Resources and Energy Quarterly

September 2017

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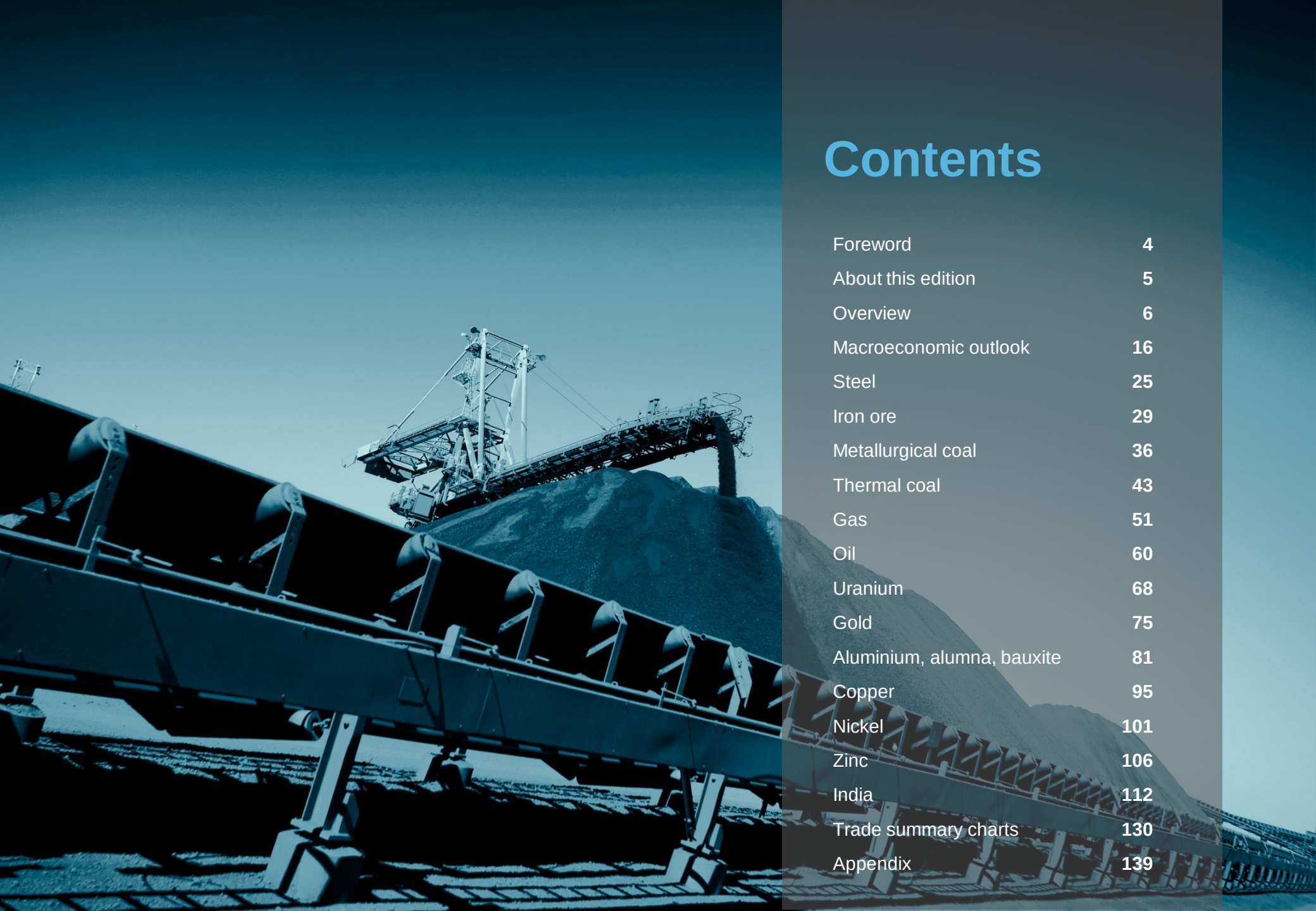

Contents

Foreword

The September quarter was one of typical significant volatility in resource and energy commodity prices. Prices for steel-making raw materials and some of the base metals rose notably through most of the quarter, before suffering a sharp setback in the second half of the month of September. As usual, the swings related largely to moves in market sentiment in relation to the Chinese economy.

