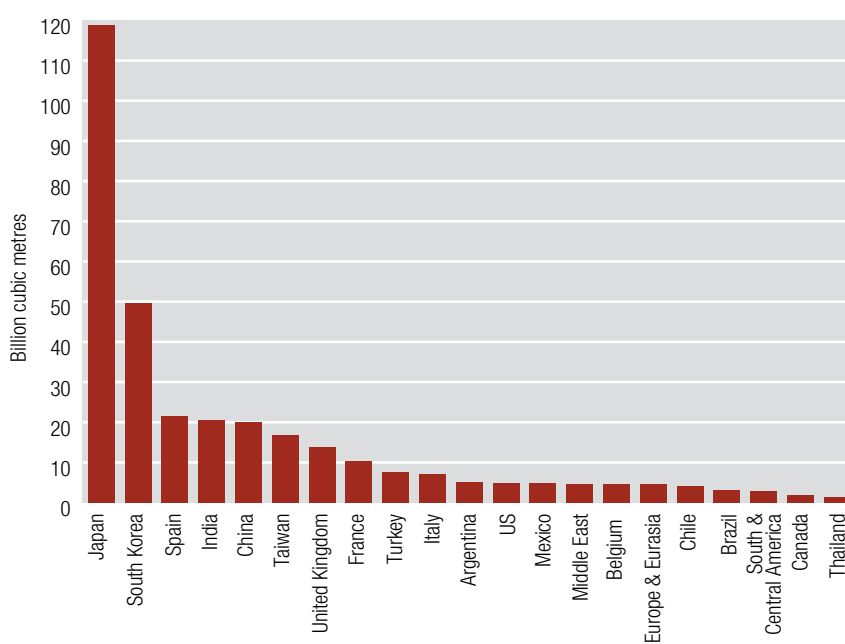


Figure 28 | **Countries Importing LNG in 2012**

Source: BP World Energy Statistics 2013

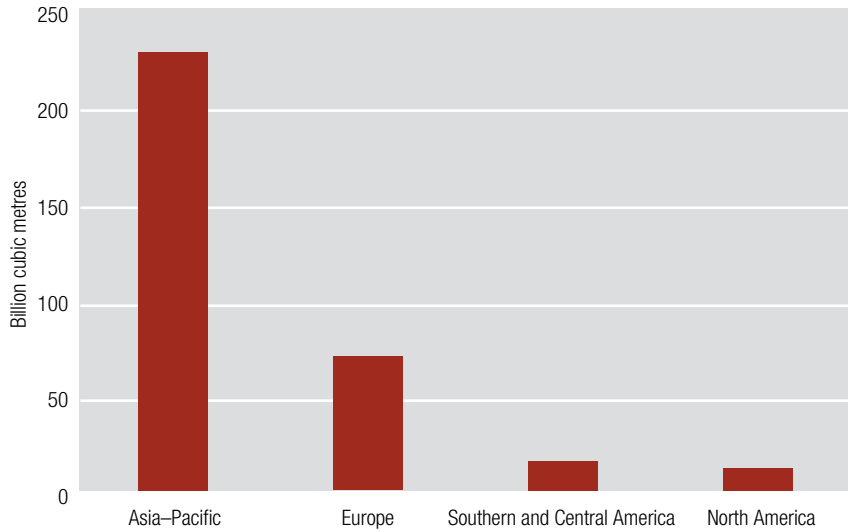


Figure 29 | **World LNG Imports by Region 2012**
Source: BP World Energy Statistics 2013

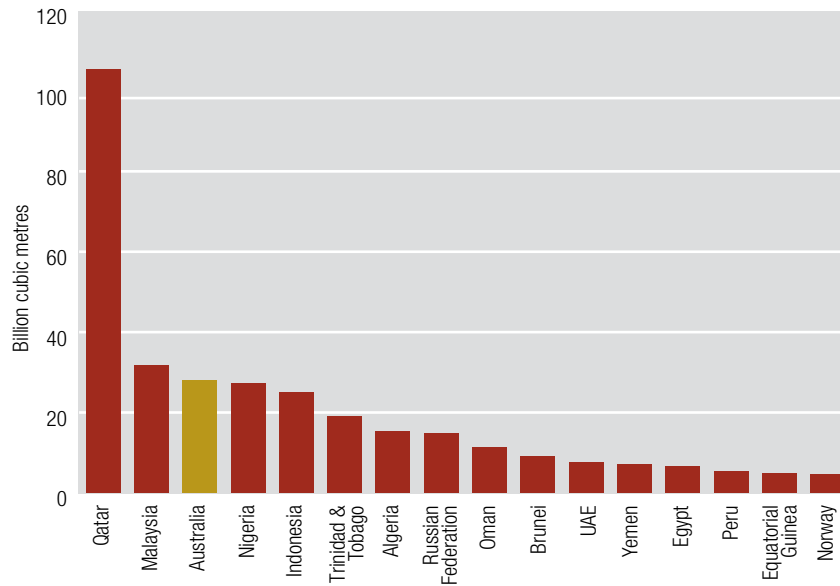


Figure 30 | **World LNG Rankings 2012**
Source: BP World Energy Statistics 2013

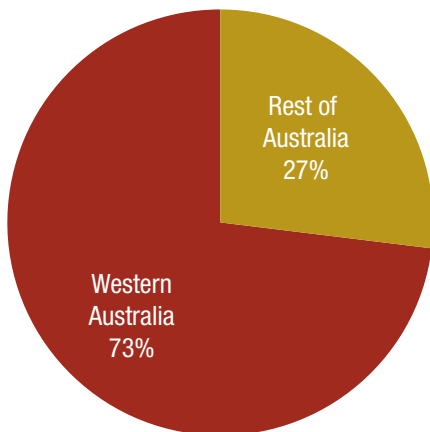


Figure 31 | **Crude Oil and Condensate Production 2012-13**
Source: EnergyQuest

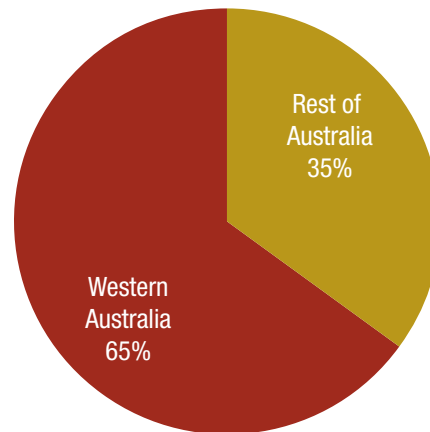


Figure 32 | **Natural Gas Production 2012-13**
Source: EnergyQuest

Petroleum Development Projects

Macedon

BHP Billiton officially opened its US\$1.57-billion Macedon domestic gas project in September 2013. Macedon is located 50 kilometres north of Exmouth and involves four offshore production wells and a gas treatment plant at Ashburton North, 17 kilometres southwest of Onslow. It is expected that Macedon will supply gas into the domestic market until 2033. The gas treatment plant has a capacity of up to 200 TJ/d of gas.

Red Gully

Commissioning of Empire Oil and Gas NL (76.4%) and ERM Power's (23.6%) Red Gully facility commenced in June 2013. The facility will process gas and condensate from the Red Gully-1 and Gingin West-1 wells. The facility is designed to produce eight TJ/d of gas and 500 barrels of condensate a day.

Coniston–Novara

Apache, in joint venture with INPEX (47%), is developing its Coniston–Novara oilfields which are located in the Exmouth Sub-basin and lie just north of the Van Gogh field. Coniston reserves are estimated at 15.7 million barrels and it is expected to be producing in 2014.

Balnaves

Another development by Apache, in joint venture with Kuwait Foreign Petroleum Exploration Company (KUFPEC) 35%, is the isolated Balnaves field. Reserves are estimated at 17 million barrels of oil and 30 Bcm of gas. The site is located in the northern Carnarvon Basin around 180 kilometres northwest of Dampier and is also expected to be producing in 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 million barrels 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.

Gorgon

The \$52-billion Gorgon project is developing the Gorgon and Jansz–lo gasfields, located within the Greater Gorgon area, around 130 kilometres 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 trillion cubic feet (Tcf) of gas. Chevron, ExxonMobil and Shell comprise the Gorgon project partners, with interests of 47, 25 and 25 per cent respectively. Osaka Gas (1.25%), Tokyo Gas (1.1%) and Chubu Electric (0.417%) make up the balance.

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 million tonnes of LNG per year, with first LNG expected in 2014.

Under the *Barrow Island Act 2003* (the Act), the joint venturers are required to reserve 2000 petajoules of gas for the domestic gas market. A domestic gas plant will progressively supply up to 300 terajoules per day, starting from 2015.

The Gorgon development will also be required under the Act 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 \$29-billion Wheatstone project at Ashburton North, 12 kilometres west of Onslow on the Pilbara coast, began in late 2011. The Chevron-led project includes a two-train, 8.9 million tonnes per annum (Mt/a) LNG facility and a domestic gas plant. The project is planned to eventually comprise five LNG processing trains producing up to 25 million tonnes of LNG a year.

The Wheatstone project is a joint venture between Australian subsidiaries of Chevron (64.14%), Apache (13%), KUFPEC (7%), Shell (6.4%) and Kyushu Electric Power Company (1.46%), and PE Wheatstone Pty Ltd (part-owned by TEPCO, 8%).

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 (80.17%) in joint venture with Australian subsidiaries of Shell (8%) and Kyushu Electric Power Company (1.83%), together with PE Wheatstone Pty Ltd (part-owned by TEPCO, 10%). 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 first LNG in early 2015.

Julimar and Brunello

Apache, in joint venture with KUFPEC (35%), 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 sales gas for the domestic market and 1.8 million barrels of condensate a year.

Browse Basin

The Browse Basin lies offshore approximately 425 kilometres north of Broome and covers around 140 thousand square kilometres. All Browse Basin fields are currently undeveloped, primarily due to their isolated location 300 kilometres from the mainland in water depths of 300 to 500 metres.

Prelude and Concerto

Shell Development Australia Pty Ltd is proceeding with its Prelude floating liquefied natural gas (FLNG) project 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 metres long and 74 metres wide. Once constructed, the facility will be towed to the Prelude field (WA-371-P) where it will be permanently moored for its 25-year project lifespan. The proposed FLNG would have a capacity to produce around 3.6 million tonnes of LNG per annum 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.

Other parties with an interest in the project include INPEX Corporation (17.5 per cent), Korea Gas Corporation (10 per cent) and CPC Corporation (5 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 million barrels of condensate.

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 gasfields. The joint venture plans to be in a position to consider the commencement of front-end engineering and design (FEED) in 2014.

Ichthys

The Ichthys field in the Browse Basin has an estimated resource of 12.8 Tcf of gas and 527 million barrels 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%), Total (30%), Tokyo Gas (1.575%), Osaka Gas (1.2%), Chubu Electric (0.735%) and Toho Gas (0.42%).

Scarborough

ExxonMobil and BHP Billiton (a 50:50 joint venture) are studying the development of the huge Scarborough and Thebe fields located in the Carnarvon Basin, 220 kilometres northwest of Exmouth in 900 metres 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.

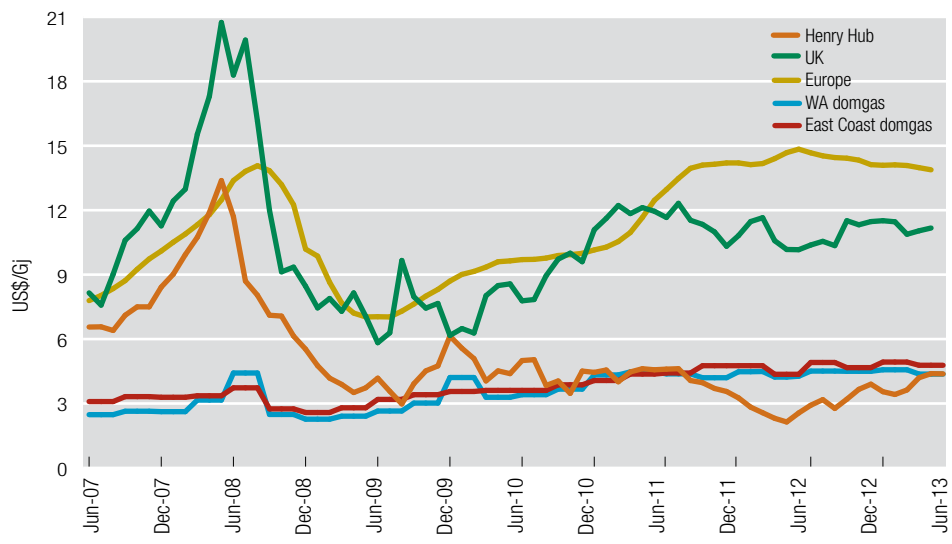


Figure 33 | **Average Natural Gas Prices** Source: Argus Monthly LNG, EnergyQuest, DMP

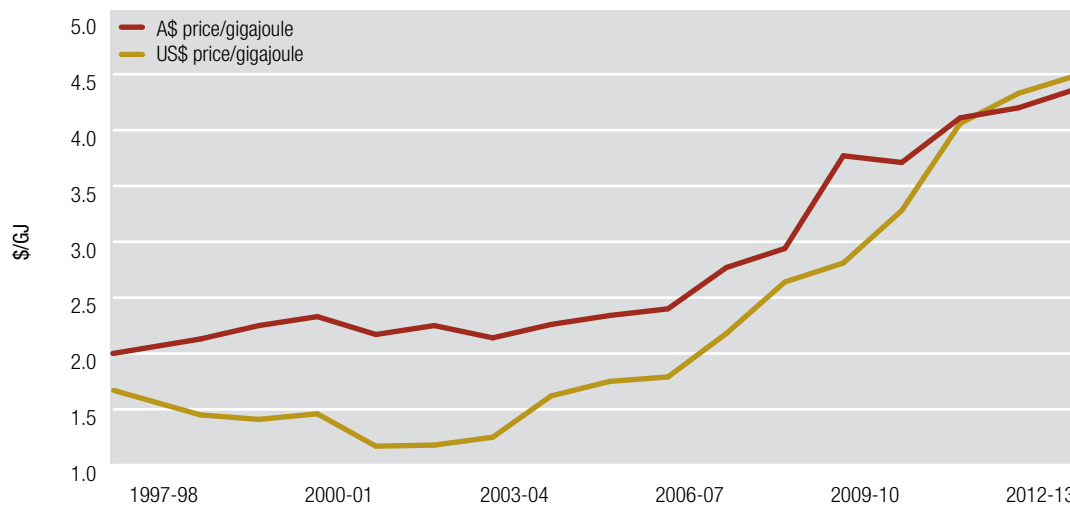


Figure 34 | **Western Australian Average Domestic Natural Gas Price** Source: DMP
 The value of Western Australian domestic gas sales is based on the summation of total domestic gas sale values as at the point of entry into the Dampier to Bunbury natural gas pipeline (DBNGP) or where applicable, the Parmelia pipeline and Goldfields pipeline.

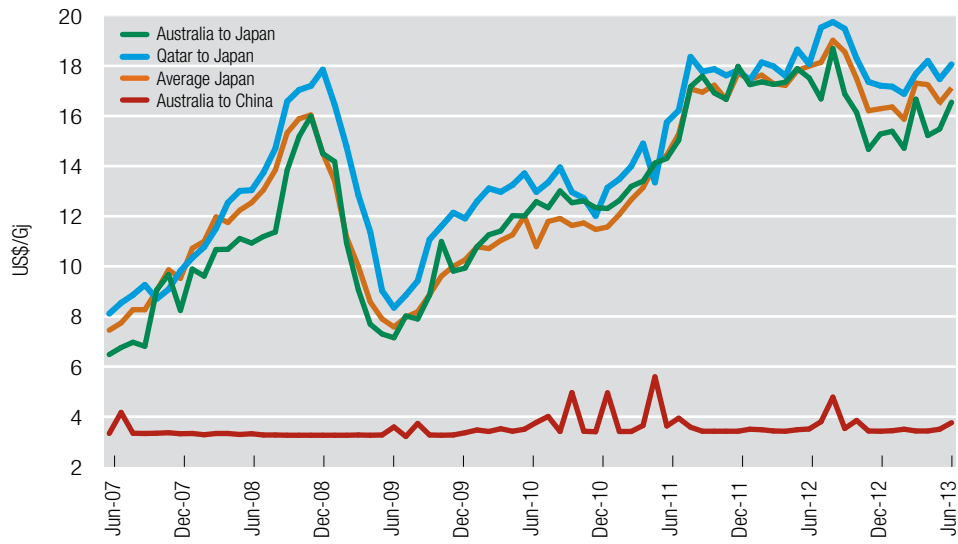


Figure 35 | **LNG Import Prices** Source: Argus Monthly LNG (Prices include freight and regassing)

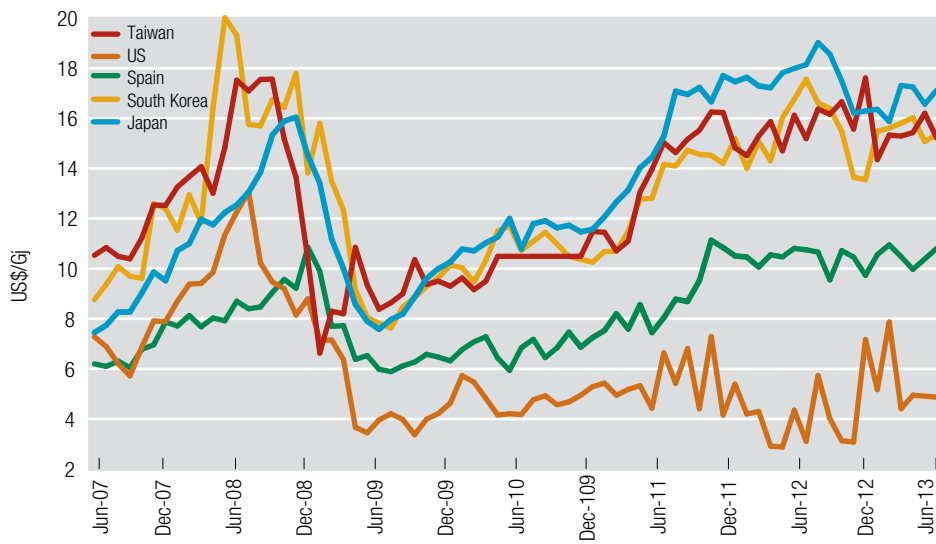


Figure 36 | **Average LNG Import Prices** Source: Argus Monthly LNG (Prices include freight and regassing)

2.4 GOLD

In 2012–13, the State's gold sector recorded sales valued at just under \$9 billion. This represented a 4.6 per cent fall from the previous record year and accounted for nine per cent of all mineral and petroleum sales in Western Australia in 2012–13.

