



# Australian Resource Reviews

## Gold 2016

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**Resource figures are current as at 31 December 2015.**

The principal uses for gold (Au) are as an investment instrument for governments, central banks and private investors, and as jewellery, which accounts for most of its annual usage. The main industrial use for gold is in the electronics industry, taking advantage of its high conductivity and corrosion-resistance properties. Small amounts of gold are present in most modern electronic devices. Gold is also used in dentistry because gold alloys are strong, resistant to tarnishing and easy to work.

According to the World Gold Council, trade in physical gold during 2015 amounted to 4212 tonnes. This is almost 1030 tonnes more than world mine production for the year (3186 tonnes) as estimated by the United States Geological Survey (USGS). World Gold Council data shows jewellery consumed

2415 tonnes, bullion and coins 1012 tonnes and technology applications 330 tonnes. Central banks were net purchasers of gold during 2015 acquiring 588 tonnes of gold.

The price of gold in US dollars declined over 2015 with the monthly average gold price commencing at a high for the year at US\$1251/oz in January and concluding at a low of US\$1067/oz in December (Figure 1. The average price over the year was \$1160/oz, which is about US\$106/oz less than that in 2014. Due to prevailing exchange rates, the price of gold in Australian dollars fluctuated between a high of \$1633/oz (January 2015) and a low of \$1462/oz (December 2015) (Figure 1. Overall, the average price of gold in Australian dollars for 2015 was \$1600/oz, which is about \$130/oz higher than in 2014.

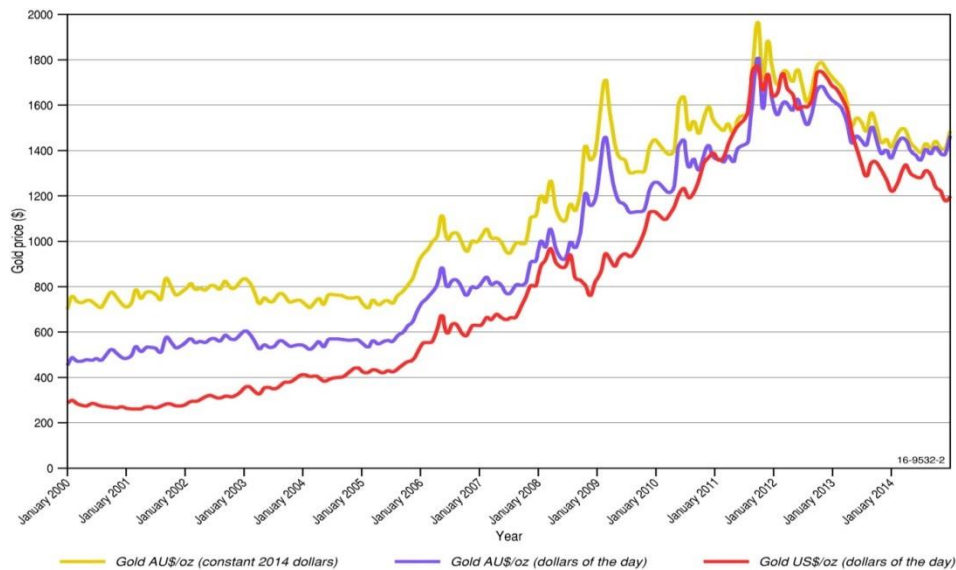


Figure 1. Monthly gold price in US\$, AUD\$ (dollars of the day) and constant 2015 AUD\$ for the period January 2000 to December 2015.

Sources: Bank of England (gold price time series in US\$), WM/Reuters (exchange rate), Reserve Bank of Australia (deflation factors).

## JORC Reserves

Proved and Probable Ore Reserves published in compliance with the Joint Ore Reserves Committee (JORC) Code increased by 2 tonnes in 2015 to 3552 tonnes (Table 1) and amounted to 39% of EDR. The most significant change in JORC Code Reserves occurred in Western Australia with a gain of 62 tonnes, to 1510 tonnes.