It appears that some resource commodity markets are, and will be in the next year at least, experiencing more intense seasonality: Chinese steel and aluminium makers stepped up their purchases of raw materials in the June–August period, as they prepared for the curtailment of a very significant part of Chinese production in the approaching winter.

Buoyant prices for steel-making commodities and thermal coal, and increased LNG export volumes, are expected to see Australia's resource and energy export earnings increase by 2 per cent in 2017–18, to a record $211 billion.

For the first time in around seven years, industrial production is currently uniformly firm in the Advanced economies, Emerging economies and in Africa and the Middle East. This has helped propelled resource commodity prices higher.

Unfortunately, the high prices that have bolstered Australia's resources and energy export earnings in 2016–17 and (in early) 2017–18 are not expected to last. The combination of both slowing demand growth from China's steel sector and increased global supplies, are expected to lower export unit values in 2018–19.

Overall, the value of Australia's resource and energy exports is forecast to fall by around $10 billion in 2018–19 to around $201 billion.

In this edition of the *Resources and Energy Quarterly*, we have a special focus on India, specifically the prospects for Indian resource and energy commodity usage over the next twenty years. While the prospects are good, they won't be on the same scale that we have seen from China over the past decade or so. India will be able to supply some of its own requirements, but will need to import large amounts of some commodities. Australia stands to benefit, particularly as the world's largest exporter of metallurgical coal: India has little resources of this commodity and a strongly growing need.

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About this edition

Each March edition of *Resources and Energy Quarterly* features a 'medium term' (five year) outlook for Australia's major resource and energy commodity exports.

The June, September and December quarter editions of *Resources and Energy Quarterly* contain a 'short term' (two year) outlook. These short term outlooks take into account the most recent developments in commodity markets and update the short term outlook in the March *Resources and Energy Quarterly*.

In this report, commodities are grouped into two broad categories, referred to as 'resources' and 'energy'. 'Energy' commodities comprise metallurgical and thermal coal, oil, gas and uranium. 'Resource' commodities in this report are all other mineral commodities.

In the *Resources and Energy Quarterly report*, 'forecast' is the term used for the two year outlook period. The term 'projection' is used to refer to the period beyond two year out. 'Estimate' is used to refer to any period in the past for which a full set of data is not yet available.

Unless otherwise stated, all Australian and US dollar figures in this report are in nominal terms.

Forecasts for this edition of *Resources and Energy Quarterly* were finalised on 22 September 2017.

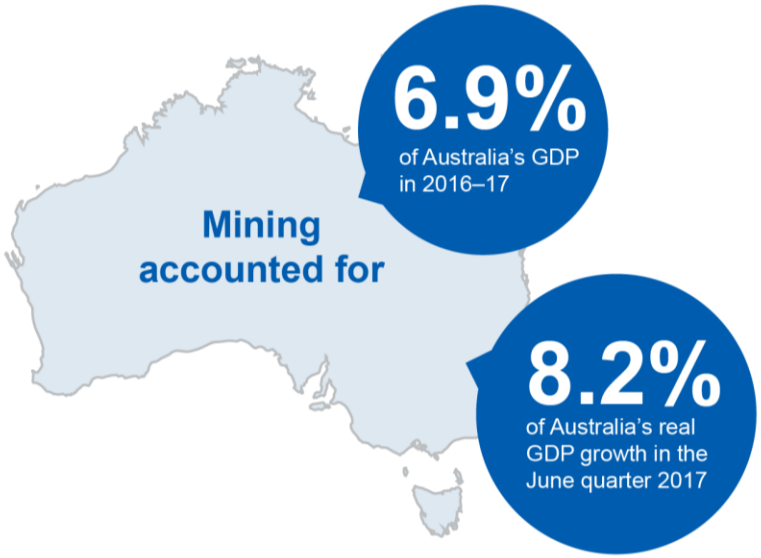
This edition of *Resources and Energy Quarterly* includes a Special Topic: the prospects for resources commodity usage in India.