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 17 per cent a year, reaching an all-time record of US\$1895 per ounce in early September 2011.

The gold price averaged US\$1603 per ounce in 2012–13, representing a four per cent decrease from 2011–12. In Australian dollar terms, the gold price averaged \$1570 per ounce in 2012–13, which was again four per cent lower than the previous year.

For the first half of 2013 prices weakened and averaged just US\$1520 per ounce. However, this is well above the price five years ago which averaged US\$823 an ounce.

The prospect of the US government tapering quantitative easing by the end of 2013 had a disproportionate downward impact on the gold price. Investors in exchange-traded funds (ETFs) saw their safe haven in gold fade and ETFs contracted 350 tonnes during the period, whilst gold bars and coin demand increased by nine per cent.

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 averaged just \$823 an ounce.

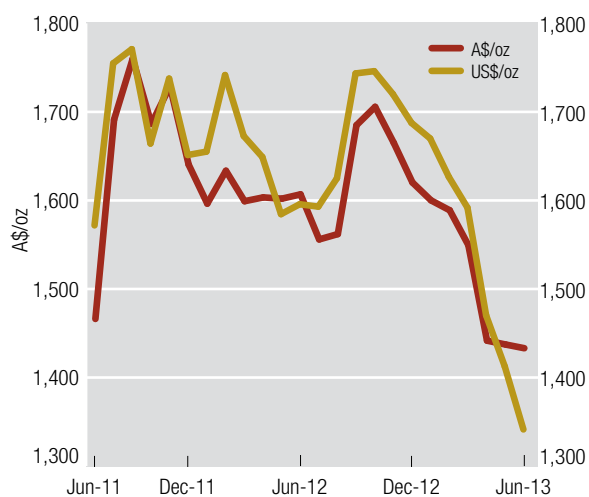


Figure 37 | **Gold Price** Source: Perth Mint and London Fix

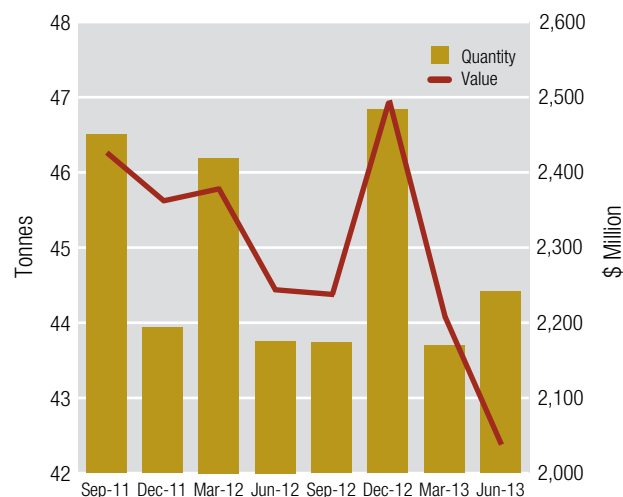


Figure 38 | **Gold Quantity and Value by Quarter** Source: DMP

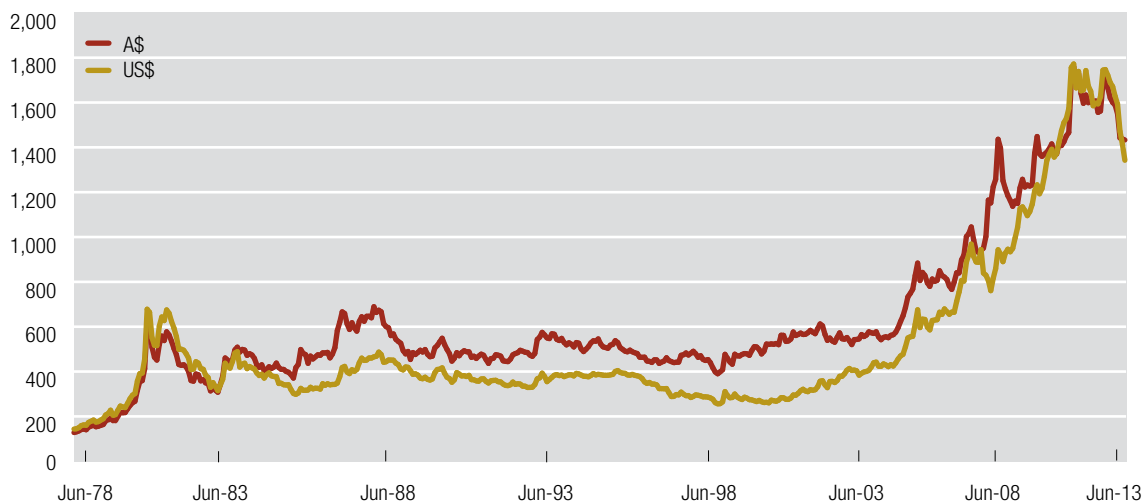


Figure 39 | **Historic Gold Price, per Ounce** Source: Perth Mint and London PM Fix

In 2012–13, the State's gold output fell marginally by just under one per cent compared with 2011–12 to 179 tonnes or 5.7 million ounces. Over the same period, Australia's gold production was just marginally less than the previous year, reaching 259 tonnes (8.3 million ounces). In 2012–13, Western Australia accounted for 69 per cent of Australia's gold production.

Western Australia's ten largest projects accounted for 61 per cent of the State's gold output in 2012–13. These projects comprised:

- Boddington (Newmont Boddington Gold Pty Ltd) – 20 tonnes
- Golden Mile (Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM)) – 19.7 tonnes
- Telfer Gold (Newcrest Mining Limited) – 16.1 tonnes
- St Ives (Gold Fields Ltd) – 13.2 tonnes
- Jundee–Nimray (Newmont Mining Corp) – 9.6 tonnes
- Sunrise Dam (AngloGold Ltd) – 7 tonnes
- Agnew (Gold Fields Ltd) – 6.2 tonnes
- Granny Smith (Barrick Gold Corporation) – 5.8 tonnes
- Gwalia–Leonora (St Barbara Limited) – 5.6 tonnes
- Kanowna Belle (Placer Dome Inc) – 5.2 tonnes

Gold exports from the State totalled \$14.9 billion in 2012–13; however, only 60 per cent of this amount (\$8.97 billion) is attributable to Western Australian mines (see Gold Export Update 2012–13 in this section). China was the State's largest gold export destination, accounting for 40 per cent of total gold exports. India was second with 20 per cent, followed by the United Kingdom at 18 per cent. Other destinations include Thailand (eight per cent) and Singapore (six per cent). A host of other countries made up the remaining balance.

The large number of gold exports going to the United Kingdom reflects London's central role in the international gold market, where it is often used as a shipping destination to be on-sold from London accounts.

Australian gold producers are continuing to experience high production costs which have increased around ten per cent in the past year averaging around \$830 an ounce for the year (source Surbiton Associates Pty Ltd).

GOLD EXPORT UPDATE 2012–13

The Australia Bureau of Statistics (ABS) release 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 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 2012–13 amounted to approximately \$14.9 billion. Approximately 60 per cent or \$8.97 billion was gold produced in Western Australia. The remaining 40 per cent (approximately \$5.9 billion) can be attributed to gold refined and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.

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

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 2012–13 fell by 16 per cent to \$467 million. With the easing of the gold price and rising costs, several producers have re-evaluated their operations or in some cases closed. This has affected over 20 gold operations, including exploration projects and head-office personnel.

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 September quarter of 2013 and is well ahead of its original target of first production in the December 2013 quarter. Tropicana is located 330 kilometres east-northeast of Kalgoorlie and is projected to produce approximately 470,000 ounces a year.

Supply and Demand

In 2012–13, overall world gold demand reached 4147 tonnes, a fall of seven per cent over the previous twelve months. This translated into a ten per cent decline in value to US\$216 billion in 2012–13. Lower prices generated a surge in jewellery demand which increased 15 per cent whilst technology (electronics, dentistry and other industrial uses) fell five 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 2012–13 fell 16 per cent.

Softer prices also impacted on the supply side of recycled gold, primarily due to consumers in developing markets holding onto their stocks of old gold as the profit motive waned along with the gold price.

Total bar and coin demand increased by nine per cent, with India and China dominating consumer demand in 2012–13, together accounting for 63 per cent of the global jewellery, bar and coin demand.

The World Gold Council reported that world mine production, including recycled gold, reached 4332 tonnes in 2012–13, a three per cent fall from 2011–12. China is ranked at the top of the list of world mine production at 14 per cent, with Australia holding second place at nine per cent. The United States is third with 8.5 per cent and Russia fourth at 7.6 per cent. Peru and South Africa are a close equal sixth at six per cent.

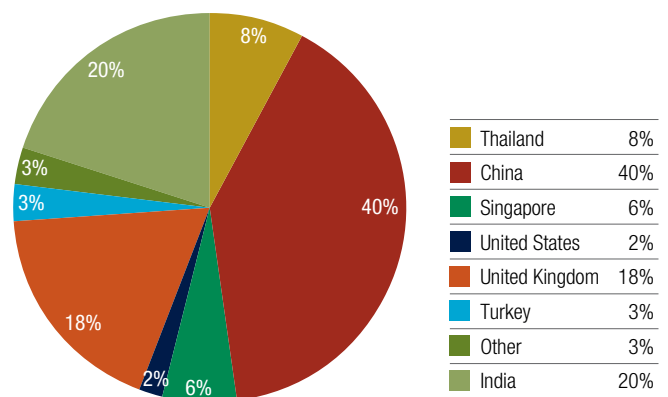


Figure 40 | **Gold Exports – Total Value \$14.9 Billion** Source: ABS and DMP
 Note: Includes gold refined/processed and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.

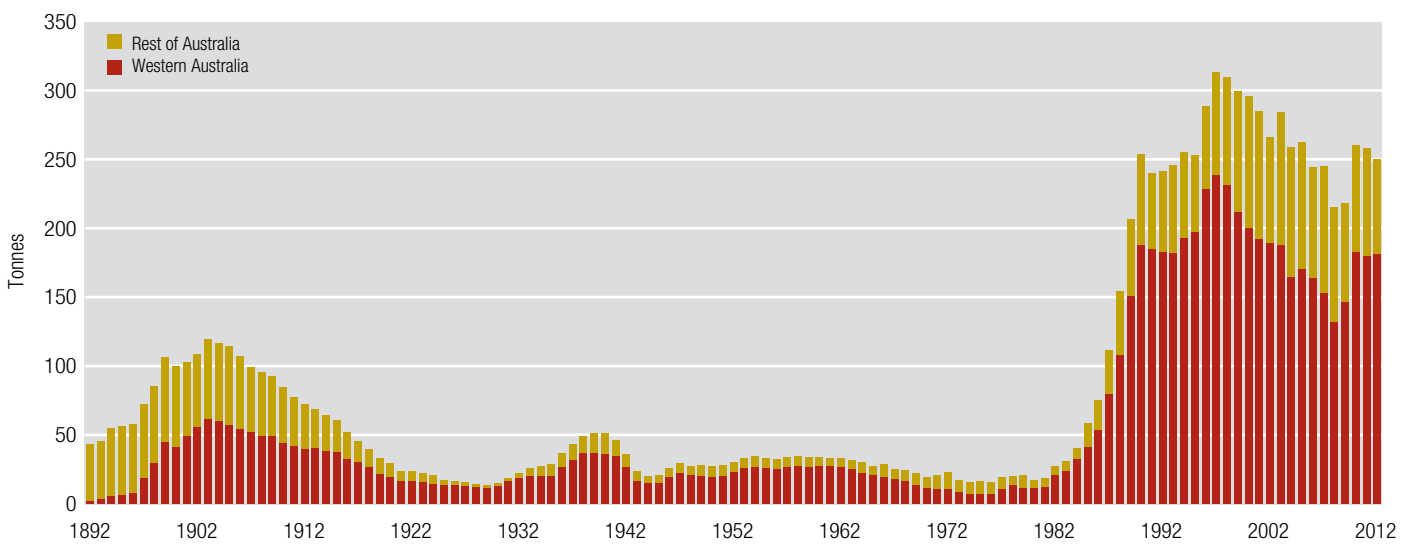


Figure 41 | **Gold Production** Source: DMP and BREE

2.5 ALUMINA

The total value of alumina sales in Western Australia amounted to \$3.9 billion in 2012–13, which was marginally lower than for 2011–12. 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 2012–13, the total quantity of alumina produced in Western Australia increased by nine per cent from the previous year to a record 13.5 million tonnes. 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 2012–13 fell nine per cent from the previous year to an average of \$285 per tonne. This coincided with a similar decline in the average Australian dollar aluminium price of \$1891 per tonne. On an annual basis, alumina prices averaged US\$292 per tonne in 2012–13, which was above its ten-year average of US\$283 per tonne.

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\$1940 per tonne in 2012–13, a fall of ten per cent on the previous year. This decline in prices was similar to most commodity prices in 2012–13.

Australia is the world's largest bauxite producer and the second-largest producer of alumina. In 2012–13, 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.

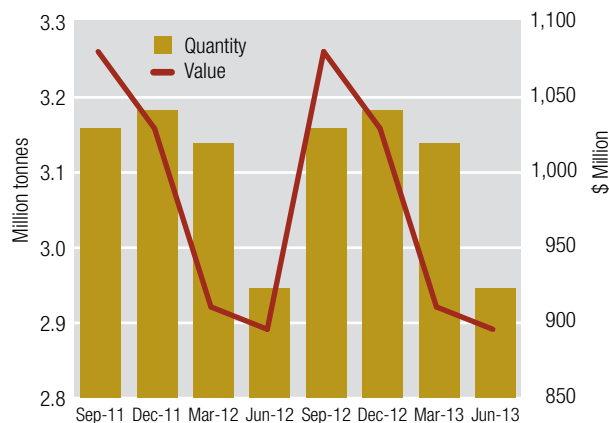


Figure 42 | Alumina Quantity and Value by Quarter
Source: DMP

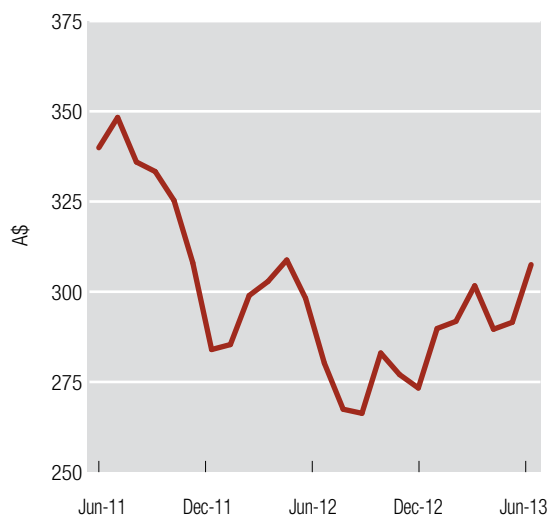


Figure 43 | Alumina Price – A\$/tonne Source: ABS

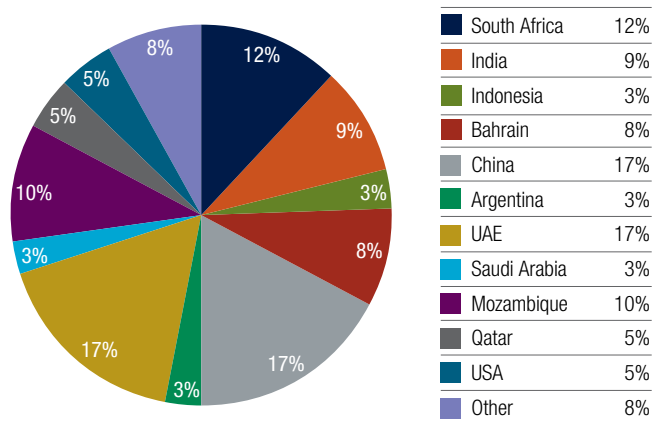


Figure 44 | Alumina Exports – Total Value \$3 Billion Source: DMP

Current production of alumina is focused in the South West of the State, with the Darling Scarp containing considerable deposits of bauxite. The 13.5 million tonnes of alumina sold in 2012–13 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 million tonnes before closing in 1998. The company currently has two operating bauxite mines, Huntly and Willowdale. Huntly was established in the early 1970s to supply bauxite to Alcoa's alumina refineries in Kwinana and Pinjarra and is currently the largest bauxite mine in the world. The other operating mine, Willowdale, was established in 1984 to supply bauxite to the Wagerup refinery. Combined, the three refineries have a production capacity of around 14 million tonnes 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 established its bauxite mine and alumina refinery in the early 1980s. The mine is located near Boddington and the bauxite is transported 51 kilometres by conveyor belt to the refinery at Worsley. Alumina is then transported 50 kilometres by rail and exported through the port of Bunbury.

A US\$3.4-billion expansion and efficiency upgrade of the Worsley alumina refinery, which is now complete, will increase the production capacity of the refinery from 3.5 Mt/a to 4.6 Mt/a. Production at Worsley during the 2012–13 financial year saw production ramp-up towards full capacity.

Around 80 per cent, or \$3 billion, of the alumina produced in Western Australia was exported in 2012–13, with a relatively small amount shipped by Alcoa to its aluminium smelters in Victoria. The State's main export markets in 2012–13 were the United Arab Emirates and China, which both took 17 per cent of the State's alumina. China is the world's largest consumer and a major producer of aluminium. Other major customers included South Africa (12 per cent), Mozambique (ten per cent), India (nine per cent), Bahrain (eight per cent), the United States and Qatar (five per cent each) and a host of other destinations.

