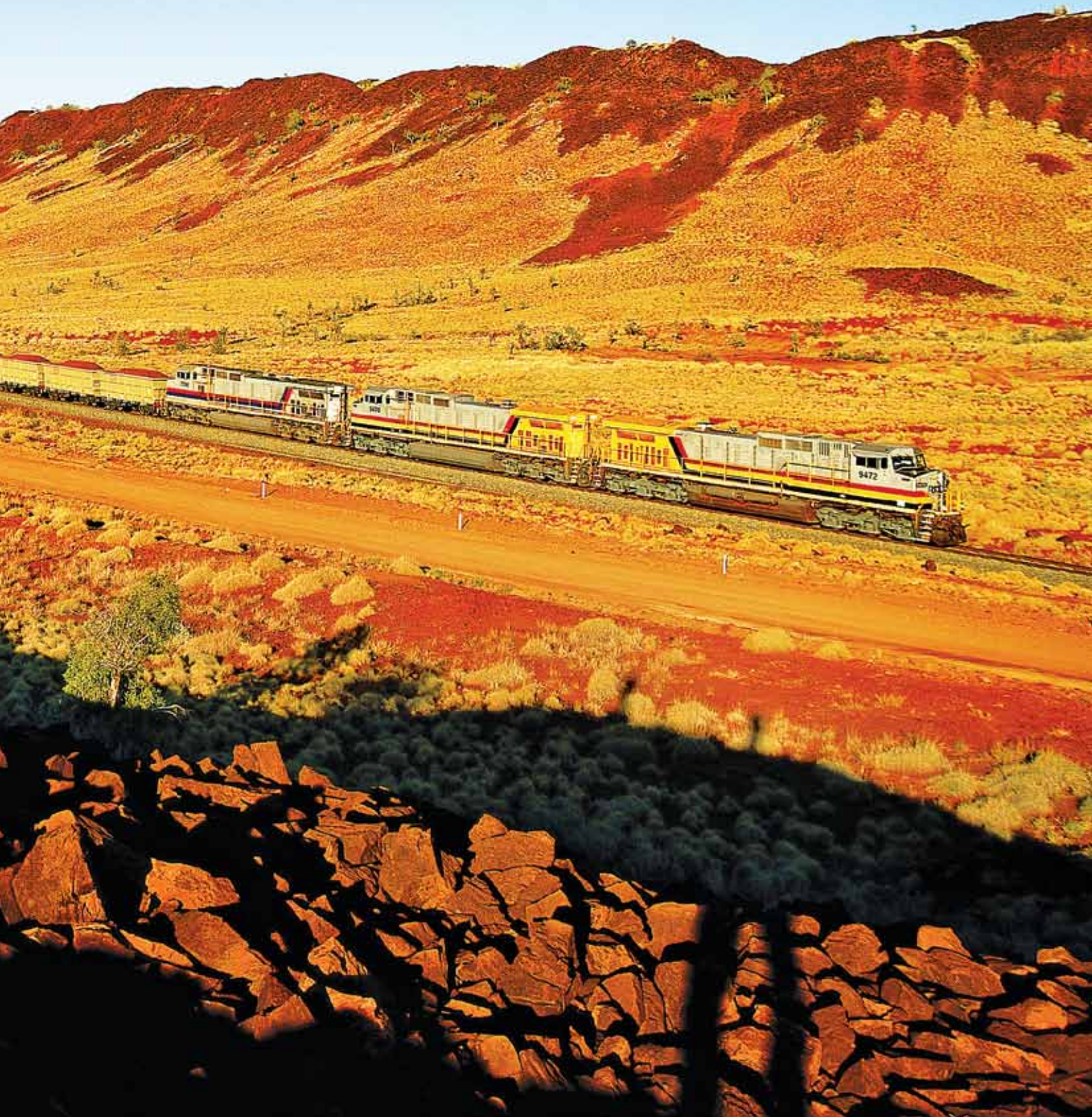




Government of Western Australia
Department of Mines and Petroleum

WESTERN AUSTRALIAN MINERAL AND PETROLEUM STATISTICS DIGEST 2011-12



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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 2011–12. 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 increased by four per cent in 2011–12, to be worth \$106 billion.

This achievement is remarkable considering global economic conditions resulted in lower commodity prices for the period. It also demonstrates the resilience of Western Australian mineral and petroleum producers, who continue to experience skills shortages and 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 15 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 2011–12, mineral and energy exports contributed a dominant 91 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 975 operating mine sites that produce more than 50 different minerals. In 2011–12, there were also 65 operating oil and gas fields. 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 2011–12 and huge investment in resource projects. The Department of Mines and Petroleum (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

1.1 MINERALS EXPLORATION

In 2011–12, mineral exploration expenditure in Western Australia increased significantly to an all-time record of \$2.1 billion. This result was 32 per cent higher than for 2010–11 and is 150 per cent higher than five years ago.

Nationally mineral exploration metres drilled increased by almost 18 per cent to 11.4 million metres over the previous year, whilst expenditure increased by 34 per cent to a record \$3.95 billion in 2010–11. Most of this drilling occurred in areas of existing deposits that accounted for 68 per cent, with the remaining 32 per cent on new ground. The higher level of expenditure to a large extent can be attributed to increased exploration costs.

The bulk of Australia’s mineral exploration activity occurs in Western Australia. The State accounted for 53 per cent (\$2107 million) of national mineral exploration expenditure in 2011–12. The following list shows the order of State and Territory share of national expenditure on mineral exploration:

- Western Australia _____ 53%
- Queensland _____ 25%
- South Australia _____ 8%
- New South Wales _____ 6%
- Northern Territory _____ 5%
- Victoria _____ 2%
- Tasmania _____ 1%

In 2011–12, the majority of Western Australia’s mineral exploration expenditure was spent on existing deposits – accounting for around 70 per cent or \$1470 million. The remaining 30 per cent, or \$637 million, was spent on greenfield areas.

In terms of expenditure by mineral, in 2011–12, iron ore dominated once again and accounted for 49 per cent, or a record \$1029 million, of Western Australian mineral

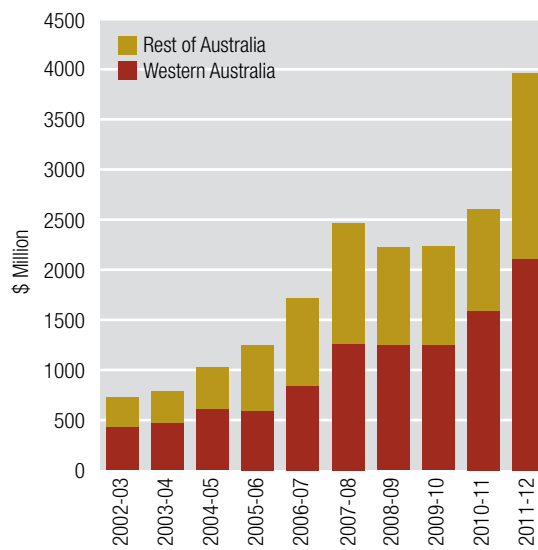


Figure 1 | **Mineral Exploration Expenditure**
Source: ABS

exploration expenditure. This was around 75 per cent higher than in 2010–11. Gold exploration was up by 23 per cent to reach an all-time record of \$557 million, with nickel down marginally by almost two per cent to \$257 million on the previous year. Other base metals exploration expenditure rose seven per cent to \$111.5 million, whilst uranium fell 22 per cent to \$78.2 million.

Together, iron ore, gold and nickel accounted for 87 per cent or \$1.8 billion of total mineral exploration expenditure in Western Australia in 2011–12.

The cornerstone of growth in the mining industry is exploration and investment. In 2009, the Western Australian government announced its \$80 million Exploration Incentive Scheme (EIS), an initiative that aims to encourage exploration in under-explored greenfield regions of the State. The Scheme is being funded over a five-year period and is currently in its third year. A flagship

project of the Scheme is the Co-funded Exploration Drilling Program. Since the Program's inception, funding has been granted for 150 drilling activities across the State, with a further 56 approved for the coming year.

The success of EIS has prompted the State Government to allocate a further \$37.5 million over two years from 2014–15.

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

1.2 PETROLEUM EXPLORATION

In 2011–12, petroleum exploration expenditure in Western Australia was \$2.1 billion. This represented a decrease of 12 per cent from 2010–11 and reversed the trend of the previous five years – where spending on petroleum exploration rose on average of seven per cent each year.

On a national level, expenditure on petroleum exploration fell by three and a half per cent to \$3.2 billion in 2011–12. At the same time, Western Australia attracted 66 per cent of national petroleum exploration expenditure, down from 72 per cent in 2010–11. This is the first time in more than five years that Western Australia has attracted less than 70 per cent of Australia's petroleum exploration expenditure.

The following list shows State and Territory share of national expenditure on petroleum exploration in 2011–12:

- Western Australia _____ 66%
- Queensland _____ 15%
- South Australia _____ 5%
- Northern Territory _____ 5%
- New South Wales _____ 1%
- Victoria _____ n/a
- Tasmania _____ n/a

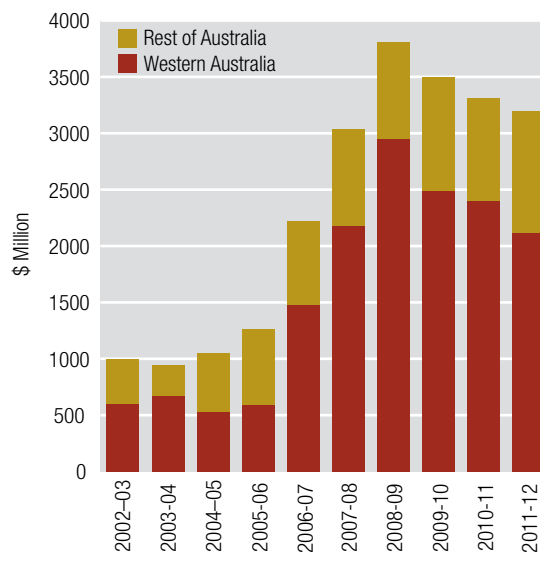


Figure 2 | **Petroleum Exploration Expenditure**
Source: ABS

Offshore basins continue to attract the majority of petroleum exploration expenditure in Australia and accounted for 71 per cent of total spending in 2011–12. The proportion of petroleum exploration expenditure spent onshore in Australia rose from 23 per cent in 2010–11 to 29 per cent in 2011–12.

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. This publication contains a comprehensive overview of petroleum exploration activities in this State, together with details on the award of petroleum exploration permits.

1.3 MINERAL TITLES

In 2011–12, the total amount of land covered by mineral tenements in force in Western Australia increased by 14 per cent to 68.9 million hectares.

Exploration Licences cover the majority of mineral tenements (88 per cent), with Mining Leases covering only three per cent. Most of the increase in area covered was accounted for by Exploration Licences which were up 16 per cent to 60.4 million hectares. The actual number of Exploration Licences increased by 14 per cent from 6050 to 6969. Mining Leases rose in number marginally from 5845 in 2010–11 to 5897 in 2011–12 and the total area covered by these licences increased from 2.233 million hectares to 2.285 million hectares.

1.4 PETROLEUM TITLES

In 2011–12, the total area covered by petroleum titles (including Commonwealth waters) in force both offshore and in Western Australia totalled 728,000 square kilometres.

The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* titles totalled 258 covering some 416,000

square kilometres. Exploration permits accounted for 137 (376,000 square kilometres), followed by 46 production permits (14,000 square kilometres). The balance includes 32 being held under retention leases and a further 43 Access Authority and Infrastructure/Pipeline licences.

The *Petroleum (Submerged Lands) Act 1982* totalled 43 titles covering 6000 square kilometres. Pipeline licences accounted for 24 of these titles, production licences 10, retention leases five and exploration permits four.

The *Petroleum and Geothermal Energy Resources Act 1967* totalled 143 titles covering 306,000 square kilometres. This was made up of 73 Exploration permits covering 228,000 square kilometres and 43 Geothermal exploration permits covering 63,000 square kilometres. 15 production licences cover 3000 square kilometres, five retention leases (411 square kilometres) and the remaining seven are made up of other miscellaneous licences/authorities.

There were a total of 84 pipeline licences held under the *Petroleum Pipelines Act 1969* in 2011–12 covering 6000 square kilometres.

	2007-08		2008-09		2009-10		2010-11		2011-12	
	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha
Prospecting Licences	6,260	800	7,110	913	7,032	890	7,106	897	7,265	910
Exploration Licences	5,427	51,790	4,959	42,367	5,297	44,123	6,050	52,205	6,969	60,396
Mining Leases	5,475	2,036	5,618	2,065	5,764	2,125	5,845	2,233	5,897	2,285
Other	3,678	4,119	2,512	3,477	2,884	4,541	2,995	4,926	3,157	5,323
Mineral Claims & Other 1904 Act	186	21	186	21	186	21	186	21	186	21
Total	21,026	58,766	20,385	48,843	21,163	51,700	22,182	60,282	23,474	68,935

Source: DMP

2.1 OVERVIEW

The value of Western Australia's mineral and petroleum industry again topped \$100 billion in 2011–12, to reach just over \$106 billion. This represents an increase of 4.4 per cent over the previous financial year and is only slightly less than the \$107 billion record set in the 2011 calendar year.

This achievement is remarkable, particularly when considering the negative impact on commodity prices, resulting from the continuing strength of the Australian dollar – maintaining an average exchange rate in excess of US\$1. While traditionally perceived as a commodity currency, the Australian dollar did not decrease in line with falling commodity prices, which normally would have helped to shield producers from lower prices.

Global economic conditions remained uncertain in 2011–12, resulting in significantly lower commodity prices for almost all commodities in the minerals sector, with the notable exceptions of gold and mineral sands. The value of sales overall, however, was maintained by an increase in quantities sold.

Iron ore and gold together accounted for \$70.4 billion (or 86 per cent) of all mineral sales in 2011–12.

Iron ore remained the State's highest value commodity, accounting for \$61.1 billion (or 75 per cent) of total mineral sales in 2011–12. With strong demand, led by China, the sector achieved record levels of export quantities. This resulted in more than 455 million tonnes exported, an increase of 14 per cent from the previous financial year. Lower prices, however, resulted in an increase of only 6.1 per cent in total sales.

The gold price continued its upwards momentum in 2011–12, resulting in total sales of \$9.4 billion. This represented an increase of 14 per cent from the previous financial year, despite the quantity sold falling slightly (from 5.9 million ounces in 2010–11 to 5.8 million ounces).

The petroleum sector, which includes crude oil, condensate, LNG, natural gas and LPG (butane and propane) was valued at \$23.8 billion. In contrast to the minerals sector, total sales increased by 2.4 per cent in comparison to the 2010–11 financial year. This occurred despite decreases in the quantities sold, ranging between 10 and 19 per cent for all petroleum products except natural gas.

Notwithstanding the uncertainty surrounding the global economic outlook, Western Australian investment activity strengthened during 2011–12, with the State's mining industry investing a record \$45 billion. This was a substantial 58 per cent increase compared to 2010–11.

Western Australia remained the nation's leading mining investment destination, attracting 55 per cent of total national capital spending valued at \$82 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 26 per cent during the five years to 2011–12.

Mineral and petroleum exports comprised 91 per cent of the State's total merchandise exports, accounting for 46 per cent of the nation's total merchandise exports.

This dominance is expected to continue given the large number of resource projects, particularly in relation to the iron ore and LNG industries, currently under development. While the recent falls in commodity prices have caused some mining companies to re-evaluate their investment positions, as at September 2012, Western Australia still had an estimated \$167 billion worth of resource projects under construction or in the committed stage of development. A further \$151 billion has been identified as planned or possible projects in the coming years.

HIGHLIGHTS IN 2011–12

Iron ore remains the State's most valuable sector of the mining industry, accounting for \$61.1 billion (or 75 per cent) of the mineral sector's total sales, an increase of 6.1 per cent from 2010–11. The higher sales figures are the result of continuing strong demand for iron ore, which saw sales increase by 14 per cent to 455 million tonnes.

Gold was the second most valuable, with total sales of \$9.4 billion – representing 11 per cent of the mineral sector's total sales. The gold price continued its upwards momentum in 2011–12, resulting in an increase of 14 per cent in sales from the previous financial year. This occurred despite the quantity sold falling slightly (from 5.9 million ounces in 2010–11 to 5.8 million ounces).

Alumina and **nickel** maintained their long-held positions as the State's third and fourth most valuable sectors. While prices for both commodities were negatively impacted this financial year, it was

most keenly felt by nickel. Although the quantity of nickel sales increased by 8.4 per cent, the total value decreased by 20.1 per cent, from \$4.6 billion in 2010–11 to \$3.7 billion this financial year. In comparison, the total value of alumina decreased by only 0.6 per cent to \$4 billion on a 2.4 per cent increase in quantity sold.

The overall value of **base metals** (copper, lead and zinc) decreased by 16 per cent to \$1.3 billion in 2011–12 on the back of weakening prices. Copper represented by far the most significant base metal, with total sales of \$1.2 billion. This represented a 9.7 per cent decrease on the previous financial year, despite the quantity of sales increasing by 2.6 per cent. Sales of lead decreased sharply due to the closure of the Magellan lead mine, resulting in sales of \$13 million dollars in comparison to \$98 million in 2010–11. Zinc production levels fell by 10 per cent, with the total value of sales falling from \$162 million in 2010–11 to \$121 million.

The total value of **mineral sands** sales increased significantly by 86 per cent to \$879 million. Sales revenues benefited from escalating prices for synthetic rutile, natural rutile and zircon – which have rebounded strongly since the Global Financial Crisis and have compensated for the general decline in volumes.

In 2011–12, the value of **salt** sales fell by four per cent to \$354 million, while volumes increased by five per cent to 12.8 million tonnes.

While **diamond** sales volumes decreased by 14 per cent to nine million carats, an improvement in prices saw total sales increase by 13 per cent to \$343 million in comparison to the previous financial year.

Coal production and prices remained static, producing sales of \$290 million from production of seven million tonnes.

Output for **cobalt**, as a by-product of nickel mining, increased by 31 per cent but weaker prices produced similar sales returned in 2010–11 of \$145 million.

Petroleum, which includes crude oil, condensate, LNG, natural gas and LPG (butane and propane), was valued at \$23.8 billion. Decreases in the quantities sold, ranging between 10 and 19 per cent for all petroleum products except natural gas, were more

than offset by increased prices. Total sales increased by 2.4 per cent in comparison to the 2010–11 financial year.

LNG was the most valuable petroleum product in the State in 2011–12. Despite output decreasing by 9.6 per cent to 15 million tonnes, the value of LNG sales rose by 15 per cent to \$10 billion on the previous financial year. LNG production is forecast to grow in the period ahead due to increased demand from Asia and supply from new projects including Woodside Energy's Pluto LNG project, which commenced production in March 2012.

While production of **crude oil**, the second most valuable petroleum product in 2011–12, fell by 19 per cent to 71 million barrels, improved prices resulted in the total value of sales falling by only 7.6 per cent to \$7.8 billion.

The value of **condensate** decreased by four per cent to \$3.8 billion, however, output fell by 14 per cent to 37 million barrels.

In 2011–12 domestic **natural gas** sales increased by three per cent to 9.1 billion cubic metres, while sales rose by seven per cent to \$1.5 billion. Output of **LPG (butane and propane)** fell by 10 per cent and the sales value also fell to \$734 million, which was down five per cent on the previous financial year.

Western Australia's mineral and petroleum resources, in order of value for 2011–12, were:

Commodity	\$A Billion
Iron Ore	61.1
Crude Oil and Condensate	11.6
LNG	10.0
Gold	9.4
Alumina	4.0
Nickel	3.7
Others	6.2
Total	106.0

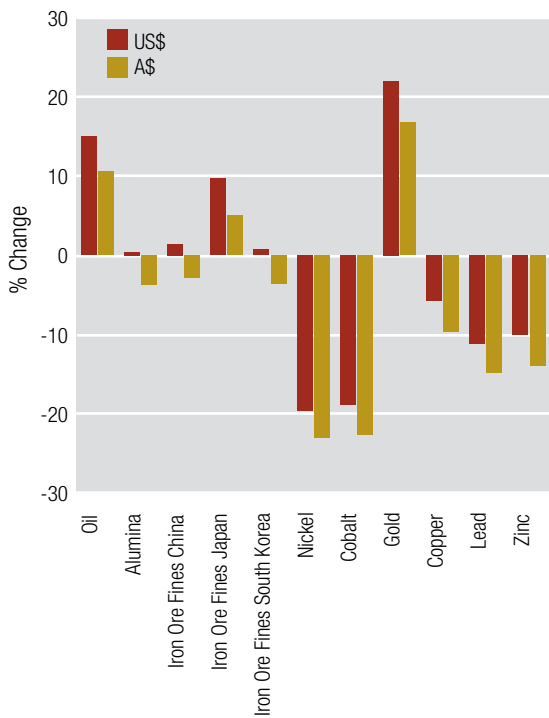


Figure 3 | **Average Price Comparison 2010-11 and 2011-12**
Source: LME, Kitco, Metal Prices, WATC and DMP

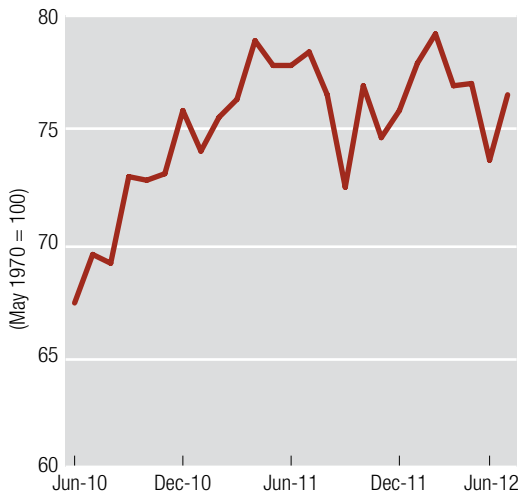


Figure 4 | **Exchange Rate Trade-Weighted Index (units of foreign currency per A\$)**
Source: Reserve Bank of Australia

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 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.

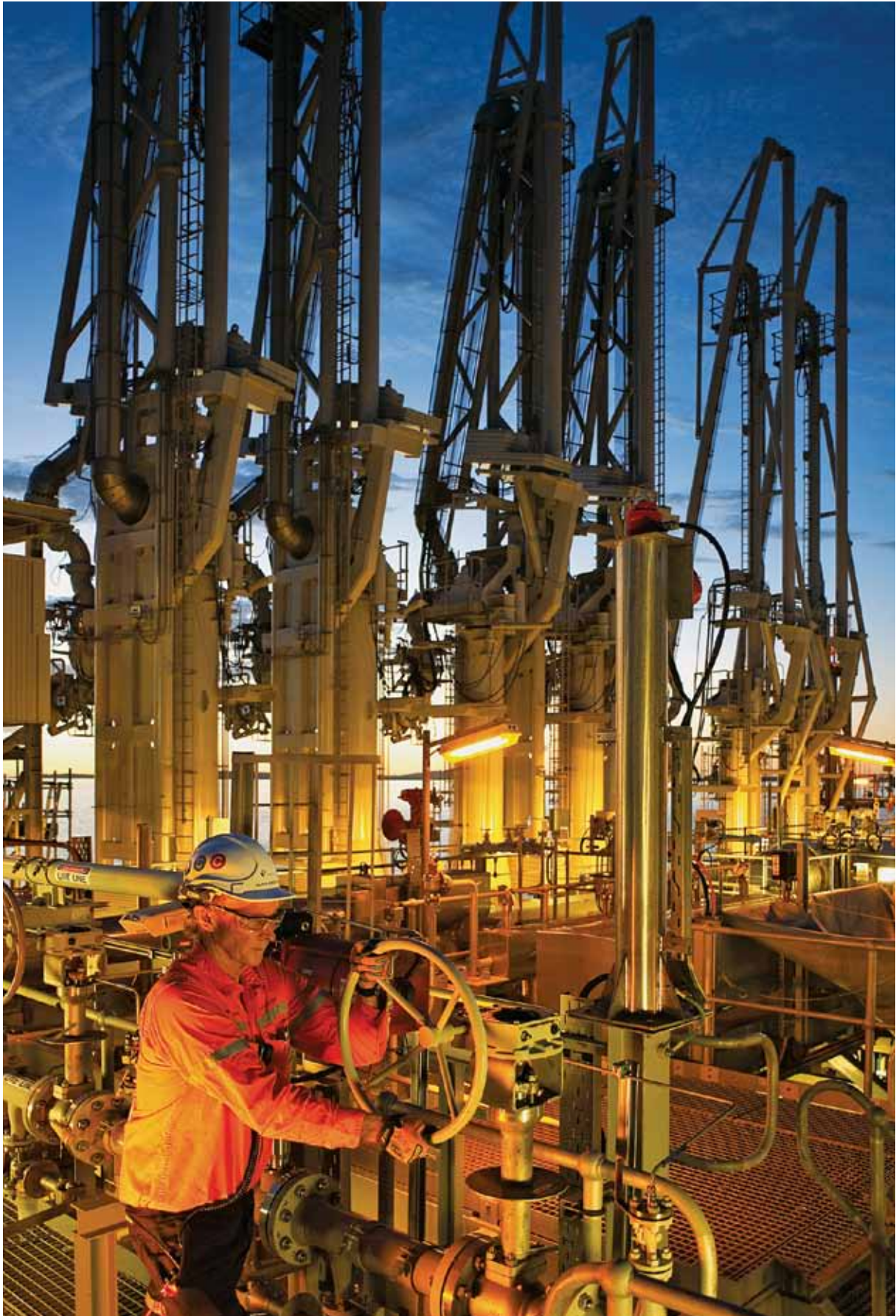
SDR is a unit of account used by the International Monetary Fund (IMF). Its value is based on a basket of currencies comprising the euro, Japanese yen, English pound and US dollar. Weights are assigned to each of these currencies to reflect their relative importance in world terms. The RBA expresses 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



Loading terminal, Pluto LNG onshore gas plant.

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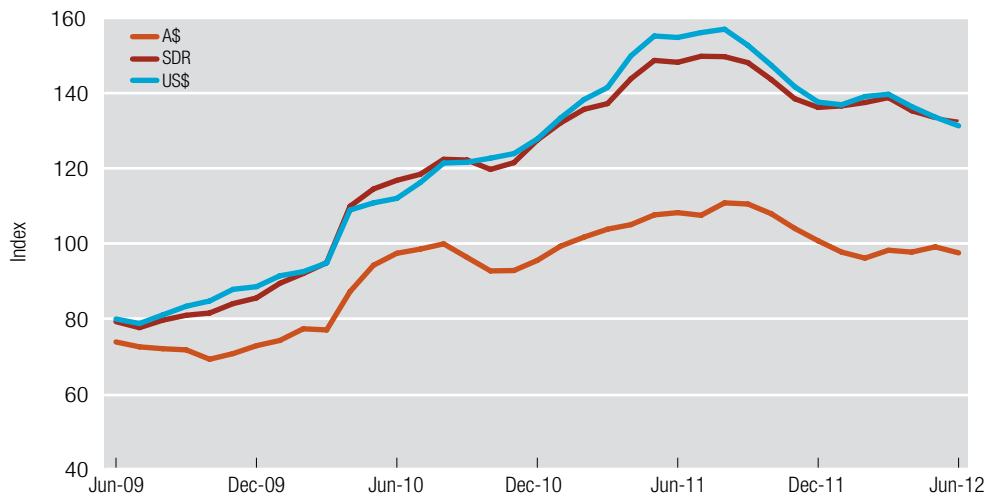


Figure 6 | **Non-rural Commodity Price Index (2008-09 = 100)** Source: Reserve Bank of Australia

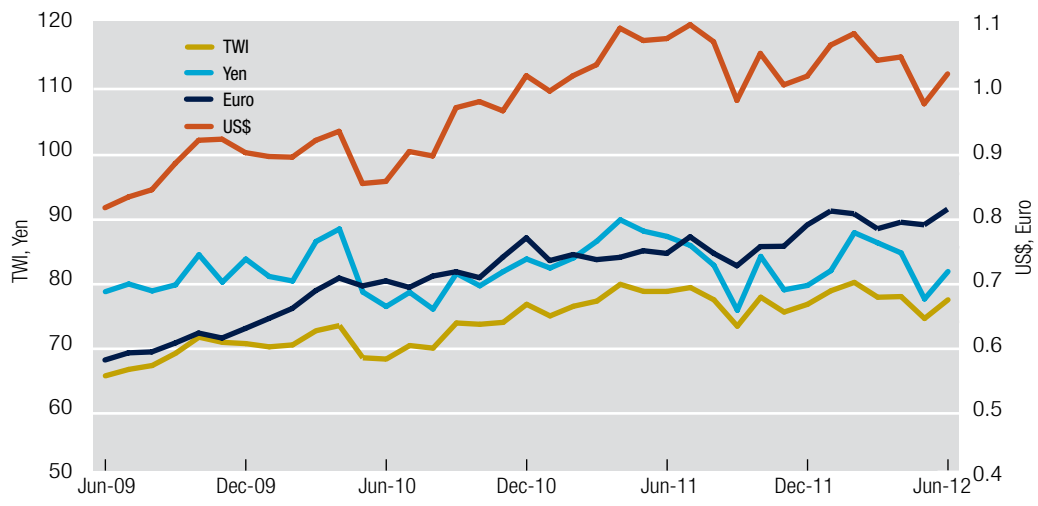


Figure 7 | **Australian Dollar Exchange Rate against Major Currencies (May 1970 = 100)** Source: Reserve Bank of Australia

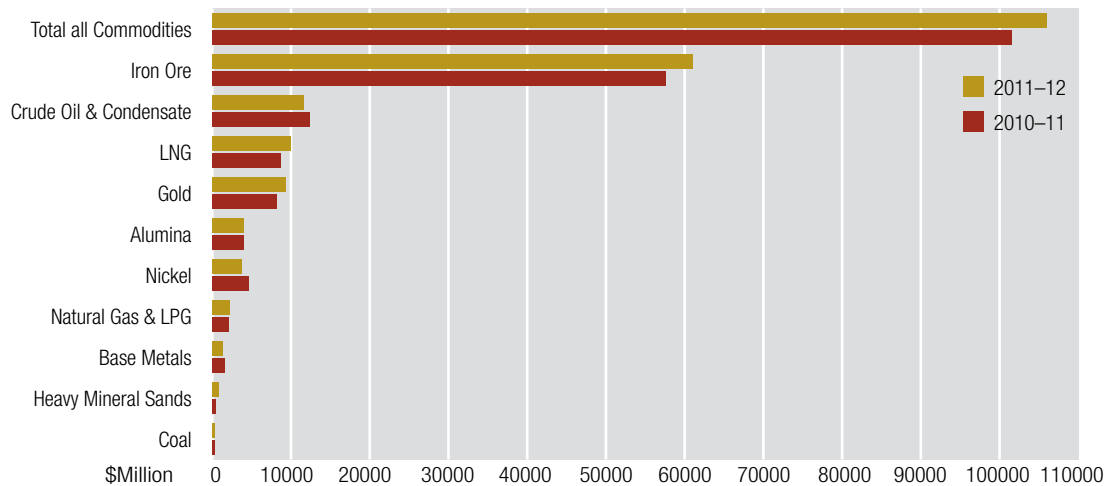


Figure 8 | **Major Commodities by Value** Source: DMP

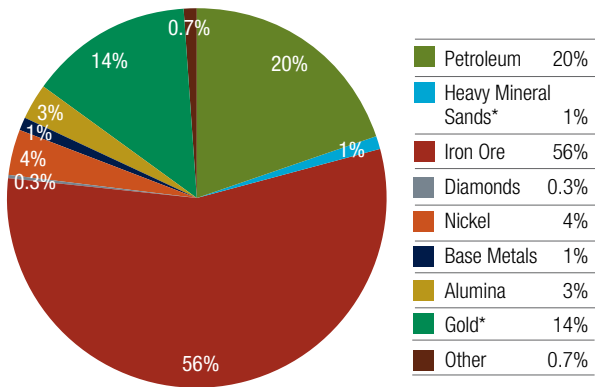


Figure 9 | **Western Australian Mineral and Petroleum Exports 2011-12 – Total Value \$110 Billion** Source: DMP

* Includes \$6.2 billion of gold and \$454 million of heavy mineral sands refined/processed and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.