Resources and Energy Quarterly publication schedule

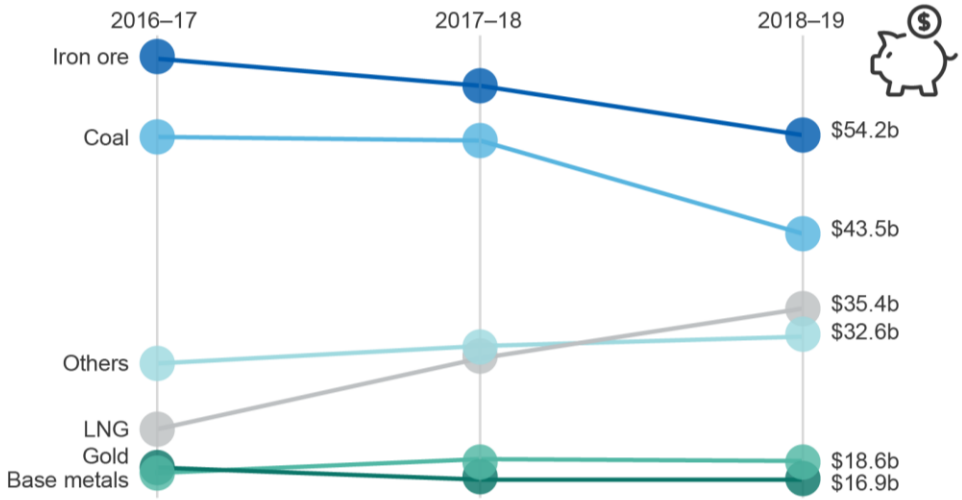
Publication	Expected release date	Outlook period	Special focus
December quarter 2017	8 January 2018	Australian data: 2018–19 International data: 2019	Resources and Energy Major Projects
March quarter 2018	6 April 2018	Australian data: 2022–23 International data: 2022	Medium term outlook
June quarter 2018	6 July 2018	Australian data: 2019–20 International data: 2020	'Critical' Commodities
September 2018	5 October 2018	Australian data: 2019–20 International data: 2020	One Belt One Road

Overview

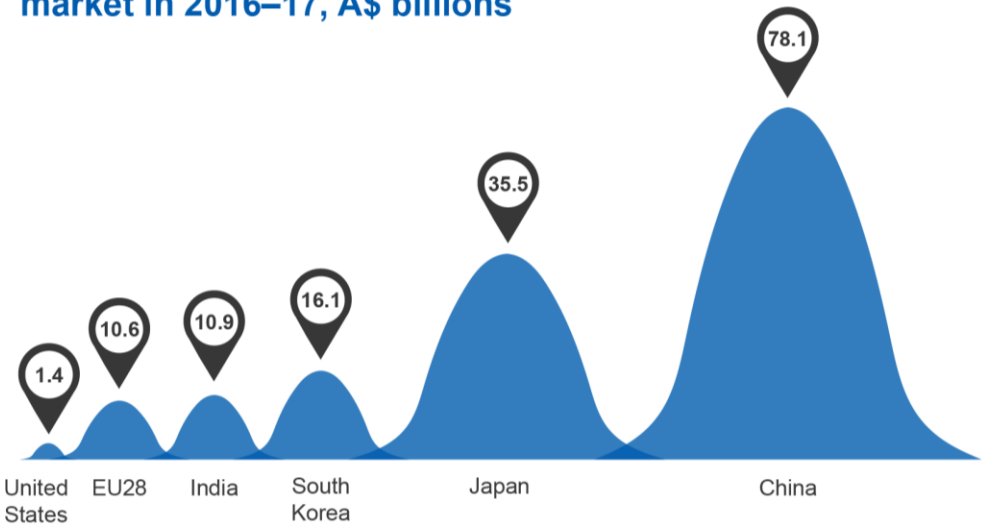
Resources and Energy Quarterly September 2017