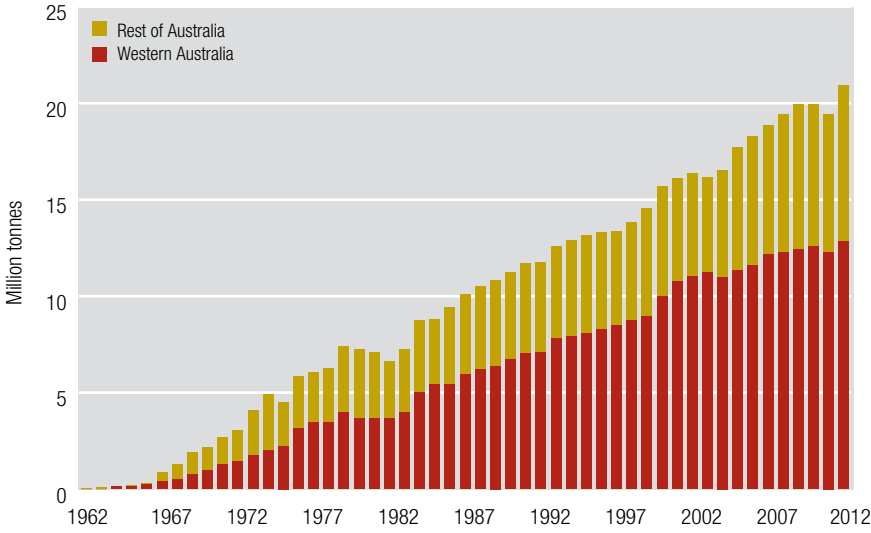


Figure 45 | Alumina Quantity Source: DMP and BREE

2.6 NICKEL

Australia holds 35 per cent of worldwide economic nickel resources amounting to 24 million tonnes. Western Australia has the largest proportion of Australia's economic nickel resources and is the sole producer, with annual sales of 228,299 tonnes in 2012–13, an increase of 19,754 on the 2011–12 financial year.

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 66 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 increase in production in 2012–13 can be attributed to the two laterite operations.

The value of Western Australian nickel sales decreased slightly from \$3.7 billion in 2011–12 to \$3.6 billion in 2012–13. This was attributable to a fall in nickel prices, which averaged \$15,974 per tonne throughout 2013–13, down 14 per cent from \$18,667 per tonne in 2011–12. Nickel producers in Western Australia are facing challenges of increased operating costs coupled with a market oversupply.

Nickel production in Western Australia came from the following operations in 2012–13:

- 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 opencut 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, McMahan and Otter Juan sulphide mines in the Kambalda area. McMahan and Otter Juan are approaching the end of their mine life and are expected to close in the near future.
- 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. Plans for an expansion of the Cosmic Boy concentrator have been deferred due to the subdued nickel price.

- 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.
- Norilsk Nickel announced in April 2013 that the company was suspending operations indefinitely at its Lake Johnston sulphide mine.
- Glencore Xstrata Nickel Australasia Pty Ltd ceased mining at its Sinclair operation in May 2013, as the mine had reached the end of its expected life. Stockpiled ore will continue to be processed into the third quarter of 2013. The Cosmos operation was placed on care and maintenance in September 2012 in response to adverse market conditions.
- Minara Resources Ltd is wholly owned by Glencore Xstrata Plc and operates the Murrin Murrin openpit laterite nickel operation located between Leonora and Laverton in the northeastern Goldfields of Western Australia.
- First Quantum Minerals operates the Ravensthorpe laterite nickel mine, which was acquired as a decommissioned nickel operation from BHP in February 2010. It includes an opencut 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 2012–13, these operations included:

- Independence Group NL's Long nickel operation
- Mincor Resources' Miitel and Carnilya Hill projects
- Panoramic Resources Ltd's Lanfranchi Tramways Operation.

Market

The nickel market is dominated by the purchasing patterns of the stainless steel industry. 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.

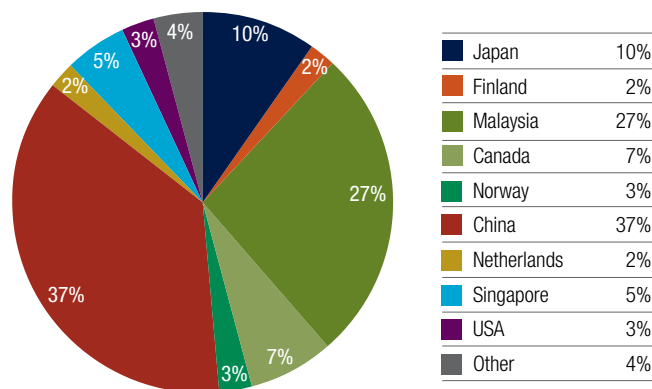


Figure 46 | **Nickel Exports – Total Value \$3.63 Billion** Source: DMP

Western Australia's largest export market for nickel in 2012–13 was China at 37 per cent. China was followed by Malaysia (27 per cent), then Japan (10 per cent), Canada (seven per cent) and Singapore (five per cent). Other export markets included the United States, Norway, the Netherlands and Finland.

Nickel producers continued to face 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).

In 2012–13, the price of nickel fell by 16 per cent to average US\$16,397 per tonne, pushed down from US\$19,298 per tonne in 2011–12. Technical innovations have pushed the break-even cost for NPI produced in China via rotary kiln electric furnaces (RKEF) down to US\$12,500 a tonne, meaning that already low nickel prices could fall further. Around 30 per cent of the whole supply of China's NPI comes from RKEF and this is projected to grow to around 50 per cent by 2013–14.

China sources most of its ore to produce NPI from Indonesia and the Philippines. The Indonesian Government plans to introduce a ban on export of unprocessed minerals from 2014, despite a recent Supreme Court ruling against the proposed law. It remains to be seen how this will affect China's NPI sector.

As a potential sign of things that may be to come, 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.

China continues to grow at around 7 per cent of GDP per year and will continue to drive demand for Western Australian nickel resources. Low commodity prices and high operating costs in Western Australia mean nickel producers will need to address costs and improve productivity to remain competitive. The extent of the recovery of the nickel market in the long-term will depend on the economic recovery of global markets outside China such as the US and Europe.



Figure 47 | **Nickel Price A\$'000/tonne**
Source: LME Cash, Monthly Average

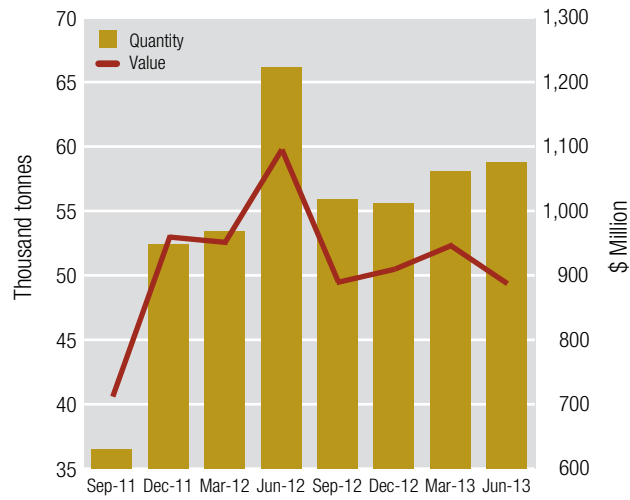


Figure 48 | **Nickel Quantity and Value by Quarter**
Source: DMP

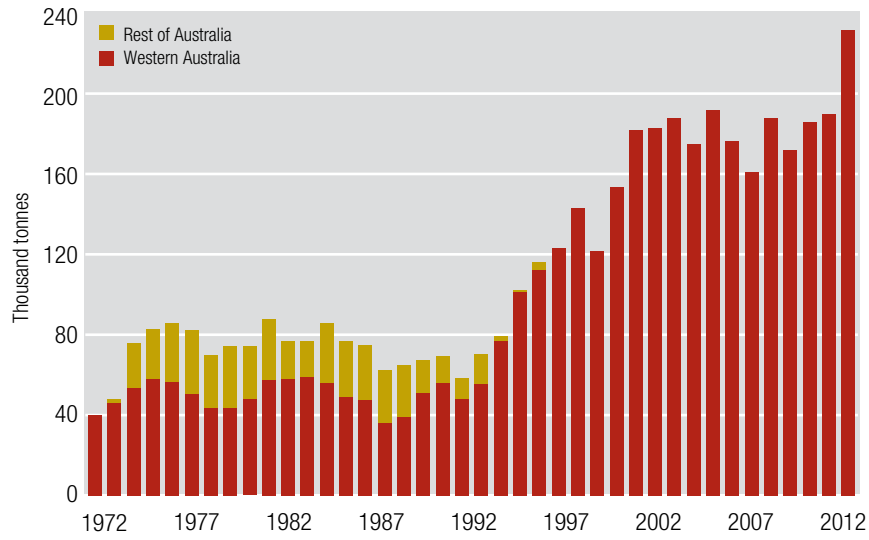


Figure 49 | **Nickel Quantity** Source: DMP and BREE

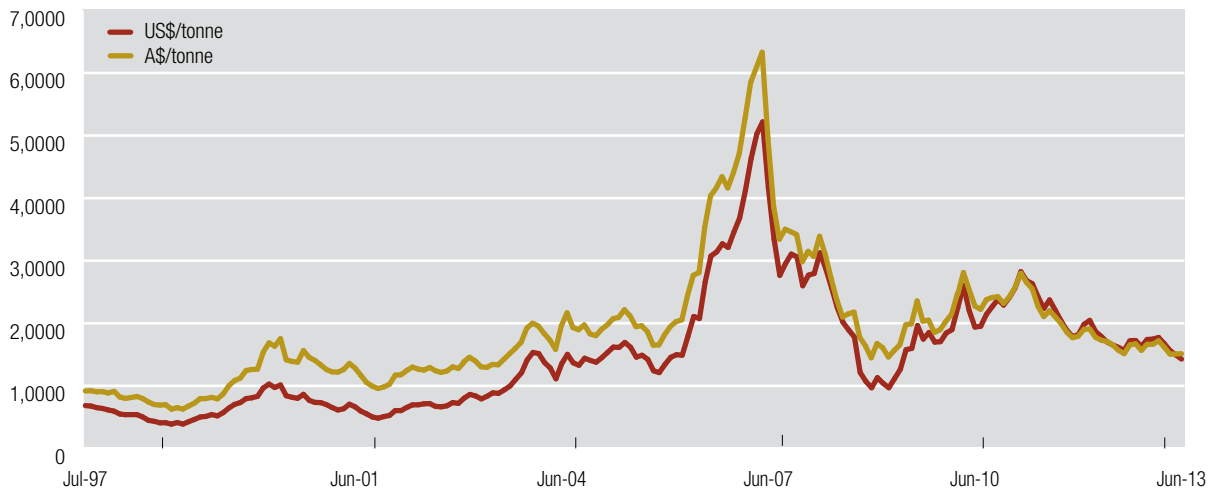


Figure 50 | **Historic Nickel Price per tonne** Source: LME

2.7 BASE METALS

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

A strong performance of the copper and lead sectors saw the value of base metals produced in Western Australia in 2012–13 increase by over 22 per cent on the previous year to slightly under \$1.6 billion. Base metals accounted for two per cent of all mineral and petroleum sales in Western Australia in 2012–13.

The value of the State's copper sales recorded a robust increase of 24 per cent, due mostly to the ramp-up of production at the DeGrussa copper mine. Copper is the largest contributor to Western Australia's base metals sector, with a value that is in excess of \$1.4 billion and accounts for over 90 per cent of base metals.

A 265 per cent increase in value of the State's lead sector, due to the recommencement of mining at Invernia's Paroo Station mine, offset a weaker performance from zinc, which fell by around 17 per cent.

In Australian dollar terms, the trading price of copper and zinc finished below 2011–12 levels, while lead recorded a slight increase. All base metal prices peaked in February before slipping towards the end of the financial year.

In 2012–13, Sandfire's DeGrussa mine took over from Aditya Birla's Nifty as the State's largest base metals producer. DeGrussa accounted for 27 per cent of the value of base metals in Western Australia, with Nifty accounting for 23 per cent.

Minerals and Metals Group's copper–lead–zinc mine, Golden Grove, was the third-largest producer (17 per cent), followed by Newmont's Boddington mine (12 per cent) and Newcrest's Telfer (10 per cent) gold–copper operations.

Some production of base metals also results as a by-product of nickel mining and in 2012–13 this accounted for five per cent of the total value of the State's base metal sales.

Copper

The average price for copper in 2012–13 fell to US\$7675 per tonne, representing a six per cent decrease on 2011–12 levels. This price decrease was a result of increased global supply due to new projects commencing, as well as slowing demand from China and high stock levels. Copper is used in a wide range of products, making prices sensitive to shifts in the economic growth outlook. The price of copper has also been affected by financial news such as changes in stimulation measures in the United States. In Australian dollar terms, copper prices averaged \$7480 per tonne, a decrease of over five per cent from the 2011–12 average.

The total quantity of copper sold out of Western Australia in 2012–13 was 198,608 tonnes, representing an increase of 28 per cent. Total value of the copper sector increased by 24 per cent to just over \$1.4 billion.

Sandfire Resources' DeGrussa high-grade copper–gold mine, located 140 kilometres northeast of Meekatharra, ramped-up production in 2012–13 to become the State's largest copper operation. DeGrussa produced 64,017 tonnes of copper, with associated sales accounting for the bulk of the increase in the value of base metals production in Western Australia in 2012–13.

Nifty, located 350 kilometres east of Port Hedland, is the State's second-largest copper mine. In 2012–13 it produced 48,418 tonnes of copper in concentrate from its large sulphide resource. The concentrate product is trucked to Port Hedland for shipping to Hindalco Copper's Dahej facility in India.

The third-largest producer Golden Grove, located 55 kilometres south of Yaloo in the Mid West, produced 31,841 tonnes, while Boddington, produced 31,752 tonnes of copper in concentrate in 2012–13.

Newcrest Mining's Telfer mine, located 310 kilometres northeast of Newman, produced 26,453 tonnes of copper in concentrate, whilst Independence Group's Jaguar was the smallest copper producer with 4992 tonnes.

Copper was also produced as a by-product (approximately five per cent of the total copper sold) from a number of nickel operations, with nine mines selling 9791 tonnes. The largest of these producers was Panoramic Resources Limited's Savannah nickel mine, producing 4443 tonnes of copper in concentrate.

Zinc

The total value of zinc sales in 2012–13 was \$100 million, down by 17 per cent on 2011–12. Zinc prices fell during 2012–13 by 4.5 per cent to an average of US\$1928 per tonne.

Western Australia has two zinc producers: Minerals and Metals Group's Golden Grove mine and Independence Group's Jaguar project which is located 60 kilometres north of Leonora. In 2012–13, Jaguar overtook Golden Grove as Western Australia's largest zinc producer.

During 2012–13, zinc production at Jaguar totalled 33,810 tonnes of metal in concentrate, up from 16,569 tonnes in 2011–12, whilst zinc production at Golden Grove amounted to 21,182 tonnes of metal in concentrate, down from 65,319 tonnes in 2011–12.

Lead

The value of Western Australian lead sales in 2012–13 reached \$47 million and were significantly boosted by the recommencement of sales and production from Ivernia's Paroo Station (formerly named Magellan) in 2012–13.

Paroo Station, the world's largest lead carbonate mine, was placed on care and maintenance in 2011 and recommenced operations in March 2013. Paroo Station produced 14,100 tonnes of lead concentrate containing 9000 tonnes of lead metal in 2012–13. Additional sales from stockpiles resulted in 16,700 tonnes of lead concentrate being shipped by Ivernia in 2012–13.

Lead averaged US\$2134 per tonne or A\$2081 per tonne for 2012–13. Despite starting the year below US\$1900 and reaching a peak of over US\$2370 in February, the average price of lead for 2012–13 was relatively stable compared to the 2012–11 average price of US\$2128 per tonne (A\$2059 per tonne).

Western Australia's only other lead producer, Golden Grove, produced 2893 tonnes of lead in 2012–13, down from 8190 tonnes in 2011–12.



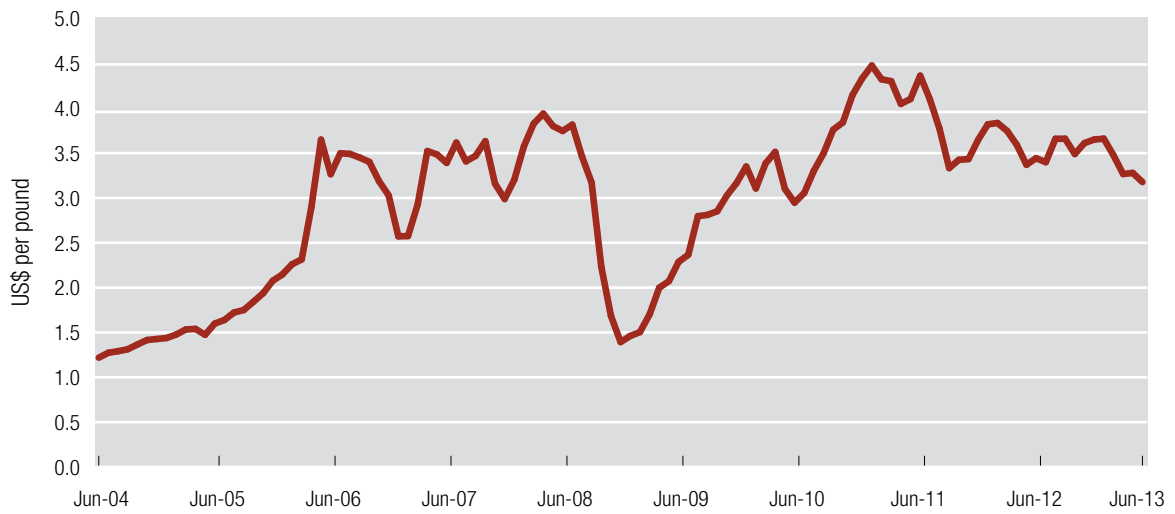


Figure 51 | **Copper Price** Source: Metalprices.com



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



Figure 53 | **Zinc Price** Source: Metalprices.com

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 approached \$756 million in 2012–13. This represents a 16 per cent decrease from the \$898 million in 2011–12. 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 and other states are excluded.