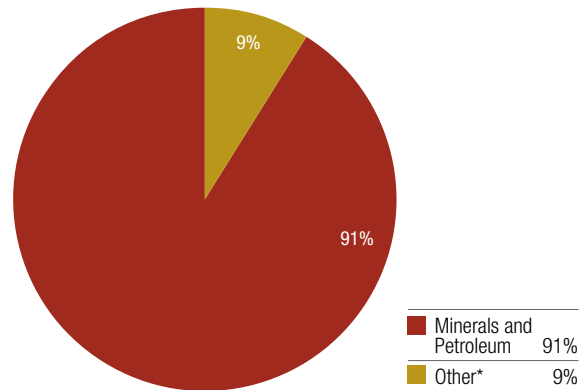


Figure 10 | **Western Australian Merchandise Exports 2011-12 \$121 Billion** Source: DMP and ABS

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

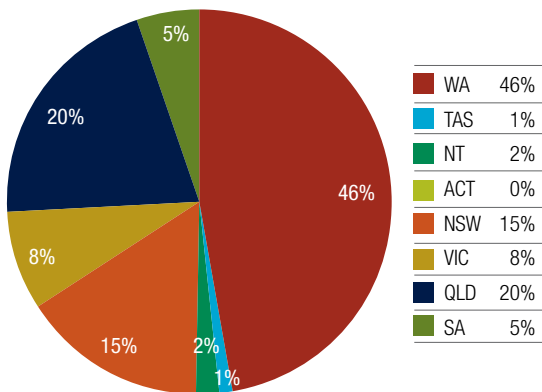


Figure 11 | **Australian Merchandise Exports 2011-12 \$265 Billion** Source: ABS

Note: These percentages are based on data which includes \$8.1 billion of re-exported goods and of no State origin available and account for around 3% of the total.

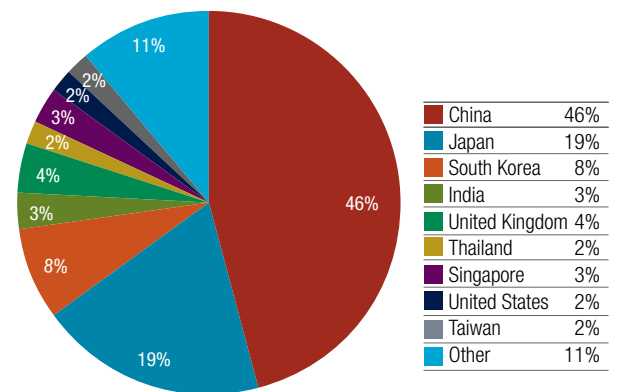


Figure 12 | **Western Australian Merchandise Exports by Country 2011-12 – \$121 Billion** Source: ABS

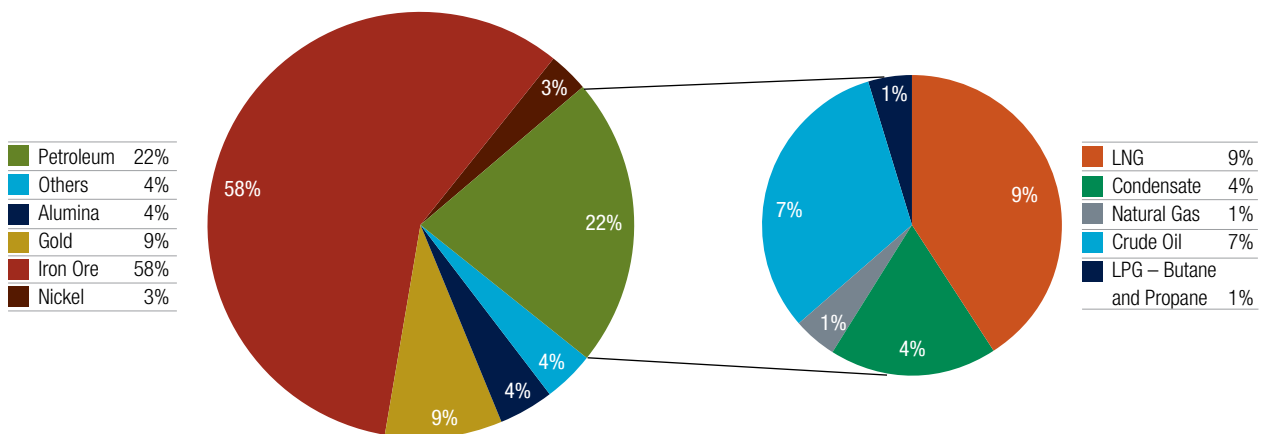


Figure 13 | **Value by Commodity 2011-12 – \$106 Billion** Source: DMP

2.2 IRON ORE

Over the past 10 years, the State's iron ore industry has experienced a period of unprecedented growth – fuelled in the main by China's demand. On average, growth in the value of sales from Western Australia's iron ore industry during this period has been 28 per cent per annum.

In 2011–12, iron ore sales output increased by 58 million tonnes or 14 per cent up from 2010–11 – reaching 455 million tonnes. At the same time, the value of sales achieved another all-time record of \$61 billion (an increase of six per cent). As a result, iron ore continued to be the most valuable resource sector in Western Australia accounting for 58 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 69 per cent or \$42 billion of the total amount shipped in 2011–12. Other major markets included Japan (17 per cent), South Korea (ten per cent) and Taiwan (three per cent).

Iron Ore Producers

Whilst the larger iron ore operations and five smaller operators are based in the Pilbara region, there are also five mines in the Mid West, three in the Kimberley and two in the Wheatbelt. Ninety five 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 and account for around 85 per cent of the State's iron ore production.

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).
- Hope Downs (50% – a joint venture between Rio Tinto Iron Ore and Hancock Prospecting Pty Ltd).

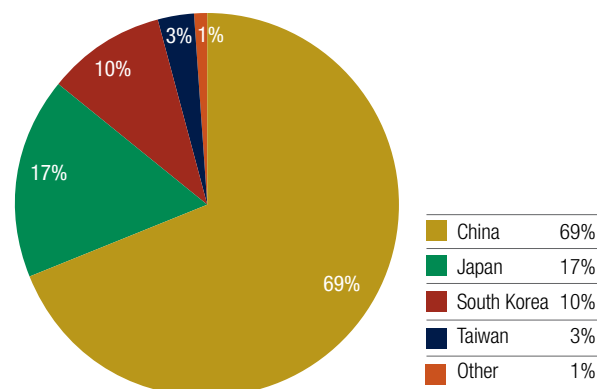


Figure 14 | **Iron Ore Exports – Total Value \$61.1 Billion**
Source: DMP

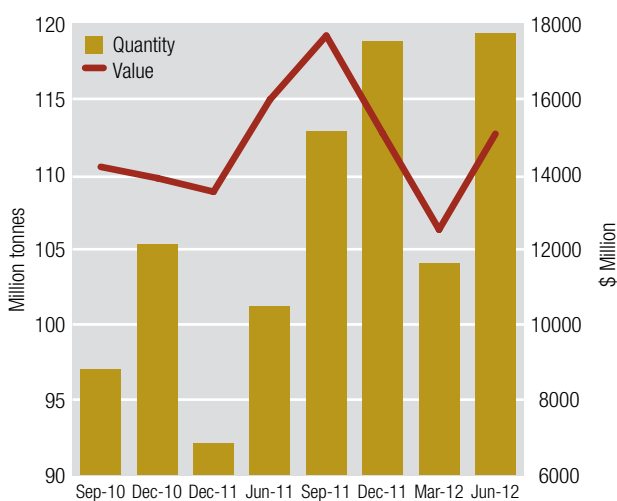


Figure 15 | **Iron Ore Quantity and Value by Quarter**
Source: DMP

- Robe River Iron Ore Operation – (53% – a joint venture with Robe River Iron Associates) and 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. This includes one of the biggest single-pit open-cut iron ore mine in the world, the massive Mt Whaleback mine. The mine was established in 1968 and is more than five kilometres long and nearly 1.5 kilometres wide. Nearby are the satellite ore bodies 18, 23, 25, 29, 30 and 35, Jimblebar, Yandi, Area C and Yarrie.

Fortescue Metals Group (FMG), with its Chichester Range Cloud Break and Christmas Creek iron ore mines, is the third-largest mining company in the Pilbara. FMG exports ore through its Herb Elliot 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 two iron ore operations in the Pilbara region, Pardoo (approximately 75 kilometres east of Port Hedland) and Wodgina (approximately 100 kilometres south of Port Hedland). These operations use road haulage and ship through Port Hedland.
- 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's Talling Peak mine 175 kilometres east of Geraldton, Extension Hill mine 260 kilometres east-southeast of Geraldton and the Koolan Island hematite mine, located in Yampi Sound off the Kimberley coast. Construction of a 13.5 metre sea wall has allowed access to high grade ore in the Koolan Island main pit.
- 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 Elliot port.
- Polaris Metals (wholly-owned by Mineral Resources Limited) commenced shipments from its Poondano tenements (30 kilometres southeast of Port Hedland) in the December quarter 2011 through the Utah Point terminal in Port Hedland. Polaris Metals also ships ore through the Kwinana Bulk Terminal from its Yilgarn Iron Ore Project (50 kilometres north of Koolyanobbing in the Wheatbelt region).
- 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 sub-sea 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 million tonnes per annum 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 one million tonnes per annum of iron ore fines.

- Crosslands Resources Ltd (wholly owned by Mitsubishi Corporation) finished production in February 2012 from its stage 1 Jack Hills mine which is located 140 kilometres northwest of Meekatharra. The company is now focusing on developing the Jack Hills Expansion Project.
- Karara Mining Ltd, a 50:50 joint venture between Gindalbie Metals Limited and Anshan Iron and Steel Group Corporation, operates the Karara DSO Project (200 kilometres east of Geraldton).

Expansions/New Projects in the Pilbara region

Both Rio Tinto and BHPB have significantly expanded their Western Australia operations over the past 10 years and have advanced plans for further expansions.

BHPB plans on increasing annual capacity from around 174 million tonnes to 220-240 million tonnes.

This comprises:

- Developing Orebody 24 (approximately 10 kilometres northeast of Newman)
- Expanding of the Jimblebar mine
- Port Hedland Inner Harbour expansion
- Developing of port blending and rail yard facilities to optimise resource and enhance efficiency across the supply chain

Rio Tinto's expansion plans comprise:

- Phase one expansion of the Pilbara mines, ports and railways – from 230 million tonnes per annum (Mt/a) to 283 Mt/a – is due to come on-stream by the end of 2013.
- Phase two of the expansion to 353 Mt/a is expected to come on-stream in the first half of 2015. This includes port and rail developments and an investment in autonomous trains.

FMG is advancing plans to expand annual production capacity in the near term from around 55 million tonnes (Mt) to 115 Mt. Expansion plans include additional infrastructure at Herb Elliott Port, 120 kilometres of mainline rail duplication, a new 130 kilometre rail spur to a new mine at Solomon and further development at the Chichester Hub.

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 Development and 30 per cent a consortia comprising POSCO, Marubeni Corporation, STX Corporation and China Steel Corporation. Roy Hill will feature a remote operations centre based in Perth.

Atlas Iron is expanding its existing Wodgina mine, as well as developing mines at Mt Dove (70 kilometres south of Port Hedland) and Abydos (130 kilometres south of Port Hedland). Atlas Iron is considering development of Mt Webber, a joint venture with Altura Mining Limited

30 per cent Atlas Iron 70 per cent. Mt Webber is located 150 kilometres south-southeast of Port Hedland.

Brockman Mining Limited is considering developing three mines within its Marillana Iron Ore Project (100 kilometres northwest of Newman), with production targeted at around 17-20 Mt/a. The project proposes to ship ore through Port Hedland and is investigating rail haulage options.

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.

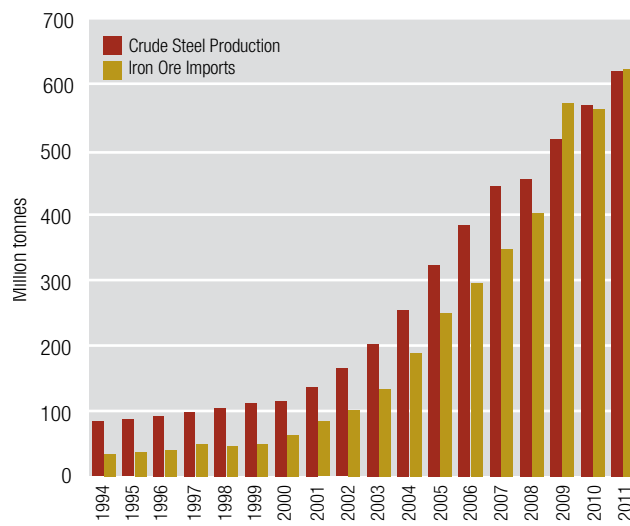


Figure 16 | **China's Crude Steel Production and Iron Ore Imports** Source: TEX Report and Interfax China Ltd

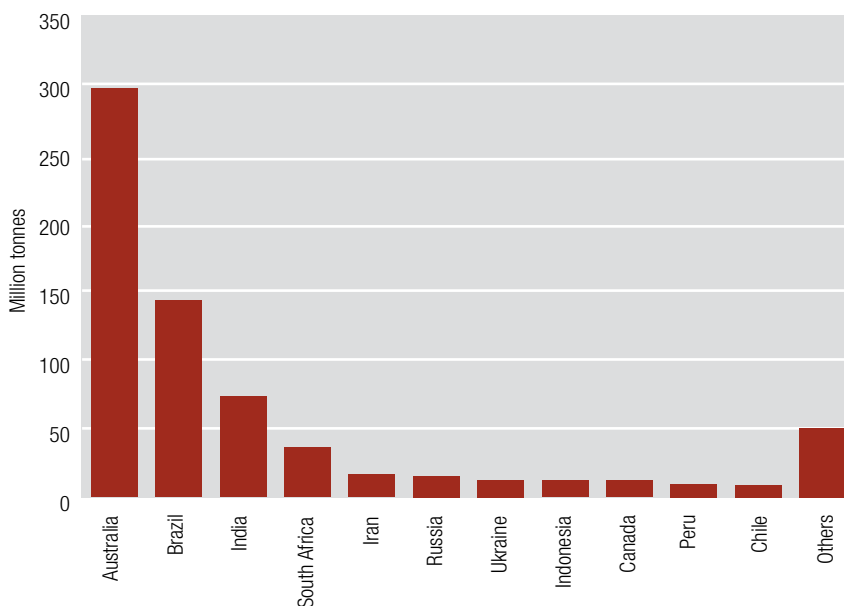


Figure 17 | **China's Iron Ore Imports by Country for 2011** Source: TEX Report

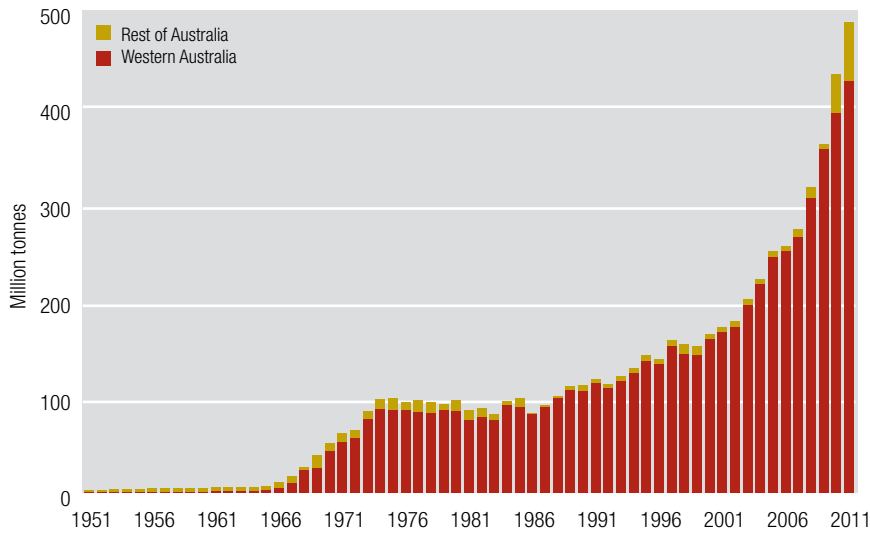


Figure 18 | **Iron Ore Quantity** Source: DMP and BREE

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 of these is CITIC Pacific Ltd's Cape Preston Sino Iron Project.

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

CITIC Pacific Mining Management (a subsidiary of CITIC Pacific Ltd) is developing the US\$8 billion Sino Iron Project located at Cape Preston, about 100 kilometres southwest of Karratha. When operational, it plans to export 27.6 million tonnes per annum of a mixture of high grade iron ore concentrate and pellets over a period of 25 years. Production and export of concentrate is expected in the latter half of 2012.

Once completed, CITIC Pacific Mining will become the first Chinese-owned mining company to ship iron ore products from Western Australia to China.

Expansions/New Projects in other Regions

A number of projects are also being developed outside the Pilbara. Some of these include:

- Karara Mining Ltd (50:50 joint venture between Gindalbie Metals Limited and Anshan Iron and Steel Group Corporation) is developing a magnetite project at Karara. The first production of magnetite

concentrate from Karara is scheduled for late in 2012 ramping-up to full production of 8 million tonnes per annum.

- The Parker Range Iron Ore Project (Cazaly Resources Limited) is located adjacent to publicly owned infrastructure (towns, roads, rail and port) in the Yilgarn region of Western Australia. The proposed project could produce up to 4.2 million tonnes per annum of iron ore fines product to be shipped through Esperance Port.
- In the Kimberley region, Cliffs Natural Resources is expanding its operations at Koolyanobbing from 8.5 million tonnes per annum to around 11 million tonnes per annum. The expansion will upgrade existing operational facilities and rail infrastructure and it is anticipated that these improvements will be completed in the second half of 2012.

Supply and Demand

Western Australian iron ore sales increased significantly in 2011–12 (up by 58 million tonnes or 14 per cent), as new projects and expansions became operational. Production also benefitted from a less severe wet season than that experienced in 2010–11.

In 2011, the international iron ore trade reached new record levels as exports increased for the tenth year in a row and reached 1155 million tonnes, up almost eight per cent. The increase was the result of higher demand, mainly from China, while most other countries had trade levels similar to the year before and have not yet regained their import levels of 2008.

In 2011, China's iron ore imports amounted to 687 million tonnes, representing 59 per cent of total world imports. Other major global importers were Japan with 128 million tonnes and South Korea with 65 million tonnes. Western Australia contributed 43 per cent of China's iron ore imports in 2011.

China will continue to play an important role in the future of the Western Australian iron ore industry. In 2011–12, it accounted for 69 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 has seen producers and potential producers re-assess 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 commodities prices could affect new capacity coming into production.

Iron Ore Prices

Iron ore prices softened in 2011–12 amid a worsening economic outlook for Europe, a slowdown in Chinese growth and increases in worldwide iron ore production putting downward pressure on prices.

Since the move away from the annual benchmark pricing system in 2010, there is little official information about 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.

Cost, Insurance and Freight (CIF) spot prices for 62 per cent Fe for 2011–12 peaked at US\$194 per tonne for lump and US\$184 per tonne for fines.

Across all grades and markets, Western Australian producers achieved an average free-on-board price of \$150 per tonne for lump and \$134 per tonne for fines in 2011–12.

Though spot prices have declined in recent months, prices are still high from a historical perspective. In September 2012, the price for iron ore fines with 62 per cent iron content slid to below \$US87 per metric tonne. Prices recovered somewhat to around \$110 per metric tonne in October 2012.

In October 2011, the Chinese Steel Industry Association (CISA) introduced the China Iron Ore Price Index (CIOPI) – which will report domestic and imported prices. The purpose of the index is to provide domestic steelmakers with an alternative reference for setting quarterly prices.

On 8 May 2012, the China Beijing International Mining Exchange established a physical iron ore trading platform. A competing platform, GlobalOre, opened on 30 May 2012. Success is yet to be measured, however, the biggest global iron ore producers have signed up to the trading platforms.

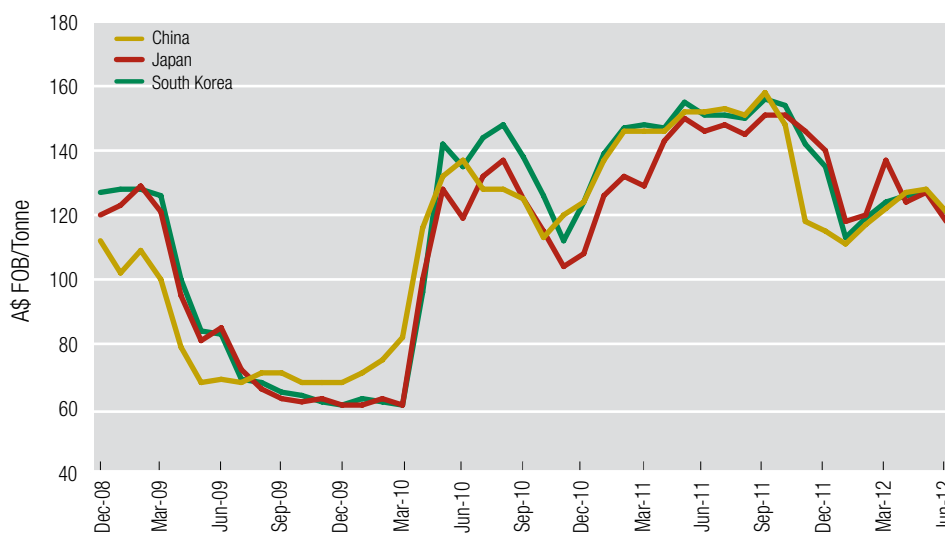


Figure 19 | **Average Price Iron Ore Fines (all grades)**
Received by Western Australian Producers Source: DMP

2.3 PETROLEUM

The value of Western Australian petroleum sales amounted to a record \$23.8 billion in 2011–12. This represented 22 per cent of the State's total value of resource sales, placing petroleum as the second most valuable resource sector after iron ore. As the nation's premier petroleum producer, Western Australia accounted for 62 per cent of conventional natural gas (including LNG feedstock but excluding coal seam methane) and 77 per cent of crude oil and condensate production in 2011–12.

A fall in oil prices in the last quarter of the period, combined with a reduction in production of petroleum products, was offset by increased LNG and natural gas prices. This led to a modest two per cent increase in the overall value of petroleum sales in 2011–12.

LNG was again the major contributor to petroleum sales, accounting for 42 per cent of value. This was followed by oil and condensate, with 33 per cent and 16 per cent respectively. Together these commodities accounted for 91 per cent of the State's petroleum sales. The remainder comprised natural gas (six per cent) and LPG (three per cent).

Over the past 10 years, Western Australia's petroleum sales have increased on average by just over nine per cent each year. This impressive record of growth is set to continue as large oil and gas projects are developed off the State's northwest coast to meet Asia's growing energy needs. This includes the recent commencement of Woodside Energy's Pluto LNG project in March 2012 and ongoing construction of the \$43 billion Gorgon LNG project.

Oil and Condensate

The value of crude oil sales from Western Australia fell from \$8.4 billion in 2010–11 to \$7.8 billion in 2011–12, a decrease of seven per cent. The fall in sales revenue was attributed to a fall in aggregate production partially offset by higher prices on average over the period.

In volume terms Western Australia's crude oil output decreased by 19 per cent in 2011–12 to 71 million barrels or 11.3 million kilolitres. This decrease was mainly attributed to the falls in production from the Pyrenees field and the Legendre field.

Over the course of 2011–12, the price of oil based on a combination of Brent, West Texas Intermediate (WTI) and Tapis, averaged US\$109.78 per barrel. This represented a 15 per cent increase compared to the equivalent average price in 2010–11. Resurgent demand for oil, strong consumption growth in developing economies and continuing disruptions to oil supply underpinned rising oil prices in 2011–12.

Oil prices were high and stable for most of 2011–12 with the Tapis oil price averaging US\$120.74 a barrel, peaking at US\$135.58 a barrel in March. This reflected continued market concerns over conflict in Libya, which temporarily ceased production during the period and concerns about political instability in the Middle East. In addition, the damage to Japan's nuclear power capacity from the March 2011 earthquake also resulted in an increase in oil demand from Japan, the world's third-largest consumer of oil.

High oil prices helped to offset the strong Australian dollar which weighed on petroleum export earnings.