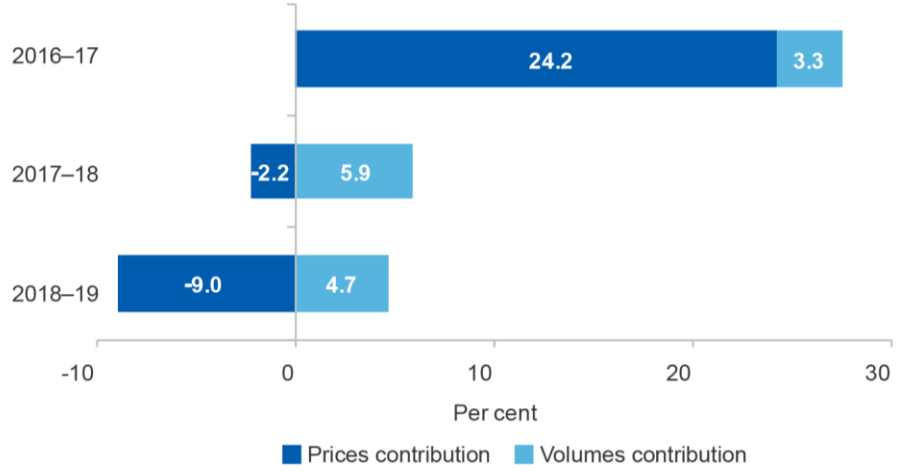
Australia's resources and energy commodity exports, A$ billions



Australia's resources and energy exports by major market in 2016–17, A$ billions



Australia's resources and energy exports growth, contributions from price and volumes



Revisions to the outlook

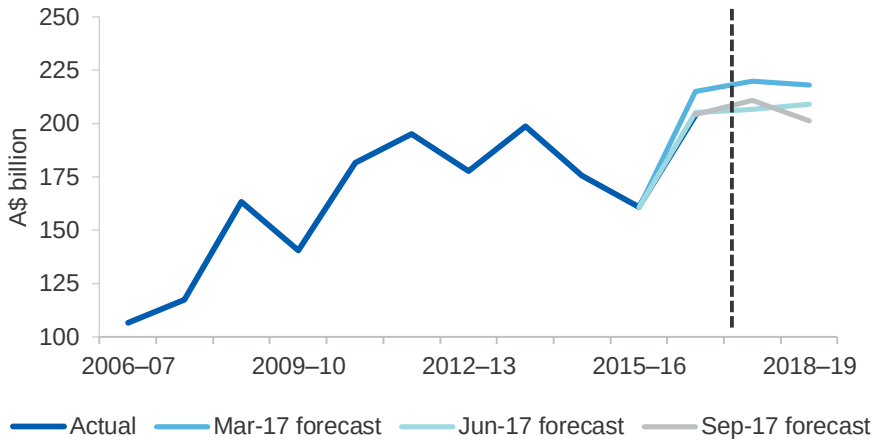
In broad terms, there have been relatively modest changes to the forecast value of Australia's resources and energy export earnings over both this financial year and the forthcoming one. 2017–18 is looking slightly stronger, but 2018–19 weaker than previously expected. In both years, export earnings will be well above levels seen in the two years prior to 2016–17.

The forecast for Australia's resources and energy export earnings in 2017–18 has been revised up by $4.1 billion (2 per cent) to $211 billion. The upward revision primarily reflects higher than expected prices for metallurgical coal, alumina and gold than forecast in the June 2017 *Resources and Energy Quarterly*. Stronger than expected demand, and supply problems, have pushed metallurgical coal and alumina prices higher, while gold has benefited from increased safe haven demand from heightened tensions on the Korean Peninsula.

These upward revisions have been partially offset by a downward revision to LNG totalling $1.8 billion in 2017–18. The outlook for LNG prices has deteriorated in line with expectations for oil prices, to which LNG prices are linked. The OPEC 2017 Production Agreement has not been as successful as many expected in driving oil prices higher. In addition, US oil production has been stronger than expected, and forecasts of future production continue to be revised higher.

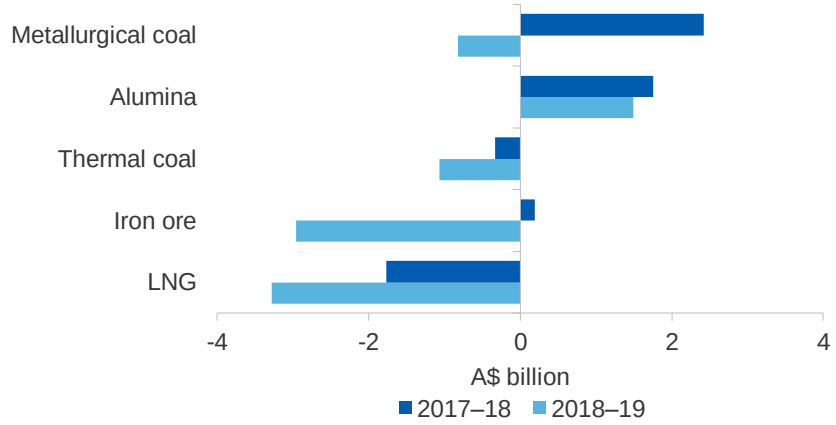
In 2018–19, export earnings are now forecast to be $201 billion, compared to $209 billion in the June 2017 *Resources and Energy Quarterly*. The deterioration in the outlook for LNG prices is a significant driver of the downward revision. In addition, lower than expected growth in iron ore production is expected to result in lower iron ore export volumes in 2018–19. The revision to iron ore production reflects both lower guidance targets from major producers and slower-than-expected production growth at several operations.