The global market for titanium and zircon is largely dependent on the health of the global economy, and continuing economic uncertainty was a challenge for the sector in 2012–13. Demand for titanium dioxide feedstocks (rutile and synthetic rutile) was unusually subdued and sluggish due to high levels of producer inventories. Zircon demand has also been down due to high stock levels as well as substitution and ‘thrifting’ (using less zircon in tile manufacturing) in China.

Prices received by Australian producers of heavy mineral sands were mixed in 2012–13, with the price of some products rising while others slipped. Zircon decreased 29 per cent and averaged \$1647 per tonne. The large decrease in zircon price can be attributed to high levels of low-grade material being sold during 2012–13. Prices for titanium dioxide pigment averaged \$2746 per tonne, which was 15 per cent lower than the previous year. Rutile and ilmenite fared better as prices rose by 12 per cent and 72 per cent respectively. A higher percentage of bagged product influenced the price outcome for ilmenite.

The largest contribution to mineral sands sales came from synthetic rutile, which was valued at \$374 million, down by \$83 million from 2011–12 (\$457 million). Quantities sold decreased by 12.5 per cent to 282,112 tonnes.

The fall in the zircon price meant the value of zircon sold decreased by 37 per cent to \$138 million, despite volumes decreasing by only seven per cent to 167,526 tonnes. In contrast, ilmenite sales fell by 22 per cent in value to \$71 million due to a sharp fall in volumes.

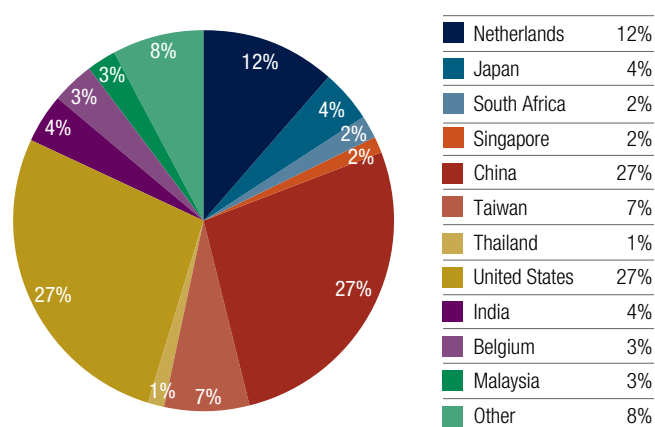


Figure 54 **Heavy Mineral Sands Exports – Total Value \$842 Million**
Source: DMP
Note: Exports include titanium dioxide and product sourced from overseas and other States and processed in Western Australia.

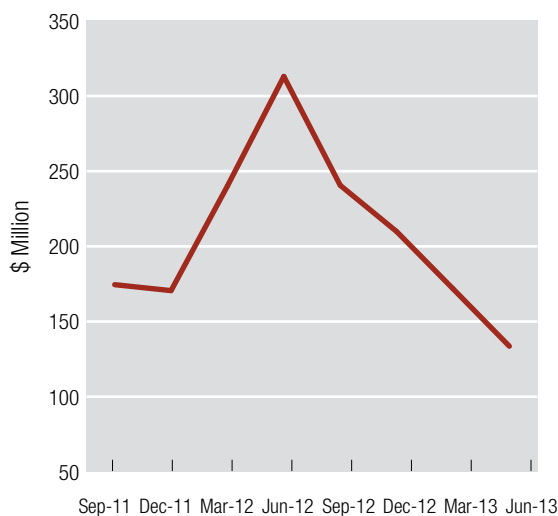


Figure 55 **Heavy Mineral Sands – Value by Quarter**
Source: DMP

Sales volumes of ilmenite fell by 38 per cent to 269,700 tonnes, offsetting the benefit of the stronger price. Rutile and leucoxene experienced strong growth and were up by 48 and 73 per cent by value respectively. These increases were due to higher prices as well as increased volumes of 12.5 per cent and 21 per cent.

In 2012–13, Western Australia exported \$842 million worth of heavy mineral sands, including product mined from private land and/or imported from interstate. The United States and China were the State’s major export markets for heavy mineral sands, each accounting for around 27 per cent of total exports. Highlighting the diversity of export markets for Western Australian heavy mineral sands, other major export destinations included the Netherlands (12 per cent), Taiwan (seven per cent) and Japan (four per cent).

Around 95 per cent of the titanium minerals produced globally is used as feedstock to produce titanium dioxide pigment. Titanium dioxide pigment 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 82 per cent (by value) of all the State’s mineral sands produced in 2012–13.

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.

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.

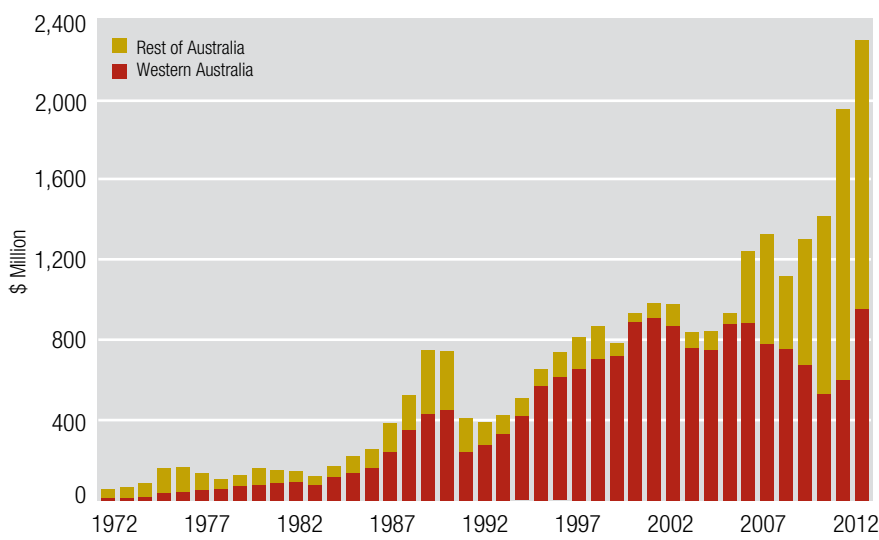


Figure 56 **Heavy Mineral Sands Value of Production**
Includes Ilmenite, Leucoxene, Upgraded Ilmenite, Rutile, Zircon and Monazite
Source: DMP and BREE

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.

In February 2013, Iluka announced they would cut production and reduce costs in 2013 due to weak demand. This would result 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. Altogether the cuts would result in Iluka's Australian operations running at 30 to 40 per cent of full capacity.

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 kilometres north of Perth; a dry mill and synthetic rutile plant 110 kilometres 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. Half 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.

Tronox has been exploring for mineral sand resources in Australia at Jurien and Dongara. The Dongara project contains approximately 85 million tonnes of ore and has a potential mine life of 7–15 years. The previously mined Jurien exploration project is located 266 kilometres north of Perth and covers 201 square kilometres.

In 2012–13, 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 been developing the Keysbrook mineral sands project 70 kilometres 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 has planning to begin production at Keysbrook in the second quarter of 2014.

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 heavy mineral sands.

2.9 DIAMONDS

In 2012–13, Western Australian diamond sales volumes increased by 11 per cent, reaching 9.6 million carats. This increase comes on the back of a poor 2011–12 when diamond sales fell to 1980 levels of 8.7 million carats when diamond mining first commenced in Western Australia.

Rio Tinto's Argyle mine, 112 kilometres south-southwest of Kununurra, accounts for the bulk of diamond production in Western Australia. The Argyle mine is known as the largest supplier of natural coloured diamonds, from exotic champagne diamonds to the remarkably rare pink diamonds. It continues to be one of the largest diamond mines in the world by volume.

In 2012–13, Argyle produced around 9.6 million carats, 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 openpit mine, which is in its final stages. The underground mine is a block-cave mine consisting of around 40 kilometres 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.

Kimberley Diamonds Ltd's Ellendale mine is located 100 kilometres east of Derby and is the State's only other producing diamond mine. In 2012–13, Ellendale produced 146 thousand carats, equalling the previous year's output. Ownership of the mine changed at the end of January 2013 when Gem Diamonds sold to Goodrich Resources (which changed its name to Kimberley Diamonds Ltd in April 2013).

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.

Kimberley Diamonds Ltd has plans to pursue an aggressive exploration program in the area to extend the life of the mine beyond its current life of eighteen months.

Supply and Demand

Large, commercial diamond mines are rare and there are only about 20 major mines in the world. Eleven mines make up around 62 per cent of the world's production of diamonds by carat weight. The last major diamond mine discovered was in Zimbabwe in 1997.

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

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.

Diamond demand is dictated by macro-economic trends. Diamonds are a luxury item and as such demand growth is expected to parallel GDP growth. The Global Diamond Industry Report 2013 states that 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. It is forecast that the next four years will see a consolidation of operations in an effort to achieve higher levels of productivity and efficiency. There will be both opportunities and challenges for companies along the value chain.

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 million tonnes of thermal coal each year.

In 2011–12, the quantity of all coal sold from Collie increased by seven per cent to 7.5 million tonnes and the value increased a similar amount to \$310 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 hydro 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 million tonne per annum coal export facility at the Bunbury port has received environmental approval. Exports from Bunbury are expected to start in 2016 and reach full capacity by 2020.

Possible Coal Developments

Depressed prices and challenging international conditions in coal markets have dampened the prospects of further coal mines being developed in Western Australia. This has resulted in the Rey Resources' Duchess Paradise coal project being sold. Crystal Yield Investments Limited, who are based in Hong Kong, entered into a staged acquisition in June 2013 of all Duchess Paradise assets. The acquisition is subject to the Foreign Investment Review Board approval and other standard conditions.

Other coal-associated developments in the South West include:

- The Collie hub carbon capture and storage (CCS) project (currently underway) is a Western Australian government–industry partnership. The Collie hub aims to develop a multi-user CCS facility featuring six participating companies – Perdaman Chemicals and Fertilisers, BHP Billiton, Worsley Alumina, Alcoa, Griffin Energy, Premier Coal and Verve Energy.

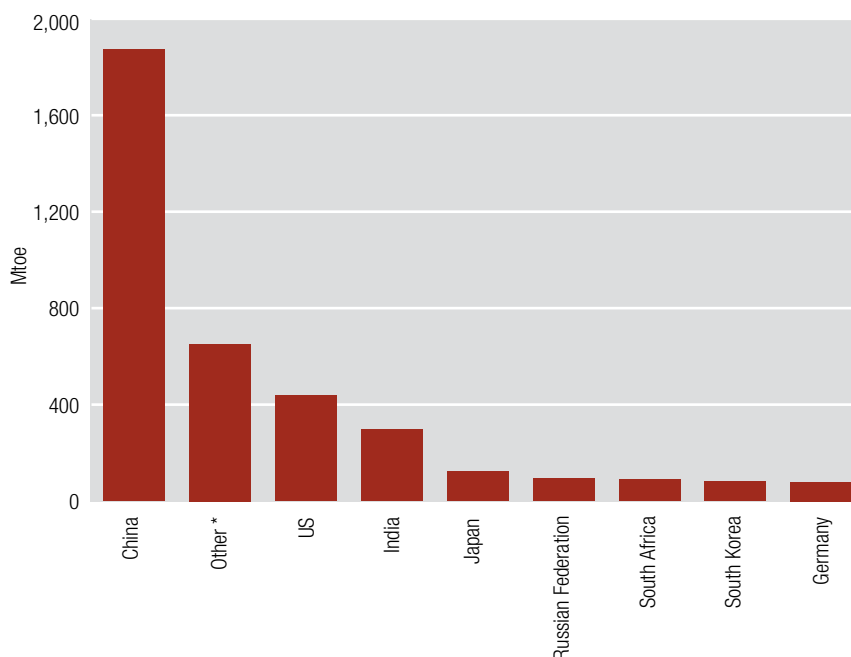


Figure 57 | **World Coal Consumption 2012** Source: BP World Energy Statistics 2013
* Other consists of 50 countries including Australia

- Perdaman Chemicals and Fertilisers has plans to develop a \$3.8-billion coal-to-urea manufacturing plant on a 125-hectare site within the Shotts Industrial Park in the southwest of the state. The Perdaman Collie Urea project would be Australia's first gasification plant, using three million tonnes per year of Collie coal to produce urea. With advanced negotiations underway with a coal supplier, Perdaman anticipate that the project will commence construction by the end of 2013.

The recently published data in BP World Energy Statistics 2013 shows that Australia's domestic coal consumption represents just 1.3 per cent of the total world's coal consumption. Accounting for around 62 per cent of consumption is China (50.2 per cent), followed by the United States (11.7 per cent).

Salt

Western Australia accounts for over 80 per cent of national salt production and is the country's dominant exporter. In 2012–13, the volume of Western Australian salt sales fell by three per cent to 12.4 million tonnes. However, sale values rose by eight per cent to \$382 million. An increase in prices helped counter a strong Australian dollar, which persisted for most of the year.

Dampier Salt Limited has operations in Dampier and Port Hedland in the Pilbara, and Lake MacLeod in the Gascoyne. The company accounted for around 76 per cent of the total salt produced in Western Australia 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 thousand tonnes per year of gritting salt to local United Kingdom (UK) authorities. 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 million tonnes to around 327 million tonnes. 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. When operational, Wodgina and Greenbushes have the capacity to produce up to 50 per cent of the world's tantalite concentrate supply.

Global Advanced Metals own both mines and currently uses the Greenbushes site to process primary tantalum concentrate from the Wodgina mine site. The company also has an agreement to purchase small amounts of tantalum pentoxide from Galaxy Resources Limited's Mt Cattlin lithium mine. This is processed through the secondary-processing plant at Greenbushes.

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.

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

Greenbushes also produces lithium (spodumene) and until recently has been Western Australia's sole producer. The lithium side of Greenbushes production is operated by Talison Lithium Australia Pty Ltd and has a nominal production capacity of approximately 260 thousand tonnes per annum 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.

Galaxy Resources Limited's Mt Cattlin lithium–tantalum project has become Western Australia's second lithium producer. Mt Cattlin is located close to the town of Ravensthorpe in the South West of the State. Galaxy ships spodumene to its value-adding lithium carbonate plant in China. The plant has a design capacity of 17 thousand tonnes per annum of battery-grade lithium carbonate and was commissioned in 2012.

Over the past twelve months, the average price for lithium has risen from US\$5500 per tonne to US\$6000 per tonne.

Reed Resources Ltd (in joint venture with Mineral Resources Limited) are looking to develop their Mt Marion lithium project which is located approximately 35 kilometres south of Kalgoorlie. Plans are in place for initial production at around 200 thousand tonnes a year. The project also has the potential to recover mica, tantalum and potash feldspar by-products.

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.

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 limited number of lithium-rich brine lakes and mineral deposits 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 due to development of rechargeable batteries for electric cars. The United States, China, Japan and a large number of European countries are making a significant investment in electric-vehicle development and associated infrastructure. Global demand is expected to grow from its current base of 150 thousand tonnes per annum to 238 thousand tonnes by 2017.

Manganese and Chromite

In 2012–13, the main producer of manganese in Western Australia was Pilbara Manganese Pty Ltd, a wholly owned subsidiary of the Ukraine-based Palmary Enterprises Ltd. Pilbara Manganese operates the Woodie Woodie mine and produces around one and a half million tonnes of manganese ore per annum 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 kilometres southeast of Port Hedland in the Pilbara region, the opencut mine was first established in 1954. It continued operating until 1982 and reopened again in 1989, and currently exports to world markets.

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. The second half of 2012–13 saw prices increase in US dollar terms by 12%.

Consolidated Minerals is the State's sole producer of chromite ore. Its Coobina mine is located 80 kilometres southeast of Newman and has an operating capacity of around 250 thousand tonnes per annum of high-grade ore. Mining at Coobina ceased in July 2013; however, processing operations will continue until stockpiled ore has been processed, which is expected to conclude around the end of 2013.

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

Rare Earths

Lynas Corporation's Mt Weld rare earths project is located 18 kilometres 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 tonnes 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's 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; however, it has now produced the full suite of rare earth products. The slower start-up of LAMP impacted upon Mt Weld operations which limited the output to accommodate Malaysia's start-up delays.

The Mt Weld deposit comprises world-class REO and niobium–tantalum deposits. Rare earth ore is mined, crushed and blended at Mt Weld and trucked to Fremantle in containers for export to Malaysia where Lynas has established its processing operation.

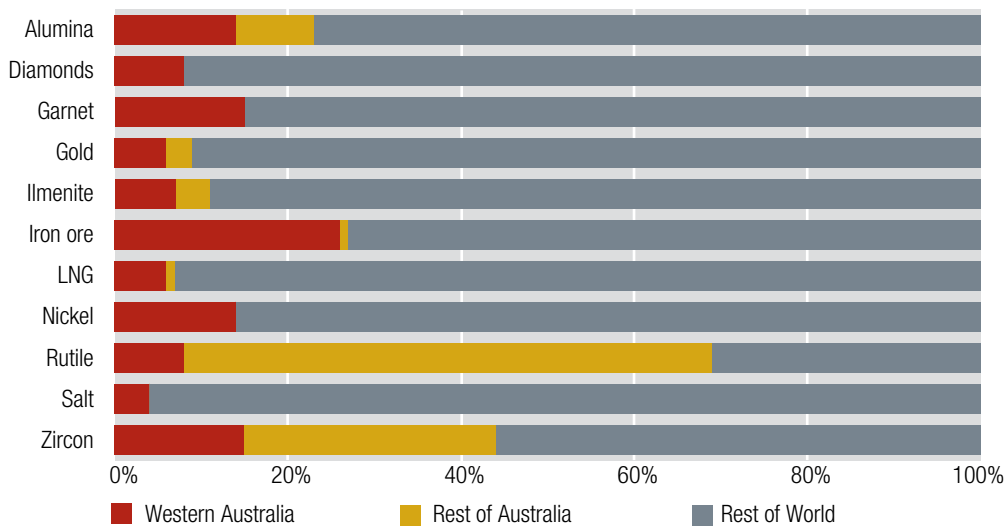


Figure 58 | **Selected WA Commodities Relative to World Production Ending 2012 by Quantity**

Source: DMP, BREE, 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 7%, iron ore 26%, LNG (sea-borne trade) 6%, nickel 14%, rutile 8%, salt 4%, zircon 15% and 8% of diamonds (mainly industrial grade)

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. The operation is well placed to take advantage of a market where supply is currently being outstripped by demand.