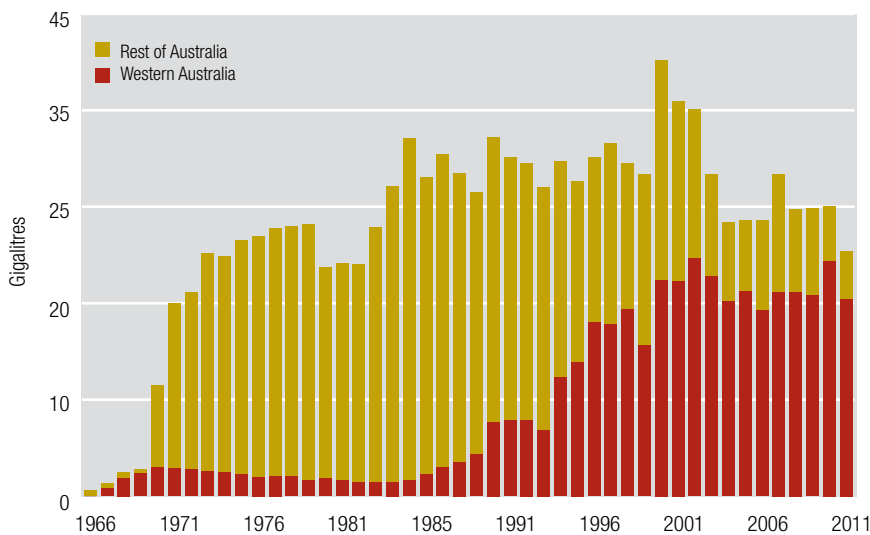


Figure 20 | **Crude Oil and Condensate Quantity** Source: DMP and BREE

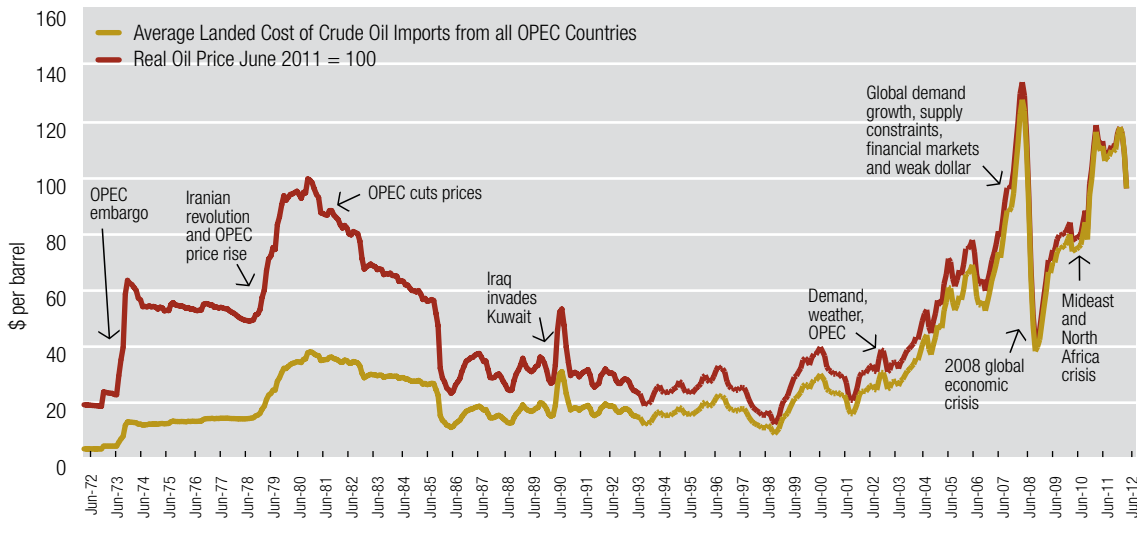


Figure 21 | **Historic Oil Prices** Source: Energy Information Administration, US Department of Energy, DMP

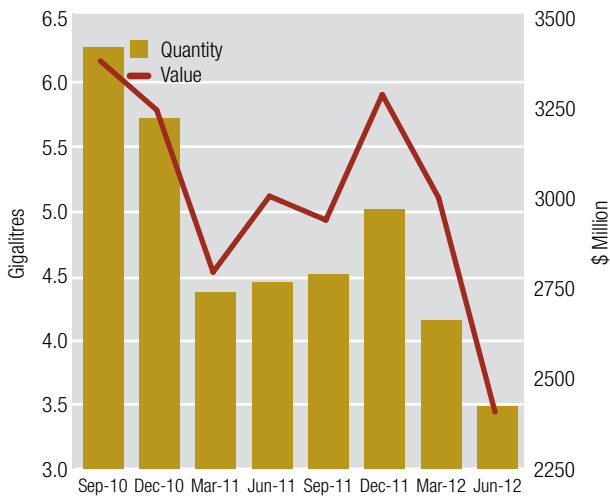


Figure 22 | **Crude Oil and Condensate Quantity and Value by Quarter** Source: DMP

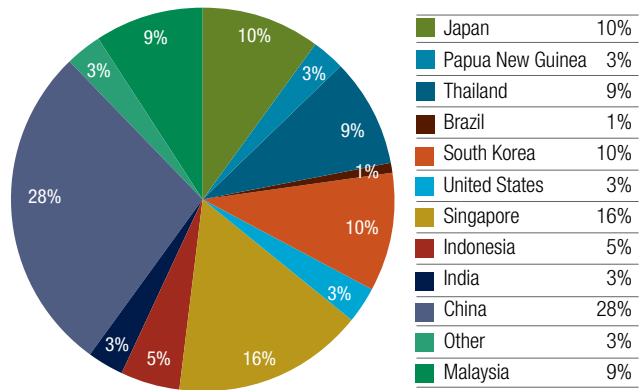


Figure 23 | **Crude Oil and Condensate Exports - Total Value \$11.2 Billion** Source: DMP and ABS



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

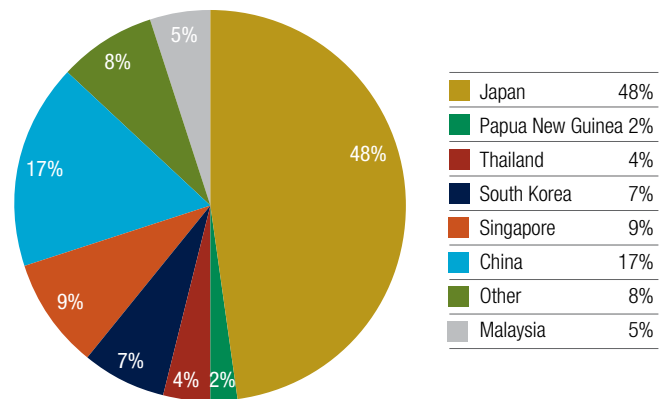


Figure 25 | **Petroleum Exports - Total Value \$21.9 Billion** Source: DMP and ABS

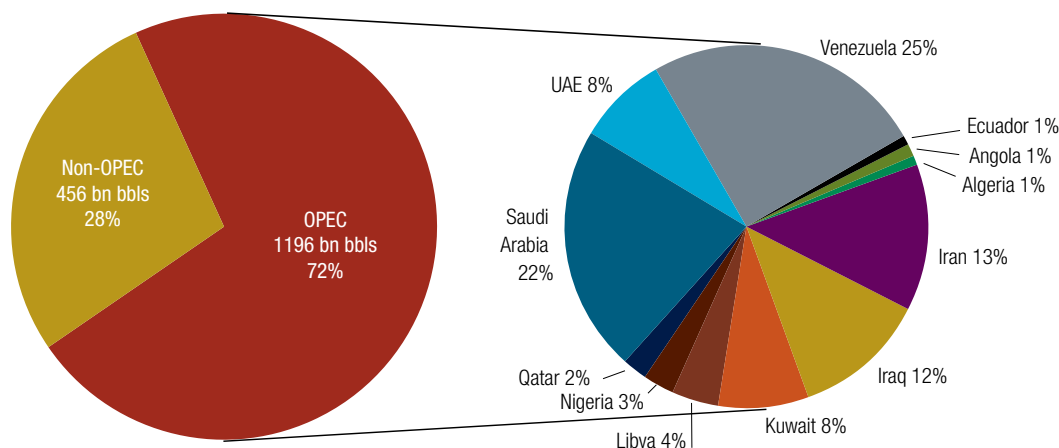


Figure 26 | **OPEC Share of World Crude Oil Reserves** Source: BP World Energy Statistics 2012

Non-OPEC countries contain less than a quarter of the world's proven oil reserves but produce 55 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. Because non-OPEC countries have smaller reserves that are being depleted more rapidly than in OPEC countries, their overall reserves-to-production ratio – an indicator of how long proven reserves would last at current production rates – is much lower (about 14 years for non-OPEC compared to 73 years for OPEC). In the future, growth in non-OPEC production is expected to slow compared to OPEC output. As a result, non-OPEC output is forecast to shrink to less than 50 per cent of total world oil production by 2015.

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

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.

As one of Australia's largest oil projects in the past decade, the BHP Billiton-operated Pyrenees development, which gathers crude from Ravensworth, Crosby and Stickle fields, remained prominent in 2011–12. The

development accounted for 30 per cent of the State's total crude oil production. Since commencing operation ahead of schedule in March 2010, Pyrenees has produced at very high rates and has the capacity to produce up to 96,000 barrels of oil per day. The project also re-injects up to 60 million cubic feet of gas per day at the nearby Macedon field for future recovery.

The Van Gogh development, operated by Apache, continued its strong production in 2011–12. Located, 53 kilometres northwest of Exmouth, the development incorporates a floating production, storage and offloading facility (FPSO), with a capacity to process 150,000 barrels of liquids per day including 63,000 barrels of oil.

Production volumes were generally down in 2011–12 due to oil field natural decline, higher than expected cyclone activity in the Northwest and redevelopment and scheduled maintenance activities. Planned outages arising from the final stages of the North West Shelf (NWS) Oil Redevelopment Project also contributed to lower volumes for the NWS oil fields. The \$1.8 billion re-development included the installation of the Okha FPSO facility which commenced production on 24 September 2011. The development will boost production from the Cossack, Wansea, Lambert and Hermes fields, and steady state operations will produce in excess of 30,000 barrels of per day.

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. However, year on year petroleum exploration in Western Australia has fallen in both absolute and trend terms. In 2011–12, Western Australian exploration expenditure fell by \$285 million or 12 per cent from the previous year.

In 2011–12, 37 million barrels or 5.9 million kilolitres of condensate was sold from Western Australia. In sales value terms, this was worth \$3.8 billion, a decrease of 4 per cent from the previous year largely reflecting lower sales volumes.

As a by-product from natural gas fields, nearly all of the State's condensate production comes from fields located in the North West Shelf. In 2011–12, sales volumes of condensate decreased by 14 per cent with most of the decrease coming from the North Rankin and Angel fields.

The volume of LPG (butane and propane) sold in 2011–12 decreased by 10 per cent to 835 271 kilolitres. However, slightly higher prices meant that the total value of LPG sales only fell by five per cent to \$734 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 Northwest Shelf Venture's (NWSV) project and the newly developed Woodside Pluto project at Karratha.

In 2011–12, reported LNG output decreased by almost 10 per cent to 15.4 Mt. This occurred despite Pluto production commencing in the June quarter of 2012. The reduced output from the NWSV was due to the ongoing refurbishment and maintenance program, with planned shutdowns being completed in the second quarter of 2012 on the Trunkline Onshore Terminal 1 and LNG Train 4. In addition, production was impacted by North Rankin Redevelopment Project activities and cyclone activity in the first quarter of 2012. However, the reduced output over the period was offset by higher commodity prices resulting in the value of sales rising by 15 per cent to \$10 billion when compared to the previous year.

Pluto commenced operation on 22 March 2012 and produced its first LNG on 29 April. Woodside shipped its first LNG shipments to Japanese customers on 12 May 2012. From start-up to the end of June 2012 the Pluto project produced approximately 0.6 Mt. Increased plant utilisation over that expected for start-up resulted in excess production beyond contracted volumes. Consequently, of the eight cargoes delivered during the period three cargoes were sold to the

spot market at prices higher than the normal contracted prices.

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 terajoules per day of gas and supports 130 heavy-duty vehicles, two remote power stations and a large industrial customer.

The NWSV 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.

Future LNG Projects and Project Expansions Gorgon

The Gorgon Project will develop the Gorgon and Jansz–lo gas fields, located within the Greater Gorgon area about 130 kilometres off the Northwest coast of Western Australia. The Greater Gorgon Area gas fields are Australia's largest known conventional gas resource and contains about 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 and a domestic gas plant, with the capacity to provide 300 terajoules per day (TJ/d) to supply gas to the Western Australian domestic market. Constructed on Barrow Island, the LNG trains will have the capacity to produce a combined 15.6 Mt/a, with first LNG expected in 2014. In addition, under the *Barrow Island Act 2003*, the joint venturers are required to reserve 2000 petajoules of gas for the domestic gas market. A domestic gas plant is expected to provide 275 TJ/d starting from 2015.

Chevron Australia reported that it had executed Sale and Purchase Agreements (SPAs) with Osaka Gas (1.375 Mt/a for 25 years), Tokyo Gas (1.1 Mt/a for 25 years), Chubu Electric Power (1.44 Mt/a for 25 years), GS Caltex of South Korea (0.25 Mt/a for 20 years), Nippon Oil Corporation (0.3 Mt/a for 15 years) and Kyushu Electric (0.3 Mt/a for up to 20 years).

Shell sells its LNG on a portfolio basis and has secured several outlets for its equity LNG into which its share of Gorgon LNG will be delivered.

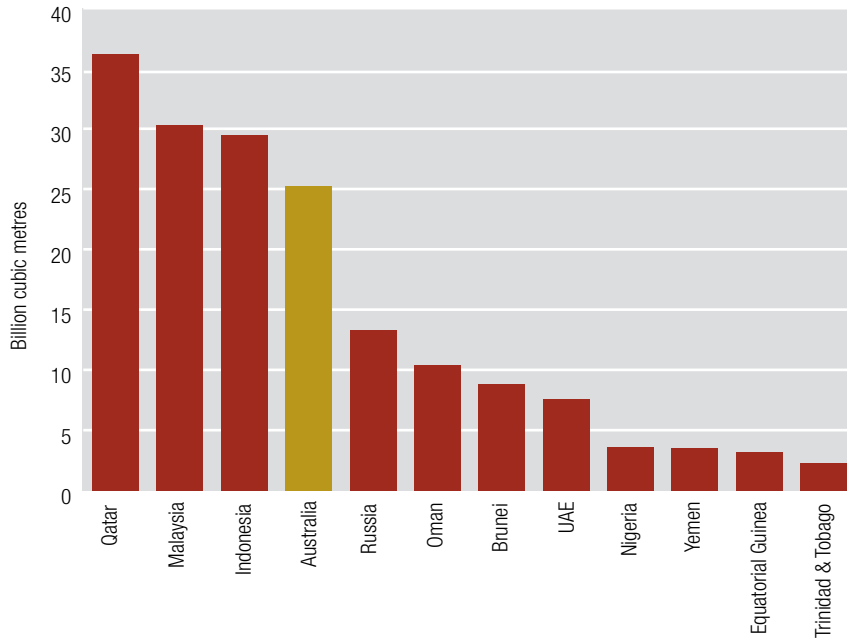


Figure 27 **Asia-Pacific Region LNG Imports 2011 by Exporting Country**
 Source: BP World Energy Statistics 2012

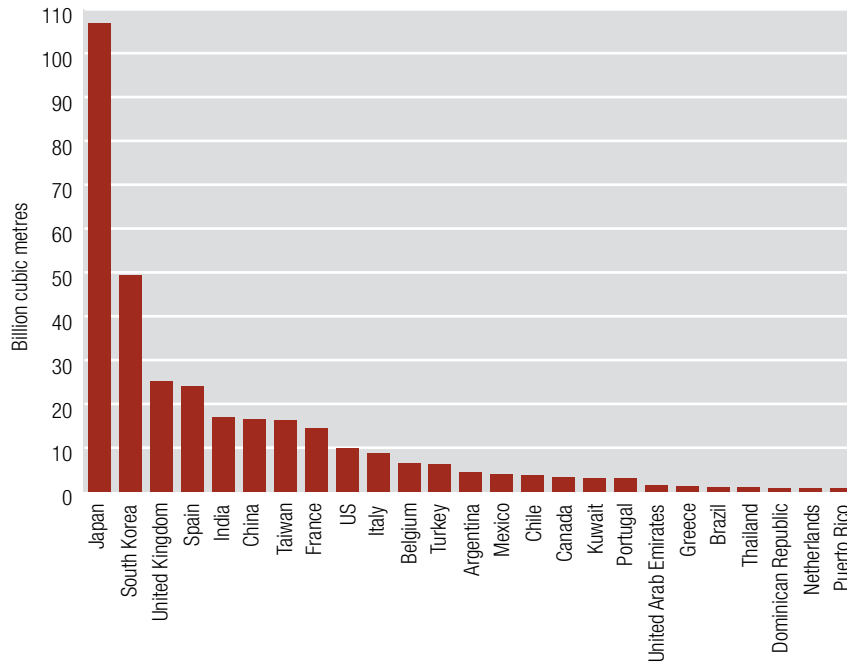


Figure 28 **Countries Importing LNG in 2011**
 Source: BP World Energy Statistics 2012

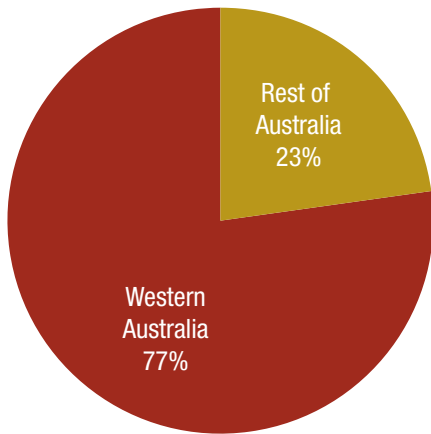


Figure 29 | **Crude Oil and Condensate Production 2011-12**
Source: EnergyQuest

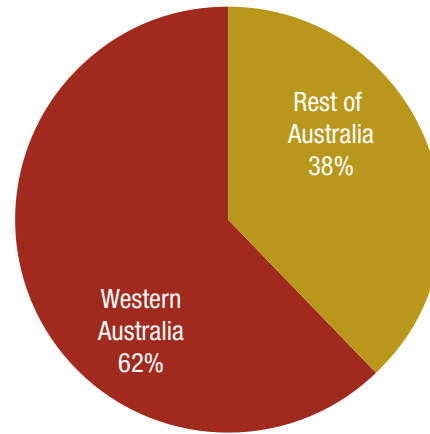


Figure 30 | **Natural Gas Production 2011-12**
Source: EnergyQuest

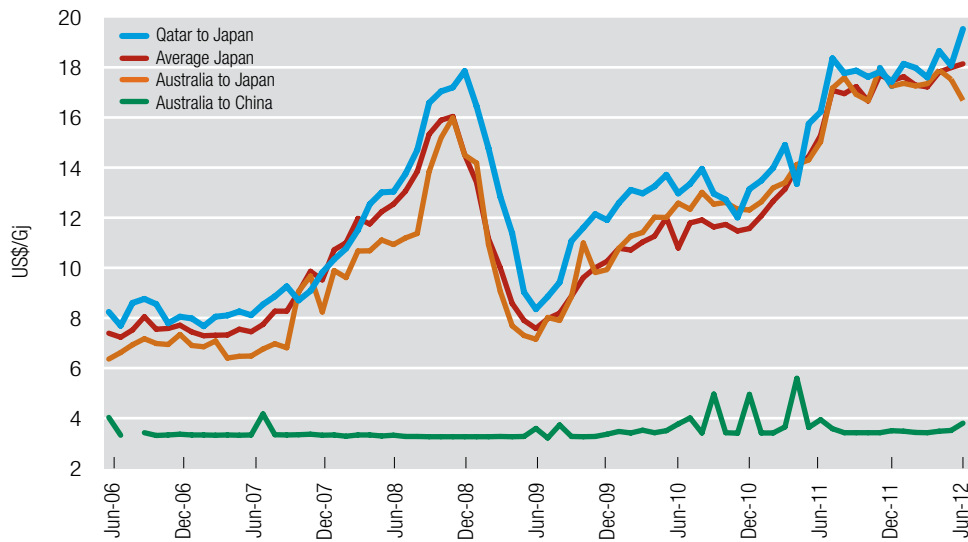


Figure 31 | **LNG Import Prices** Source: Argus Monthly LNG (Prices include freight and regassing)

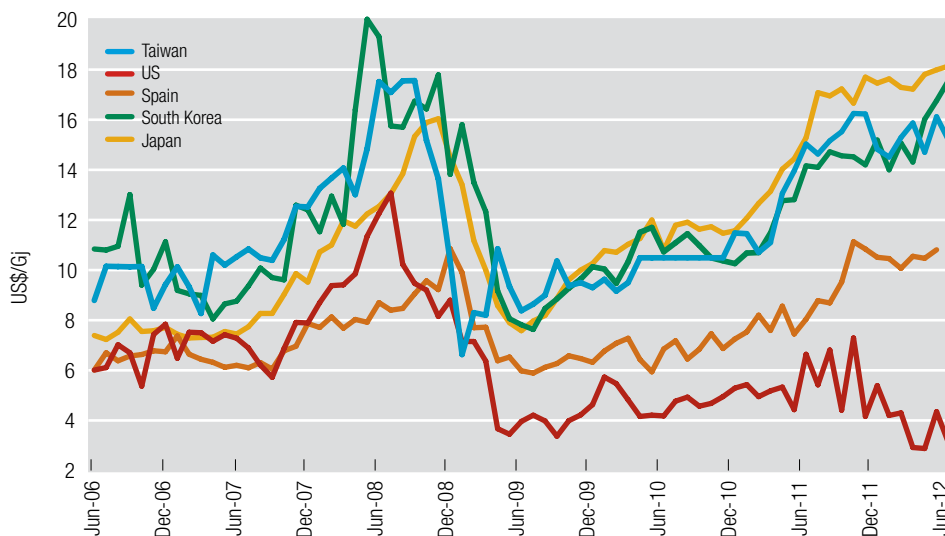


Figure 32 | **Average LNG Import Prices** Source: Argus Monthly LNG (Prices include freight and regassing)

An Australian subsidiary of ExxonMobil has signed long-term sales and purchase agreements with Petronet LNG Limited of India and PetroChina International Company Limited for the supply of LNG from the Gorgon Project. The agreement with Petronet LNG is for the supply of approximately 1.5 Mt/a of LNG over a 20-year term, while the agreement with PetroChina is for the supply of approximately 2.25 Mt/a over a 20-year term. Together, these two sales and purchase agreements commit the ExxonMobil subsidiary's share of LNG from the 15 Mt/a Gorgon LNG Project.

Total expenditure for the Gorgon Project is expected to reach \$20 billion during the five-year construction period. Contracts include the fabrication and assembly of main LNG modules, construction of a 2.1 kilometre LNG jetty, marine structures and LNG tank, and offshore pipe lay. In excess of \$9 billion of construction works has already been committed to Australian companies across the country, including more than 90 per cent in Western Australia.

Under the *Barrow Island Act 2003*, the Gorgon development will be required to implement geosequestration as a means of reducing carbon emissions from the project. As a result, the Gorgon project will include the world's largest commercial-scale greenhouse gas storage site – with up to 3.75 Mt/a of carbon dioxide injected and stored in a deep sandstone reservoir within the DuPuy formation, 2.4 kilometres beneath Barrow Island. 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 Mt/a LNG facility and a separate domestic gas plant.

The Wheatstone Project is planned to eventually comprise five LNG processing trains producing up to 25 Mt/a.

The Wheatstone Project is a joint venture between Australian subsidiaries of Chevron (64.14%), Apache (13%), Kuwait Foreign Petroleum Exploration Company (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 field, 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.

Since commencement of construction, Chevron has announced that:

- In April 2012, it signed a heads of agreement (HOA) with Chubu Electric Power Company Incorporated for the delivery of up to 1 Mt/a of LNG for up to 20 years.
- In May 2012, it signed a HOA with Tohoku Electric Power Company Incorporated for the delivery of up to 1 Mt/a of LNG for up to 20 years.
- In June 2012 an additional binding agreement was signed between TEPCO and Chevron to purchase an additional 0.4 Mt/a of Wheatstone LNG for up to 20 years, a 10 percent participating interest in the Wheatstone field licenses and an eight per cent interest in the Wheatstone natural gas processing facilities.

Pluto

The current Pluto project is based on a single LNG train producing 4.3 Mt/a by processing gas from the Pluto and Xena gas fields, located about 190 kilometres northwest of Karratha. It is estimated that these two fields contain a total recoverable reserve volume of approximately 4.8 Tcf of gas, sufficient to underpin a one train operation.

Woodside has completed onshore front-end engineering design for trains two and three which could ultimately triple output to 12.9 Mt/a. However, a final investment decision for the expansion remains contingent on securing sufficient volumes of economically viable gas resources. Woodside has stated that eight exploration wells are currently planned for 2013, to support its future growth.

In addition to a continuing exploration program, Woodside has publically stated that they have been in ongoing discussions with third parties for gas to be processed through an expanded Pluto project. Until recently one of the main possibilities for the delivery of additional gas into the Pluto was the Scarborough

field (BHP Billiton Billiton and Exxon Mobil) and the Thebe field (BHP Billiton) which hold an estimated 10 Tcf and three Tcf of gas respectively. However, recent nearby discoveries may mean these fields can be developed as a stand alone project.

Browse Basin

The Browse Basin lies offshore approximately 425 kilometres north of Broome and covers about 140,000 square kilometres. Exploration commenced in the Browse Basin in 1967 when the Burmah Oil Company Australia Ltd acquired 1600 kilometres of regional seismic data.

The Browse Basin's P50 (50 per cent certainty of recovery) resources were estimated at 31.4 Tcf, as of 31 December 2010. 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.

In February 2011, Woodside as operator, in partnership with BP, BHP Billiton, Chevron and Shell selected James Price Point as the preferred location for its Browse LNG development. The proposed Browse LNG development includes the Torosa, Brecknock and Calliance fields and is located approximately 42 kilometres north of Broome. Combined, these fields contain an estimated 14 Tcf of

gas and 370 million barrels of condensate (as at September 2011).

In May 2011, the traditional owners of James Price Point reached a consent agreement with Woodside and the Western Australian Government for development of the site.

In April 2012, the State and Commonwealth Governments approved amendments to the Browse retention leases, which include extending the timetable for readiness for a final investment decision into the first half of 2013. The variation is to allow time for better evaluation of the outcomes of frontend engineering and design work and the results of the tender processes for the development's major contracts. Browse engineering and environment studies at the proposed LNG Precinct at James Price Point and offshore areas continued in the first half of 2012.

On 1 May 2012, Woodside announced that its intention to sell a minority portion of its equity interest in the proposed Browse LNG Development to Japan Australia LNG (MIMI Browse) Pty Ltd (MIMI). The transaction will give MIMI an estimated 14.7% interest in the development and is expected to be finalised in the third quarter of 2012.

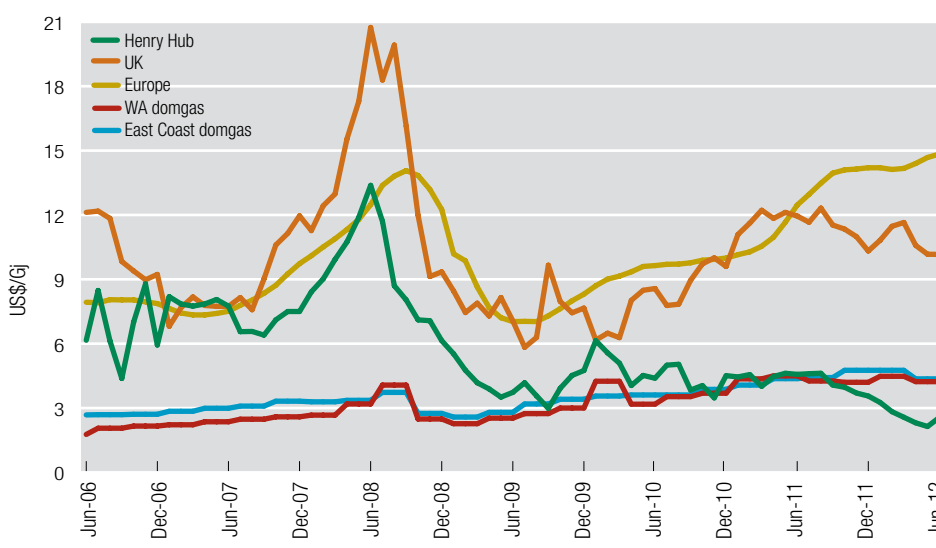


Figure 33 | Average Natural Gas Prices Source: Argus Monthly LNG, EnergyQuest, DMP

Prelude

On 20 May 2011, Shell reached a final investment decision (FID) to proceed with its Prelude floating liquefied natural gas (FLNG) project in the Browse Basin. Shell anticipates operations commencing 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 Concerto field will also be developed as part of this project. The proposed FLNG would have a capacity to produce around 3.5 Mt/a.

In July 2010, Shell signed its first sales agreement with Japan's Osaka Gas to permit sales from the FLNG project. It comprised a 25-year, 0.8 Mt/a sale and purchase agreement.

In December 2011, Kogas announced it was in negotiations with Shell to acquire an interest in the Prelude FLNG Project. In a statement to the Korea Stock Exchange Kogas stated that in 2012 it planned to set up a wholly owned subsidiary, KOGAS Prelude in Perth.

On 16 March 2012, Inpex Corporation announced it had agreed to acquire a 17.5% participating interest in the Prelude FLNG project.

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%).

A FID on the project was reached in January 2012 and construction officially commenced on 18 May 2012. The project will initially have the capacity to produce 8.4 Mt/a, approximately 1.6 million tonnes of liquefied petroleum gas (LPG) per annum, as well as 100,000 barrels of condensate per day at peak. It is expected to employ 300 people on an ongoing basis and will operate for at least 40 years.

On 6 December 2011, the Ichthys Project announced that it had completed LNG sales and purchase agreements totaling 4.0 Mt/a with a consortium of five

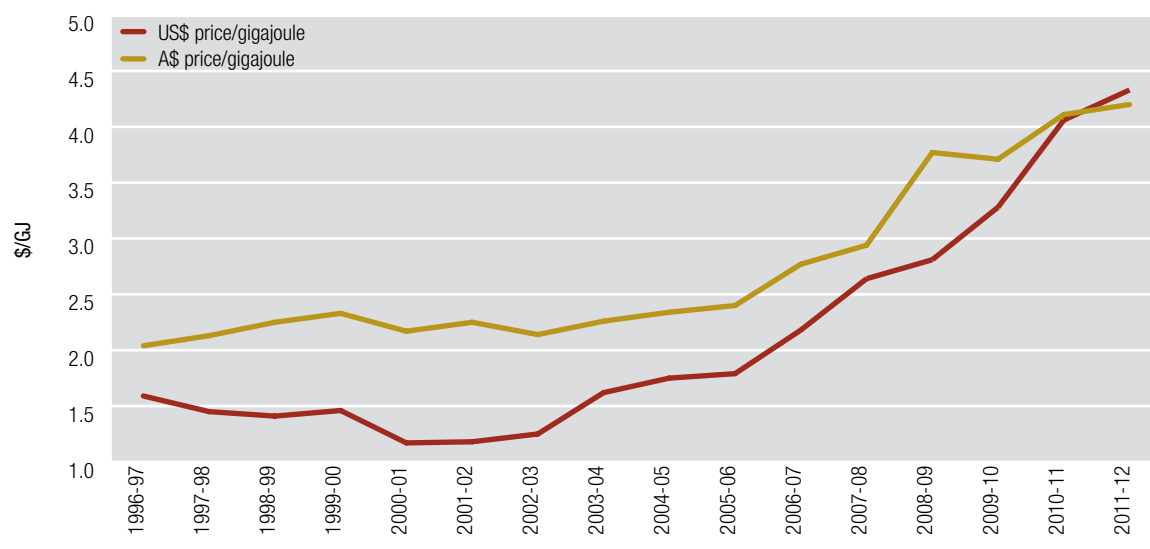


Figure 34 | **Western Australian Average Domestic Natural Gas Price** Source: DMP
The value of Western Australian domestic gas sales is based on the summation of total domestic gas sale values as at the point of entry into the Dampier to Bunbury natural gas pipeline (DBNGP) or where applicable, the Parmelia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

major Japanese utility companies composed of Tokyo Electric Power Company, Inc, Tokyo Gas Co., Ltd., The Kansai Electric Power Co., Inc., Osaka Gas Co., Ltd. and Kyushu Electric Power Company Inc., and LNG offtake agreements for 1.8 Mt/a were also agreed by Inpex and a Total affiliate.