Figure 1.1: Revisions to export earnings



Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Figure 1.2: Selected revisions to export earnings, June 2017 to September 2017



Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Market summary: Commodity prices and world demand

Commodity prices rebounded in the September quarter 2017

Preliminary estimates suggest that the September quarter 2017 saw the Australian Resource and Energy Commodity Price Index — the weighted-average price Australian resource and energy exporters receive for their commodities — reverse two thirds of the June quarter's sharp (8.9 per cent) losses. However, an appreciation in the Australia-United States exchange rate almost totally offset the impact of the rise in USD commodity prices: Australia's resources and energy export prices are estimated to have risen by just 2.2 per cent.

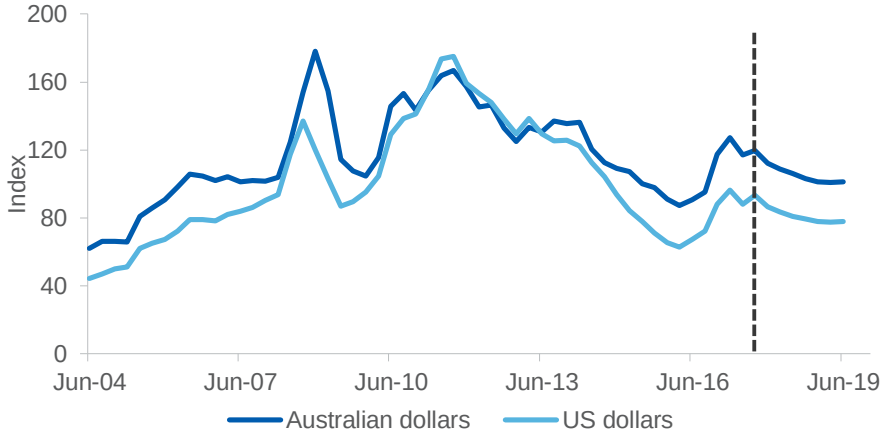
The rise in resource and energy commodity prices (in USD terms) was largely driven by a rebound in the prices of iron ore and thermal coal, with contributions from gains in aluminium, alumina and copper prices. The iron ore price rose as Chinese steel mills competed intensively for ore, in order to take advantage of high local steel prices. Thermal and metallurgical coal prices benefited from disruptions to global supply against a firm demand back-drop.

Increased seasonality in some resource and energy commodity markets

It appears that some resource commodity markets are and will be — in the next year at least — experiencing more intense seasonality: Chinese steel and aluminium makers stepped up their purchases of raw materials in the June–August period, as they prepared for the curtailment of some of domestic production in the approaching winter. The current trend is for Beijing and some provincial Chinese governments to force the closure of a large portion of Chinese metal production capacity during the winter months, in order to reduce the level of air pollution in some of the larger Chinese cities.