China supplies approximately 95 per cent of the global rare earth element market (with more than 70% 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 set-up shop 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.

China also holds 50 per cent of rare earth element reserves, Commonwealth of Independent States (Russia) 17 per cent followed by the United States at 12 per cent and Australia with almost two per cent. Recent regulatory changes will reduce the amount of rare earth elements being extracted within China and the supply of high-demand elements will require the development of other sources.

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 rarely present in economic concentration.

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 kilometres from Mount Magnet, hosts one of the largest proven vanadium reserves in the world. Atlantic Ltd acquired the Windimurra project in 2010 and it is anticipated that Windimurra production at capacity could meet around seven per cent of world demand. Worldwide, vanadium consumption is currently around 78 thousand tonnes per annum and set to continue through 2013 and beyond.

Atlantic's first shipment of ferrovandium left Windimurra in May 2012 and production is ramping-up to full plant capacity of 6300 tonnes per annum. 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.

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 million tonnes of ore and producing 13 thousand tonnes of high-quality vanadium pentoxide.

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

3. EMPLOYMENT, INVESTMENT AND ROYALTIES

3.1 EMPLOYMENT

Mining

The Department of Mines and Petroleum's Resources Safety Division collects 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 *Mining Act 1978*. These reports identify the number of direct employees and contractors (including exploration personnel) working on operating mining leases as well as greenfield sites.

Whilst as accurate as possible at the time of compilation, this data must be interpreted with some caution.

For example, it can reflect employment changes relating to construction activity, depletion of resources, scheduled maintenance shut-downs, level of brownfield exploration activity and seasonal weather constraints on mine operations.

In addition, the data is not directly comparable with those sourced from the Australian Bureau of Statistics (ABS). This is due to the narrow definition of mining activities used by the ABS, which is based on the Australian and New Zealand Standard Industrial Classification (ANZSIC). Under these guidelines, not all mining-related employment is reflected in ABS's mining industry classification. For example, employees engaged in mineral processing, surveying, transport and catering are not included.

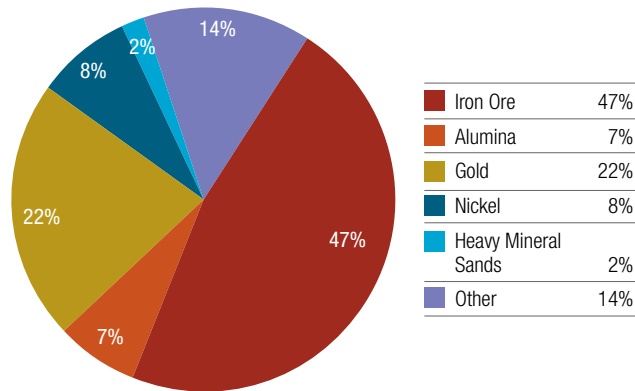


Figure 59 | **WA Minerals Employment 2012-13**
Source: DMP

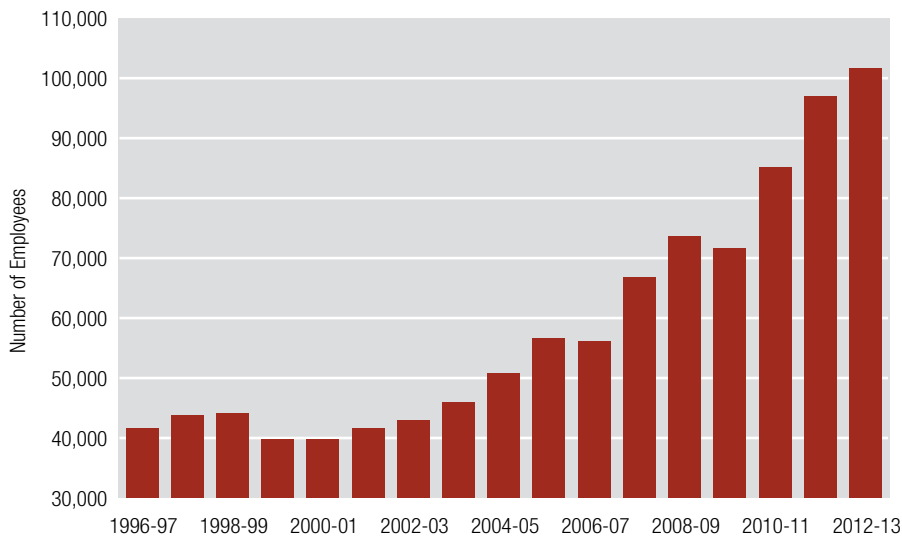


Figure 60 | **WA Mining Employment 1996-97 to 2012-13**
Source: DMP Resources Safety Division AXTAT Reporting System. Breakdown of 2006-07 is estimated. Does not include petroleum data.

Continual efforts are made by the Department to improve data and evidence-driven safety regulation. This has involved introducing the Safety Regulation System (SRS) AXTAT+, a web-based database. The SRS is also designed to enhance data quality and analysis and report mine safety and occupational health information.

Statistics generated from the SRS AXTAT+ database for 2012–13 show that there were on average 101,698 persons directly employed in Western Australia’s mining industry (including 2779 people employed in mineral exploration). This represents an increase of five per cent compared with 2011–12 which totalled 96,876 employees.

In 2012–13, iron ore was the largest employment sector in the State’s mining industry with 47,429 employees. Gold and nickel followed with 22,349 and 7664 persons respectively. Together the iron ore, gold and nickel sectors accounted for 76 per cent of total employment in the State’s mining industry in 2012–13.

The high level of construction activity being carried out in the Western Australian mining industry has generated an increase in workforce numbers by almost 50 per cent since 2007–08, when numbers totalled 66,850 persons. 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 whole host of projects are completed throughout 2013 and into 2014.

Rising cost pressures will undoubtedly have producers reviewing employment levels, which will also have a negative effect on employment numbers.

3.2 INVESTMENT

The Australian Bureau of Statistics (ABS) private new capital expenditure statistics indicate that the State’s mining industry invested a record \$48 billion in 2012–13. This represents a seven per cent increase compared to 2011–12 and highlights the high levels of resource construction activity in Western Australia.

Western Australia remained the nation’s leading mining investment destination in 2012–13, attracting 51 per cent of total capital spending by the industry in Australia at a value of \$95 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 23 per cent during the five years to 2012–13.

More broadly, in 2012–13, new capital expenditure in Western Australia by mining, manufacturing and other selected industries increased marginally by four per cent to \$58 billion and accounted for 36 per cent of the Australian total. The vast majority of this investment is attributed to the mining industry, which represented 83 per cent of the State’s total private new-capital expenditure in 2012–13.

It is important to note that the figures reported above by 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).

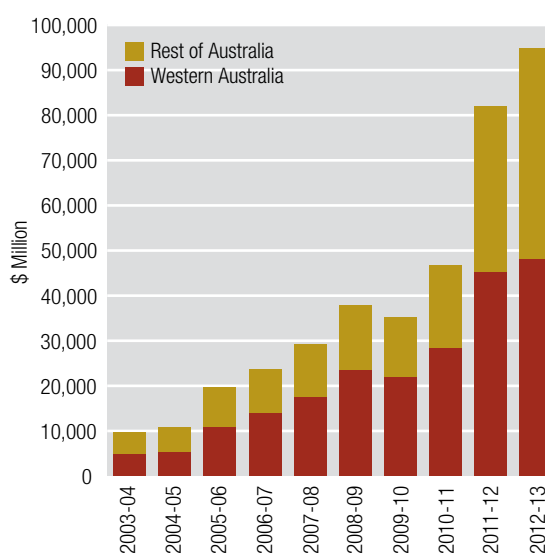


Figure 61 | Mining Investment Source: ABS

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 collects information on mineral and petroleum projects to estimate actual and possible investment. Where possible, information is collated relating to expected capital expenditure, project timing, and employment during both construction and operation phases.

Information is obtained from various sources including the Bureau of Resources and Energy Economics' (BREE) list of major mineral and energy projects, Deloitte Access Economics' Investment Monitor, REPS' Major WA Projects Listing, online company research consultancy systems, media announcements and company websites. Currently, information on mineral and petroleum projects comprises approximately 100 projects.

Projects are ranked according to 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.

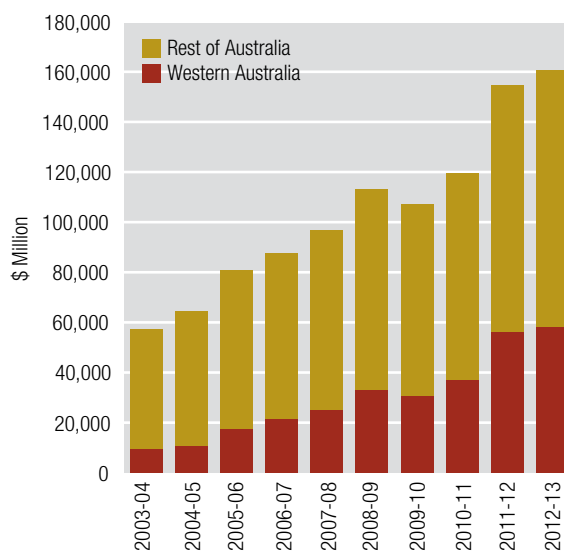


Figure 62 | **New Capital Investment**
Source: ABS

Based on information available up to 30 September 2013, 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 2013, Western Australia had an estimated \$146 billion worth of resource projects under construction or in the committed stage of development. A further \$97 billion have been identified for planned or possible projects in coming years.

The total value of major projects under construction or committed as at the end of September 2013 has fallen by around \$30 billion compared to estimates made in March 2013, due to a host of projects completing construction. Western Australia has now moved from a rapid investment phase to significant expansions in mining output. Examples of completed projects include:

- Rio Tinto's expansion of Pilbara mines, ports and railways to 290 Mt/a (\$9.5 billion)

- Fortescue Metals Group's Chichester and Solomon Hub mines and Herb Elliot port and rail infrastructure expansions to support increased capacity to 120 Mt/a (\$9 billion)
- CITIC Pacific Mining's completion of construction of their Sino Iron project (\$8.4 billion)
- BHP Billiton's Jumblebar mine expansion (\$3.7 billion)
- The Argyle Diamond mine expansion (\$2.1 billion)
- Rio Tinto and Hancock Prospecting JV's Hope Downs 4 expansion (\$2 billion)
- AngloGold Ashanti/Independence Group's Tropicana gold project (\$845 million).

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

The \$52-billion Gorgon LNG project continues to lead resource construction, followed by the \$29-billion Wheatstone LNG project. Shell is constructing the \$12-billion Prelude project, the world's first floating LNG facility, while the \$5-billion North Rankin natural gas redevelopment is nearing completion and due to come onstream by the end of 2013.

Major iron ore projects still under construction include Hancock Prospecting's Roy Hill mine (\$9.5 billion) and Rio Tinto's expansion of its Marandoo and Yandicoogina mines (\$2.7 billion).

Investment in Major Projects

(as at September 2013)

MAJOR PROJECTS	CAPEX MILLIONS \$	
	Committed/ Under Construction	Planned/ Possible
Commodity		
Gold	20	3,303
Iron Ore	15,680	23,208
Nickel	197	3,497
Other Minerals and Infrastructure	7,838	16,997
Sub-Total	23,735	47,005
Crude Oil and Condensate	974	820
LNG	112,498	46,800
Gas	9,000	617
Pipelines and Infrastructure		1,585
Sub-Total	122,472	49,822
Total Forecast Investment	146,207	96,827

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 409 per cent from just over \$1 billion in 2003–04 to \$5.3 billion in 2012–13. This represents royalties paid into the Western Australian Government Consolidated Revenue Fund. It also includes Western Australia's share of royalties paid by petroleum projects, and royalties collected in the Territorial Sea subsisting permit areas, Barrow Island and the North West Shelf (where the State receives approximately 65 per cent of royalties) that are shared with the Commonwealth.

The bulk of collections for 2012–13 (attributed directly to the State) came from iron ore (70 per cent), whilst petroleum (which includes shared funds with the Commonwealth) accounted for 20 per cent.

In May 2011, the Western Australian State Government announced reforms of royalty rates on iron ore, with the removal of the iron ore fines concession rate. Royalties on fines increased to 6.5 per cent on 1 July 2012, with a further increase to 7.5 per cent on 1 July 2013 (which is equivalent to the existing rate of lump ore).



TABLE 3. ROYALTY RECEIPTS 2011–12 AND 2012–13

COMMODITY	2011–12	2012–13	2012–13 Growth	
	Total A\$	Total A\$	A\$	%
ALUMINA	68,320,773	65,114,004	-3,206,769	(5)
DIAMONDS	15,183,262	15,966,746	783,484	5
GOLD	224,729,595	220,130,464	-4,599,131	(2)
HEAVY MINERAL SANDS	19,220,492	27,514,333	8,293,841	43
IRON ORE	3,831,267,729	3,654,716,731	-176,550,998	(5)
NICKEL	89,827,390	92,813,250	2,985,860	3
PETROLEUM *	18,749,522	18,187,507	-562,015	(3)
OTHER	116,569,262	142,104,143	25,534,881	22
TOTAL ROYALTY RECEIPTS	4,383,868,025	4,236,547,176	-147,320,849	(3)
NORTH WEST SHELF GRANTS	935,598,442	1,019,886,602	84,288,160	9
TOTAL REVENUE	5,319,466,467	5,256,433,779	-63,032,688	(1)

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 Lands) Act 1982 (PSLA).

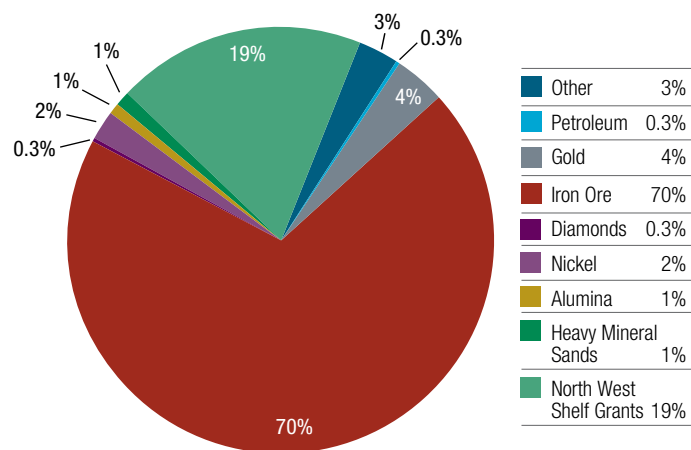


Figure 63 | **Royalty Receipts 2012–13 and North West Shelf Grants \$5.26 Billion** Source: DMP

TABLE 4. QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY	UNIT	FINANCIAL YEAR 2011–12		FINANCIAL YEAR 2012–13	
		QUANTITY	VALUE	QUANTITY	VALUE
ALUMINA	t	12,424,859 (r)	3,907,182,441 (r)	13,530,753	3,856,406,507
BASE METALS					
Copper Metal	t	155,079 (r)	1,165,528,441 (r)	198,608	1,441,204,252
Lead Metal	t	6,554	12,873,609	22,588	46,990,055
Zinc Metal	t	63,497	120,742,626	55,757	100,263,777
TOTAL BASE METALS			1,299,144,676 (r)		1,588,458,084
CHROMITE	t	104,854	n/a	199,656	n/a
CLAYS		75,091 (r)	1,663,209 (r)	41,235	1,099,571
COAL	t	6,986,433	289,629,252	7,494,280	310,640,894
CONSTRUCTION MATERIALS					
Aggregate	t	3,722,254 (r)	97,854,121 (r)	4,385,795	148,172,440
Gravel	t	283,899 (r)	2,454,938 (r)	573,653	4,037,974
Rock	t	509,983 (r)	6,262,935 (r)	944,676	22,112,809
Sand	t	6,286,702 (r)	54,502,065 (r)	5,417,528	61,673,753
TOTAL CONSTRUCTION MATERIALS			161,074,059 (r)		235,996,976
DIAMONDS	ct	8,689,501 (r)	343,293,394	9,609,436	349,521,176
DIMENSION STONE		7,590 (r)	1,450,510	3,806	988,947
GEM & SEMI-PRECIOUS STONES	kg	251,693 (r)	308,241 (r)	218,049	224,839
GOLD	kg	180,395 (r)	9,402,604,230 (r)	178,681	8,970,089,237
GYPSUM	t	331,898 (r)	4,854,468 (r)	404,998	7,474,188
HEAVY MINERAL SANDS					
Garnet	t	301,945	n/a	317,336	n/a
Ilmenite	t	432,199 (r)	92,122,966 (r)	269,700	71,767,558
Leucoxene	t	22,231	16,691,847	26,982	28,886,465
Zircon	t	180,817 (r)	219,261,542 (r)	167,526	138,275,018
Other	t		570,191,722 (r)		516,975,805
TOTAL HEAVY MINERAL SANDS			898,268,077 (r)		755,904,846
IRON ORE	t	454,397,951 (r)	60,799,070,148 (r)	512,579,289	56,368,813,389
LIMESAND–LIMESTONE–DOLOMITE	t	4,156,645 (r)	34,608,977 (r)	4,561,757	37,038,269
MANGANESE ORE	t	769,033 (r)	n/a	590,965	n/a
NICKEL INDUSTRY					
Cobalt	t	4,888 (r)	145,164,992 (r)	6,383	159,805,179
Nickel	t	208,545 (r)	3,711,527,012 (r)	228,299	3,625,205,342
Palladium and Platinum By-Product	kg	626	14,909,443	658	15,047,084
TOTAL NICKEL INDUSTRY			3,871,601,447 (r)		3,800,057,604

COMMODITY	UNIT	FINANCIAL YEAR 2011-12		FINANCIAL YEAR 2012-13	
		QUANTITY	VALUE	QUANTITY	VALUE
PETROLEUM *					
Condensate	kl	5,888,608	3,842,111,571	6,116,968	3,927,809,827
Crude Oil	kl	11,272,357	7,791,464,150	8,609,185	6,003,555,552
LNG	t	15,367,979	9,958,128,430	19,804,916	12,468,223,400
LPG – Butane and Propane	t	835,271	734,484,653	752,910	639,209,578
Natural Gas	'000m ³	9,110,271	1,454,459,941	8,713,949	1,434,550,772
TOTAL PETROLEUM			23,780,648,746		24,473,349,130
SALT	t	12,807,461 (r)	353,776,447	12,390,185	381,664,353
SILICA-SILICA SAND	t	452,638	14,742,316	498,232	16,886,756
SILVER	kg	123,132 (r)	118,684,075 (r)	120,035	108,515,256
TIN-TANTALUM-LITHIUM	t		201,617,416 (r)		181,614,697
OTHER (Includes Chromite, Manganese, Rare Earths, Spongolite, Talc and Vanadium)			410,189,003 (r)		400,595,271
TOTAL VALUE			105,894,411,130 (r)		101,845,339,990

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

(r) Revised from previous edition

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

* Includes fields under both federal and State jurisdiction.