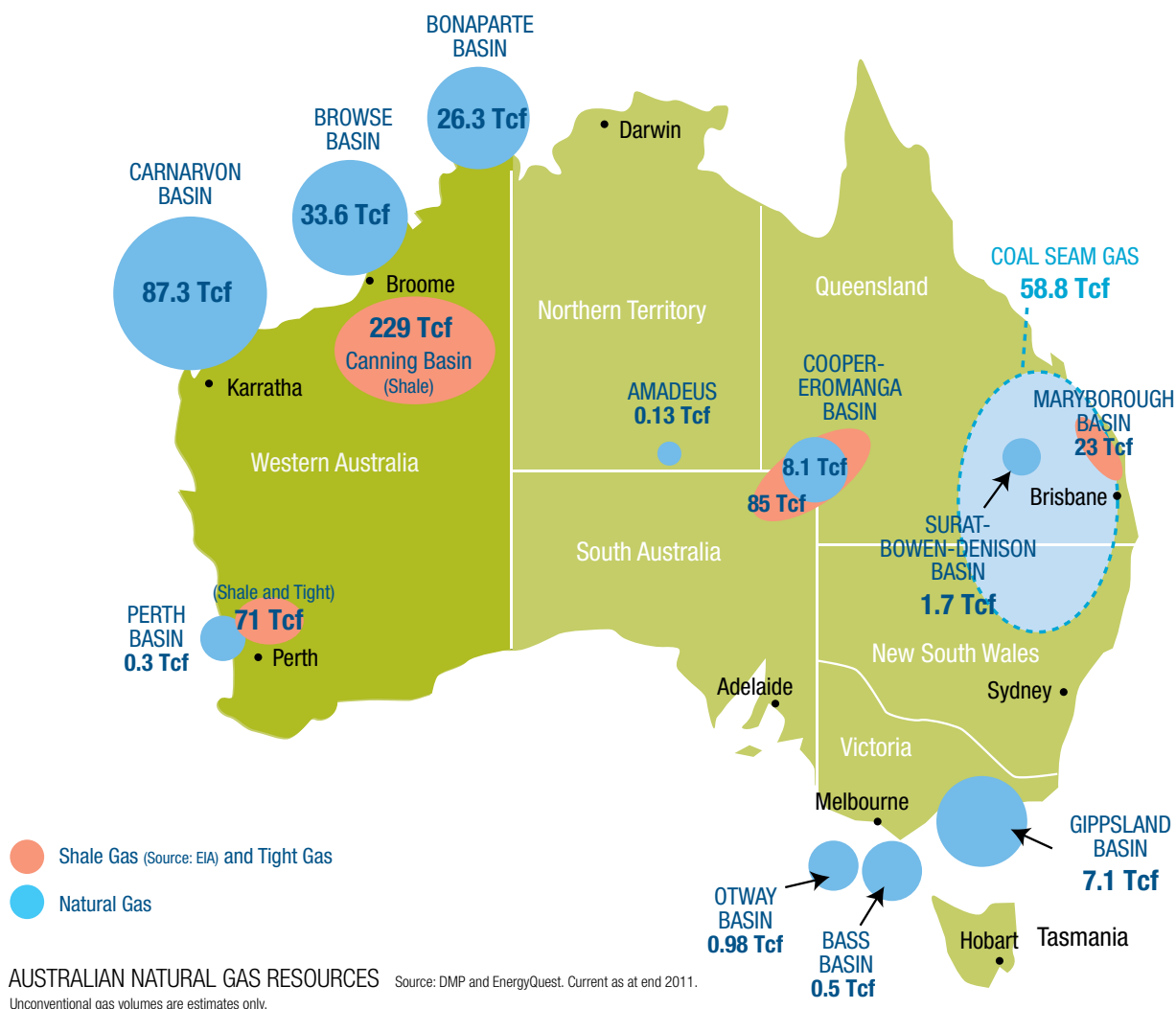
On 10 January 2012, the Ichthys Project Joint Venture announced it had finalised sales and purchase agreements for a total of 2.52 Mt/a with Chubu Electric Power Company (0.49 Mt/a), with Toho Gas Company (0.28 Mt/a) and CPC Corporation, Taiwan (1.75 Mt/a), over 15 years commencing in 2017.

The Ichthys Project is now fully contracted for its 8.4 Mt/a capacity.

Future Developments

BHP Billiton and ExxonMobil (a 50:50 joint venture) are studying the development of the huge Scarborough and Thebe fields, located 300 kilometres northwest of Onslow in the Carnarvon Basin. Scarborough is estimated to hold around 10 Tcf of gas. Thebe (100 per cent owned by BHP Billiton) is estimated to contain between two and three Tcf of gas.

The Scarborough field is located in a remote difficult location, which has to date been assessed to be unviable as a stand-alone gas project. However, recently reported nearby discoveries, such as Tallaganda field (which it has been suggested could hold up to 1.3 Tcf of gas), may have changed the economics of development. However, the focus for the development of the Scarborough field appears to remain developing the field an FLNG plant. Exxon Mobil has indicated a decision on how the Scarborough field will be developed is now anticipated before the end of 2013.



Map 1. Australian Natural Gas Resources

Domestic Natural Gas Supply

Western Australia

The quantity of natural gas supplied into the domestic market in 2011–12 rose by two per cent to 9.1 Bcm compared to the previous year and the value of sales increased by seven per cent to \$1.45 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.

The graph on page 26 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 five per cent in 2011–12 and averaged \$4.20 per gigajoule.

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 210 TJ/d into the domestic market.

In 2011 development of the Reindeer field, located in the offshore WA-209-P block, was completed with first gas production in December 2011 when the Devil Creek Gas Plant was commissioned. The Reindeer field will supply gas to the Devil Creek facility at a rate of around 110 terajoules per day and will produce around 500 barrels per day of condensate.

Halyard and Spar Fields

On June 1, 2011 Apache Corporation announced it had commenced gas and condensate production at the Halyard-1 discovery well. The Halyard gas field is located in permit WA-13-L in the Carnarvon Basin. Spar is situated in permit WA-4-R, about 70 kilometres west of Varanus Island and two kilometres from Halyard. Apache is the operator of the project with a 55 per cent interest and Santos holds the remaining 45 per cent.

Production from the Halyard well will be through an existing pipeline to the East Spar field facilities and to Apache's Varanus Island hub. The development of the Spar field, located in adjacent licence WA-4-R, is expected to follow in late 2012 as additional capacity becomes available at Varanus Island.

Macedon Project

In September 2010, BHP Billiton approved the development of the US\$1.57-billion Macedon gas field located 50 kilometres north of Exmouth. The Macedon development involves four offshore production wells and a gas treatment plant to be built at Ashburton North, 17 kilometres southwest of Onslow. First production is expected in 2013.

Onshore Gas Development

The last 12 months has seen increased interest in the possibility of developing Western Australia's shale resources in the Canning and Perth basins. Although there have been very few shale gas wells drilled, two proof of concept flows from Arrowsmith 2 and Woodada Deep 1, post fracture stimulation, have occurred and gas to surface has been reported. At time of writing, preparation for fracture stimulation for Senecio 2 is also underway.

Given the proximity of these developments to pipeline infrastructure, such developments raise the possibility that Western Australia's future energy security could be boosted by onshore sources of gas supply that are not dependent on gas reserved from large LNG developments.

Gingin

Empire Oil and Gas is looking to commercialise its Gingin West and Red Gully gas fields (EP389) in the Perth Basin. Gingin West-1 is the largest gas flow in the area and is the closest discovery to Perth.

Plant under consideration to commercialise the fields would have an initial operational processing capacity of around 10 million cubic feet per day of gas and 500 barrels per day of condensate. This could be doubled with an additional train.

Commissioning of the Red Gully Facility, which will process gas from the Red Gully-1 and Gingin West-1 wells is anticipated to start in early 2013.

Warro

The Warro Gas Project is contained within Exploration Permits EP407 and EP321 and is located 200 kilometres north of Perth. The Warro gas field is estimated to a P50 recoverable resource of 1.1 Tcf. The field is 31 kilometres from both the DBNGP and Parmelia pipelines, which provide easy access to gas consumers both north and south of the field.

Warro is partly funded by Alcoa, which has taken up to a 65 per cent stake in the Warro field in return for spending up to \$100 million on appraisal and development

activities. Transerv Energy has retained a 35 per cent stake in the field and is operator of the project.

Development of the Warro field has included to date:

- Drilling, stimulation and flow testing of Warro-03 in March 2009 to October 2009
- Warro 3D Seismic Acquisition in March 2011
- Drilling, stimulation and flow testing of Warro-04 in April 2011 to November 2011

Future plans for the development include a pipeline in late 2012 and anticipated gas production by end of 2013 or beginning of 2014.

Domestic Gas Sourced from LNG Projects

While the focus has been on LNG production, the Gorgon Project will also progressively provide up to 300 TJ/d of domestic gas to Western Australia. This gas will be delivered through a tie-in to the existing DBNGP, with delivery expected to begin in 2015.

The Western Australian Government is also negotiating with Chevron and its joint venture partners to formalise the implementation of the Western Australian Domestic Gas Policy. Under the policy, the Government will be looking to reserve for domestic use up to 15 per cent of gas feeding into the Wheatstone Project.



Aerial view of the Gorgon Plant Site on Barrow Island.

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2.4 GOLD

In 2011–12, the State's gold sector set a new record with sales valued at \$9.4 billion. This represented a 14 per cent increase from the previous year and accounted for nine per cent of all mineral and petroleum sales in Western Australia in 2011–12.

Gold has a dual character as both a commodity and a monetary asset. Over the past 10 years, the gold price has risen almost seven-fold from a low just above US\$282 per ounce in September 2001 to an all-time record of US\$1895 per ounce in early September 2011.

The gold price averaged US\$1672 per ounce in 2011–12, representing a 22 per cent increase from 2010–11.

In Australian dollar terms, the gold price averaged \$1635 per ounce in 2011–12 which was 17 per cent higher than the previous year.

The challenging economic climate continues to work in gold's favour. In general, forecasts indicate that gold prices will remain relatively high and will remain so until the US and European economies improve and stabilise.

In 2011–12, the State's gold output fell marginally by two per cent compared with 2010–11 to 179 tonnes or 5.8 million ounces. Over the same period, Australia's gold production fell by three per cent to 239 tonnes (7.7 million ounces). In 2011–12, Western Australia accounted for around 75 per cent of Australia's gold production.



Figure 35 | **Gold Price** Source: Perth Mint and London Fix

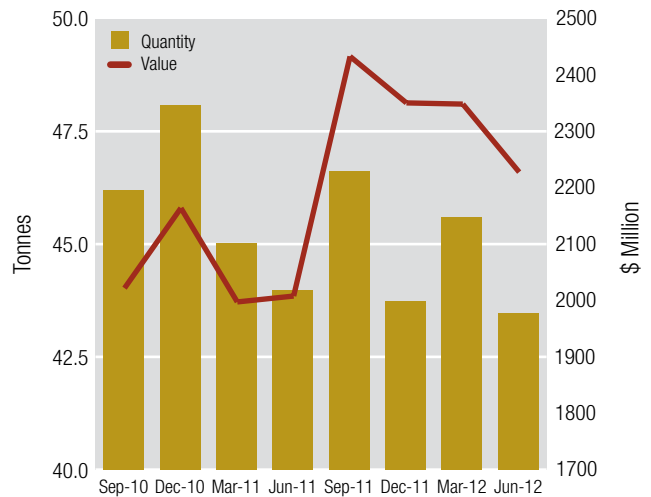


Figure 36 | **Gold Quantity and Value by Quarter** Source: DMP

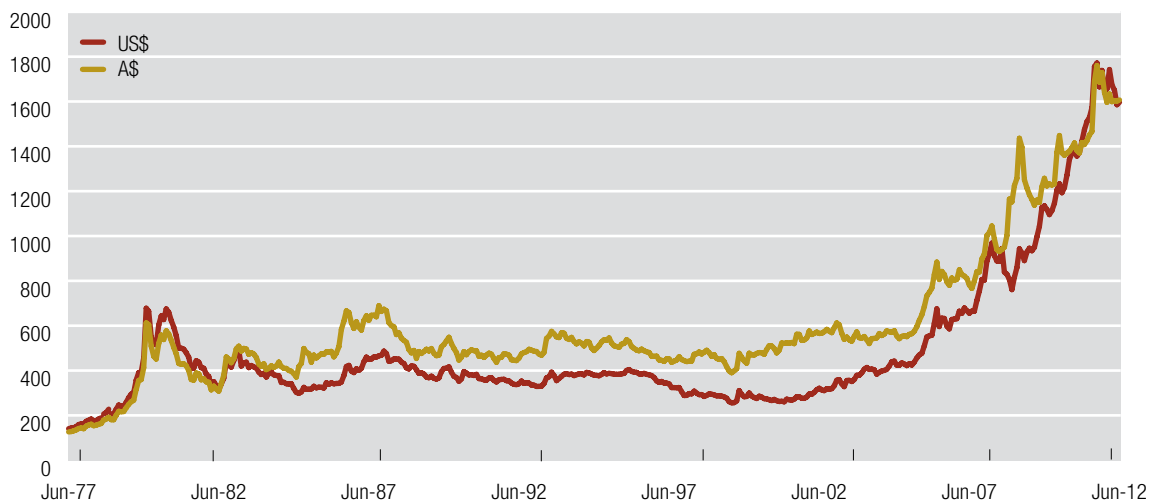


Figure 37 | **Historic Gold Price, per Ounce** Source: Perth Mint and London PM Fix

Western Australia's 10 largest projects accounted for 65 per cent of the State's gold output in 2011–12. These projects comprised:

- Golden Mile (Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM)) – 22.5 tonnes
- Boddington (Newmont Boddington Gold Pty Ltd) – 19.9 tonnes
- Telfer Gold (Newcrest Mining Limited) – 17.6 tonnes
- St Ives (Gold Fields Ltd) – 14.6 tonnes
- Jundee Nimary (Newmont Mining Corp) – 10.3 tonnes
- Sunrise Dam (AngloGold Ltd) – 7.8 tonnes
- Granny Smith (Barrick Gold Corporation) – 6.3 tonnes
- Gwalia – Leonora (St Barbara Limited) – 5.8 tonnes
- Agnew (Gold Fields Ltd) – 5.6 tonnes
- Kanowna Belle (Placer Dome Inc) – 4.8 tonnes

Gold exports from the State totalled \$15.6 billion in 2011–12; however only 60 per cent of this amount (\$9.4 billion) is attributable to Western Australian mines (see Gold Export update 2011–12 in this section). The United Kingdom was the State's largest gold export destination, accounting for 29 per cent of total gold exports. China was second with 27 per cent, followed by India at 19 per cent. Other destinations include Thailand (ten per cent) and Singapore (seven 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.

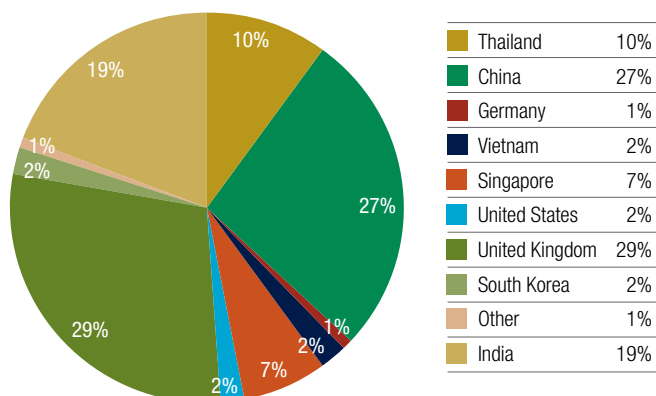


Figure 38 | **Gold Exports – Total Value \$15.6 Billion** Source: ABS and DMP
Note: Includes gold refined/processed and exported from Western Australia, but produced from mining operations in other States, Territories and overseas.

GOLD EXPORT UPDATE 2011–12

The Australia Bureau of Statistics (ABS) release Western Australian export trade data, which shows 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 2011–12 amounted to approximately \$15.6 billion. Approximately 60 per cent or \$9.4 billion was gold produced in Western Australia. The remaining 40 per cent (approximately \$6.2 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.

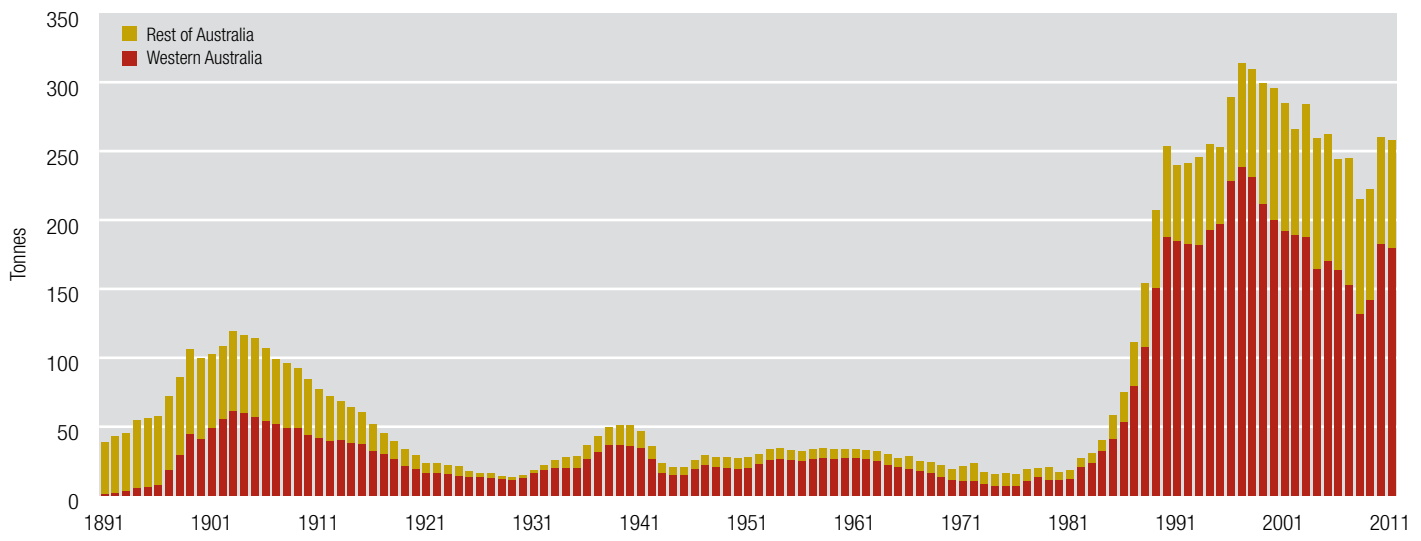


Figure 39 | **Gold Production** Source: DMP and BREE

Australian gold producers are continuing to experience high production costs, which have increased on average around 10 per cent in the past year averaging around \$822 an ounce for the year (source Surbiton Associates Pty Ltd).

The high gold price has encouraged producers to expand existing mines and exploit previously non-commercially viable deposits. It has also resulted in a 23 per cent increase in exploration expenditure in Western Australia over the past year to a record \$557.4 million.

Listed below are details of some of the Western Australian mines that have recently commenced operations, completed expansions or plan to open in the near future.

- Regis Resources Ltd's Garden Well gold project completed its first gold pour in September 2012. Garden well is projected to have an average annual production of 180,000 ounces over nine years.
- Millennium Minerals Ltd commenced production in the second half of 2012 of its 80,000-ounce per annum (oz/a) Nullagine gold project located in the East Pilbara region.
- Ramelius Resources Ltd reopened its Mt Magnet gold mine early in 2012. Ramelius expects to produce around 520,000 ounces of gold over a six-year period from Mt Magnet.
- AngloGold Ashanti Ltd and joint venture partner Independence Group NL are developing the Tropicana Gold project located northeast of Kalgoorlie. The capital cost of the project is around \$740 million with a targeted production rate of 3.45 million ounces over a ten-year mine life. First production is targeted for the December quarter of 2013.
- Sandfire Resources NL is developing its Doolgunna Copper–Gold Project's DeGrussa deposit 140 kilometres north-northeast of Meekatharra. Sandfire's latest indicated inferred resources at DeGrussa show 600,000 tonnes of contained copper, 660,000 ounces of gold and 5.1 million ounces of silver. Production commenced in the second half of 2012.
- Reed Resources Ltd's Meekatharra project is on schedule to produce in the last quarter of 2012 with a target production of 95,000 ounces for the first twelve months of operation.
- Doray Minerals Ltd's 74,000 oz/a Andy Well project, 45 kilometres north of Meekatharra, is scheduled to commence construction in the second half of 2012.
- Kentor Gold Ltd's Burnakura project recommenced operations and poured first gold in August 2012. Initial production is scheduled at 24,000 oz/a over three and a half years.

There are many additional gold projects in various stages of exploration and feasibility in an effort to capitalise on the buoyant gold market.

China and India continue to dominate global consumer demand (jewellery, technology, investment and official sector purchases). In 2011–12, world demand increased five per cent to 4,456 tonnes compared to the 2010–11 period. Jewellery demand fell 13 per cent whilst technology (electronics, dentistry and other industrial uses) fell six per cent. Investment (physical bar, coin and exchange traded funds) rose 14 per cent, whilst official sector purchases increased a massive 144 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. In the June 2012, quarter gold reserve purchases increased to 157.5 tonnes, the largest quarterly net purchase by this sector since it became a net buyer in 2009.

The World Gold Council report world mine production reached 2842 tonnes in 2011–12, which was two per cent higher than 2010–11. China is ranked at the top of the list producing 13 per cent with Australia holding second place at nine per cent. The United States and Russia are a close equal third at eight per cent with South Africa and Peru equal fourth at seven per cent.



Gold pouring.

© KCGM

2.5 ALUMINA

The total value of alumina sales in Western Australia amounted to just under \$4 billion in 2011–12 and virtually unchanged from 2010–11. 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 2011–12, the total quantity of alumina produced in Western Australia increased slightly by two per cent to 12.6 Mt, compared to 12.3 Mt in 2010–11. The State’s alumina production has increased steadily over the past 20 years at an annual growth rate of three per cent.

The alumina price decreased steadily over the year from US\$366 per tonne in July 2011 to US\$298 per tonne in June 2012, coinciding with downward movements in aluminium prices. On an annual basis, alumina prices averaged US\$324 per tonne in 2011–12 – which was equivalent to 2010–11 levels and above its 10 year average of US\$270 per tonne. In Australian dollar terms, alumina prices averaged \$314 per tonne in 2011–12 which was four per cent lower than the previous year.

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\$2161 per tonne in 2011–12, a fall of nine per cent from the previous year. This decline in prices, particularly in the first half of 2012, was mainly attributable to weak global consumption growth of aluminium combined with increased stock levels. Whilst aluminium prices have been volatile during the period, they have remained above their decade average to June 2012 of US\$2078 per tonne.

Australia is the world’s largest bauxite producer and the second-largest producer of alumina. In 2011, Western Australia produced 63 per cent of the country’s total alumina output. The State’s bauxite reserves are

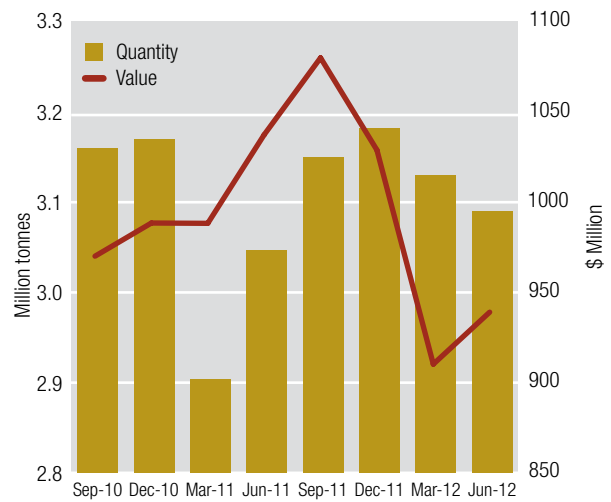


Figure 40 | Alumina Quantity and Value by Quarter Source: DMP

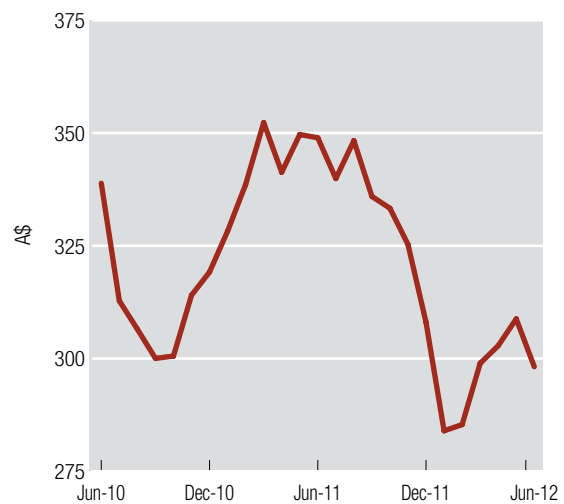


Figure 41 | Alumina Price – A\$/tonne Source: ABS

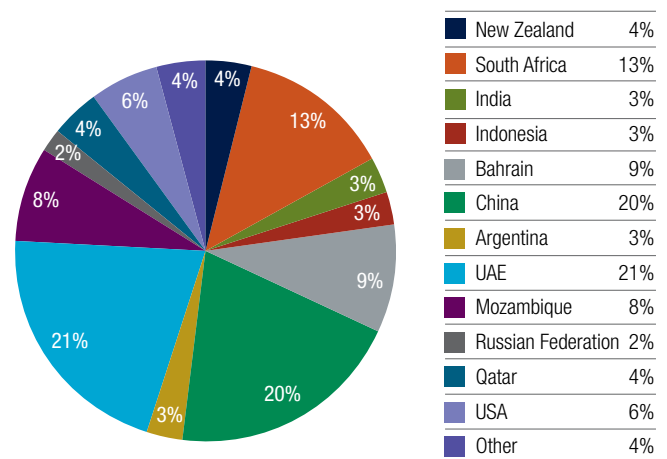


Figure 42 | Alumina Exports – Total Value \$3.7 Billion Source: DMP

estimated to sustain more than 50 years of alumina production at current levels.

Current production of alumina is focused in the South West of the State, with the Darling Scarp containing considerable deposits of bauxite. The 12.6 Mt of alumina sold in 2011–12 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 allow economical processing of relatively low-grade bauxite.

Alcoa's first bauxite mine at Jarrahdale opened in 1963 to supply the Kwinana alumina refinery and produced 168 Mt before closing in 1998. The company currently has two operating bauxite mines, Huntly and Willowdale. Huntly was established in 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 about 10 Mt of alumina per year.

In May 2012, Alcoa was granted a five-year extension by the State Government to expand its Wagerup Alumina Refinery to a maximum production capacity of 4.7 Mt/a. The planned expansion was suspended in November 2008 due to the Global Financial Crisis.

Worsley Alumina 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.

The expansion and efficiency upgrade of the Worsley alumina refinery commenced production in the first quarter of 2012. The US\$3.4 billion construction project, which is now complete, represents one of the largest single industrial investments in Western Australia's South West region. The expansion project will increase the production capacity of the refinery from 3.5 Mt/a to 4.6 Mt/a. Production at Worsley is expected to increase during the 2012–13 financial year as the expansion project ramps up towards full capacity.

Around 93 per cent, or \$3.7 billion, of the alumina produced in Western Australia was exported in 2011–12, with a relatively small amount shipped by Alcoa to its aluminium smelters in Victoria. The State's main export market in 2011–12 was the United Arab Emirates, which took 21 per cent of the State's alumina. China, the world's largest consumer and major producer of aluminium accounted for 20 per cent. Other major customers included South Africa (13 per cent), Bahrain (nine per cent), Mozambique (eight per cent), United States (six per cent), and Qatar and New Zealand (four per cent each).

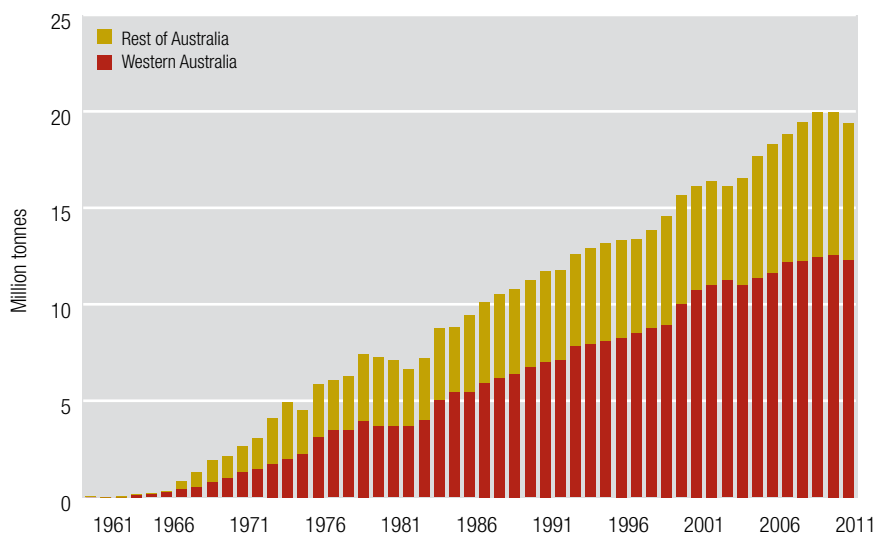


Figure 43 | Alumina Quantity Source: DMP and BREE

2.6 NICKEL

Western Australia is the sole producer of nickel in Australia and accounts for about 13 per cent of the world's nickel output. In 2011–12, nickel production for the State totalled 208,560 tonnes, 16,111 tonnes higher than in 2010–11. Most of this production comes from nickel sulphide mines, which accounted for 79 per cent of the total. The balance emanates from two laterite mines, Murrin Murrin and First Quantum Minerals' Ravensthorpe mine which restarted in late 2011. These latter operations underpinned the increase in the State's nickel production in 2011–12.

The value of Western Australian nickel sales decreased by 20 per cent to \$3.7 billion in 2011–12. This was attributable to a 20 per cent fall in nickel prices, which averaged US\$19,298 per tonne for the year. Slower demand in China along with growing world supplies of nickel continues to place downward pressure on nickel prices. The high value of the Australian dollar also had a negative impact on sales of the State's nickel, which averaged \$18,667 per tonne in Australian dollar terms in 2011–12.

During 2011–12, nickel prices have shown a gradual decrease, falling by 25 per cent in Australian dollar terms from \$22,010 in July 2011 to \$16,541 in June 2012. Market conditions have been extremely challenging for the State's nickel sector in recent months which has seen some producers placed under severe cost pressure. This has resulted in the deferral of several nickel projects and some mines being put on care and maintenance until conditions improve.

Nickel production in Western Australia came from the following operations in 2011–12:

- BHP Billiton's Nickel West, which is the largest producer of nickel in Western Australia. This operation incorporates concentrators at Mt Keith, Leinster and Kambalda, the Kalgoorlie smelter and the Kwinana refinery. Nickel West is also the world's fourth largest producer of nickel in concentrate.

Falling nickel prices has resulted in BHP Billiton scaling back its Western Australian nickel operations.

- Minara Resources Ltd – Murrin Murrin laterite operation located between Leonora and Laverton in the northeast goldfields of Western Australia.
- Mincor Resources NL – Carnilya Hill, McMahon, Otter Juan, Mariners and Miitel nickel mines

- Western Areas NL – Forrester Nickel Operation incorporating Flying Fox and Spotted Quoll nickel mines and the Lounge Lizard deposit (acquired in July 2012).
- Panoramic Resources Limited – Lanfranchi nickel operation incorporating four separate orebodies (Lanfranchi, Helmut South, Winner and Deacon) and the Savannah nickel mine.
- Xstrata Nickel Australasia Pty Ltd – Cosmos nickel operation incorporating Alec Mairs, Cosmos South (Prospero) Tapinos and their Sinclair nickel mine. Cosmos has since been placed on care and maintenance.
- First Quantum Minerals Ltd – Ravensthorpe laterite nickel mine achieved commercial production in late 2011, after having been in care and maintenance for almost two years. First Quantum acquired the project from BHP Billiton in February 2010 and includes an open cut mine and hydrometallurgical process plant.