*Table 1: Ore Reserves of gold reported in compliance with the JORC Code, production and potential reserve life\*, 2002-2015.*

Year	Proved and Probable Ore Reserve (Mt)	Production (Mt)	Reserve Life (years)
2015	3552	278	13
2014	3550	274	13
2013	3911	265.0	15
2012	4119	251	16
2011	4131	258	16
2010	4070	260	16
2009	3548	223	16
2008	3409	215	16
2007	3284	245	13
2006	3329	246	14
2005	3343	263	13
2004	3330	259	13
2003	3432	282	12
2002	3573.9	266	13

*\*Reserve life is the ratio of Ore Reserves to production and represents a snapshot in time. It assumes that future production continues at the same rate and does not take into account future resource upgrades and successful exploration for new deposits.*

## Identified Resources

Australia's gold resources occur in all states and the Northern Territory (Figure 2). As at December 2015, total resources of gold compliant with the JORC Code increased 464 tonnes to 14 480 tonnes, an increase of 3% on the previous year. Resource increases were reported in Western Australia (up 301 tonnes), South Australia (82 tonnes), New South Wales (66 tonnes), Queensland (47 tonnes) and Victoria (26 tonnes). The Northern Territory and Tasmania both reported falls, with the Northern Territory's gold resources down 27 tonnes and Tasmania down by 1 tonne.

In 2015 Australia's Economic Demonstrated Resources (EDR) of gold increased 456 tonnes to 9546 tonnes (Table 2; Figure 3), up by 5% from 2014 (9112 tonnes). All jurisdictions had an increase in EDR with the exception of Tasmania (down 9 tonnes). The largest growth in EDR occurred in Western Australia (up 330 tonnes) with increases occurring in New South Wales (up 46 tonnes), Queensland (up 24 tonnes), South Australia (up 22 tonnes), Northern Territory (up 12 tonnes) and Victoria (up 5 tonnes). Western Australia continued to hold the largest share of EDR (3850 tonnes), followed by South Australia (2526 tonnes) and New South Wales (1806 tonnes). Collectively, these three states hold slightly more than 86% of the national EDR.

Table 2: Australia's identified gold resources and world figures (tonnes) for selected years from 1975-2015.

Year	Demonstrated Resources			Inferred Resources <sup>2</sup>	Accessible EDR <sup>3</sup>	Australian Mine Production <sup>4</sup>	World Economic Resources <sup>5</sup>	World Mine Production <sup>6</sup>
	Economic <sup>1</sup>	Paramarginal	Submarginal					
<b>2015</b>	<b>9546</b>	<b>227</b>	<b>75</b>	<b>4632</b>	<b>9516</b>	<b>278</b>	<b>57 000</b>	<b>3186</b>
2014	9112	244	95	4562	9082	274	55 000	3314
2013	9808	317	110	4520	9778	265	54 000	3022
2012	9909	372	122	4571	9879	251	54 300	2660
2011	9153	487	135	4513	9112	258	52 740	2700
2010	8410	930	120	4450	8380	260	51 800	2510
2009	7399	1495	120	4431	7270	223	47 000	2350
2008	6255	1478	123	4596	6130	215	48 655	2407
2007	5839	1272	138	4336	5780	245	42 000	2476
2006	5480	1265	128	4499	5420	246	42 480	2500
2005	5225	1315	118	4403	5173	263	42 225	2457
2000	4959	1021	117	2717		296	48 959	2445
1995	4263	1100	48	1378		253	44 000	2200
1990	2129	588	126	1311		243	42 400	2010
1985	959	119	122	1146		59	74 640	1556
1980	332	73	14	16		17	31 415	1188
1975	156					16		

1. EDR includes Ore Reserves and most Measured and Indicated Mineral Resources reported in compliance with the JORC Code.
2. Total Inferred Resources in economic, subeconomic and undifferentiated categories.
3. Accessible Economic Demonstrated Resources (AEDR) is the portion of total EDR that is accessible for mining. AEDR does not include resources that are inaccessible for mining because of environmental restrictions, government policies or military lands.
4. Source: Office of the Chief Economist (Resources and Energy Quarterly).
5. Source: United States Geological Survey (Mineral Commodity Summaries).
6. Source: World Gold Council.

The 39 largest contributing deposits in 2015, with an EDR in excess of 30 tonnes, accounted for 72% of the national EDR. Just over 43% of the national EDR was derived from the five largest of these deposits, namely — Olympic Dam and Carapatenna in South Australia, Boddington and Kalgoorlie in Western Australia and Cadia East in New South Wales (Figure 2).