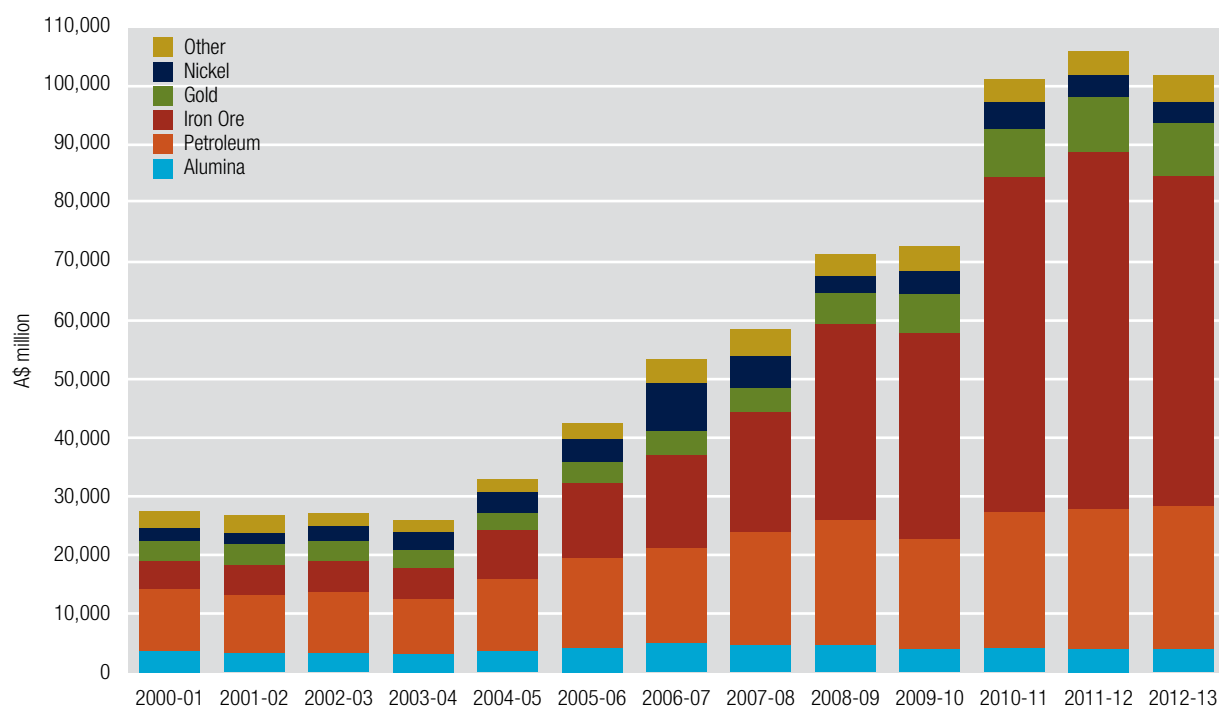


Figure 64 | Value of Minerals and Petroleum by Commodity Source: DMP

TABLE 5. QUANTITY AND VALUE OF SELECTED MAJOR COMMODITIES

		2003–04		2004–05		2005–06		2006–07	
	Unit	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
ALUMINA	Mt	11.17	3,085.11	11.16	3,461.63	11.47	4,111.25	11.98	4,847.03
BASE METALS									
Copper Metal	kt	53.29	155.82	61.93	243.73	81.20	559.85	115.98	1,052.48
Lead Metal	kt	29.45	10.57	2.32	0.31	58.74	86.55	70.47	146.07
Zinc Metal	kt	108.04	79.55	48.40	42.42	110.52	336.65	142.18	675.75
TOTAL BASE METALS			245.95		286.46		983.05		1,874.31
COAL	Mt	5.98	274.28	6.28	271.72	6.71	297.37	6.02	271.52
COBALT	kt	4.55	213.14	4.50	202.38	5.02	183.98	4.70	275.28
DIAMONDS	M ct	32.50	519.72	22.80	467.8	29.26	693.80	18.22	435.3
GOLD	t	177.01	3,109.56	167.35	3,016.38	166.17	3,715.05	161.77	4,222.91
HEAVY MINERAL SANDS									
Ilmenite	Mt	0.76	91.03	0.71	79.55	590.24	65.92	0.82	90.90
Rutile	kt	138.77	84.57	101.71	63.02	n/a	n/a	n/a	n/a
Upgraded Ilmenite (Synthetic Rutile)	kt	592.18	307.00	652.94	336.37	n/a	n/a	n/a	n/a
Zircon	kt	433.14	251.97	420.04	298.37	402.42	357.34	323.56	282.18
Other HMS			20.53		23.58		442.71		414.98
TOTAL HEAVY MINERAL SANDS			755.10		800.89		865.97		788.06
IRON ORE	Mt	202.04	5,331.53	233.15	8,302.34	242.63	12,699.09	257.64	15,732.60
MANGANESE ORE	kt	584.97	81.78	606.94	116.32	888.43	117.97	902.05	153.32
NICKEL	kt	182.21	3,031.04	180.42	3,503.20	183.56	3,815.11	173.66	8,059.38
PETROLEUM									
Condensate	Gl	6.18	1,747.51	5.63	2,203.11	5.63	2,791.73	5.86	2,970.82
Crude oil	Gl	13.22	3,773.64	12.80	5,146.61	11.16	5,935.12	13.99	7,398.31
LNG	Mt	7.79	2,775.88	11.04	3,953.10	11.68	4,625.22	12.21	4,481.79
LPG - Butane **	kt	383.92	154.13	77.17	421.74	871.98	654.42	898.61	605.08
LPG - Propane **	kt	311.35	128.02						
Natural Gas	Gm ³	8.06	694.07	7.64	678.72	7.71	703.28	8.71	919.49
TOTAL PETROLEUM			9,273.25		12,403.29		14,709.77		16,375.49
SALT	Mt	9.88	179.85	11.58	221.25	10.83	229.85	10.42	236.15
OTHER			316.87		820.06		1,113.02		866.73
TOTAL			26,417.17		33,405.91		42,841.48		53,702.78

** LPG Butane and Propane combined from 2004-05 onwards

2007–08		2008–09		2009–10		2010–11		2011–12		2012–13	
Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
12.31	4,522.14	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
124.53	1,080.56	127.33	654.34	149.81	1,156.69	148.76	1,290.07	155.08	1,165.53	198.61	1,441.20
25.71	81.39	25.20	42.12	26.09	61.59	40.72	97.73	6.55	12.87	22.59	46.99
197.13	578.31	142.06	231.27	87.56	210.12	70.54	162.11	63.50	120.74	55.76	100.26
	1,740.27		927.72		1,428.40		1,549.91		1,299.14		1,588.46
6.23	270.42	6.98	332.57	6.71	325.86	7.23	296.26	6.99	289.63	7.49	310.64
5.09	448.53	4.71	220.20	4.36	190.32	3.73	145.59	4.89	145.16	6.38	159.81
27.97	610.67	9.19	261.5	16.28	304.33	10.12	303.0	8.69	343.29	9.61	349.5
141.48	4,136.28	136.61	5,226.84	163.83	6,548.81	183.80	8,186.21	180.39	9,402.60	178.68	8,970.09
0.73	83.74	0.45	64.19	0.51	68.52	0.39	52.77	0.43	92.12	0.27	71.77
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
262.63	204.76	255.64	231.44	347.75	287.24	298.50	200.93	180.82	219.26	167.53	138.28
	381.90		414.01		315.28		219.63		586.88		545.86
	692.48		728.87		695.87		473.33		898.27		755.90
291.00	21,949.80	316.54	33,633.37	384.97	35,325.94	397.56	57,579.92	454.40	60,799.07	512.58	56,368.81
373.47	382.75	417.70	n/a	730.30	382.99	735.13	386.77	769.03	n/a	590.97	n/a
172.36	5,141.53	178.39	2,996.72	180.15	4,041.29	192.45	4,649.91	208.54	3,711.53	228.30	3,625.21
6.19	3,971.79	12.94	3,108.79	7.42	3,501.19	6.88	3,987.53	5.89	3,842.11	6.12	3,927.81
12.77	8,697.92	13.96	7,659.58	11.84	6,385.07	13.92	8,436.21	11.27	7,791.46	8.61	6,003.56
12.15	5,105.96	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
818.39	683.35	866.53	750.83	975.75	647.35	923.76	774.20	835.27	734.48	752.91	639.21
			–								
9.16	1,025.20	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
	19,484.22		21,275.82		18,776.97		23,220.61		23,780.65		24,473.35
10.59	232.93	10.52	386.25	10.97	417.46	12.23	366.94	12.81	353.78	12.39	381.66
	1,454.29		698.13		363.89		437.61		964.10		1,005.48
	60,072.89		71,252.03		72,612.30		101,572.94		105,894.41		101,845.34

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

REGION	2012–13 Value
Pilbara Region	
Iron Ore	53,593,560,699
Gold and Silver	1,007,952,954
Manganese and Salt	528,215,994
Copper	518,180,909
Other	218,745,186
Total	55,866,655,742

Offshore Petroleum	
Crude Oil and Condensate	9,917,424,800
Liquefied Natural Gas	12,468,223,400
Natural Gas	1,391,223,061
LPG Butane and Propane	639,209,578
Total	24,416,080,839

Goldfields–Esperance Region	
Gold	5,745,961,516
Nickel, Platinum and Palladium	2,975,535,771
Cobalt	150,447,984
Copper and Zinc	90,460,794
Silver and Rare Earths	60,603,034
Gypsum and Limesand	14,217,287
Construction Materials	8,557,580
Other	12,522,192
Total	9,058,306,158

Peel Region	
Alumina	3,856,406,507
Gold, Silver and Copper	1,224,237,858
Total	5,080,644,365

Mid West Region	
Gold	965,284,068
Iron ore	832,112,809
Copper, Lead and Zinc	746,082,797
Nickel and Vanadium	108,097,079
Talc and Chromite	112,059,239
Heavy Mineral Sands, Chromite	186,224,003
Silver	43,289,295
Natural Gas	43,327,711
Crude Oil and Condensate	3,850,328
Gypsum and Limesand	3,890,327
Total	3,044,217,656

REGION	2012–13 Value
Wheatbelt Region	
Iron ore	1,407,888,951
Nickel, Copper and Salt	462,467,217
Gypsum and Heavy Mineral Sands	438,912,812
Gold and Silver	195,158,580
Other	6,774,500
Total	2,511,202,060

Kimberley Region	
Iron Ore	535,250,930
Diamonds and Crude Oil	359,611,428
Nickel, Copper and Cobalt	154,515,553
Gold and Silver	50,641,077
Construction Materials	11,781,110
Total	1,111,800,098

South West Region	
Coal	310,640,894
Clay, Limesand–Limestone and Spodumene	151,074,194
Heavy Mineral Sands	135,150,223
Total	596,865,311

Gascoyne Region	
Salt and Gems	110,258,170
Gypsum and Limesand–Limestone	2,390,191
Construction Materials	355,808
Total	113,004,169

Perth Metropolitan Region	
Construction Materials, Silica Sand and Limesand–Limestone	39,749,889

Great Southern Region	
Spongolite, Silica Sand and Limesand	6,813,703

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

REGION	2012–13 Value
Pilbara Region	
East Pilbara	30,557,843,736
Ashburton	24,226,752,344
Port Hedland and Marble Bar	904,322,320
Roebourne and Karratha	177,737,342
Total	55,866,655,742

Offshore Petroleum	24,416,080,839
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Goldfields–Esperance Region	
Coolgardie	2,860,675,791
Kalgoorlie–Boulder	2,007,704,213
Leonora	1,605,599,843
Laverton	1,576,555,541
Ravensthorpe	643,351,347
Menzies and Esperance	208,816,751
Dundas	155,602,672
Total	9,058,306,158

Peel Region	
Waroona	2,630,690,950
Boddington	2,449,953,415
Total	5,080,644,365

Mid West Region	
Meekatharra and Morawa	915,225,259
Wiluna and Three Springs	707,956,733
Yalgoo and Carnamah	722,911,618
Mullewa and Mt Magnet	333,323,385
Cue, Coorow and Geraldton	245,210,715
Northampton, Perenjori and Sandstone	70,788,897
Irwin and Murchison	48,801,049
Total	3,044,217,656

Wheatbelt Region	
Yilgarn	1,473,278,798
Dalwallinu and Kondinin	455,874,280
Dandaragan	436,551,744
Lake Grace and Westonia	138,619,148
Moora and Wyalkatchem	4,805,911
Gingin and Koorda	1,842,464
Northam and Kellerberrin	229,715
Total	2,511,202,060

REGION	2012–13 Value
Kimberley Region	
Derby–West Kimberley	512,235,842
Wyndham–East Kimberley	386,933,427
Halls Creek	205,167,412
Broome	7,463,417
Total	1,111,800,098

South West Region	
Bridgetown–Greenbushes, Capel and Collie	533,750,739
Bunbury, Dardanup and Manjimup	63,114,572
Total	596,865,311

Gascoyne Region	
Carnarvon	81,660,707
Exmouth, Shark Bay and Upper Gascoyne	31,343,462
Total	113,004,169

Perth Metropolitan Region	
Kalamunda, Swan and Wanneroo	24,586,980
Cockburn, Kwinana and Rockingham	15,162,909
Total	39,749,889

Great Southern Region	
Albany, Denmark and Plantagenet	6,813,703

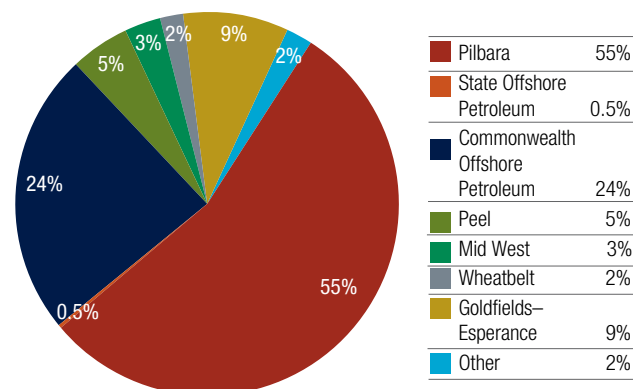


Figure 65 **Value of Minerals and Petroleum by Region 2012–13**
Total \$101.8 Billion Source: DMP

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY

MINERAL/Company	Operating Site	2011-12	2012-13
BAUXITE – ALUMINA			
Alcoa World Alumina Australia	Huntly	846	957
	Kwinana Alumina Refinery	1,329	1,303
	Pinjarra Refinery	1,661	1,588
	Wagerup Alumina Refinery	1,085	998
	Willowdale	327	318
Bauxite Resources Limited	Bindoon Bauxite Quarry	1	0
Doral Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	100	80
Worsley Alumina Pty Ltd	Boddington Bauxite	481	328
	Worsley Refinery	4,417	1,906
TOTAL BAUXITE – ALUMINA		10,247	7,478
BASE METALS			
Birla (Nifty) Pty Ltd	Nifty	744	761
Jabiru Metals Ltd	Jaguar	352	348
Lennard Shelf Pty Ltd	Pillara	4	0
Minerals and Metals Group	Golden Grove	1,120	999
Rosslyn Hill Mining Pty Ltd	Paroo Station	37	51
Sandfire Resources NL	DeGrussa Mine	633	703
Venturex Resources Limited	Whim Creek	17	20
TOTAL BASE METALS		2,907	2,882
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja Open Cut	474	211
Premier Coal Ltd	Premier	202	207
TOTAL COAL		676	418
DIAMONDS			
Argyle Diamond Mines Pty Ltd	Argyle Diamond Mine	1,917	2,097
Kimberley Diamonds Limited	Ellendale	328	335
Merlin Diamonds Ltd	Wangara Laboratory	3	3
TOTAL DIAMONDS		2,248	2,435
GOLD			
Agnew Gold Mining Company Pty Limited	Agnew-Emu	529	519
Andy Well Mining Pty Ltd	Andy Well	0	38
AngloGold Ashanti Australia Ltd	Sunrise Dam	1,111	1,030
	Tropicana Gold Mine	163	636
Apex Gold Pty Ltd	Wiluna Group	232	222
Avoca Resources Ltd	Higginsville Gold Project	611	628
Barrick Gold of Australia Ltd	Darlot	482	481
	Granny Smith	897	994
	Kalgoorlie West Group	869	836
	Lawlers	477	502
	Plutonic	679	601