A range 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 2011–12, these operations included:

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

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 other non-ferrous (including 'super') alloys, nine per cent is used for plating and six per cent in other uses including coins and a variety of nickel chemicals.

Western Australia's largest export market for nickel in 2011–12 was China taking 40 per cent, followed by Canada and Japan – which accounted for 11 per cent and nine per cent respectively. Other export markets included the United States (eight per cent), Malaysia (six per cent), Norway and the Netherlands (taking five per cent each) followed by Finland (four per cent).

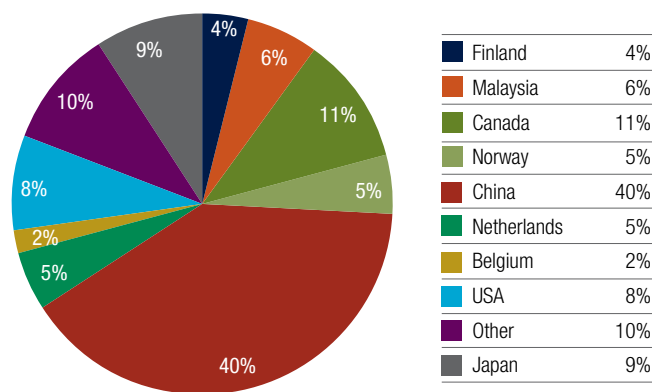


Figure 44 | **Nickel Exports – Total Value \$3.7 Billion** Source: DMP

The growth of nickel pig iron production in China to produce stainless steel continues to influence the global nickel market. Nickel pig iron is a low purity ferro-nickel with 1.5 to 8 per cent nickel grade being produced from blast furnaces and 10 to 25 per cent nickel grade from electric furnaces (much lower than conventional ferro-nickel, which averages 25 to 40 per cent nickel content), with iron accounting for the balance.

The blast furnace process used to produce nickel pig iron has costs of around US\$20,000 per tonne and is gradually being replaced by the rotary kiln electric furnace which has lower costs of around US\$15,000 per tonne and added advantages of energy conservation and emissions reduction. As highlighted in 2007, when nickel prices reached a record high of over US\$50,000 per tonne, nickel pig iron provides a low cost substitute for high quality refined nickel when prices are high.

Since it started in 2005, China's production of nickel pig iron has risen more quickly than its output of refined primary nickel and now exceeds its refined nickel production. Almost all of China's low grade nickel laterite ores to produce nickel pig iron are sourced from the Philippines and Indonesia. China has also been expanding its nickel refining capacity and nickel pig iron accounts for the largest proportion of this additional capacity.

Plans by the Indonesian Government to introduce a ban on the export of unprocessed minerals from 2014 has resulted in a surge in Indonesian laterite nickel ore production and exports, as producers seek to beat the ban. This has seen a substantial rise in China's

imports of laterite ores from Indonesia which has also contributed to increased global nickel stocks which have weighed on nickel prices. It is unclear how the export ban will affect global nickel supply and prices in the longer term.

Demand for the State's high quality nickel concentrate is expected to increase, as world economic activity picks up along with demand for stainless steel. In the short-term, nickel demand will continue to be driven by China. However, a sustained recovery of the nickel market will depend upon improvements in other markets such as Europe and the United States. A key challenge for nickel producers will be to continue to reduce operating costs.

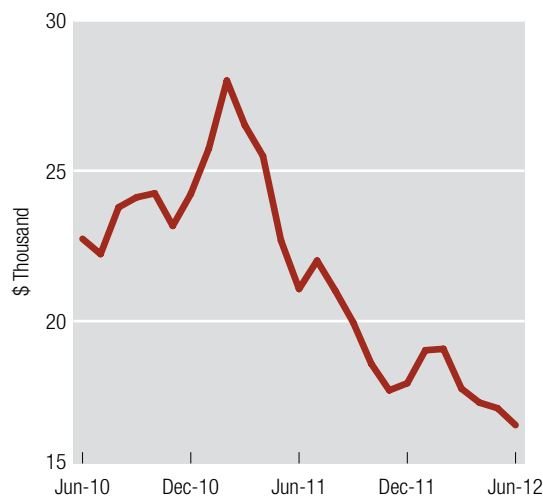


Figure 45 | **Nickel Price A\$'000/tonne**
Source: LME Cash, Monthly Average

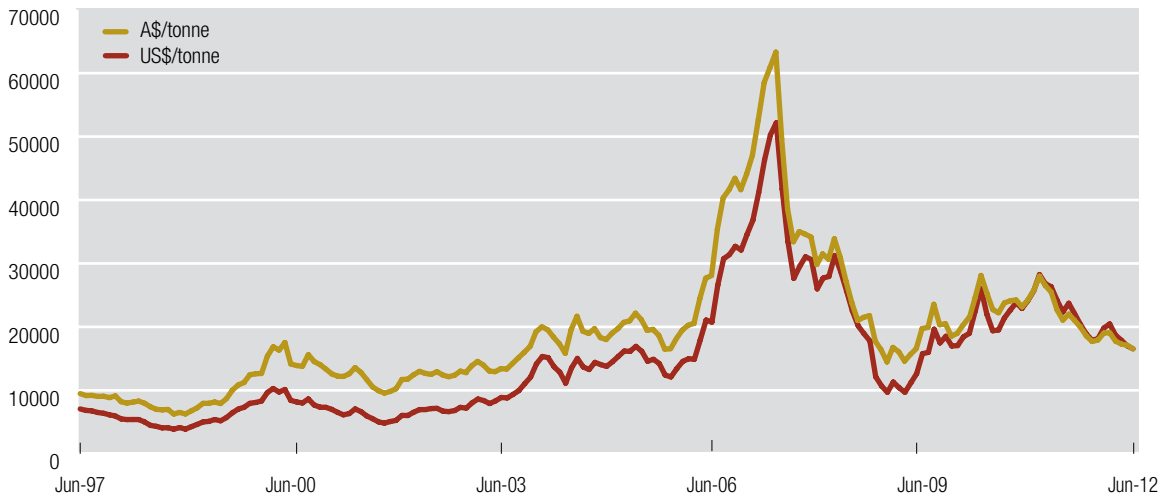


Figure 46 | **Historic Nickel Price per tonne** Source: LME

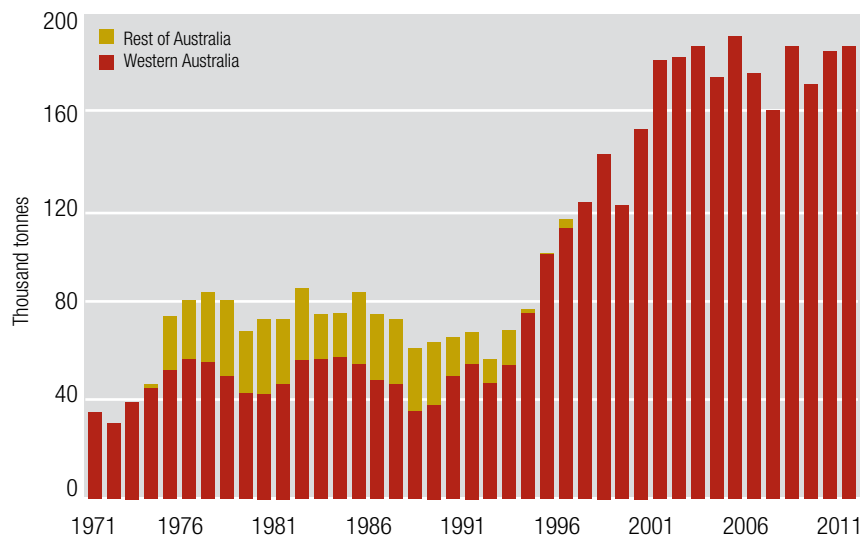


Figure 47 | **Nickel Quantity** Source: DMP and BREE

2.7 BASE METALS

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

Continued global economic constraints saw the value of base metals produced in Western Australia in 2011–12 decrease by more than 16 per cent on the previous year to slightly under \$1.3 billion.

This is largely attributable to strengthening of the Australian dollar and a 10 per cent decrease in the value of the State's most valuable base metal, copper, which achieved marginally under \$1.2 billion in sales.

The trading prices for all base metals, in Australian dollar terms, finished below 2010–11 levels and below pre-Global Financial Crisis highs.

The production of base metals in Western Australia is dominated by Aditya Birla Minerals' Nifty copper mine, producing 29 per cent of the total value of base metals, followed by Minerals and Metals Group's Golden Grove copper–lead–zinc mine (25 per cent).

The other major producers of base metals include Newmont's gold–copper mine at Boddington (17 per cent), and Newcrest's Telfer gold–copper operation (15 per cent).

Some production of base metals also emanates as a by-product of nickel mining and in 2011–12 this accounted for six per cent of the total value of the State's base metal sales.

Copper

The average price for copper in 2011–12 fell to US\$8164 per tonne representing a six per cent decrease on 2010–11 levels. This decrease is a result of the ongoing sovereign debt crisis in Europe, uneven US economic recovery, slowing down of China's economic growth and high stock levels. Copper is used in a wide range of products, making prices sensitive to shifts in the economic growth outlook. In Australian dollar terms, copper prices averaged \$7901 per tonne, a decrease of almost 10 per cent over 2010–11.

During 2011–12, the total quantity of copper sold out of Western Australia was 152,567 tonnes, at a total value approaching \$1.2 billion.

Nifty, located 350 kilometres east of Port Hedland, is the State's largest copper producing mine. In 2011–12 it produced 47,154 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.

Telfer, located 310 kilometres northeast of Newman, produced 31,236 tonnes of copper in concentrate, followed by Boddington, which produced 30,196 tonnes of copper in concentrate.

Golden Grove was the next major producer, located 55 kilometres south of Yalgoo in the Mid West, which produced 23,879 tonnes of copper in 2011–12.

Golden Grove consists of the Scuddles and Gossan Hill mines and processing operations. Mining at Scuddles restarted in April 2011. Gossan Hill operations commenced in January 2012 and will produce approximately 235,000 tonnes of copper concentrate containing 59,600 tonnes of copper metal in concentrate over the life of the mine.

Jaguar was the smallest copper producer with 7257 tonnes.

Copper was also produced as a by-product (approximately seven per cent of the total copper produced) from a number of nickel operations, with nine mines selling 10,597 tonnes. The largest of these producers was Panoramic Resources Limited's Savannah nickel mine, producing 4987 tonnes of copper in concentrate.

The newest copper mine to come into production was Sandfire Resources DeGrussa high grade copper–gold mine which is located 140 kilometres northeast of Meekatharra. The start of ore mining at DeGrussa occurred in February 2012, with the first shipment of copper ore in May 2012. Regular shipments of high-grade direct shipping ore are expected over the remainder of 2012.

Zinc

The average prices for zinc and lead also fell during 2011–12 by 10 per cent to US\$2019 per tonne and 11 per cent to US\$2128 per tonne respectively. In Australian dollar terms, the decreases were marginally more pronounced with zinc falling by 14 per cent to \$1954 per tonne and lead decreasing by 15 per cent to \$2059 per tonne.

Western Australia's two zinc producers are Minerals and Metals Group's Golden Grove mine and Independence Group's Jaguar Project.

During 2011–12, zinc production at Golden Grove amounted to 65,319 tonnes of metal in concentrate, up from 58,906 tonnes in 2010–11. Zinc production at Jaguar totalled 16,569 tonnes of metal in concentrate, up from 14,671 tonnes in 2010–11.

Lead

Lead sales in Western Australia decreased by 87 per cent to 6554 tonnes in 2011–12. Production was limited to one producer – Golden Grove.

Golden Grove reported an increase in annual production to 8190 tonnes in 2011–12, from 6052 tonnes in 2010–11.

Ivernia's Magellan lead operation, located 30 kilometres West of Wiluna, was under review and placed in care and maintenance in 2010–11. In mid-2012 Magellan Metals recommenced the export of lead carbonate concentrate via Fremantle Port.



MMG Golden Grove base and precious metals underground mine in Western Australia's Mid West.

© MMG MINERALS AND METALS GROUP

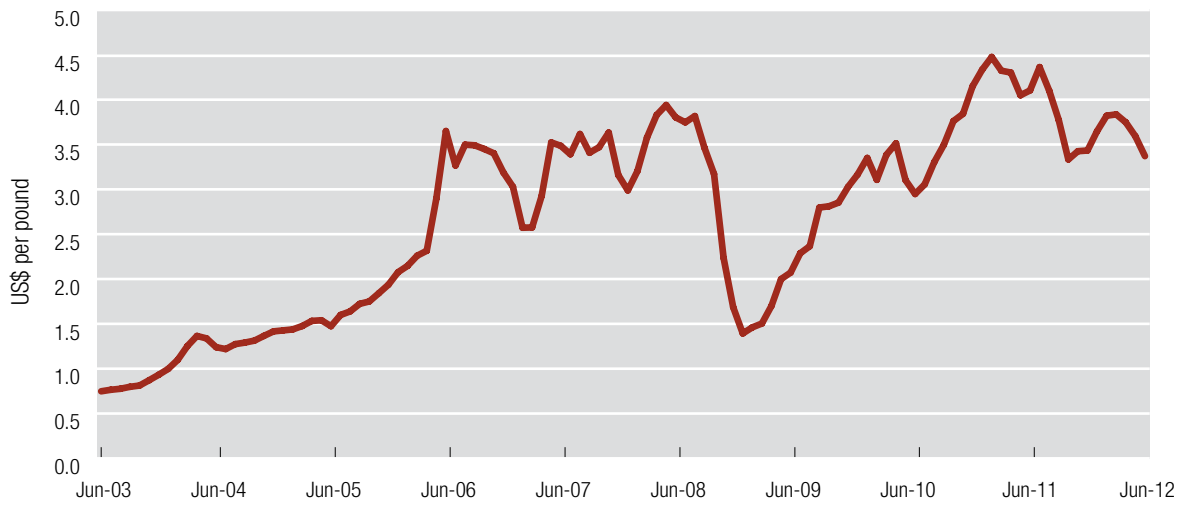


Figure 48 | **Copper Price** Source: Metalprices.com



Figure 49 | **Lead Price** Source: Metalprices.com

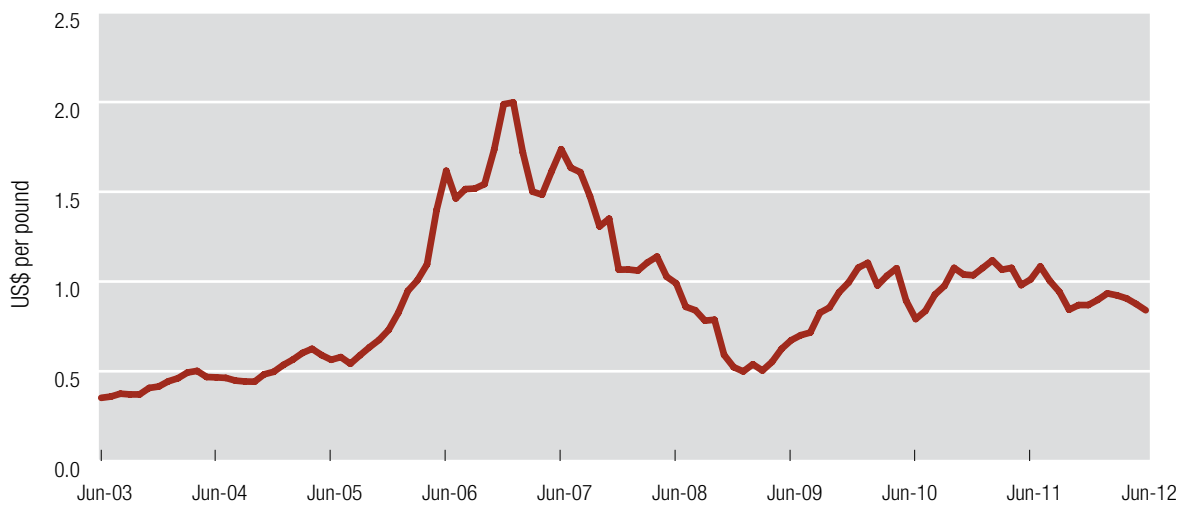


Figure 50 | **Zinc Price** Source: Metalprices.com

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 was \$879 million in 2011–12. This represents a substantial 86 per cent increase from the \$473 million in 2010–11. Only product covered by the *Mining Act 1978* and relevant State Agreement Acts are included in these calculations. Product mined from land titled prior to 1 January 1899 and other states are excluded.

Sales revenues in 2011–12 benefited from escalating prices for synthetic and natural rutile, and zircon which have rebounded strongly since the global financial crisis and have compensated for the general decline in volumes. In part, this reflects the continuing transition of the titanium feedstock sector away from long term contracts and annual pricing, towards shorter term contracts and more frequent price negotiation.

Prices received by Australian producers of heavy mineral sands were significantly higher in 2011–12 and more than offset the strong Australian dollar. Zircon prices increased by 82 per cent and averaged \$2327 per tonne. Prices for titanium dioxide (TiO₂) pigment averaged \$3216 which was 21 per cent higher than the previous year. Rutile and ilmenite prices also rose by 114 per cent and 44 per cent respectively.

The best sales result came from synthetic rutile which was valued at \$457 million, up by a considerable \$329 million from 2010–11 (\$128 million) and was the State's highest valued titanium mineral product. Quantities sold increased by 28 per cent to 322,389 tonnes. This was against a general backdrop of declining production and coincided with the commissioning of Iluka's Tutunup South mine in June 2011 and the re-commencement of mining activities at Eneabba in 2012. Both mines provide a feed source for Iluka's synthetic rutile operations.

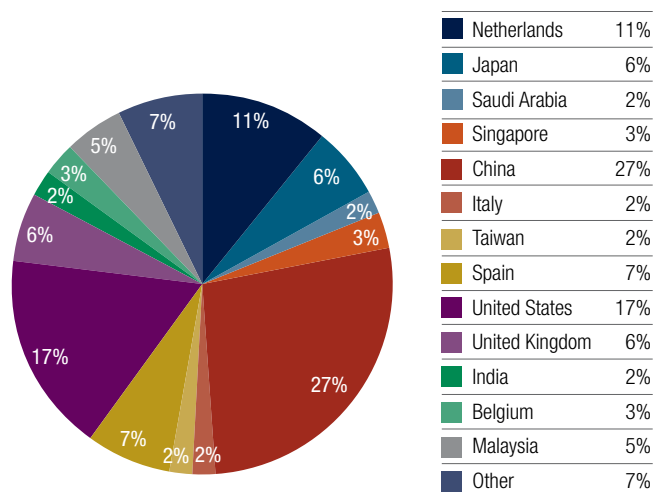


Figure 51 | **Heavy Mineral Sands Exports – Total Value \$1.3 Billion**

Source: DMP

Note: Exports include titanium dioxide and product sourced from private land, overseas and other States and processed in Western Australia.

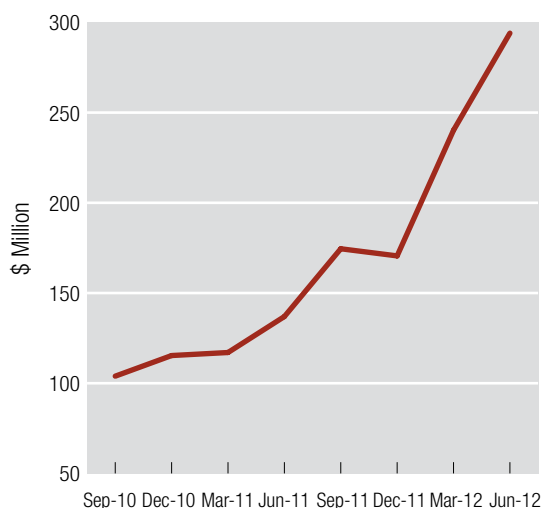


Figure 52 | **Heavy Mineral Sands – Value by Quarter**

Source: DMP

The value of zircon sold increased by 11 per cent to \$222 million despite a 39 per cent decrease in output which totalled 182,042 tonnes. Similarly, ilmenite sales rose by 32 per cent in value to \$70 million whilst quantities declined by eight per cent to 362,011 tonnes. Sales of rutile and leucoxene were also up by 49 and 37 per cent respectively in spite of corresponding production falls of 22 per cent and 15 per cent.

In 2011–12, Western Australia exported \$1.3 billion worth of heavy mineral sands including product mined from private land and/or imported from interstate. China was the State's major export market for heavy mineral sands accounting for 27 per cent of total exports followed by the United States which took 17 per cent. Highlighting the diversity of export markets for Western Australian heavy mineral sands, other major export destinations included the Netherlands (11 per cent), Spain (7 per cent) and the United Kingdom (6 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 81 per cent (by value) of all the State's mineral sands produced in 2011–12.

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.

The Narngulu processing facility was upgraded in 2009 and 2010 to accept Jacinth-Ambrosia heavy mineral concentrate, and again in 2011 to support production from Eneabba via the reactivation of its synthetic rutile kiln three for commercial production.

In response to strong demand for titanium dioxide and zircon products, Iluka re-commenced mining activities at Eneabba in 2012 which were placed on halt in 2010 due

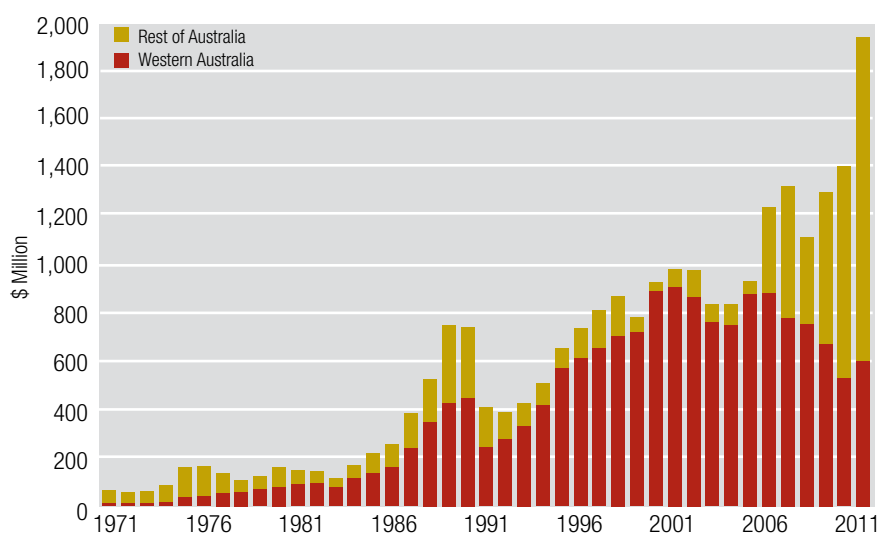


Figure 53 **Heavy Mineral Sands Value of Production**
Includes Ilmenite, Leucoxene, Upgraded Ilmenite, Rutile, Zircon and Monazite
Source: DMP and BREE

to declining ore grades and low margins. The mine produces ilmenite as a feed source for synthetic rutile capacity, as well as zircon and rutile and is expected to occur for three years.

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.

Following the acquisition of its equal joint venture partner, South African company Exxaro Resources, the Tiwest project became fully owned by United States based titanium producer Tronox on 18 June 2012. This resulted in a change of name for the project from the Tiwest Joint Venture to Tronox Management.

The 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. This synthetic rutile is then 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 Management aims to extend the life of its mining operations and increase production capacity via its Rapid Growth Projects. This includes extending the Cooljarloo mine by including Cooljarloo West and developing a greenfields mining and processing site at Dongara. The new mine is expected to begin production in 2014 subject to obtaining all statutory approvals. Growth plans also include the development of new technologies for the production of titanium alloys and proposals to expand synthetic rutile and pigment operations at the Chandala and Kwinana plants.

In 2011–12, other companies producing titanium minerals and zircon in Western Australia included Doral Mineral Sands Pty Ltd which has its mineral sands operation near Bunbury along with the Saudi Arabian owned Cristal Global operating as Cable Sands (WA) Pty Limited. In December 2011, the proposed acquisition of Cable Sands by Minerals Commodities Ltd came to an end and did not eventuate.

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

Western Australian diamond sales volumes fell by 14 per cent in 2011–12 to 8.7 million carats, a level not seen since the 1980s when diamond mining first commenced operations in Western Australia.

Rio Tinto's Argyle mine, 112 kilometres south-southwest of Kununurra, accounts for the bulk of diamond production in Western Australia and celebrated its 25th anniversary in 2011. 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 2011–12, Argyle sold around 8.5 million carats, a decrease of 15 per cent from the previous year. This fall reflects the depletion of reserves in the open pit and the fact that the open pit mine is in its final stages prior to an underground mine accessing higher grades. The underground mine will replace the open pit and extend the life of the mine beyond 2019. This transition to underground is expected to take place in 2013 and produce more than 20 million carats in 2014 and close to 30 million carats by 2016.

Gems Diamonds, with its Ellendale mine, is located 100 kilometres east of Derby and is the State's only other producing diamond mine. In 2011–12 Ellendale produced 147,000 carats, up nine thousand carats or seven per cent on the previous year. Supply from this mine remains well below 2007–08 levels of 488,000 carats. Processing of difficult wet ore has hampered production however recent modifications to plant have facilitated improved production rates.

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.

In the first half of 2011–12, the company achieved an average price per carat for its yellow diamonds of US\$4711 and US\$4315 for the second half.

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 was discovered in Zimbabwe in 1997.

Botswana and Russia are the two largest producers and between them 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. Slower GDP growth, which is now the expectation for the next couple of years (particularly in the US and Europe) coupled with currency fluctuations could be an issue for the diamond industry.

As with gold, the diamond industry is experiencing declining reserves, increased costs and lower grades. To lower costs, diamond cutters are using recent advances in sophisticated laser cutting machines that can cut and polish diamonds with minimal human labour.

The recent strength in rough diamond prices can be attributed to increased demand from emerging markets such as India and China and a diminishing supply of rough and polished diamonds in the cutting centres. This trend is set to continue with a lack of large diamond mines coming on stream in the past five years.

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 decreased by three per cent to slightly under seven million tonnes, whilst the value decreased by two per cent to \$290 million.

Verve Energy, the State's major generator of electricity, purchase about 80 per cent of the coal mined at Collie for use in their power stations. Coal fuels around 35 per cent of Western Australia's power generation. Gas represents about 60 per cent of the total fuel used while fuel oil and renewable energy sources such as wind and hydro make up the remainder.

About 90 per cent of Collie coal is used as thermal coal, mostly in power stations. The majority of the remainder is used in metallurgy by the mineral sands industry to transform ilmenite to synthetic rutile.

To date, the export of raw coal, through Kwinana port, has been minimal. A plan to establish a 12 million tonne per annum coal export facility at Bunbury port has been proposed.

Possible Coal Developments

Rey Resources Limited has completed a definitive feasibility study on their \$199 million Duchess–Paradise coal project in the Canning Basin. Located 150 kilometres southeast of Derby, the project has the potential to export thermal coal to Asian power generation markets. The project is currently progressing through the Government approvals process and the initial construction phase is proposed to start in 2013 with first production anticipated in 2014. The proposed operation has a project life of 20 years.

There are several coal associated developments in the South West which 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.

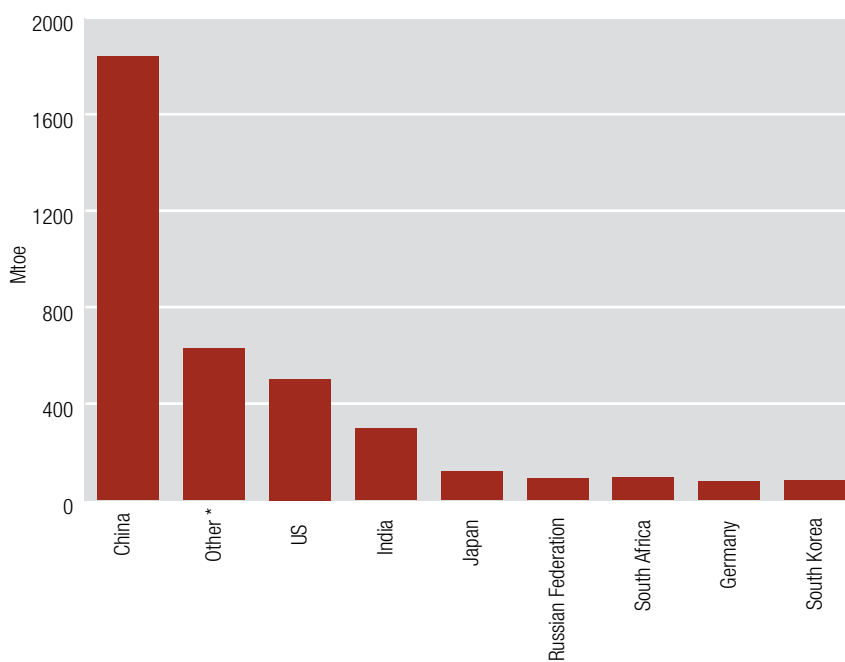


Figure 54 | **World Coal Consumption 2011** Source: BP World Energy Statistics 2012
* Other consists of 50 countries including Australia

- Perdaman is developing a \$3.8-billion coal-to-urea manufacturing plant on a 125-hectare site within the Shotts Industrial Park. The Perdaman Collie Urea project would be Australia's first gasification plant, using three million tonnes per year of Collie coal to produce urea.
- The Blackham Resources Limited (operator) and Wesfarmers Limited joint venture completed a preliminary processing study on a coal to liquids (CTL) project to produce diesel near Esperance. A number of studies have been completed of the upgrading of coal for possible export as well as a scoping study for exporting Scaddan coal. Blackham manages a combined coal resource estimated at 1.4 billion tonnes.

The recently published data in the BP World Energy Statistics 2011 shows that Australia's domestic coal consumption represents just 1.3 per cent of the total world's coal consumption. Accounting for around 63 per cent of consumption is China (49.4 per cent), followed by the United States (13.5 per cent).