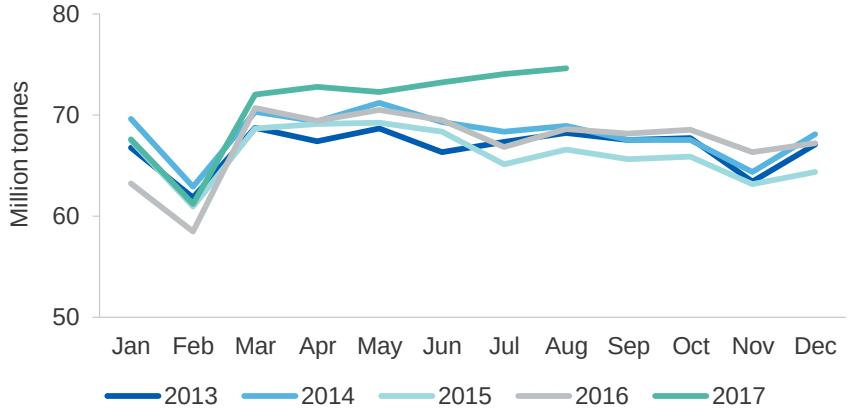
Outside the winter period, Chinese production of steel and aluminium has surged, as mills/smelters seek to make up for lost production in the winter. While the 'winter curtailment' policy is maintained, maintenance of mills and smelters will likely be delayed until the winter months, allowing for production to run at full strength outside of winter. Strong import demand from China in the February–September period of each year may give market participants an overinflated view of the strength of their respective markets.

Figure 1.3: Resource and energy export prices



Notes: The price index is a Fisher Price Index based on Australia's export volumes and values. US dollar commodity prices are converted at the market exchange rate
Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Figure 1.4: China's monthly crude steel production



Source: Bloomberg (2017) World Steel Association, Bloomberg (2017) National Bureau of Statistics of China

With small, less efficient mills/smelters being squeezed out of the industry in China — in order to raise the efficiency of energy usage in Chinese industry — the remaining large/efficient producers face reduced competition in the short/medium term. The resultant increased margins for those surviving producers has tended, and will tend, to encourage increased production, eventually restoring Chinese production to pre-rationalisation levels. In the long run, Chinese production of steel and aluminium will tend to shift away from heavily populated cities where pollution is a major problem. If coastal production moves inland, this could pose problems for seaborne exporters supplying China; the cost of transporting coal and ore inland would diminish their competitiveness.

Australian bulk commodity exporters set to receive lower prices

Australia's resources and energy export prices are forecast to decline by 4.3 per cent in 2017–18 and by a further 11.1 per cent in 2018–19. This primarily reflects forecast declines in US dollar-denominated bulk commodity prices — as China's steel sector loses some of its recent buoyancy at the same time that the supply of bulk commodities picks up.

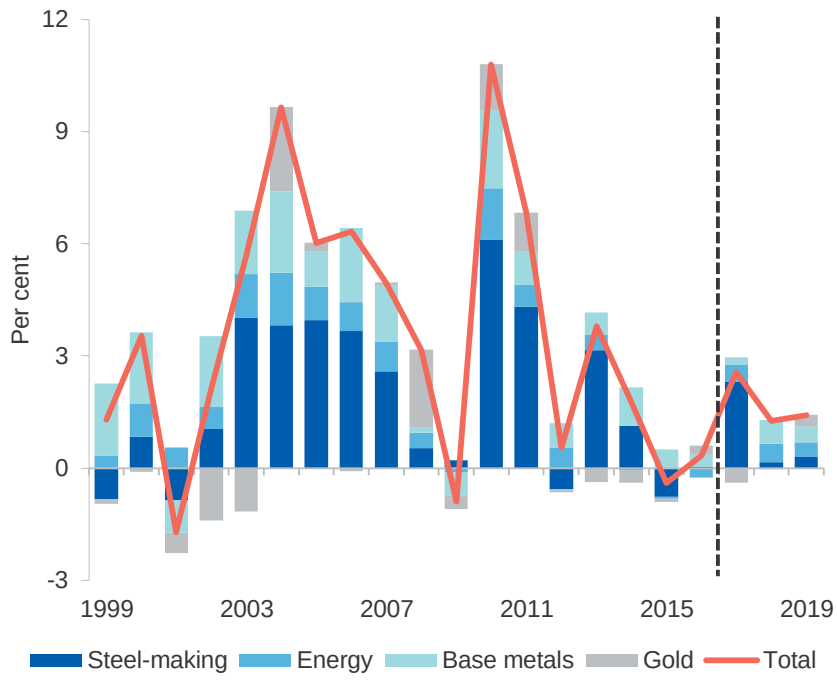
Demand for Australia's resource and energy commodities is forecast to rise modestly in the next two years

After what appears likely to be a relatively strong year in 2017 (in comparison to 2015 and 2016), global demand for the types of resource and energy commodities that Australia produces is forecast to grow more moderately in 2018 and 2019. In particular, growth in consumption of steel-making commodities (iron ore and metallurgical coal) — which together currently represent almost half of Australia's resources and energy exports — is forecast to show slower growth after a strong 2017.