MINERAL/Company	Operating Site	2011–12	2012–13
GOLD Continued			
Blue Tiger Mines Pty Ltd	Gunga West Open Pit	0	7
Bullabulling Operations Pty Ltd	Bullabulling	19	8
Central Norseman Gold Corporation	Central Norseman Group	264	178
Dacian Gold Ltd	Mt Morgans Gold Mine	3	15
Evolution Mining Limited	Edna May Gold Project	142	199
Focus Minerals Ltd	Laverton Gold Project	268	137
	The Mount	66	60
	Three Mile Hill	152	133
	Tindals	153	110
FMR Investments Pty Ltd	Burbanks	4	2
	Greenfields Mill	49	72
	Gordon Sirdar Project	19	29
GMK Exploration Pty Ltd	Meekatharra Gold Operations – Bluebird	10	96
Haoma Pty Ltd	Bamboo Creek	10	14
HBJ Minerals Pty Ltd	South Kal Operations	277	255
Integra Mining Ltd	Randalls	184	91
Jinka Minerals Ltd	Burnakura	0	35
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile – Super Pit	1,903	1,844
Kalgoorlie Mining Company (Bullant) Pty Ltd	Bullant Mine	58	10
Kalnorth Gold Mines Ltd	Lindsays – Eastern	0	15
Kentor Gold Ltd	Burnakura	52	91
La Mancha Resources Australia Pty Ltd	Frogs Leg Group	235	239
	White Foil	3	19
Millennium Minerals Limited	Nullagine Gold Operations	59	187
Minjar Gold Pty Ltd	Minjar Gold Project	28	13
Mount Magnet South NL	Kirkalocka	7	6
Mt Magnet Gold Pty Ltd	Hill 50 – Mt Magnet Group	241	163
	Western Queen South	0	9
Navigator (Bronzewing) Pty Ltd	Bronzewing	275	183
Newcrest Mining Ltd	Telfer	2,570	2,692
Newmont Boddington Gold Pty Ltd	Boddington	3,402	3,045
Newmont Mining Corporation	Jundee	672	588
Nex Metals Explorations Ltd	Orient Well	31	7
Northern Star Resources Ltd	Paulsens	237	296
Northwest Nonferrous Australia	Indee Gold	4	10
Northwest Resources Ltd	Blue Spec – Golden Spec Mine	4	7
Paddington Gold Mine Pty Ltd	Paddington Gold	501	559
	Binduli	198	152
Ramelius Milling Services Pty Ltd	Burbanks Treatment Plant	18	36
Ramelius Resources Ltd	Wattle Dam	64	19

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY

MINERAL/Company	Operating Site	2011–12	2012–13
GOLD Continued			
Reed Resources Ltd	Sand Queen	1	1
Regis Resources Limited	Duketon	153	146
	Garden Well	244	411
Silver Lake Resources Limited	Daisy–Milano	224	216
	Lakewood – Fintails Plant	67	49
	Murchison Operations	22	259
	Randalls	0	86
Saracen Gold Mines Pty Limited	Carosue Dam	277	270
St Barbara Mines Ltd	Southern Cross – Marvel Loch and Hercules mines	397	150
	Leonora Operations – Sons of Gwalia	512	558
	King of the Hills Underground	150	189
St Ives Gold Mining Company Pty Limited	Kambalda/St Ives	1,825	1,582
Stone Resources Aust Ltd	Brightstar Beta–Mikado	17	10
Swan Gold Mining Ltd	Carnegie Gold	3	7
	Mt Ida	3	4
Tanami Gold NL	Coyote Minesite	196	181
The Perth Mint	Perth Mint	103	100
Troy Resources Ltd	Sandstone Group	3	1
Other	Various	10	11
TOTAL GOLD		22,439	22,349
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	7	8
Bemax Resources Limited	Bunbury	155	168
Doral Mineral Sands Pty Ltd	Dardanup	268	567
Mintech Chemical Industries Pty Ltd	Rockingham Zirconia Plant	50	71
GMA Garnet Pty Ltd	Narngulu Garnet Plant	34	42
	Port Gregory	32	37
Iluka Resources Limited	Capel	652	503
	Eneabba	143	161
	Narngulu Synthetic Rutile Plants	298	209
	Gingin/Iluka	16	13
	Tronox Management Pty Ltd	Chandala–Muchea	361
	Cooljarloo	205	253
	Bunbury Port	10	12
TOTAL HEAVY MINERAL SANDS		2,231	2,395
IRON ORE			
Atlas Iron Ltd	Abydos DSO Project	2	91
	Mt Dove	1	54
	Pardoo RSD Group	85	77
	Wodgina	116	173

MINERAL/Company	Operating Site	2011–12	2012–13
IRON ORE Continued			
BC Iron Limited	Nullagine	329	432
BHP Billiton Iron Ore Pty Ltd	Boodarie HBI Plant	15	17
	Mt Newman Orebody 25	767	771
	Jimblebar Hub	29	396
	RGP4 Jimblebar construction site	0	932
	Mining Area C	1,988	2,064
	Mt Whaleback	1,909	2,279
	Nelson Point	1,172	1,574
	RGP4/5 Port Hedland Pace Project	958	1,745
	Yandi – Marillana Creek	1,425	1,795
	Yandi 3 Rail Loop Ore Handling Plant	37	0
	Yarnima Power	0	187
	Yarrie Group	0	170
Calibre Projects Pty Ltd	Western Turner Syncline	136	471
	Brockman 4 – Phase 2	274	192
Citic Pacific Mining Management Pty Ltd	Sino Iron	668	1,955
Cliffs Natural Resources Pty Ltd	Koolyanobbing	1,114	1,292
Crosslands Resources Ltd	Cuddingwarra	59	1
	Geraldton Port Storage Facility	39	3
	Jack Hills	64	16
Downer EDI Works Pty Ltd	Warrambo Project	87	4
Forge Resources Ltd	Balla Balla Group	1	4
Fortescue Metals Group Ltd	Anderson Point Port Facility	884	1,121
	Christmas Creek	2,928	3,847
	Cloudbreak	3,809	3,526
	Kings Resources Group	0	1,705
	Rail Ballast Quarry	19	16
	Solomon Operations – Central Admin	1,172	1,068
GHD Pty Ltd	Jimblebar Non-Process Infrastructure	0	788
Hamersley HMS Pty Ltd	Hope Downs 1-3 Group	415	1,158
	Coondiner HD4 Central	10	432
Hamersley Iron Pty Ltd	Brockman 2 – Detritals Group	655	688
	Brockman 4 – Resources Safety Group	1,079	1,212
	Dampier Port Operations	2,697	1,904
	Dampier Power Plant	51	17
	Hismelt Kwinana	50	80
	Marandoo	421	534
	Paraburdoo–Channar–Eastern Range	1,469	1,753
	Tom Price	2,145	1,891
	Yandicoogina	1,221	1,195

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY

MINERAL/Company	Operating Site	2011–12	2012–13
IRON ORE Continued			
Henry Walker Eltin Cockatoo Pty Ltd	Cockatoo Island	200	45
Karara Mining Limited	Karara – Blue Hills Group	196	940
	Karara Export Terminal	0	46
Kimberley Metals Group Pty Ltd	Ridges Iron Ore project	111	141
Lycopodium Minerals Pty Ltd	Marandoo Phase 2 – Construction	97	423
MacMahon Holdings Pty Ltd	Orebody 18 – Wheelarra	432	422
Mount Gibson Mining Limited	Extension Hill	175	70
	Geraldton Port Storage Facility	22	33
	Koolan Island	606	529
	Perenjori Iron Ore Sliding	47	103
	Ruvidini Rail Terminal	70	83
	Tallering Peak	354	234
Ngarda Civil and Mining Pty Ltd.	Yarrie Nimingarra	388	236
Pluton Resources Ltd	Cockatoo Island – Homer (and Seawall)	0	62
Polaris Metals Pty Ltd	Carina Iron Ore Mine	249	200
Process Minerals International	Boodarie RSI	33	0
	Phils Creek	0	28
	Poondano	84	73
Rio Tinto Iron Ore Pty Ltd	Cape Lambert Power Station	58	18
	Cape Lambert Expansion	121	12
	Dampier Fuel Wharf	128	17
	Kangaroo Hill Village	32	37
	West Angelas Power Plant	2	99
	West Pilbara Village	0	11
Robe River Mining Co. Pty Ltd	Cape Lambert Port Operations and Power Plant	1,452	1,259
	Pannawonica	684	673
	West Angelas Plant	1,381	1,697
Roy Hill Iron Ore Pty Ltd	Roy Hill	149	250
Sinosteel Midwest Corporation Limited	Koolanooka	155	58
TOTAL IRON ORE		37,526	47,429
MANGANESE			
Pilbara Manganese Pty Ltd	Woodie Woodie	770	588
Process Minerals International	Nicholas Downs	6	0
	Woodie Woodie Tailings Treatment Plant	24	31
TOTAL MANGANESE		800	619
NICKEL			
BHP Billiton (Nickel West)	Cliffs	254	219
	Kalgoorlie Nickel Smelter	644	622
	Kambalda	179	120
	Kwinana Refinery	556	428

MINERAL/Company	Operating Site	2011–12	2012–13
NICKEL Continued			
BHP Billiton (Nickel West) Continued	Leinster	961	976
	Mt Keith	1,289	914
Consolidated Nickel Pty Ltd	Beta-Hunt Nickel Group	4	5
First Quantum Minerals (Australia) Pty Limited	Ravensthorpe	979	1,019
Focus Minerals Ltd	Nepean	1	1
Fox Resources Pty Ltd	Radio Hill	29	22
Lake Johnston Ltd	Emily Ann	243	228
Lightning Nickel Pty Ltd	Long Shaft	203	211
Mincor Operations Pty Ltd	Carnilya Hill	10	0
	Mincor Operations – Miitel	120	147
	Otter Juan	111	77
Norilsk Nickel Avalon Pty Ltd	Avalon–Bulong Plant	13	8
	Black Swan	16	15
	Cawse	16	10
	Waterloo	10	8
Murrin Murrin Operations Pty Ltd	Murrin Murrin	1,493	1,349
Panoramic Resources Limited	Lanfranchi	311	245
	Savannah Group	355	356
Poseidon Nickel Ltd	Windarra Group	26	32
Xstrata Nickel Australasia Operations Pty Ltd	Cosmos	246	68
	Sinclair	109	77
Southern Cross Energy	Southern Cross Energy Power Group	95	0
Western Areas Limited	Forrestania	525	507
TOTAL NICKEL		8,798	7,664
SALT			
Dampier Salt Ltd	Dampier	262	319
	Lake MacLeod	249	217
	Port Hedland	210	211
WA Salt Supply Koolyanobbing Pty Ltd	Lake Deborah	11	9
Onslow Solar Salt Pty Ltd	Onslow	154	272
Shark Bay Salt JV	Useless Loop	123	108
Western Salt Refinery Pty Ltd	Pink Lake	1	1
TOTAL SALT		1,010	1,137
TIN, TANTALUM AND LITHIUM			
Galaxy Resources Ltd	Mt Cattlin (Spodumene)	162	56
Global Advanced Metals Greenbushes Pty Ltd	Greenbushes	22	11
	Wodgina	127	55
Nagrom and Co.	Kelmscott	86	98
Talison Lithium Aust Pty Ltd	Greenbushes	254	216
TOTAL TIN, TANTALUM AND LITHIUM		651	436

TABLE 8. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS INDUSTRY			
MINERAL/Company	Operating Site	2011–12	2012–13
OTHER COMMODITIES			
TOTAL CHROMITE		92	76
TOTAL CLAYS		106	110
TOTAL CONSTRUCTION MATERIALS		918	918
TOTAL DIMENSION STONE		123	102
TOTAL GYPSUM		12	18
TOTAL INDUSTRIAL PEGMATITE MINERALS		23	20
TOTAL LIMESTONE – LIMESAND		208	218
TOTAL MINERAL EXPLORATION		3,681	2,779
TOTAL PHOSPHATE		170	176
TOTAL RARE EARTHS		162	183
TOTAL SILICA – SILICA SAND		580	445
TOTAL SILVER		42	60
TOTAL TALC		49	39
TOTAL TUNGSTEN AND MOLYBDENUM		95	92
TOTAL VANADIUM		340	151
TOTAL VARIOUS PORTS		740	962
ALL OTHER MATERIALS		2	107
TOTAL		96,876	101,698

SOURCE: Safety Regulation System (SRS) AXTAT+ Reporting System, Resources Safety Division, Department of Mines and Petroleum.

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

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](http://www.adityabirlaminerals.com.au/aboutusoverview.asp)

BHP Billiton (Nickel West),
191 Great Eastern Highway,
Belmont WA 6104,
(08) 6272 3000,
Kambalda.
www.bhpbilliton.com

MMG Golden Grove Pty Ltd,
Level 23,
28 Freshwater Place,
Southbank Vic 3001,
(03) 9288 0413,
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 6580,
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.
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

CHROMITE

Consolidated Minerals,
Level 1, 28 Ventnor Avenue,
West Perth WA 6005,
(08) 9460 7000,
Coobina.
www.consminerals.com.au

CLAY

Attapulgitite

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,
(08) 9756 6121,
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.wesfarmers.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

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

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

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.,
41 Spearwood Avenue,
Bibra Lake WA 6163,
(08) 9434 2299,
Pickering Brook.
www.walimestone.com

Sand

Boral Resources (WA) Ltd,
63–69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Gnangara, Gosmont.
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

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 4602,
Sunrise Dam.
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,
Darlot, Lawlers, Plutonic,
Granny Smith, Kanowna Belle,
East Kumdana, Kalgoorlie.
www.barrick.com

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

**Kalgoorlie Consolidated Gold
Mines Pty Ltd,**
Private Mail Bag 27,
Kalgoorlie WA 6433,
(08) 9022 1100,
Golden Mile Fimiston Super Pit.
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

Northern Star Resources Limited,
Level 1, 1 Puccini Court,
Stirling WA 6021,
(08) 6188 2100,
Paulsens.
www.nsr ltd.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, Wattle Dam.
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,
Marve Loch – Southern Cross,
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.agltime.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

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

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

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, Yandicoogina.
www.bhpbilliton.com

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

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, Paraburdoo,
Tom Price, West Angelas,
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, Talling 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

**Process Minerals
International Pty Ltd,**
1 Sleaf Road,
Applecross WA 6153,
(08) 9329 3600,
Woodie Woodie.
www.processminerals.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,
McMahon, Mariners,
Miitel, Otter Juan.
www.mincor.com.au

Norilsk Nickel Australia Pty Ltd,
Level 1, 88 Colin Street,
West Perth WA 6005,
(08) 9426 0100,
Lake Johnson.
www.nornik.ru/en

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.
www.awexp.com.au/irm/content/home.html

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

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

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

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

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](http://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

Galaxy Resources Ltd,

Level 2, 16 Ord Street,
West Perth WA 6005,
(08) 9215 1700,
Mt Cattlin.
www.galaxyresources.com.au

Tantalum

Galaxy Resources Ltd,

Level 2, 16 Ord Street,
West Perth WA 6005,
(08) 9215 1700,
Mt Cattlin.
www.galaxyresources.com.au

Global Advanced Metals Pty Ltd,

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

Tin

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

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 (1 tonne LPG-butane = 1,720 litres)		
LPG-propane	25.4 MJ/L (1 tonne LPG-propane = 1,960 litres)		

DATA SOURCES

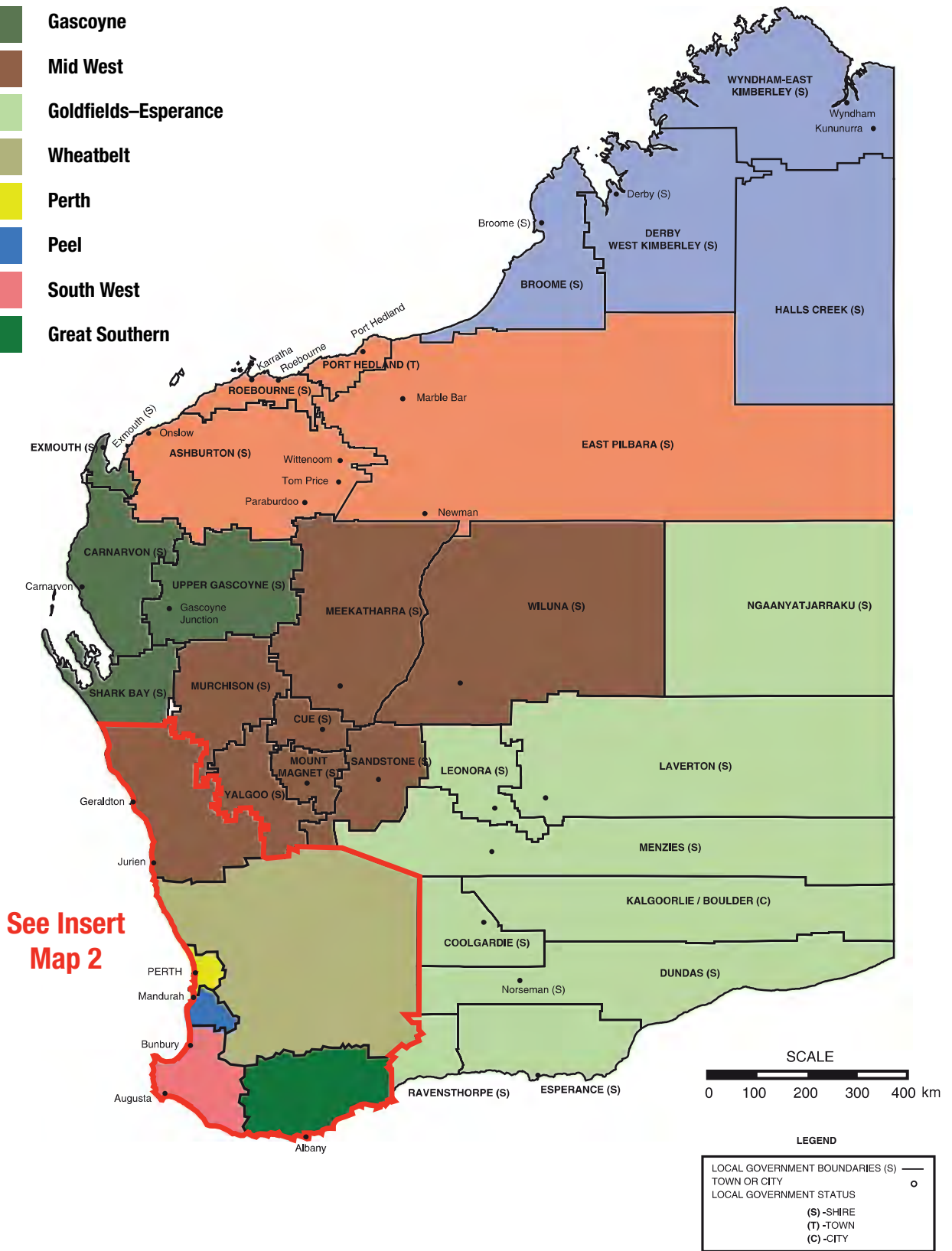
Quantities and values for minerals and petroleum in this publication are collected from a variety of sources including:

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

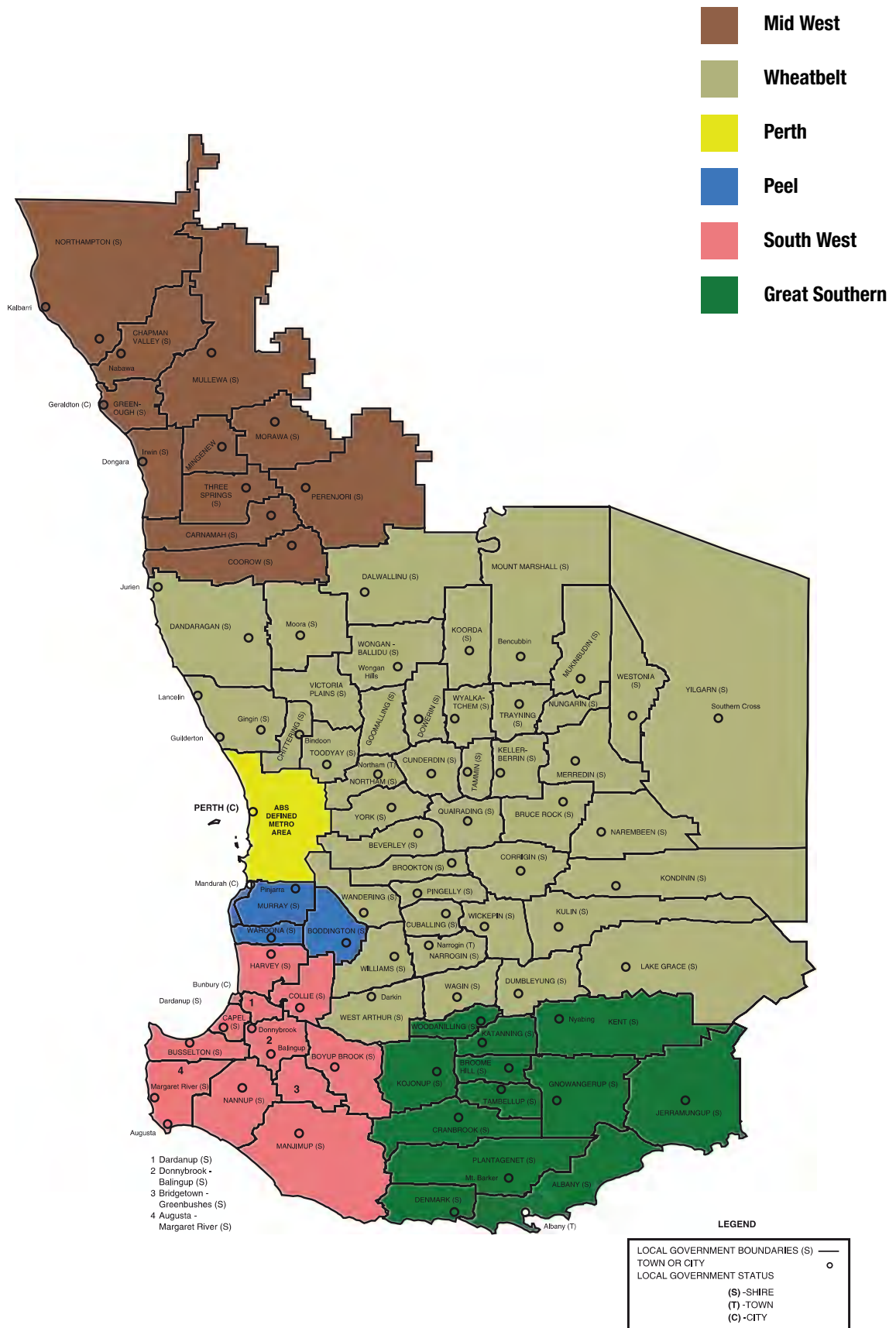
Quantities specified relate to either mine production or sales as listed below for each commodity.

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
Salt
Silver
Spongolite
Tin–Tantalum–Lithium
Vanadium

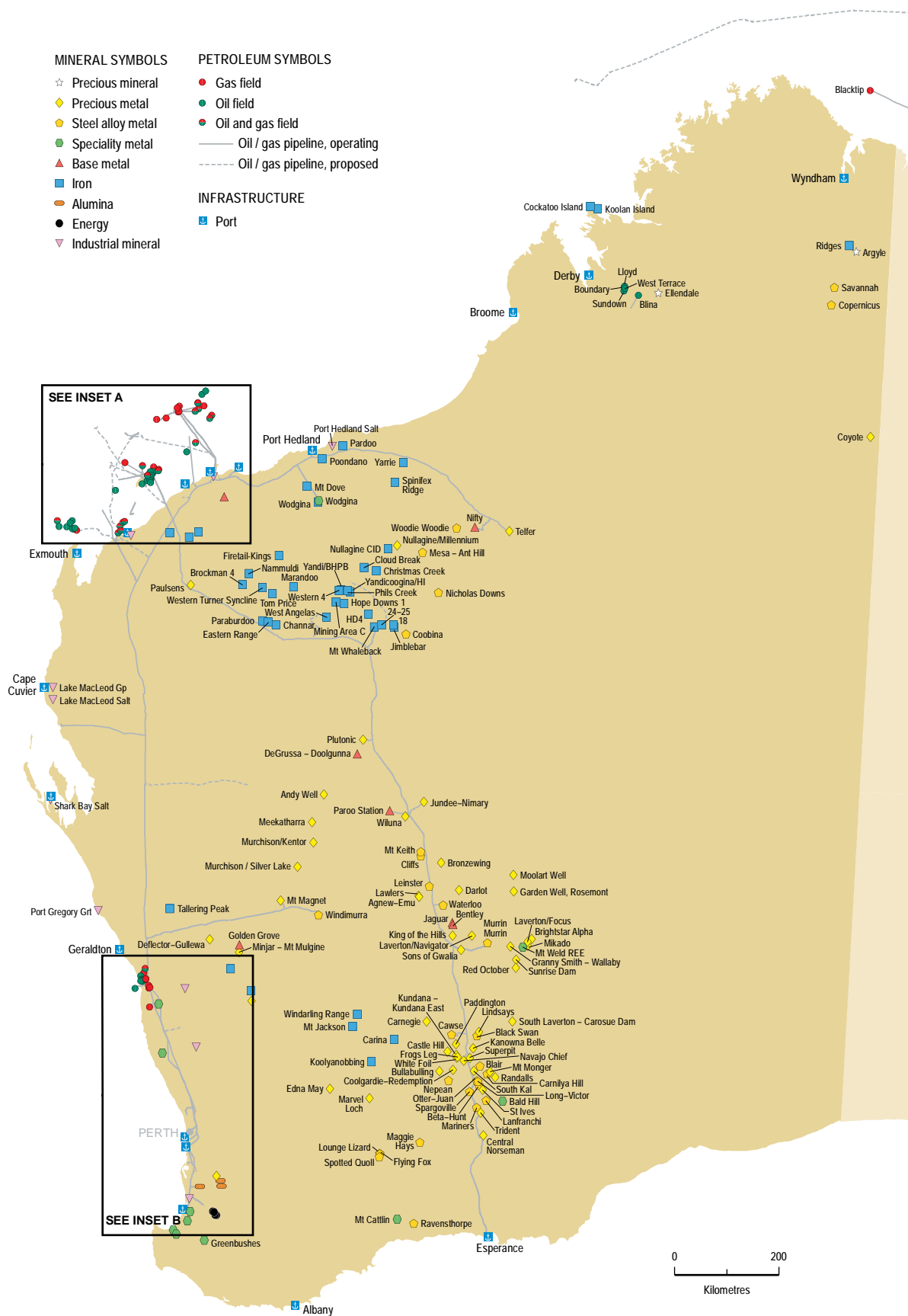
- Kimberley
- Pilbara
- Gascoyne
- Mid West
- Goldfields–Esperance
- Wheatbelt
- Perth
- Peel
- South West
- Great Southern



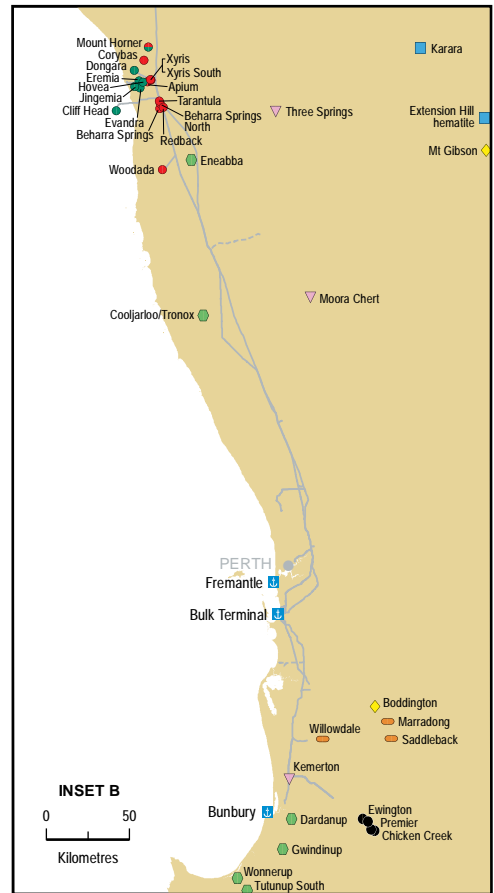
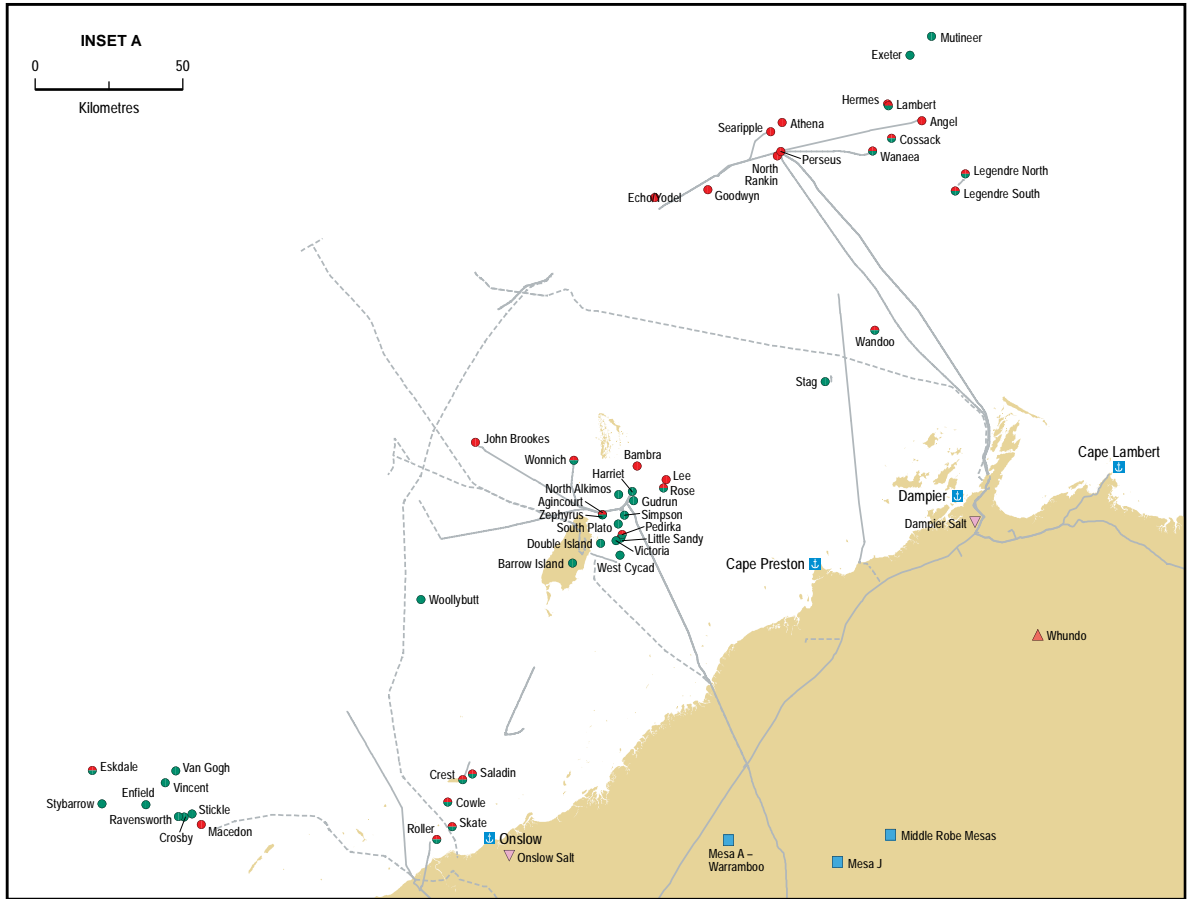
Map 1. Local Government and Regional Boundaries



Map 2. Local Government and Regional Boundaries Insert

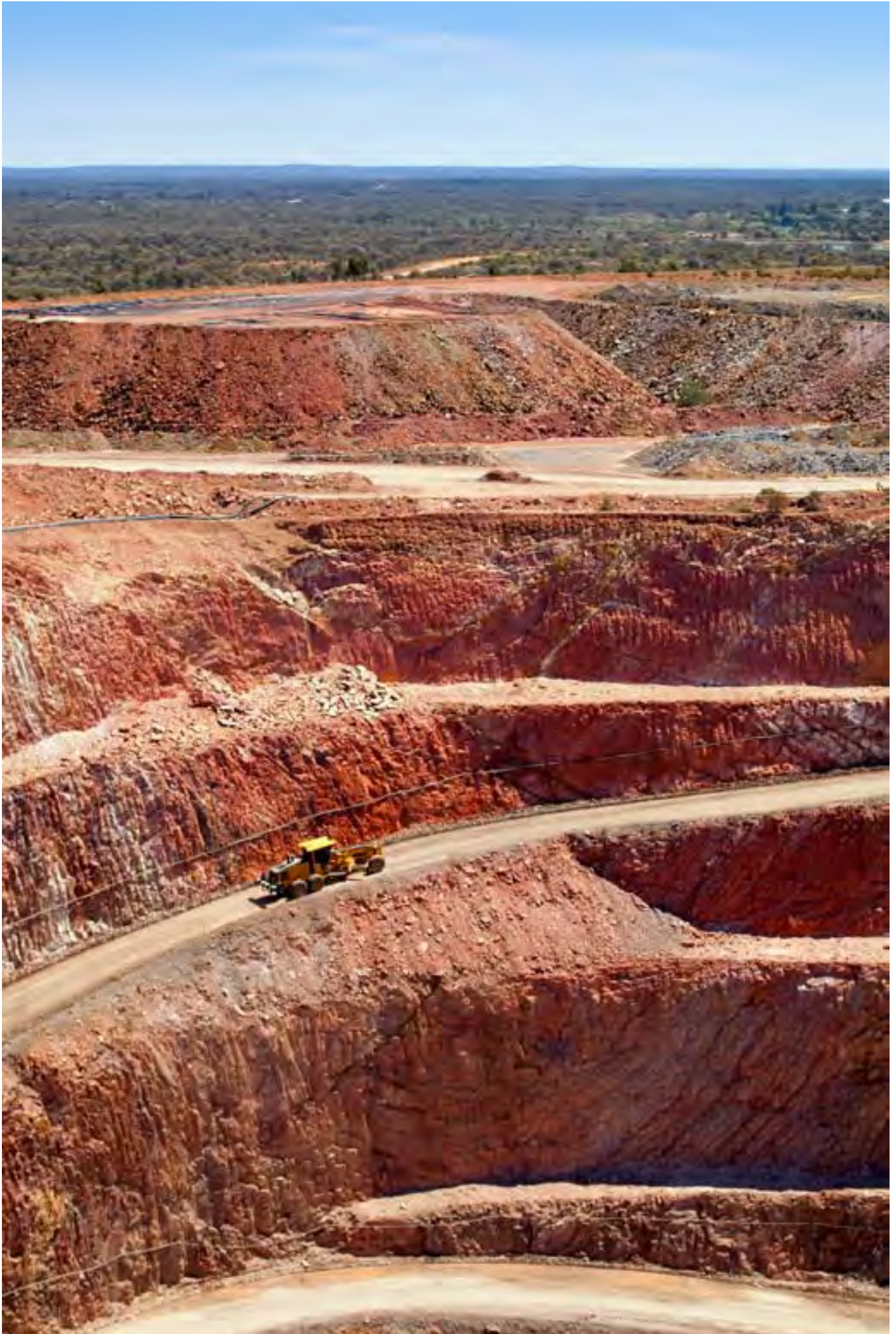


Map 3. Major Mineral and Petroleum Projects in Western Australia



- MINERAL SYMBOLS**
- ◆ Precious metal
 - Speciality metal
 - Iron
 - Alumina
 - Energy
 - ▽ Industrial mineral
- PETROLEUM SYMBOLS**
- Gas field
 - Oil field
 - Oil and gas field
 - Oil / gas pipeline, operating
 - - - Oil / gas pipeline, proposed
- INFRASTRUCTURE**
- Port

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



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Mineral House, 100 Plain Street
East Perth, Western Australia 6004

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