Salt

Western Australia accounts for more than 80 per cent of national salt production and is the country's dominant exporter. In 2011–12, the volume of Western Australian salt sales rose by five per cent to 12.8 Mt. However sale values fell by a similar amount to \$354 million. A four per cent strengthening of the Australian dollar together with the expiry of high long-term price contracts (which had been negotiated at pre-global economic crisis levels) offset increased output levels.

Dampier Salt Limited has operations in Dampier and Port Hedland in the Pilbara and Lake MacLeod in the Gascoyne. The company accounted for around 74 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 the WA Salt Supply's Lake Deborah East (at Koolyanobbing) and Pink Lake (at Esperance) operations make up the smaller producers.

In June 2010, Dampier Salt Limited signed a five-year contract to supply approximately 500,000 t/a of gritting

salt to local United Kingdom (UK) authorities. This allows the UK to be better prepared for unpredictable winter weather conditions and will not have to rely on emergency supplies from other European regions.

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.

With anticipated growth in China, world demand for salt is projected to increase in the next three years from 290 Mt to about 300 Mt. Western Australian salt producers are well placed to take advantage of this growing market.

Lithium, Tin and Tantalum

Tantalum production in Western Australia has traditionally come from two mines, Greenbushes in the South West and Wodgina in the Pilbara region. 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 Australia Limited's recently opened Mt Catlin 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 therefore found in many everyday devices such as mobile phones, lap-top 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 260,000 t/a of lithium concentrate.

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

In October 2010, Galaxy Resources Limited's \$68 million Mt Cattlin lithium–tantalum project commenced production becoming Western Australia's second lithium producer. Mt Cattlin is located close to the town of Ravensthorpe in the South West of the State. Galaxy's first shipment of spodumene was shipped in March 2011 to its value-adding lithium carbonate plant in China. The plant has a design capacity of 17,000 tonnes per annum of battery grade lithium carbonate and was commissioned earlier in 2012.

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 200,000 t/a. The project also has the potential to recover mica, tantalum and potash–feldspars 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 including a range of rock types, brine lakes and sea water. The contained concentration of lithium is generally low and there are only a limited number of resources where lithium can be economically extracted. These are lithium-rich brine lakes and mineral deposits. 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.

Manganese and Chromite

In 2011–12 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 about 1.5 Mt/a of manganese ore with an average grade of about 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 open-cut mine was first established in 1954. It continued operating until 1982 and re-opened 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 have long-term contracts with Boasteel Resources Co. Ltd of China for the supply of both lump and fines manganese.

Nicholas Downs, located 130 kilometres northwest of Newman, is a joint venture between Mineral Resources Limited (operator) and Hancock Prospecting Pty Ltd. The project first operated in the second half of 2010 with final sales being shipped in the September quarter of 2011.

The weakening of the Australian dollar combined with a drop of 18 per cent in output and softer prices saw the value of Manganese fall by almost 32 per cent to \$264 million. June 2012 quarter average prices fell by some 12 per cent when compared with the same time last year.

Manganese ore is priced on a monthly basis using a specification grade of 45.5 per cent manganese grade.

Consolidated Minerals is also the State's sole producer of chromite ore. Their Coobina mine is located 80 kilometres southeast of Newman and has an operating capacity of around 250,000 t/a of high-grade ore.

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

June 2007 saw the commencement of mining operations at Lynas Corporation's Mt Weld Rare Earths project located 18 kilometres southeast of Laverton. The initial mining campaign was successfully completed in June 2008 with 773,300 tonnes of ore,



Rare earths concentration plant at Mount Weld, WA (operated by Lynas Corporation Ltd)

© Lynas Corporation Ltd

at an average grade of 15.4 per cent rare earths oxide (REO) stockpiled. This provides sufficient stockpiled ore for the first two years of Lynas's downstream processing operation. The second mining campaign is scheduled for 2013.

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. Around 13,000 tonnes of concentrate containing more than 4800 tonnes of REO is now bagged ready for export to Lynas' Advanced Materials Plant in Malaysia (LAMP).

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

The first phase of the project is designed to produce an estimated 11,000 t/a whilst a second phase expansion would increase to 22,000 t/a. The mine is expected to have at least a 20-year mine-life.

Mt Weld, with its very high grade, contains light rare earths and is also high in europium, a heavy rare earth, 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 earths output (with 70 per cent of light rare earths 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 earths and 25 per cent on heavy rare earths.

China also holds 50 per cent of rare earth reserves, 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 earths being extracted from within China and the supply of high demand elements will require the development of other sources.

Rare earths 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 earths are relatively abundant in the Earth's crust; however, they are often of low quality and rarely present in economic concentration.

Rare earths 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 this demand. Worldwide, vanadium consumption is currently around 75,000 t/a.

Atlantic's first shipment of ferro-vanadium left Windimurra in May 2012 and production is on track to ramp-up to full

plant capacity of 6,300 t/a by early 2013. Windimurra has a projected life of around 24 years and will also produce around 1.5 Mt/a of hematite 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 eventually closing after processing 7.2 Mt of ore and producing 13,000 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.

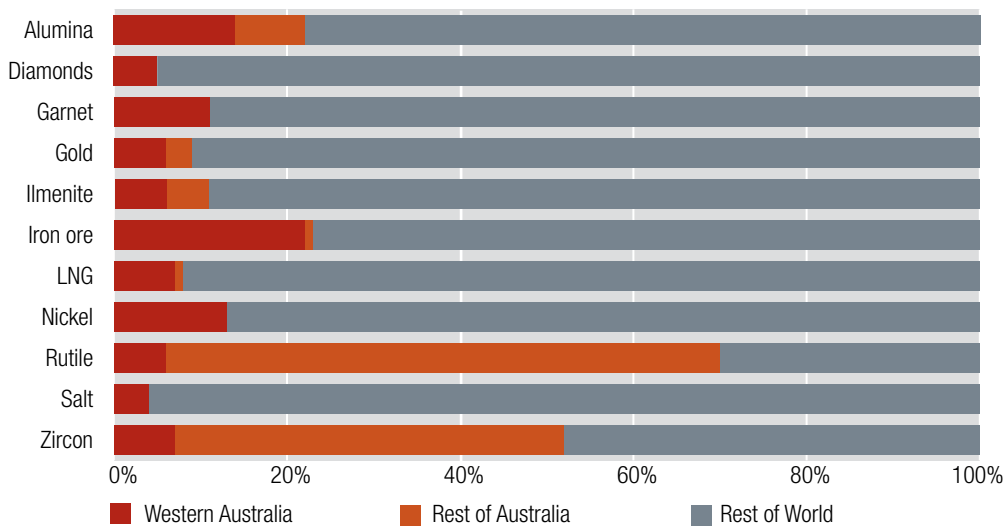


Figure 55 | **Selected WA Commodities Relative to World Production Ending 2011 by Quantity**

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 11%, gold 6%, ilmenite 6%, iron ore 22%, LNG (sea-borne trade) 7%, nickel 13%, rutile 6%, salt 4%, zircon 7% and 5% of diamonds (mainly industrial grade)

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. In March 2008, legislation was introduced to capture exploration personnel working on 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, 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.

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 2011–12 show that there were on average 96,876 persons directly employed in Western Australia's mining industry (including 3681 people employed in mineral exploration). This represents an increase of 14 per cent compared with 2010–11 which reached 85,113 employees.

In 2011–12, iron ore was the largest employing sector in the State's mining industry with 37,526 employees. Gold and bauxite–alumina followed with 22,439 and 10,247 persons respectively. Together the iron ore, gold and bauxite–alumina sectors accounted for 72 per cent of total employment in the State's mining industry in 2011–12.

Supported by the current wave of construction activity, Western Australia's mining workforce is projected to grow before peaking in 2014 as a number of projects become operational. As witnessed in the latter half of 2012, mineral producers are increasingly looking to review employment levels amidst rising cost pressures.

Petroleum

From 1 January 2012 the responsibility for administering safety regulation for coastal waters under the *Petroleum (Submerged Lands) Act 1982* reverted to the Department of Mines and Petroleum. This service had previously been provided by the National Offshore Petroleum Safety Authority (NOPSA) which is now known as the National Offshore Petroleum Safety and Environment Management Authority (NOPSEMA). NOPSEMA is responsible for administering safety regulation in Commonwealth waters.

For areas under State jurisdiction, petroleum employment data is compiled from monthly safety reports submitted to the Department of Mines and Petroleum. This is for Western Australian petroleum facilities and pipelines both onshore

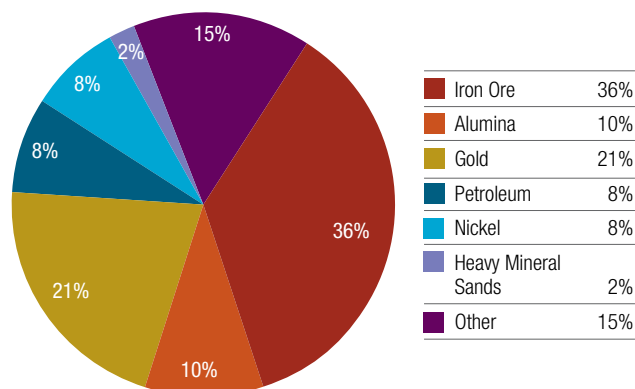


Figure 56 | **Minerals and Petroleum Employment 2011–12**
Total 105,581
Source: DMP and Petroleum Producing Companies

and in coastal waters. This data represents the average number of persons employed at operating sites, including contractor employees, over a 12 month period.

In order to capture the wider extent of petroleum employment, offshore Western Australia plus LNG facilities, the Department conducts a survey of petroleum producing companies in Western Australia to estimate the average number of people working in locations not within scope of the Department's petroleum safety regulatory responsibilities. Where possible, estimates are obtained for both direct and contract employees working at operational sites and on major developments.

In 2011–12, the average number of petroleum employees working onshore and in coastal waters in Western Australia reached 2885 persons. Approximately 5820 petroleum employees were located in offshore (Commonwealth) waters and/or LNG processing facilities. In total, Western Australia's petroleum industry employed an estimated 8705 persons.

Although the petroleum industry is characterised by massive amounts of capital expenditure, it does not require the same level of operational labour as does mining. However, employment in the State's petroleum industry is set to increase substantially due to growing energy demand from Asia which is underpinning the development of large projects for the export of LNG.

Major projects under construction include the Gorgon LNG project which is now estimated to cost in excess of \$50 billion and the \$29 billion Wheatstone LNG project and are scheduled to operate in 2015 and 2016 respectively. These projects are generating thousands of employment opportunities during construction. As these projects and other potential developments move towards operation over the next five years, the LNG operator workforce is expected to rise rapidly.



Pluto LNG oshore gas plant.

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3.2 INVESTMENT

Australian Bureau of Statistics (ABS) private new capital expenditure statistics indicate that the State's mining industry invested a record \$45 billion in 2011–12. This represents a substantial 58 per cent increase compared to 2010–11 and highlights the high levels of resource construction activity in Western Australia which continues to be a major driver of the economy.

Western Australia remained the nation's leading mining investment destination in 2011–12 attracting 55 per cent of total capital spending by the industry in Australia valued at \$82 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 26 per cent during the five years to 2011–12.

In 2011–12, new capital expenditure in Western Australia by mining, manufacturing and other selected industries increased by 52 per cent to \$56 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 80 per cent of the State's total private new capital expenditure in 2011–12. This dominance is expected to continue given the large pipeline of major resource projects under construction.

It is important to note that the figures reported above do not capture all mining investment as the ABS uses classifications specified in the 2006 edition of the Australian and New Zealand Standard Industrial Classification (ANZSIC) (ABS catalogue number 1292.0). Accordingly, mining is broadly defined as the extraction of minerals occurring naturally as solids such as coal and ores, 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.

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

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, on-line company research consultancy systems, media announcements and company websites. Currently, information on mineral and petroleum projects comprises approximately 125 projects.

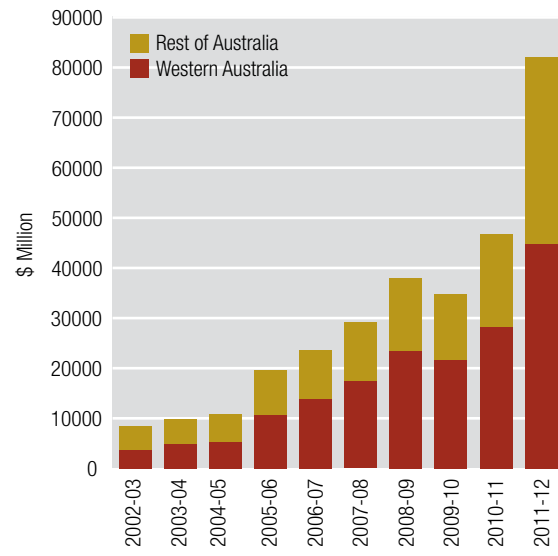


Figure 57 | Mining Investment Source: ABS

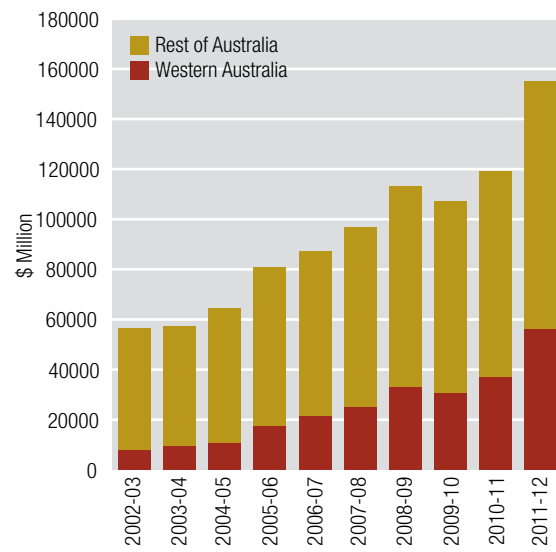


Figure 58 | New Capital Investment Source: ABS

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.

Based on information available up to 30 September 2012, 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 2012, Western Australia had an estimated \$167 billion worth of resource projects under construction or in the committed stage of development. A further \$151 billion has been identified as planned or possible projects in coming years.

The total value of major projects in September 2012 has remained constant compared to March 2012 despite some project cancellations due to falls in global commodity prices and a number of projects completing. This has largely been offset by rises in project values arising from cost revisions.



The scale of investment in the State remains at record levels and led by major export orientated LNG and iron ore projects under construction.

The \$43 billion Gorgon LNG project continues to lead resource construction followed by the \$29 billion Wheatstone LNG project, while the \$5 billion North Rankin natural gas redevelopment is still underway.

Major iron ore projects under construction include Hancock Prospecting's Roy Hill mine (\$9.5 billion) and its Hope Downs 4 mine expansion (\$2.0 billion) in joint venture with Rio Tinto, BHP Billiton's Jimblebar mine expansion (\$3.3 billion), CITIC Pacific's Sino Iron Pellet Project (\$7.8 billion) and Gindalbie Metals' Karara Magnetite project (\$2.6 billion) which are both nearing completion.

Continued expansion of the iron ore industry is supporting high levels of construction in major infrastructure. This includes Rio Tinto's expansion of Pilbara mines, ports, railways to 283 Mt/a valued at \$9.5 billion, with further expansion to 353 Mt/a (\$5.7 billion) by 2015.

Additional major infrastructure developments include BHP Billiton's Port Hedland inner harbour port expansion (\$2.2 billion) and enhancement of Port Blending and Rail Yard facilities (\$1.6 billion). Fortescue Metals Group has revised its Pilbara mines and infrastructure expansion plans to support increased capacity to 115 Mt/a (\$4.4 billion).

Other significant mineral projects under construction include Rio Tinto's Argyle Diamond Underground Development (\$2.0 billion) and AngloGold Ashanti/ Independence Group's Tropicana gold project (\$740 million).

Weaker commodity prices and falling demand from China has resulted in the deferral of some projects notably BHP Billiton's Port Hedland outer harbour port expansion and Fortescue's Metals Group's \$7 billion Solomon mine expansion. Subdued market conditions have also seen Heron Resources' Kalgoorlie Nickel Project (\$1.4 billion) and BHP Billiton's Mount Keith nickel expansion (\$1.3 billion) being put on hold.

Major projects completed since March 2012 include Worsley's Alumina Refinery expansion (\$3.4 billion), Fortescue Metals Group Christmas Creek expansion (\$1 billion) and Atlantic's Windimurra vanadium project (\$600 million).

Investment in Major Projects (as at 30 September 2012)

MAJOR PROJECTS Commodity	CAPEX MILLIONS	
	Committed/ Under Construction	Planned/ Possible
Gold	996	215
Iron Ore	29,394	34,183
Nickel	53	3,496
Other Minerals and Infrastructure	26,291	22,627
Sub Total	56,734	60,521
Crude Oil and Condensate	1,451	820
LNG	100,190	88,100
Gas	9,000	447
Pipelines and Infrastructure		1,525
Sub Total	110,641	90,892
Total Forecast Investment	167,375	151,413

Source: Department of Mines and Petroleum

3.3 ROYALTIES

Over the past 10 years, royalties received by the Western Australian Government from the State's mineral and petroleum producers have increased 365 per cent from \$1.14 billion in 2002–03 to \$5.3 billion in 2011–12. This represents royalties paid into the Western Australian Government Consolidated Revenue Fund. It includes Western Australia's share of royalties paid by petroleum projects, 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 2011–12 (attributed directly to the State) came from iron ore (72 per cent) and petroleum (18 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 is set to increase to 7.5 per cent on 1 July 2013 which is equivalent to the existing rate of lump ore.

While not collected by Western Australia, it is estimated that \$1.51 billion was also received by the Commonwealth in 2011–12 from petroleum resource rent tax (PRRT). Approximately 50 per cent of this resource rent tax (\$760 million) could be attributed to operating fields within designated Commonwealth waters off the Western Australian coast.

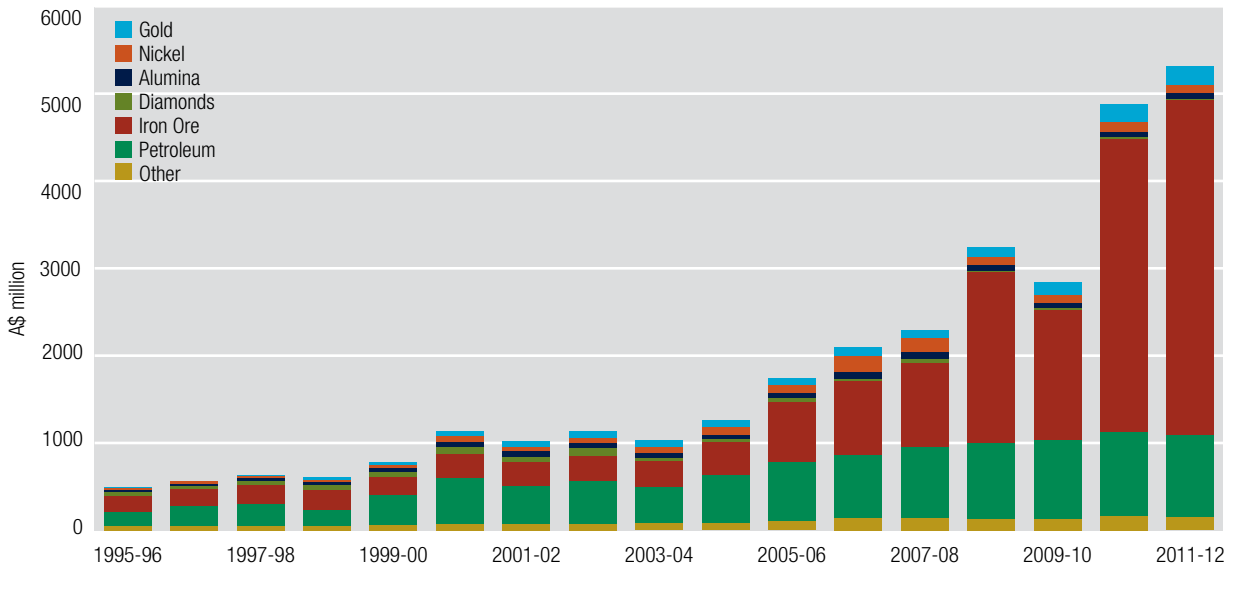


Figure 59 | Royalty Receipts by Commodity Source: DMP

TABLE 2. ROYALTY RECEIPTS 2010–11 AND 2011–12

COMMODITY	2010–11	2011–12	2011–12 Growth	
	Total A\$	Total A\$	A\$	%
ALUMINA	66,136,237	68,320,773	2,184,536	3
DIAMONDS	15,746,837	15,183,262	-563,575	(4)
GOLD	197,792,516	224,729,595	26,937,079	14
HEAVY MINERAL SANDS	19,937,428	19,220,492	-716,936	(4)
IRON ORE	3,358,628,676	3,831,267,729	472,639,053	14
NICKEL	112,934,304	89,827,390	-23,106,914	(20)
PETROLEUM	955,228,166	944,606,348	-10,621,818	(1)
OTHER	145,174,559	126,310,878	-18,863,681	(13)
TOTAL REVENUE	4,871,578,723	5,319,466,467	447,887,744	9

Note: All Royalty Receipts above are only those paid into the State's Consolidated Revenue Fund during the period. It includes the State share of the North West Shelf JV receipts. It does not include royalty receipts collected on behalf of the Commonwealth.

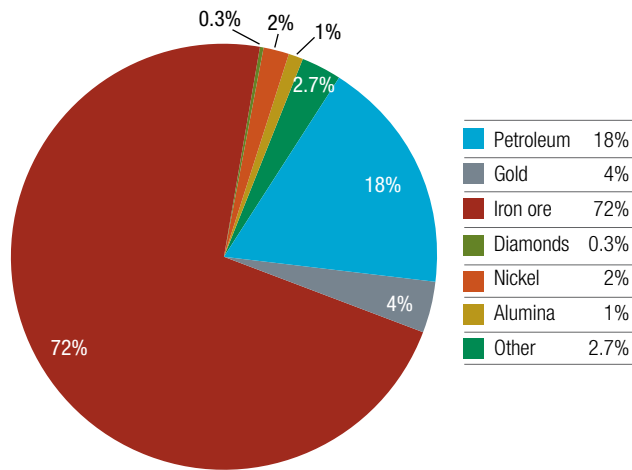


Figure 60 | **Royalty Receipts 2011–12 – \$5.3 Billion** Source: DMP

TABLE 3. QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY	UNIT	FINANCIAL YEAR 2010–11		FINANCIAL YEAR 2011–12	
		QUANTITY	VALUE	QUANTITY	VALUE
ALUMINA	t	12,280,629	3,976,889,404	12,568,987	3,950,894,867
BASE METALS					
Copper Metal	t	148,759 (r)	1,290,066,817 (r)	152,567	1,164,997,090
Lead Metal	t	40,722 (r)	97,733,654 (r)	6,554	12,873,609
Zinc Metal	t	70,537 (r)	162,108,266 (r)	63,497	120,742,626
TOTAL BASE METALS			1,549,908,737 (r)		1,298,613,325
CHROMITE	t	84,804	n/a	248,902	n/a
CLAYS		61,484	1,184,395	73,815	1,566,621
COAL	t	7,234,455	296,259,551 (r)	6,986,433	289,629,252
CONSTRUCTION MATERIALS					
Aggregate	t	1,934,860 (r)	43,801,514 (r)	3,368,354	83,798,537
Gravel	t	230,785 (r)	1,760,531 (r)	276,700	2,234,921
Rock	t	298,262 (r)	3,251,624 (r)	370,800	5,125,433
Sand	t	4,818,062 (r)	34,712,549 (r)	5,752,503	46,450,360
TOTAL CONSTRUCTION MATERIALS			83,526,218 (r)		137,609,251
DIAMONDS	ct	10,116,259	302,992,846 (r)	8,686,926	343,293,394
DIMENSION STONE		8,669 (r)	861,017 (r)	7,545	1,450,510
GEM & SEMI-PRECIOUS STONES	kg	321,349	238,547	251,190	328,719
GOLD	kg	183,800 (r)	8,186,209,475 (r)	179,417	9,350,745,265
GYPSUM	t	590,741 (r)	11,114,731 (r)	317,377	4,664,509
HEAVY MINERAL SANDS					
Garnet	t	226,620	n/a	301,944	n/a
Ilmenite	t	394,096	52,766,190	362,011	69,702,533
Leucoxene	t	26,030	12,165,131	22,231	16,691,847
Zircon	t	298,497 (r)	200,931,067 (r)	182,042	222,407,957
Other	t		207,468,336 (r)		570,540,320
TOTAL HEAVY MINERAL SANDS			473,330,724 (r)		879,342,657
IRON ORE	t	397,563,656 (r)	57,579,919,424 (r)	455,091,105	61,079,285,549
LIMESAND-LIMESTONE-DOLOMITE	t	3,717,462 (r)	32,724,760 (r)	3,581,865	32,694,634
MANGANESE ORE	t	735,135 (r)	386,769,767 (r)	603,060	264,291,911
NICKEL INDUSTRY					
Cobalt	t	3,725 (r)	145,593,537 (r)	4,890	145,415,717
Nickel	t	192,449 (r)	4,649,912,149 (r)	208,560	3,716,996,217
Palladium and Platinum By-Product	kg	440	7,036,097	626	14,909,443
TOTAL NICKEL INDUSTRY			4,802,541,783 (r)		3,877,321,377

COMMODITY	UNIT	FINANCIAL YEAR 2010–11		FINANCIAL YEAR 2011–12	
		QUANTITY	VALUE	QUANTITY	VALUE
PETROLEUM					
Condensate	kl	6,881,791	3,987,526,747	5,888,608	3,842,111,571
Crude Oil	kl	13,924,847	8,436,211,080	11,272,357	7,791,464,150
LNG	t	17,009,845	8,658,081,992	15,367,979	9,958,128,430
LPG - Butane and Propane	t	923,763	774,197,459	835,271	734,484,653
Natural Gas	'000m ³	8,862,205	1,364,589,067	9,110,271	1,454,459,941
TOTAL PETROLEUM			23,220,606,345		23,780,648,746
SALT	t	12,234,865	366,935,891	12,806,246	353,776,447
SILICA-SILICA SAND	t	430,363	13,304,556	452,637	14,742,316
SILVER	kg	85,987 (r)	76,602,551 (r)	124,202	114,746,344
TIN-TANTALUM-LITHIUM	t		142,826,593		201,828,591
OTHER (Includes Feldspar, Red Oxide, Spongolite, Talc and Vanadium)	t		68,189,253 (r)		67,909,899
TOTAL VALUE			101,572,936,568 (r)		106,045,384,184

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, feldspar, garnet, red oxide, talc, spodumene, tantalite and vanadium not available.