Paramarginal Resources of gold declined by 18 tonnes to 227 tonnes in 2015. Submarginal Resources declined by 20 tonnes in 2015 to 75 tonnes (Table 2). Gold in Paramarginal and Submarginal Resources has declined by about

1100 tonnes since 2009 as more resources are being converted to JORC 2012 compliant resources.

Inferred Mineral Resources of gold in Australia had a minor rise of about 70 t, or 2%, to total 4632 t. The largest rise in this resource category was seen in New South Wales (up by 24 t) and the largest fall was recorded in Northern Territory (down by 23 t) with lesser rises and falls across the other states. Apart from the falls in total JORC Resources in 2013 and 2014, the nation's total gold resource has generally grown by between 200 t and 400 t per annum over the last two decades. Western

Australia's Inferred Mineral Resources remain the largest of any state or territory at 1870 tonnes followed by South Australia with 1201 tonnes and Queensland with 652 tonnes. Since an abrupt increase of about 1100 tonnes in 2004, due mainly to a substantial increase at Olympic Dam, the amount of gold in this

category has remained relatively constant. In general, the trends in the data over recent years indicate equilibrium between defining new resources and converting existing Inferred Mineral Resources to those with higher geological certainty.

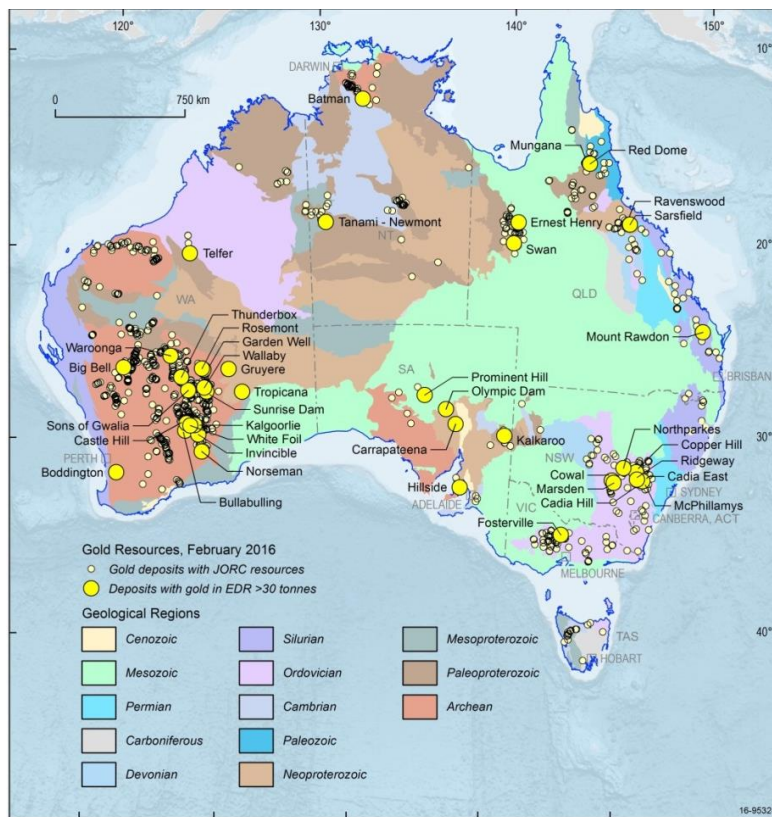


Figure 2. Gold deposits with Mineral Resources reported in compliance with the JORC Code, highlighting those with more than 30 tonnes of contained gold as at December 2015.

## Accessible EDR

Australia's EDR for gold is essentially unencumbered with around 30 tonnes, or less than 1%, currently unavailable for exploitation. Accessible EDR in 2015 was 9516 tonnes (Table 2). Deposits that contain gold resources that are unavailable for mining include Jabiluka, Koongarra and Coronation Hill, all of which are located in the Northern Territory.

## Exploration

Total mineral exploration expenditure, as reported by the Australian Bureau of Statistics, decreased by 22%, to \$1438.6 million in 2015. However, exploration expenditure on gold increased by 26% over the previous year to total \$475.9 million. Gold had the highest exploration expenditure of all commodities for 2015, ahead of iron ore (\$316.4 million) and coal (\$213.2 million) reflecting the relatively strong price of gold in Australian dollars.