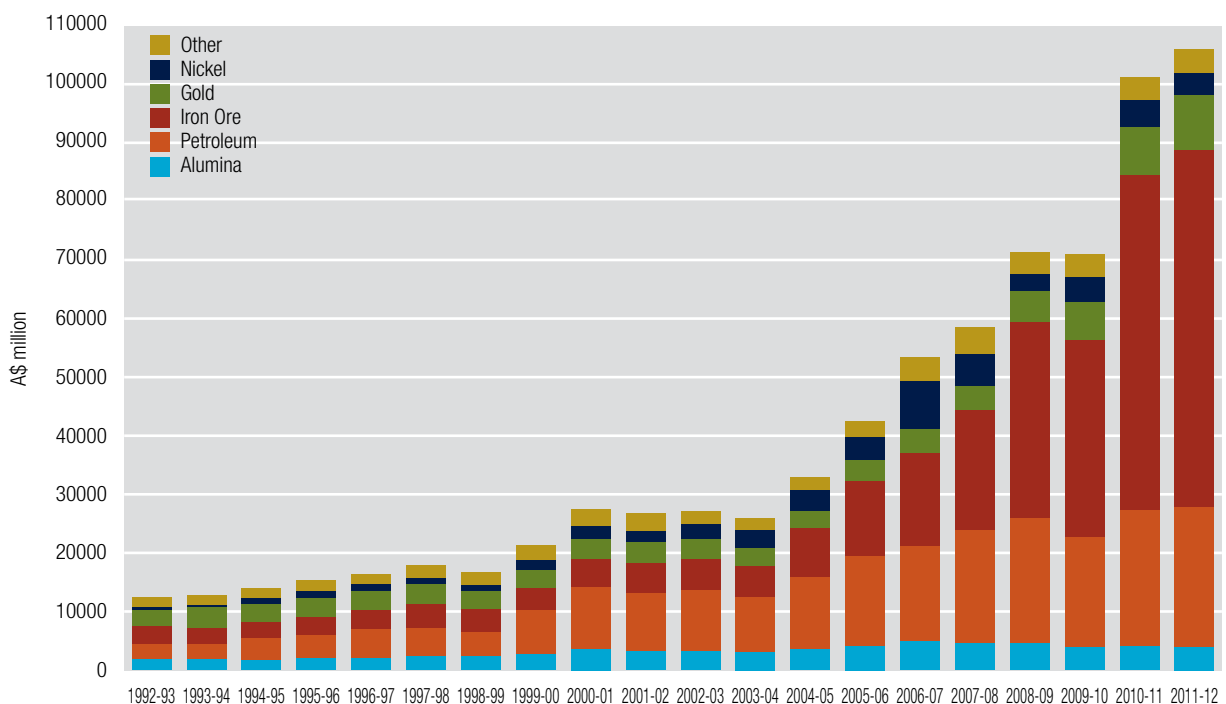


Figure 61 | Value of Minerals and Petroleum by Commodity Source: DMP

TABLE 4. QUANTITY AND VALUE OF SELECTED MAJOR COMMODITIES

		2002-03		2003-04		2004-05		2005-06	
	Unit	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
ALUMINA	Mt	11.13	3,204.65	11.17	3,085.11	11.16	3,461.63	11.47	4,111.25
BASE METALS									
Copper Metal	kt	59.45	138.78	53.29	155.82	61.93	243.73	81.20	559.85
Lead Metal	kt	70.02	31.85	29.45	10.57	2.32	0.31	58.74	86.55
Zinc Metal	kt	206.45	173.19	108.04	79.55	48.40	42.42	110.52	336.65
TOTAL BASE METALS			343.82		245.95		286.46		983.05
COAL	Mt	6.32	272.89	5.98	274.28	6.28	271.72	6.71	297.37
COBALT	kt	4.92	124.18	4.55	213.14	4.50	202.38	5.02	183.98
DIAMONDS	M ct	38.89	773.3	32.50	519.72	22.80	467.8	29.26	693.80
GOLD	t	187.47	3,445.34	177.01	3,109.56	167.35	3,016.38	166.17	3,715.05
HEAVY MINERAL SANDS									
Ilmenite	Mt	0.96	136.51	0.76	91.03	0.71	79.55	590.24	65.92
Rutile	kt	113.57	82.53	138.77	84.57	101.71	63.02	n/a	n/a
Upgraded Ilmenite (Synthetic Rutile)	kt	597.27	353.10	592.18	307.00	652.94	336.37	n/a	n/a
Zircon	kt	411.15	255.81	433.14	251.97	420.04	298.37	402.42	357.34
Other HMS			16.86		20.53		23.58		442.71
TOTAL HEAVY MINERAL SANDS			844.81		755.10		800.89		865.97
IRON ORE	Mt	188.52	5,205.27	202.04	5,331.53	233.15	8,302.34	242.63	12,699.09
MANGANESE ORE	kt	619.65	75.38	584.97	81.78	606.94	116.32	888.43	117.97
NICKEL	kt	191.89	2,482.47	182.21	3,031.04	180.42	3,503.20	183.56	3,815.11
PETROLEUM									
Condensate	Gl	6.93	2,046.37	6.18	1,747.51	5.63	2,203.11	5.63	2,791.73
Crude oil	Gl	14.00	4,258.12	13.22	3,773.64	12.80	5,146.61	11.16	5,935.12
LNG *	Btu 10 ¹² & t	403.83	3,130.83	404.94	2,775.88	11.04	3,953.10	11.68	4,625.22
LPG – Butane **	kt	460.47	221.47	383.92	154.13	77.17	421.74	871.98	654.42
LPG – Propane **	kt	346.60	172.39	311.35	128.02				
Natural Gas	Gm ³	8.12	661.92	8.06	694.07	7.64	678.72	7.71	703.28
TOTAL PETROLEUM			10,491.10		9,273.25		12,403.29		14,709.77
SALT	Mt	9.61	227.95	9.88	179.85	11.58	221.25	10.83	229.85
OTHER			366.48		316.87		820.06		1,113.02
TOTAL			27,857.66		26,417.17		33,405.91		42,841.48

* Expressed in million tonnes from 2004-05 onwards

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

2006-07		2007-08		2008-09		2009-10		2010-11		2011-12	
Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
11.98	4,847.03	12.31	4,522.14	12.27	4,563.99	12.64	3,810.17	12.28	3,976.89	12.57	3,950.89
115.98	1,052.48	124.53	1,080.56	127.33	654.34	149.81	1,156.69	148.76	1,290.07	152.57	1,165.00
70.47	146.07	25.71	81.39	25.20	42.12	26.09	61.59	40.72	97.73	6.55	12.87
142.18	675.75	197.13	578.31	142.06	231.27	87.56	210.12	70.54	162.11	63.50	120.74
	1,874.31		1,740.27		927.72		1,428.40		1,549.91		1,298.61
6.02	271.52	6.23	270.42	6.98	332.57	6.71	325.86	7.23	296.26	6.99	289.63
4.70	275.28	5.09	448.53	4.71	220.20	4.36	190.32	3.73	145.59	4.89	145.42
18.22	435.3	27.97	610.67	9.19	261.5	16.28	304.33	10.12	303.0	8.69	343.29
161.77	4,222.91	141.48	4,136.28	136.61	5,226.84	163.83	6,548.81	183.80	8,186.21	179.42	9,350.75
0.82	90.90	0.73	83.74	0.45	64.19	0.51	68.52	0.39	52.77	0.36	69.70
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
323.56	282.18	262.63	204.76	255.64	231.44	347.75	287.24	298.50	200.93	182.04	222.41
	414.98		381.90		414.01		315.28		219.63		587.23
	788.06		692.48		728.87		695.87		473.33		879.34
257.64	15,732.60	291.00	21,949.80	316.54	33,633.37	384.97	35,325.94	397.56	57,579.92	455.09	61,079.29
902.05	153.32	373.47	382.75	417.70	n/a	730.30	382.99	735.13	386.77	603.06	264.29
173.66	8,059.38	172.36	5,141.53	178.39	2,996.72	180.15	4,041.29	192.45	4,649.91	208.56	3,717.00
5.86	2,970.82	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
13.99	7,398.31	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
12.21	4,481.79	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
898.61	605.08	818.39	683.35	866.53	750.83	975.75	647.35	923.76	774.20	835.27	734.48
8.71	919.49	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
	16,375.49		19,484.22		21,275.82		18,776.97		23,220.61		23,780.65
10.42	236.15	10.59	232.93	10.52	386.25	10.97	417.46	12.23	366.94	12.81	353.78
	866.73		1,454.29		698.13		363.89		437.61		592.45
53,702.78		60,072.89		71,252.03		72,612.30		101,572.94		106,045.38	

TABLE 5. VALUE OF MINERALS AND PETROLEUM BY REGION BY COMMODITY

REGION	2011–12 VALUE
Pilbara Region	
Iron Ore	58,409,756,204
Gold and Silver	1,081,291,638
Copper	576,068,671
Manganese and Salt	487,020,586
Other	167,518,671
Total	60,721,655,770

Offshore Petroleum	
Crude Oil and Condensate	11,617,334,162
Liquefied Natural Gas	9,958,128,430
Natural Gas	1,421,141,175
LPG Butane and Propane	734,484,653
Total	23,731,088,420

Goldfields–Esperance Region	
Gold	6,048,668,468
Nickel, Platinum and Palladium	2,798,337,354
Cobalt	131,324,019
Copper and Zinc	95,342,629
Silver	31,703,640
Gypsum and Limesand	14,304,822
Construction Materials	6,124,216
Other	19,482,784
Total	9,145,287,932

Peel Region	
Alumina	3,950,894,867
Gold, Silver and Copper	1,278,305,771
Total	5,229,200,638

Mid West Region	
Gold	832,197,728
Iron Ore	577,412,679
Copper, Lead and Zinc	351,203,644
Cobalt, Nickel and Talc	297,784,641
Heavy Mineral Sands, Chromite	241,512,910
Silver	53,854,603
Natural Gas	33,318,766
Crude Oil and Condensate	14,201,953
Other	3,985,386
Total	2,405,472,310

REGION	2011–12 VALUE
Wheatbelt Region	
Iron Ore	1,342,483,170
Nickel, Copper and Salt	506,515,898
Gypsum and Heavy Mineral Sands	505,367,557
Gold and Silver	299,535,057
Other	16,965,352
Total	2,670,867,034

Kimberley Region	
Iron Ore	749,633,496
Diamonds and Crude Oil	345,053,165
Nickel, Copper and Cobalt	208,289,820
Gold and Silver	66,791,338
Other	10,090,937
Total	1,379,858,756

South West Region	
Coal	289,629,252
Heavy Mineral Sands	185,068,704
Clay, Limesand and Spodumene	121,274,565
Total	595,972,521

Gascoyne Region	
Salt and Gems	122,166,705
Gypsum and Limesand-Limestone	1,368,268
Construction Materials	225,537
Total	123,760,510

Perth Metropolitan Region	
Construction Materials, Silica Sand, Limesand-Limestone	36,482,280

Great Southern Region	
Spongolite, Silica Sand and Limesand	5,738,013

TABLE 6. VALUE OF MINERALS AND PETROLEUM BY REGION BY LOCAL GOVERNMENT AREA

REGION	2011–12 VALUE
Pilbara Region	
East Pilbara	38,700,612,064
Ashburton	21,179,609,948
Roebourne and Karratha	131,759,082
Port Hedland and Marble Bar	709,674,676
Total	60,721,655,770

Offshore Petroleum	23,731,088,420
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Goldfields–Esperance Region	
Coolgardie	3,316,673,820
Kalgoorlie–Boulder	2,231,141,587
Leonora	1,708,324,838
Laverton	1,224,199,728
Ravensthorpe	339,753,559
Dundas and Menzies	325,194,400
Total	9,145,287,932

Peel Region	
Waroona	2,898,880,018
Boddington	2,330,320,620
Total	5,229,200,638

Mid West Region	
Wiluna and Three Springs	914,666,602
Yalgoo and Carnimah	624,432,244
Coorow and Geraldton	34,967,333
Mullewa and Mt Magnet	223,835,308
Meekatharra and Morawa	346,760,340
Irwin and Murchison	196,542,599
Northampton, Perenjori and Sandstone	64,267,884
Total	2,405,472,310

Kimberley Region	
Derby–West Kimberley	703,940,103
Wyndham–East Kimberley	394,333,215
Halls Creek	275,207,638
Broome	6,377,800
Total	1,379,858,756

REGION	2011–12 VALUE
Wheatbelt Region	
Yilgarn	1,519,317,670
Dalwallinu and Kondinin	520,336,059
Dandaragan	503,452,555
Lake Grace and Westonia	122,828,163
Moora and Wyalkatchem	3,570,698
Gingin and Koorda	1,153,029
Northam and Kelleberrin	208,860
Total	2,670,867,034

South West Region	
Bridgetown–Greenbushes, Capel and Collie	492,164,737
Bunbury, Dardanup and Manjimup	103,807,784
Total	595,972,521

Gascoyne Region	
Carnarvon	81,891,055
Exmouth and Shark Bay	41,869,455
Total	123,760,510

Perth Metropolitan Region	
Kalamunda, Swan and Wanneroo	24,759,660
Cockburn, Kwinana and Rockingham	11,722,620
Total	36,482,280

Great Southern Region	
Albany, Denmark and Plantagenet	5,738,013

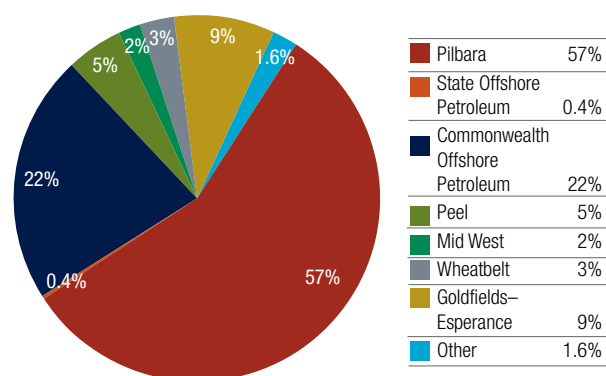


Figure 62 | **Value of Minerals and Petroleum by Region 2011–12**
Total \$106 Billion Source: DMP

TABLE 7. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS AND PETROLEUM INDUSTRIES

MINERAL/Company	Operating Site	2010–11	2011–12
BAUXITE – ALUMINA			
Alcoa World Alumina Australia	Huntly	819	846
	Kwinana Alumina Refinery	1,303	1,329
	Pinjarra Refinery	1,600	1,661
	Wagerup Alumina Refinery	1,058	1,085
	Willowdale	361	327
Bauxite Resources Limited	Bindoon Bauxite Quarry	0	1
Doral Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	101	100
Worsley Alumina Pty Ltd	Boddington Bauxite	495	481
	Worsley Refinery	5,171	4,417
TOTAL BAUXITE – ALUMINA		10,908	10,247
BASE METALS			
Birla (Nifty) Pty Ltd	Nifty	746	744
Jabiru Metals Ltd	Jaguar	323	352
Lennard Shelf Pty Ltd	Pillara	16	4
Magellan Metals Pty Ltd	Magellan	201	37
Minerals and Metals Group	Golden Grove	950	1,120
Sandfire Resources NL	DeGrussa Mine	61	633
Venturex Resources Limited	Whim Creek	20	17
TOTAL BASE METALS		2,317	2,907
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja Open Cut	430	474
Wesfarmers Premier Coal Ltd	Premier	555	202
TOTAL COAL		985	676
DIAMONDS			
Argyle Diamond Mines Pty Ltd	Argyle Diamond Mine	1,378	1,917
Kimberley Diamond Company Ltd	Ellendale/Kimberley Diamonds	305	328
North Australian Diamonds Limited	Wangarra Laboratory	4	3
TOTAL DIAMONDS		1,687	2,248
GOLD			
A1 Minerals Ltd	Brightstar Beta-Mikado	48	17
Agnew Gold Mining Company Pty Limited	Agnew-Emu	435	529
AngloGold Ashanti Australia Ltd	Sunrise Dam	1,025	1,111
	Tropicana Gold Mine	6	163
Apex Gold Pty Ltd	Wiluna Group	300	232
Auzex / CCG JV	Bullabulling	12	19
Avoca Resources Ltd	Higginsville Gold Project	588	611
Barrick Gold of Australia Ltd	Darlot	487	482
	Granny Smith	778	897
	Kalgoorlie West Group	782	869
	Lawlers	393	477
	Plutonic	661	679

MINERAL/Company	Operating Site	2010–11	2011–12
GOLD Continued			
Central Norseman Gold Corporation	Central Norseman Group	307	264
Crescent Gold Limited	Laverton Gold Project	210	268
Dacian Gold Ltd	Mt Morgans Gold Mine	96	3
Evolution Mining Limited	Edna May Gold Project	129	142
Focus Minerals Ltd	The Mount	25	66
	Three Mile Hill	174	152
	Tindals	116	153
FMR Investments Pty Ltd	Burbanks	7	4
	Greenfields Mill	66	49
	Gordon Sirdar Project	58	19
GMK Exploration Pty Ltd	Meekatharra Gold Operations – Bluebird	2	10
Haoma Pty Ltd	Bamboo Creek	8	10
HBJ Minerals Pty Ltd	South Kal Operations	225	277
Integra Mining Ltd	Randalls	196	184
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile – Super Pit	1,693	1,903
Kalgoorlie Mining Company (Bullant) Pty Ltd	Bullant Mine	14	58
Kentor Gold Ltd	Burnakura	0	52
La Mancha Resources Australia Pty Ltd	Frogs Leg Group	236	235
	White Foil	12	3
Mc Verde Minerals Pty Ltd	Pithara Open Pit Mine	4	1
Millennium Minerals Limited	Nullagine Gold Operations	0	59
Minjar Gold Pty Ltd	Minjar Gold Project	19	28
Mount Magnet South NL	Kirkalocka	6	7
Navigator (Bronzewing) Pty Ltd	Bronzewing	208	275
Newcrest Mining Ltd	Telfer	1,946	2,570
Newmont Boddington Gold Pty Ltd	Boddington	2,495	3,402
Newmont Mining Corporation	Jundee	593	672
Nex Metals Explorations Ltd	Orient Well	5	31
Northern Star Resources Ltd	Paulsens	168	237
Northwest Nonferrous Australia	Indee Gold	7	4
Northwest Resources Ltd	Blue Spec – Golden Spec Mine	2	4
Paddington Gold Mine Pty Ltd	Paddington Gold	448	501
	Binduli	180	198
Ramelius Milling Services Pty Ltd	Burbanks Treatment Plant	19	18
Ramelius Resources Ltd	Wattle Dam	69	64
	Hill 50 – Mt Magnet Group	8	241
Reed Resources Ltd	Sand Queen	2	1
Regis Resources Limited	Duketon	174	153
	Garden Well	0	244
Silver Lake Resources Limited	Daisy-Milano	161	224
	Lakewood – Fintails Plant	44	67
	Murchison Operations	0	22

TABLE 7. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS AND PETROLEUM INDUSTRIES Continued

MINERAL/Company	Operating Site	2010–11	2011–12
GOLD Continued			
Saracen Gold Mines Pty Limited	Carosue Dam	331	277
St Barbara Mines Ltd	Southern Cross – Marvel Loch and Hercules mines	399	397
	Leonora Operations – Sons of Gwalia	511	512
	King of the Hills Underground	67	150
St Ives Gold Mining Company Pty Limited	Kambalda/St Ives	1,569	1,825
Swan Gold Mining Ltd	Carnegie Gold	3	3
	Mt Ida	4	3
Tanami Gold NL	Coyote Minesite	200	196
The Perth Mint	Perth Mint	87	103
Troy Resources Ltd	Sandstone Group	14	3
Other	Various	27	9
TOTAL GOLD		18,859	22,439
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	3	7
Bemax Resources Limited	Bunbury	158	155
Doral Mineral Sands Pty Ltd	Dardanup	281	268
Mintech Chemical Industries Pty Ltd	Rockingham Zirconia Plant	30	50
GMA Garnet Pty Ltd	Narngulu Garnet Plant	30	34
	Port Gregory	30	32
Iluka Resources Limited	Capel	360	652
	Eneabba	35	143
	Narngulu Synthetic Rutile Plants	272	298
	Gingin/Iluka	5	16
Tronox Management Pty Ltd	Chandala-Muchea	401	361
	Cooljarloo	194	205
	Bunbury Port	13	10
TOTAL HEAVY MINERAL SANDS		1,812	2,231
IRON ORE			
Atlas Iron Ltd	Abydos DSO Project	0	2
	Mt Dove	0	1
	Pardoo RSD Group	83	85
	Wodgina	65	116
BC Iron Limited		215	329
BHP Billiton Iron Ore Pty Ltd	Boodarie HBI Plant	58	15
	Eastern Ridge Operation	625	767
	Jimblebar Hub	0	29
	Mining Area C	1,687	1,988
	Mt Newman Railway	532	0
	Mt Whaleback	1,765	1,909
	Nelson Point	1,617	1,172

MINERAL/Company	Operating Site	2010–11	2011–12
IRON ORE Continued			
BHP Billiton Iron Ore Pty Ltd Continued	RGP4/5 Port Hedland Pace Project	258	958
	Yandi – Marillana Creek	1,166	1,425
	Yandi 3 Rail Loop Ore Handling Plant	0	37
Calibre Projects Pty Ltd	Western Turner Syncline	0	136
	Brockman 4 – Phase 2	0	274
Citic Pacific Mining Management Pty Ltd	Sino Iron	520	668
Cliffs Natural Resources Pty Ltd	Koolyanobbing	836	1,114
Crosslands Resources Ltd	Cuddingwarra	61	59
	Geraldton Port Storage Facility	55	39
	Jack Hills	126	64
Downer EDI Works Pty Ltd	Warrambo Project	0	87
Forge Resources Ltd	Balla Balla Group	3	1
Fortescue Metals Group Ltd	Anderson Point Port Facility	380	884
	Christmas Creek	1,182	2,928
	Cloudbreak	3,316	3,809
	Rail Ballast Quarry	15	19
	Solomon Project	0	1,172
Hammersley HMS Pty Ltd	Hope Downs 1-3 Group	1,390	415
	Hope Downs 4	0	10
Hammersley Iron Pty Ltd	Brockman	594	655
	Dampier Port Operations	1,685	2,697
	Dampier Power Plant	252	51
	Hismelt Kwinana	77	50
	Marandoo	383	421
	Paraburdoo/Channar/Eastern Range	1,454	1,469
	Tom Price	2,041	2,145
	Yandicoogina	1,093	1,221
Henry Walker Eltin Cockatoo Pty Ltd	Cockatoo Island	173	200
Karara Mining Limited	Karara	103	196
Kimberley Metals Group Pty Ltd	Ridges Iron Ore Project	16	111
Lycopodium Minerals Pty Ltd	Marandoo Phase 2 Construction	0	97
MacMahon Holdings Pty Ltd	Orebody 18 – Wheelarra	459	432
Mount Gibson Mining Limited	Extension Hill	191	175
	Geraldton Port Storage Facility	24	22
	Koolan Island	556	606
	Perenjori Iron Ore Sliding	0	47
	Ruvidini Rail Terminal	83	70
	Tallering Peak	310	354
Ngarda Civil and Mining Pty Ltd.	Yarrie Nimingarra	411	388
Polaris Metals Pty Ltd	Carina Iron Ore Mine	75	249
Process Minerals International	Boodarie RSI	33	33
	Poondano	10	84

TABLE 7. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS AND PETROLEUM INDUSTRIES Continued

MINERAL/Company	Operating Site	2010–11	2011–12
IRON ORE Continued			
Rio Tinto Iron Ore Pty Ltd	Brockman 4 Operations	827	1,079
	Cape Lambert Power Station	61	58
	Cape Lambert Expansion	154	121
	Dampier Fuel Wharf	81	128
	Kangaroo Hill Village	0	32
	West Angelas Power Plant	0	2
Robe River Mining Co. Pty Ltd	Cape Lambert Port Operations and Power Plant	1,258	1,452
	Pannawonica	667	684
	West Angelas	1,168	1,381
Roy Hill Iron Ore Pty Ltd	Roy Hill	0	149
Sinosteel Midwest Corporation Limited	Koolanooka	76	155
TOTAL IRON ORE		30,270	37,526
MANGANESE			
Pilbara Manganese Pty Ltd	Woodie Woodie	782	770
Process Minerals International	Peak Hill	30	0
	Nicholas Downs	26	6
	Woodie Woodie Tailings Treatment Plant	28	24
TOTAL MANGANESE		866	800
NICKEL			
BHP Billiton (Nickel West)	Cliffs	269	254
	Kalgoorlie Nickel Smelter	615	644
	Kambalda	189	179
	Kwinana Refinery	495	556
	Leinster	1,030	961
	Mt Keith	1,527	1,289
Consolidated Nickel Pty Ltd	Beta-Hunt Nickel Group	4	4
First Quantum Minerals (Australia) Pty Limited	Ravensthorpe	799	979
Focus Minerals Ltd	Nepean	1	1
Fox Resources Pty Ltd	Radio Hill	30	29
Lake Johnston Ltd	Emily Ann	78	243
Lightning Nickel Pty Ltd	Long Shaft	209	203
Mincor Resources NL	Carnilya Hill	41	10
	Mincor Operations	270	120
	Otter Juan	152	111
Norilsk Nickel Avalon Pty Ltd	Avalon-Bulong Plant	12	13
	Black Swan	22	16
	Cawse	15	16
	Waterloo	8	10
Murrin Murrin Operations Pty Ltd	Murrin Murrin	1,738	1,493
Panoramic Resources Limited	Lanfranchi	276	311
	Savannah Group	354	355

MINERAL/Company	Operating Site	2010–11	2011–12
NICKEL Continued			
Poseidon Nickel Ltd	Windarra Group	13	26
Xstrata Nickel Australasia Operations Pty Ltd	Cosmos	307	246
	Sinclair	93	109
Southern Cross Energy	Southern Cross Energy Power Group	89	95
Western Areas Limited	Forrestania	532	525
TOTAL NICKEL		9,168	8,798
SALT			
Dampier Salt Ltd	Dampier	667	262
	Lake MacLeod	221	249
	Port Hedland	168	210
WA Salt Supply Koolyanobbing Pty Ltd	Lake Deborah	11	11
Onslow Solar Salt Pty Ltd	Onslow	112	154
Shark Bay Salt JV	Useless Loop	115	123
Western Salt Refinery Pty Ltd	Pink Lake	1	1
TOTAL SALT		1,295	1,010
TIN, TANTALUM AND LITHIUM			
Galaxy Resources Ltd	Mt Cattlin (Spodumene)	157	162
Global Advanced Metals Greenbushes Pty Ltd	Greenbushes	21	22
	Wodgina	98	127
Nagrom and Co.	Kelmscott	69	86
Talison Minerals Pty Ltd	Greenbushes	187	254
TOTAL TIN, TANTALUM AND LITHIUM		532	651
OTHER COMMODITIES			
TOTAL CHROMITE		111	92
TOTAL CLAYS		104	106
TOTAL CONSTRUCTION MATERIALS		692	918
TOTAL DIMENSION STONE		137	123
TOTAL GYPSUM		30	12
TOTAL INDUSTRIAL PEGMATITE MINERALS		24	23
TOTAL LIMESTONE – LIMESAND		176	208
TOTAL MINERAL EXPLORATION		3,353	3,681
TOTAL PHOSPHATE		159	170
TOTAL RARE EARTHS		109	162
TOTAL SILICA – SILICA SAND		450	580
TOTAL SILVER		9	42
TOTAL TALC		64	49
TOTAL TUNGSTEN AND MOLYBDENUM		83	95
TOTAL VANADIUM		111	340
TOTAL VARIOUS PORTS		798	740
ALL OTHER MATERIALS		4	2
TOTAL		85,113	96,876

TABLE 7. AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS AND PETROLEUM INDUSTRIES Continued

MINERAL/Company	Operating Site	2010–11	2011–12
PETROLEUM (onshore facilities and pipelines covered under <i>Petroleum Pipelines Act 1969</i> and <i>Petroleum Geothermal Energy Resources Act 1967</i>) *			
APA Group	Includes Parmelia and Telfer Nifty Pipelines		139
Apache Energy Ltd	Burrup Fertilisers Lateral, Devil Creek and Varanus		235
APT Parmelia Pty Ltd	Mondarra Gas Storage Facility		59
ARC Energy Ltd	Includes Dongara and Hovea Production facilities and Woodada Gas Field		103
BHP Billiton Petroleum	Griffin Export Facility, Macedon Gas Project		277
Buru Energy	Includes various Pipelines, Blina, Century, Ensign		247
Chevron (Australia) Pty Ltd	Gorgon, WA Oil Asset and Drilling		1,157
DBNGP (WA) Transmission Pty Ltd	Dampier-Bunbury Natural Gas Pipeline		241
Epic Energy Corp Shared Services Pty Ltd	Pilbara Pipeline System		17
Goldfields Gas Transmission Pty Ltd	Goldfields Gas Pipeline		71
Origin Energy Resources Ltd	Beharra Springs, Jingemina and Cockburn Lateral		46
Pilbara Iron	Cape Lambert Lateral, Paraburdoo Gas Lateral		20
Roc Oil (WA) Pty Ltd	Arrowsmith Stabilisation Facility		159
Southern Cross Pipelines Aust Pty Ltd	Mt Keith, Parkeston, Kambalda and Leinster Laterals		25
Other	Various sites		89
TOTAL WA ONSHORE & COASTAL WATERS			2,885**
<i>Estimated offshore petroleum (Commonwealth waters) plus LNG processing facilities</i>			<i>5,820***</i>

SOURCE: AXTAT Reporting System, Resources Safety Division, Department of Mines and Petroleum for minerals data and Monthly Status Reports submitted to the Department for Western Australian onshore petroleum facilities and pipelines. Figures shown are preliminary, subject to revision and include employees as well as contractors.

* From 1 January 2012, the responsibility for administering safety regulation for coastal waters under the *Petroleum (Submerged Lands) Act 1982* reverted to DMP.

** Excludes operational personnel working at onshore LNG processing facilities and oil and gas sites located in Commonwealth offshore waters.

*** Estimates are derived from contacting petroleum companies including Woodside Energy Ltd and Chevron (Australia) Pty Ltd to ascertain the number of people working at oil and gas sites in offshore Commonwealth waters and onshore LNG processing facilities.

TABLE 8. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS (EFFECTIVE 1 JULY 2012)

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

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

Minmetals Australia Pty Ltd,
Level 8,
564 St Kilda Road,
Melbourne Vic 3004,
(03) 9520 6800,
Golden Grove.
www.minmetals.com/index.jsp

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

**Newmont Boddington Gold Pty
Ltd,**
Post Office Box 48,
Boddington WA 6390,
(08) 9883 3400,
Boddington.
www.newmont.com

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,
Del Park, Willowdale, Huntly.
www.alcoa.com.au

Worsley Alumina Pty Ltd,
PO Box 344,
Collie WA 6225,
(08) 9734 8311,
Boddington.
[www.bhpbilliton.com/home/
businesses](http://www.bhpbilliton.com/home/businesses)

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 Nerramayne.
www.hudsonresources.com

Clay Shale

Lanco Infratech Limited,
Level 15, 28 The Esplanade,
Perth WA 6000,
(08) 6188 2200,
Collie.
www.griffincoal.com.au

Saponite

Watheroo Minerals Pty Ltd,
PO Box 353,
Dunsborough WA 6281,
(08) 9756 6121,
Watheroo Clays.
www.bentoniteproductswa.com.au

COAL

Lanco Infratech Limited,
Level 15, 28 The Esplanade,
Perth WA 6000,
(08) 6188 2200,
Collie.
www.griffincoal.com.au

**Yanzhou Coal Mining Company
Limited,**
Premier Road,
Collie WA 6225,
(08) 9780 2222,
Collie.
www.wesfarmers.com.au

CONSTRUCTION MATERIALS

Aggregate

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

Boral Resources (WA) Ltd,
63–69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Mt Regal, Pilbara Area,
Seven Mile Hill.
www.boral.com.au

Gravel

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

TABLE 8. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS Continued (EFFECTIVE 1 JULY 2012)

Rock

BGC Contracting Pty Ltd,
290 Bushmead Road,
Hazelmere WA 6055,
(08) 9442 2300,
Port Hedland.
www.bgc.cc

Holcim (Australia) Pty Ltd,
18 Brodie Hall Drive,
Bentley WA 6102,
(08) 9212 2000,
Golden Mile, Newman.
www.com.au

Sand

Boral Resources (WA) Ltd,
63–69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Gnangara, Grosmont,
Maitland River, Turner River.
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,
T/as Action Sand Supplies
42 Noel Road,
Gooseberry Hill WA 6076,
(08) 9275 1100,
Mobile: 0408 923 801,
Chidlow.

DIAMONDS

Argyle Diamonds Australia
2 Kings Park Road,
West Perth WA 6005,
(08) 9482 1166,
Argyle.
www.argylediamonds.com.au

Kimberley Diamond Company,
Level 3, 52 Kings Park Road,
West Perth WA 6005,
(08) 9426 9888,
Ellendale.
www.gemdiamonds.com

DIMENSION STONE

Granite

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

GOLD

A1 Minerals Limited,
Suite 34, 25 Walters Drive,
Osborne Park WA 6017,
(08) 9244 1400,
Brightstar.
www.a1minerals.com.au

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

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

Apex Minerals NL,
Level 1, 10 Ord Street,
West Perth WA 6005,
(08) 6311 5555,
Wiluna.
www.apexminerals.com.au

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

Barrick Gold of Australia Limited,
Level 10, 2 Mill Street,
Perth WA 6000,
(08) 9212 5777,
Darlot, Lawlers, Plutonic, Granny
Smith,
Kanowna Belle, East Kundana,
Kalgoorlie.
www.barrick.com

Catalpa Resources Ltd,
Level 1, 9 Havelock Street,
West Perth WA 6005,
(08) 9216 9700,
Edna May.
www.catalparesources.com.au

Crescent Gold Limited,
Level 2, 40 Subiaco Square,
Subiaco WA 6008,
(08) 6380 7100,
Laverton.
www.crescentgold.com

FMR Investments Pty Ltd,
Suite 11, 2 Hardy Street,
South Perth WA 6151,
(08) 6216 5400,
Gordon-Sirdar.
www.fmrinvestments.com.au

Focus Minerals Limited,
Level 10, Exchange House,
68 St Georges Terrace,
Perth WA 6000,
(08) 9215 7888,
Coolgardie–Redemption, The Mount.
www.focusminerals.com.au

Integra Mining Limited,
168 Stirling Highway,
Nedlands WA 6009,
(08) 9423 5920,
Randalls.
www.integramining.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, White Foil.
www.lamancha.ca

Navigator Resources Limited,
45 Richardson Street,
West Perth WA 6005,
(08) 9226 5311,
Bronzewing,
www.navigatorresources.com.au

Northern Star Resources,
Level 1, 24 Mumford Place,
Balcatta WA 6021,
(08) 6241 1888,
Paulsens.
www.nsr ltd.com

Newcrest Mining Ltd,
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

Norseman Gold Plc,
Suite 1D, 21 Teddington Road,
Burswood WA 6100,
(08) 9473 2222,
Norseman.
www.norsemangoldplc.com

Paddington Gold Pty Ltd,
Menzies Highway,
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,
Wattle Dam, Hill 50 – Mt Magnet.
www.rameliusresources.com.au

Regis Resources Limited,
Level 1, 1 Alvan Street,
Subiaco WA 6008,
(08) 9442 2290,
Moolart Well–Duketon.
www.regisresources.com

Saracen Mineral Holdings Limited,
Level 5, 89 St Georges Terrace,
Perth WA 6000,
(08) 9212 4100,
Porphyry.
www.saracen.com.au

Silver Lake Resources Limited,
31 Malcolm Street,
West Perth WA 6005,
(08) 6313 3800,
Mt Monger–Silver Lake.
www.silverlakeresources.com.au

St Barbara Limited,
1205 Hay Street,
West Perth WA 6005,
(08) 9476 5555,
Marvel 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 4, 50 Colin Street,
West Perth WA 6005,
(08) 9212 5999,
Tanami Coyote.
www.tanami.com.au

GYPSUM

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

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

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

Wandhill Gypsum,
PO Box 46,
Gibson WA 6448,
(08) 9075 3031,
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,
Level 18 Exchange Plaza,
2 The Esplanade
Perth WA 6000,
(08) 9287 3200,
Port Gregory.
www.garnetsales.com

Ilmenite, Leucoxene, Rutile and Zircon

Bemax Resources Limited,
Koombana Drive, North Shore,
Bunbury WA 6230,
(08) 9721 0200,
Gwindinup Mine, Bunbury.
www.bemax.com.au

TABLE 8. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS Continued (EFFECTIVE 1 JULY 2012)

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, Eneabba.
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,

Level 9, Alluvion,
58 Mounts Bay Road,
West Perth WA 6005.
(08) 9476 7900,
Pardoo, Wodgina.
www.atlasiron.com.au

BC Iron Limited,

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

**BHP Billiton Iron Ore
(Goldsworthy) Ltd,**

225 St Georges Terrace,
Perth WA 6000,
(08) 6224 4444,
Mining Area C.
www.bhpbilliton.com

BHP Billiton Iron Ore Ltd,

225 St Georges Terrace,
Perth WA 6000,
(08) 6224 4444,
Jimblebar, Newman, Yandi.
www.bhpbilliton.com

Channar Mining Pty Ltd,

152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2327,
Channar.

Cliffs Natural Resources Pty Ltd,

Level 12, 1 William Street,
Perth WA 6000,
(08) 9426 3333,
Cockatoo Island, Koolyanobbing.
www.cliffsnaturalresources.com

Fortescue Metals Limited,

Level 2, 87 Adelaide Terrace,
East Perth WA 6004,
(08) 6218 8888,
Cloud Break, Christmas Creek,
Nullagine CID.
www.fmgil.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 2327,
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 7000,
Hope Downs.

Kimberley Metals Group,

Suite C5, 1 The Esplanade,
Mt Pleasant WA 6153,
(08) 8364 2699,
Ridges.
www.kmetgroup.com

Mineral Resources Limited,

1 Sleat Road,
Applecross WA 6153,
(08) 9329 3600,
Carina, Poondano.
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,

1st Floor,
7 Havelock Street,
West Perth WA 6005,
(08) 9426 7500,
Tallering Peak, Koolan Island,
Extension Hill, Mt Gibson.
www.mtgibsoniron.com.au

Murchison Metals Ltd,

Level 1, 5 Ord Street,
West Perth WA 6005,
(08) 9492 2600,
Jack Hills.
www.mml.net.au

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,
Cockburn, Denison, Ledge Point,
Wanneroo.
www.cockburncement.com.au

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

Limestone Resources Australia Pty Ltd,
25-29 Frobisher Street,
Osborne Park WA 6017,
(08) 9340 0022,
Wanneroo, Moore River, Carabooda.
www.limestone-resources.com.au

WA Limestone Co.,
41 Spearwood Avenue,
Bibra Lake WA 6163,
(08) 9434 2299,
Various sites throughout State.
www.walimestone.com/

MANGANESE

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

NICKEL

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

Independence Group NL,
Suite 1, 183 Great Eastern Highway,
Belmont WA 6104,
(08) 9479 1777,
Long Nickel.
www.independencigroup.com.au

Minara Resources Limited,
Level 4, 30 The Esplanade,
Perth WA 6805,
(08) 9226 1099,
Murrin Murrin.
www.minara.com.au

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

Norilsk Nickel,
Level 1, 88 Colin Street,
West Perth WA 6005,
(08) 9426 0100,
Lake Johnston.
www.norik.ru/en/

Panoramic Resources Ltd,
Level 9, 553 Hay Street,
Perth WA 6000,
(08) 9225 0999,
Savannah, Lanfranchi Tramways.
www.panoramicresources.com

Western Areas NL,
Level 1, 11 Ventnor Avenue,
West Perth WA 6005,
(08) 9334 7777,
Forrestania, Flying Fox,
Spotted Quoll.
www.westernareas.com.au

Xstrata Nickel Australasia,
Level 3, 24 Outram Street,
West Perth WA 6005,
(08) 9213 1588,
Cosmos, Sinclair
www.xstrata.com

PALLADIUM

BHP Billiton (Nickel West),
191 Great Eastern Highway,
Belmont WA 6104,
(08) 9479 0500,
Kambalda.
www.bhpbilliton.com

PETROLEUM

Apache Energy Ltd,
Level 9, 100 St Georges Terrace,
Perth WA 6000,
(08) 6218 7100,
Albert, Artreus, Bamba,
Gudrun, Harriet, Hoover,
Lee, John Brookes,
Linda, Little Sandy, Mohave,
North Alkimos, Pedirka, Rose,
Sinbad, Stag, Van Gogh,
Victoria, West Cycad,
Wonnich.
www.apachecorp.com

AWE Ltd,
Level 16, 40 Mount Street,
North Sydney NSW 2060,
(02) 8912 8000,
Apium, Corbyas, Hovea–Eremia,
Mt Horner,
Dongara, Woodada, Xyris, Yardarino.
[http://www.awexp.com.au/irm/
content/home.html](http://www.awexp.com.au/irm/content/home.html)

Buru Energy Limited,
Level 2, 97 William Street,
Perth WA 6000,
Freecall: 1800 337 330,
Blina, Lloyd, Ungani.
www.buruenergy.com.au

BHP Billiton Petroleum (North West Shelf) Pty Ltd,
Level 42, Central Park,
152–158 St Georges Terrace,
Perth WA 6000,
(08) 9338 4888,
Chinook–Scindian, Crosby,
Eskdale, Macedon, Pyranees,
Ravensworth, Stickle, Stybarrow.
www.bhpbilliton.com

TABLE 8. PRINCIPAL MINERAL AND PETROLEUM PRODUCERS Continued (EFFECTIVE 1 JULY 2012)

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

ENI Australia Limited,
Level 3, 40 Kings Park Road,
West Perth WA 6005,
(08) 9320 1111,
Blacktip, Woollybutt.

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

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

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

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

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

PLATINUM

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

RARE EARTHS

Lynas Corporation Ltd,
Level 1, 7 Tully Road,
East Perth WA 6004,
(08) 6241 6842,
Mt Weld.
www.lynascorp.com

SALT

Dampier Salt Pty 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.

WA Salt Supply Ltd,
Cockburn Road,
Hamilton Hill 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 Pty Ltd,
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

Sibelco Australia and New Zealand,

26 Tomlinson Road,
Welshpool WA 6106,
(08) 9362 1411,
Mt Seabrook.
www.unimin.com.au

TIN-TANTALUM-LITHIUM

Spodumene

Galaxy Resources Ltd,

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

Talison Minerals Ltd,

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

Tantalum

Global Advanced Metals Pty Ltd,

Ground Floor,
76 Kings Park Road,
West Perth WA 6005,
(08) 96217 2500,
Greenbushes, Wodgina.
www.globaladvancedmetals.com

Tin

Talison Minerals Ltd,

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

VANADIUM

Atlantic Ltd,

Level 29, Bankwest Tower,
108 St George's 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
Gm ³	billion cubic metres	OPEC	Organization of Petroleum Exporting Countries
ha	hectares	RBA	Reserve Bank of Australia
km	kilometres	t/a	tonnes per annum
km ²	square kilometres	Tcf	trillion cubic feet
kt	thousand tonnes	TJ/d	terajoules per day
LME	London Metal Exchange	US\$	United States dollar

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

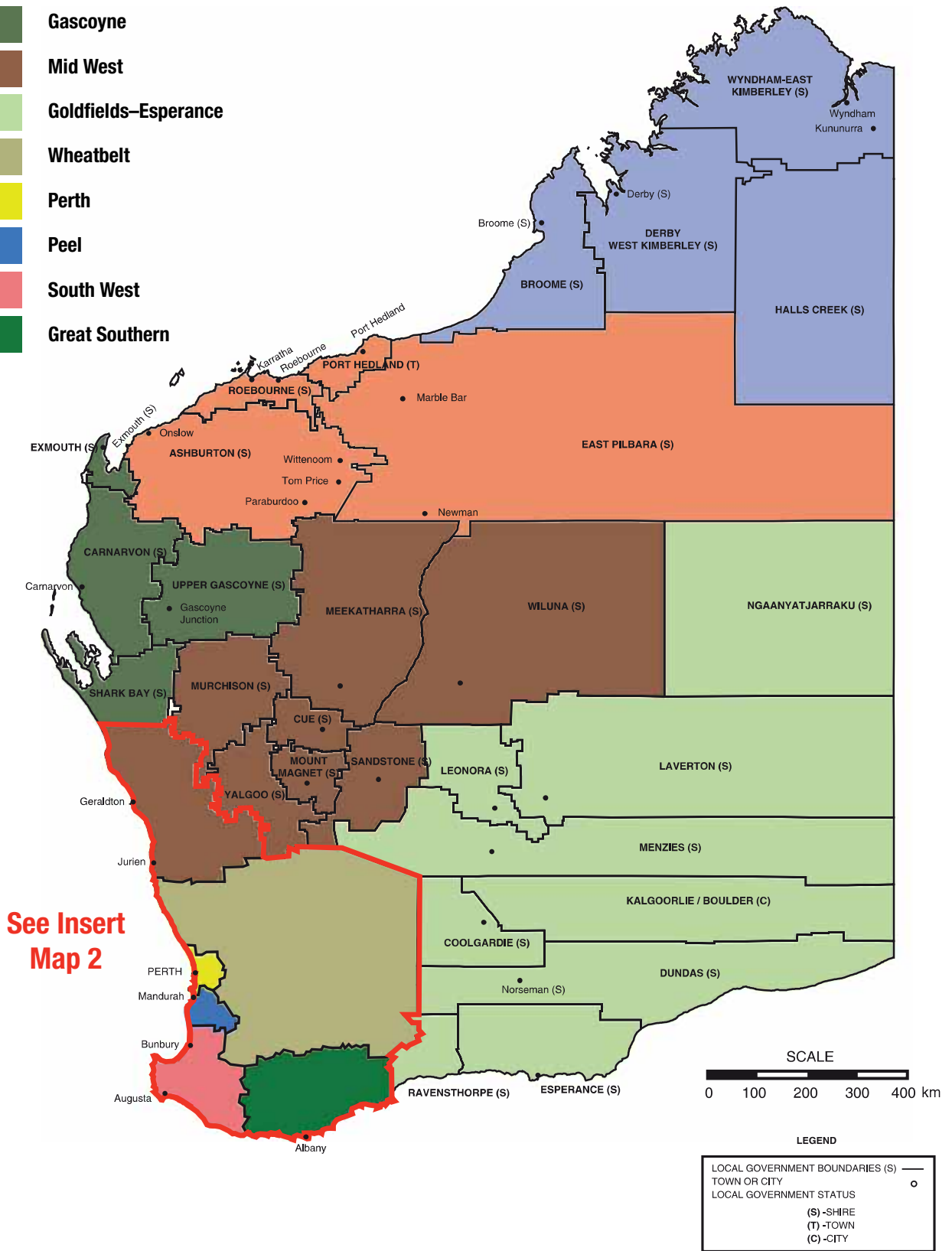
Quantities and values for minerals and petroleum in this publication are collected from a variety of sources including:

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

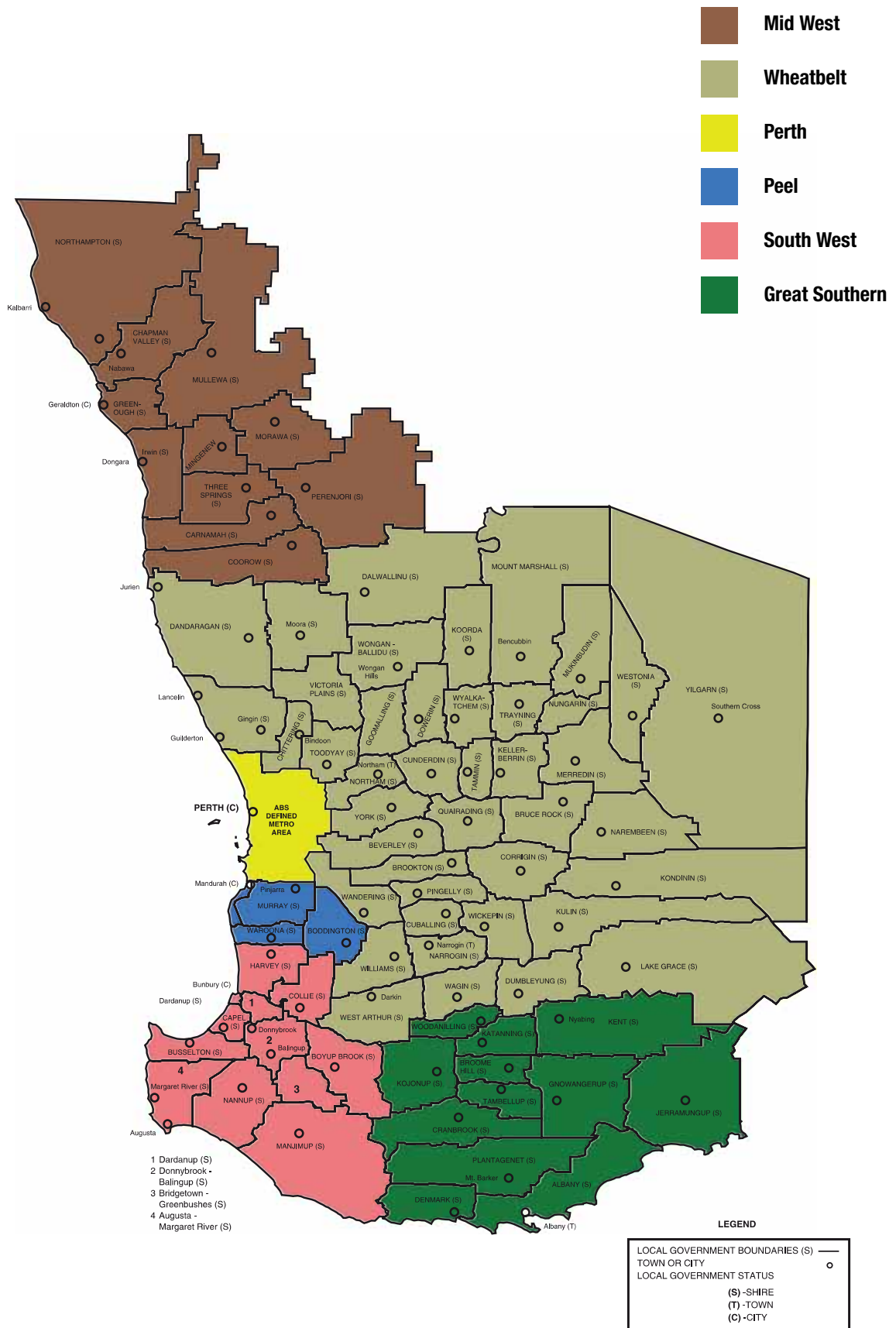
Quantities specified relate to either mine production or sales as listed below for each commodity.

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

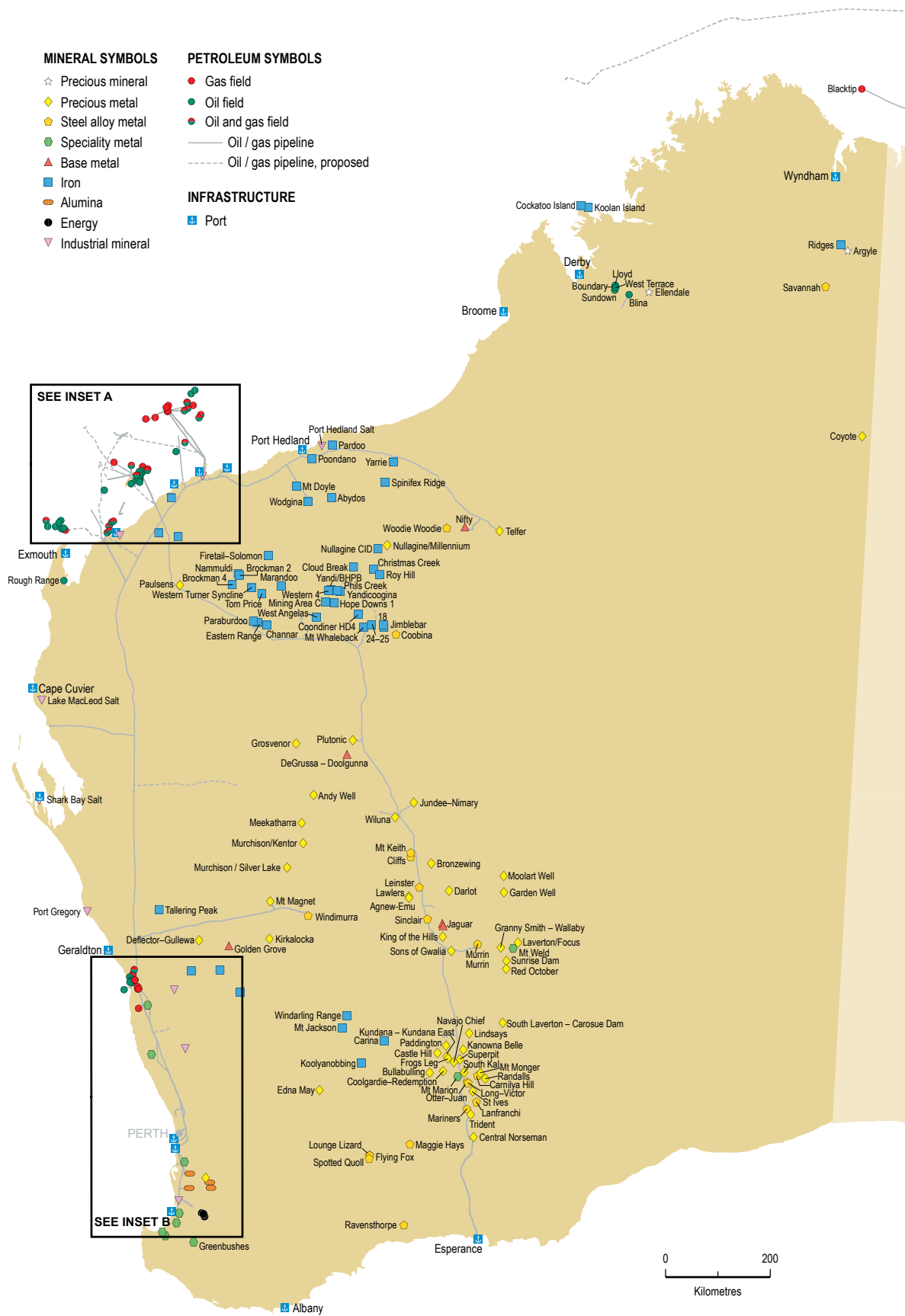
- Kimberley
- Pilbara
- Gascoyne
- Mid West
- Goldfields–Esperance
- Wheatbelt
- Perth
- Peel
- South West
- Great Southern



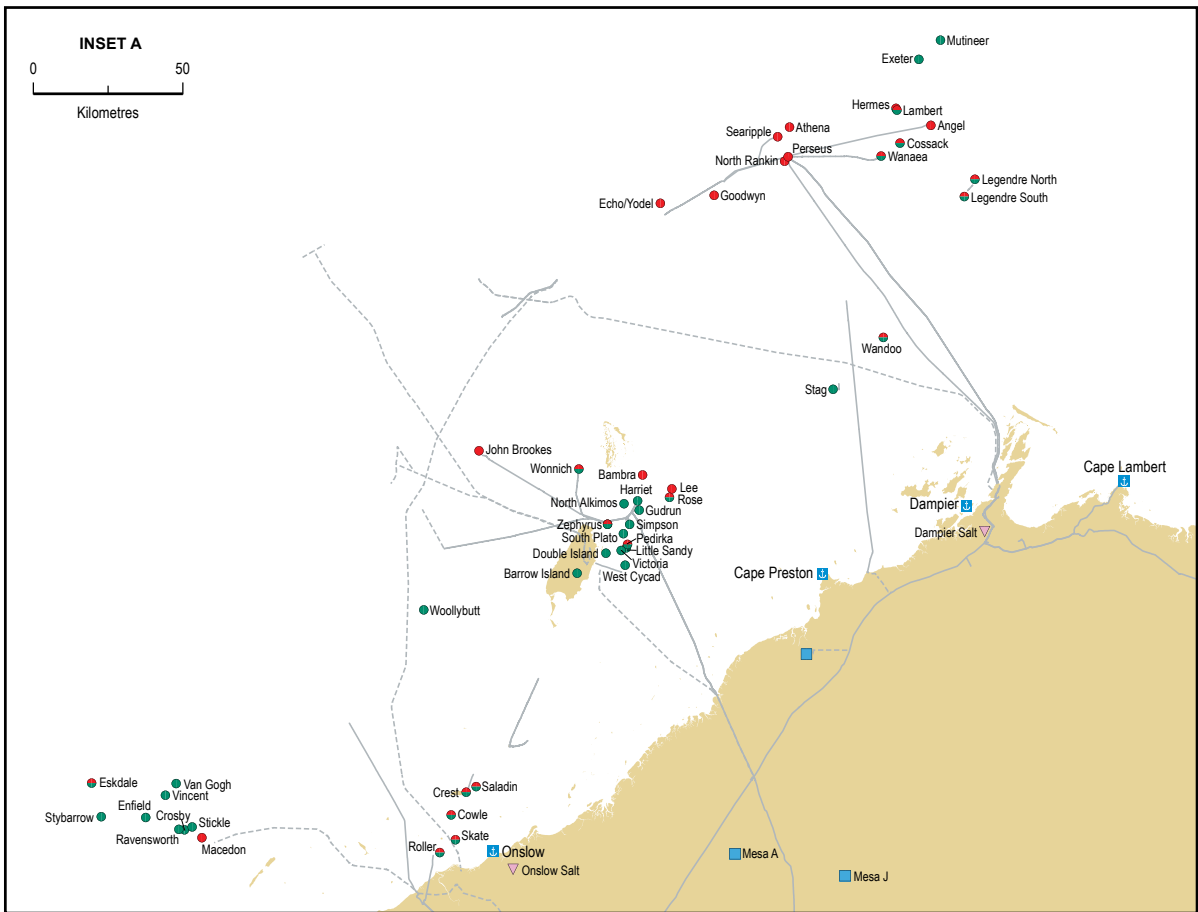
Map 2. Local Government and Regional Boundaries



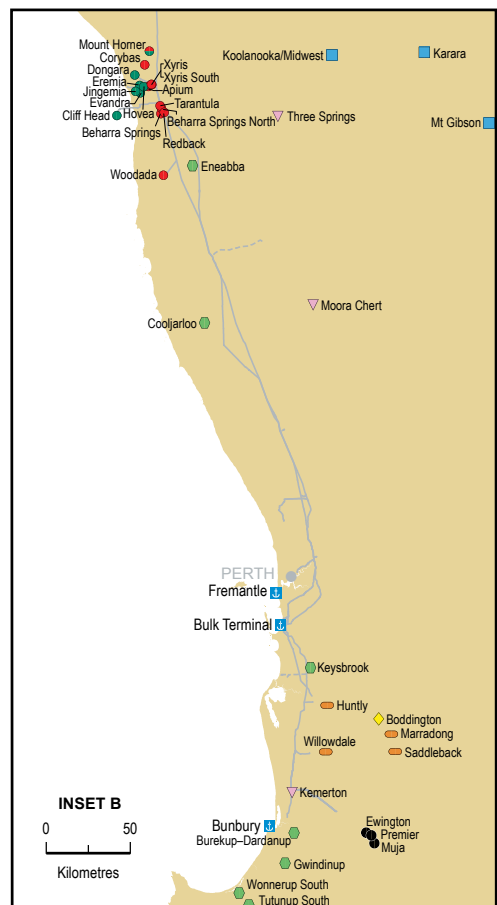
Map 3. Local Government and Regional Boundaries Insert



Map 4. 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
 - - - Oil / gas pipeline, proposed
- INFRASTRUCTURE**
- Port

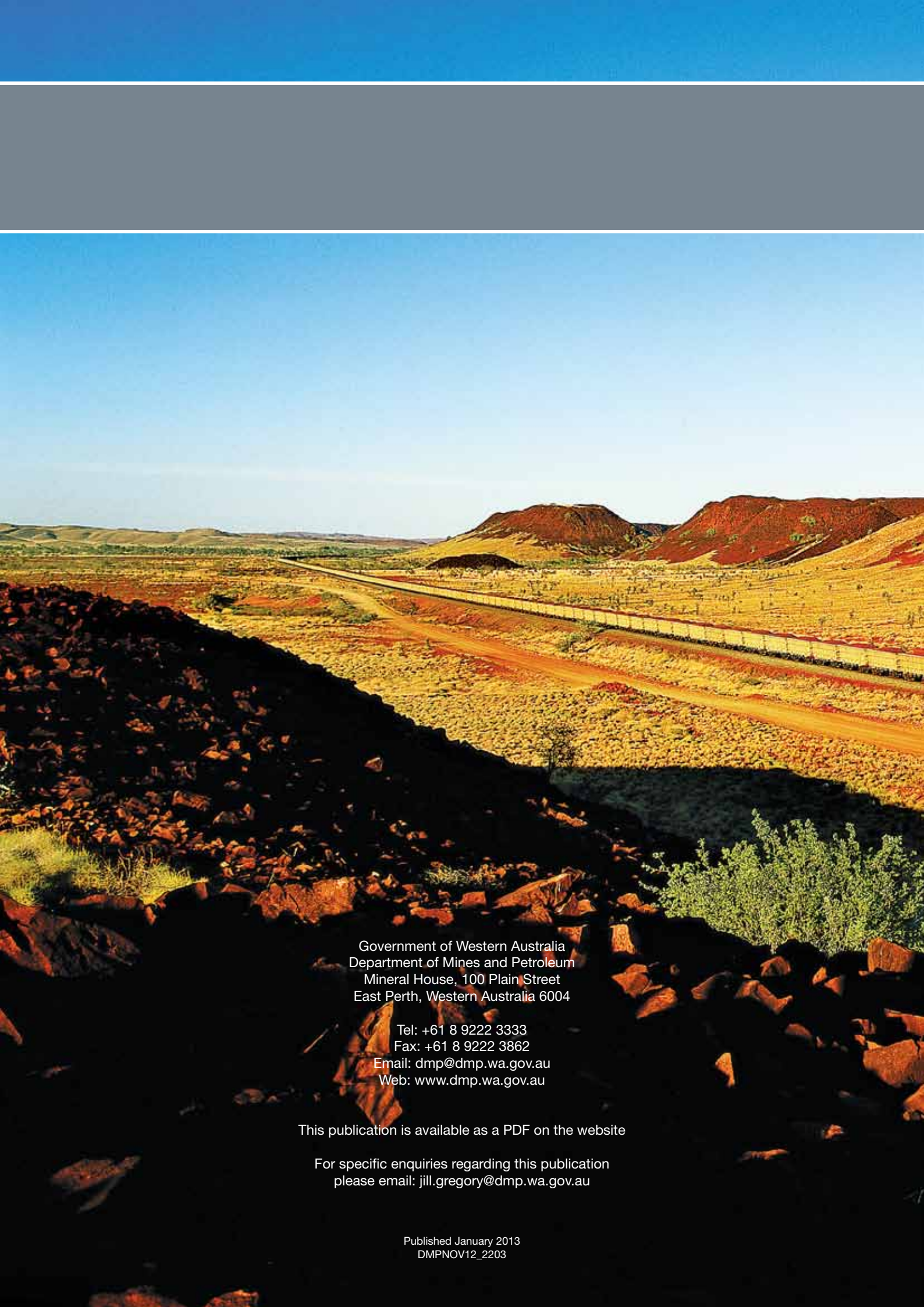


Map 5. Major Mineral and Petroleum Projects in Western Australia Insert



Loading a ship at Parker Point iron ore terminal.

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