## Production

Gold is mined in all states and the Northern Territory in Australia. The Perth Mint in Western Australia is the sole refiner of gold in the country. The mint acquires raw material from domestic mine production, recycled materials and from sources overseas. Total refined gold for 2015 amounted to 278 tonnes.

Domestic mine production increased 4 tonnes in 2015 to 278 tonnes. By state, Western Australia maintained the highest output of gold at 188 tonnes. New South Wales gold

production retained second position at 35 tonnes, returning to 2007 levels of production, and Queensland had the third highest production at 18 tonnes. As a percentage, Western Australia's share of production was 68% followed by New South Wales with 8% and Queensland with 6% (**Error! Reference source not found.**). Three jurisdictions recorded an increase in gold output: New South Wales up by 1 tonne, the Northern Territory up by 3 tonnes and Queensland up by 2 tonnes. All other jurisdictions had minor falls in gold output or remained the same.

Table 3. Gold production by jurisdiction (rounded to the nearest tonne) from 2008 to 2015.

Jurisdiction	2008	2009	2010	2011	2012	2013	2014	2015
New South Wales	31	25	30	30	26	32	34	35
Victoria	5	8	7	5	4	6	7	7
Queensland	18	16	15	16	15	17	16	18
Western Australia	134	152	181	180	180	183	189	188
South Australia	7	8	13	14	12	13	13	12
Tasmania	5	4	4	4	3	2	2	2
Northern Territory	15	10	10	9	10	12	13	16
Australia Total	215	223	260	258	251	265	274	278

Sources: Australian Bureau of Statistics and the Office of the Chief Economist.

Gold was a primary commodity output of about 75 open-pit and underground mining and processing operations (many with multiple mines) during 2015. As in 2014, about 20 operations also produced gold as by-product from processing other commodities.

Gold deposits can be grouped into a number of geological or metal-association types with differing contributions to production and resources. In 2015, lode-gold deposits of Archean age yielded 179 tonnes or 64% of Australian mine production, more than double the next largest producing type, copper-gold deposits. In contrast, lode-gold deposit

contribute 3828 tonnes to EDR or 40% of the national total. Copper-gold deposits include porphyries and the iron oxide-copper-gold deposits (e.g., Olympic Dam). Gold output in 2015 from these deposits amounted to 81 tonnes or 29% of national production while their combined contribution to EDR was 5005 tonnes or 52% of the national total. Production for the year from polymetallic (5 tonnes) and other deposits, including epithermal and antimony-gold deposits, was relatively minor, totalling 18 tonnes. Polymetallic and other deposits' contribution to EDR were also proportionally small at only 5%.

## World Ranking

Based on estimates provided by the USGS and adjusted for Australia by Geoscience Australia, world economic resources of gold increased by approximately 2000 tonnes or 4% in 2015 to 57 000 tonnes. Australia, with EDR of 9546 tonnes, or slightly more than 17% of world resources, has the largest share ahead of Russia with 8000 tonnes (14%) and South Africa with 6000 tonnes (11%) and United States and Indonesia both with 3000 tonnes (7%). According to the World Gold Council, the world produced 3186 tonnes of gold from mining in 2015. Using USGS figures, Australia's mine production of 278 tonnes accounts for 9% of world production and was second to that of China (490 tonnes), but ahead of the Russia (242 tonnes) and the USA (200 tonnes).

## Industry Developments

The following selected announcements provide a snapshot of industry activities in 2015:

- Gold Road Resources released a scoping study for the **Gruyere** gold project in Western Australia. The project has an 11-year mine life and is expected to produce 190 000 ounces of gold per year.
- Impact Minerals released a maiden Inferred Resource for the **Commonwealth** project in New South Wales. The resource comprises 720 000 tonnes at 4.7 g/t gold equivalent for 110 000 ounces grading at 2.8 g/t Au, 48 g/t Ag, 1.5% Zn, 0.6% Pb and 0.1% Cu.
- Dacian Gold announce a new resource for the **Westralia** gold deposit. The new resource is 4.6 million tonnes at 5.8 g/t Au for 853 000 ounces, which is a 40% increase over the previous resource.

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