Stronger Chinese growth in base metal demand in 2018 — particularly for copper — is expected to drive improved world base metal demand, with decent contributions from other major consuming countries/regions.

Global demand for energy commodities (excluding metallurgical coal) is also forecast to pick up modestly in 2018. Firm world economic growth and a modest recovery in Chinese energy consumption will contribute to the rise. For Australia, the most important source of growth in energy commodity demand will be from LNG, which is forecast to grow at an average annual rate of 9.3 per cent between 2016 and 2019.

Figure 1.5: Annual global consumption growth of resource and energy commodities



Notes: Steel-making include iron ore and metallurgical coal. Energy excludes metallurgical coal. Consumption volumes for each commodity are weighted by their share in Australia's resources and energy export values for that year.

Source: Bloomberg (2017) World Steel Association; IEA (2017) Coal Information 2016; Nexant World Gas Model (2017); International Energy Agency Monthly Oil Data Service (2017); World Nuclear Association (2017); Thompson Reuters (2017); World Bureau of Metal Statistics (2017); International Nickel Study Group (2017); International Lead Zinc Study Group (2017); Department of Industry, Innovation and Science (2017)

Australia overview

Australia's resource and energy export values have grown rapidly so far in 2017, driven by a surge in prices attained

Australia's resources and energy export values grew by more than 25 per cent year-on-year in the September quarter 2017. The major driver of the rise related to developments in China — on both the supply and demand side — through 2016–17, which lifted prices noticeably.

China acted to restrict domestic coal output from the June quarter of 2016, to reduce loss making in the domestic coal industry. Beijing's efforts were arguably too successful, and created shortages of coal — particularly the metallurgical variety — for the next several quarters. Chinese iron ore production was also weak in 2016, just as Chinese steel input demand staged a significant recovery in the latter half of 2016 and then into 2017.

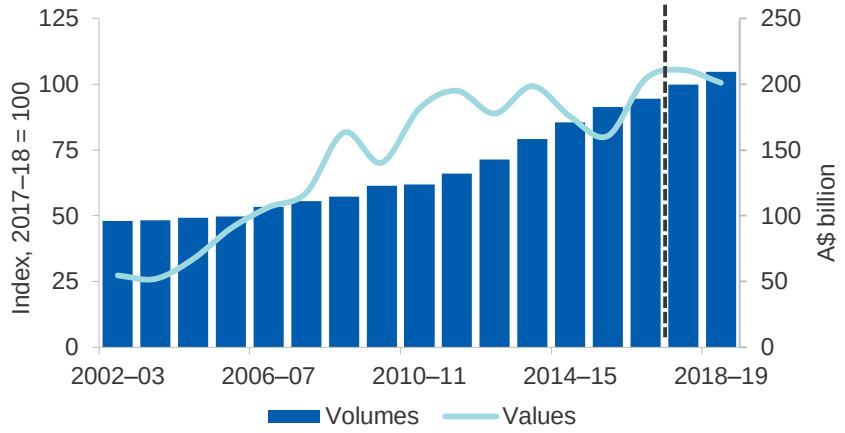
Australia was a major beneficiary of the ongoing shortages created in China by government-enforced cutbacks to domestic production, on both the volume and price sides. However, weather-related disruptions constrained growth in the volume of Australia's bulk exports in 2016–17, and producers are only just catching up now. Given Australia's large presence in seaborne export markets, these weather disruptions contributed significantly to higher prices, offsetting much of the impact of the volume loss.

Prices for iron ore and metallurgical and thermal coal are forecast to decline in the next two years, while LNG prices — which are linked to oil prices by formula under contractual arrangement — are forecast to edge up. A rise in Australian LNG export volumes will partly offset the impact of weaker bulk commodity revenues.

The fall in prices will be more than offset by the impact of rising volumes during 2017–18, but will overwhelm the volume effect in 2018–19. Recent trends in exploration and capital expenditure in the Australian mining sector do not point to an extension of the resource production boom, currently forecast to peak in late in 2019.

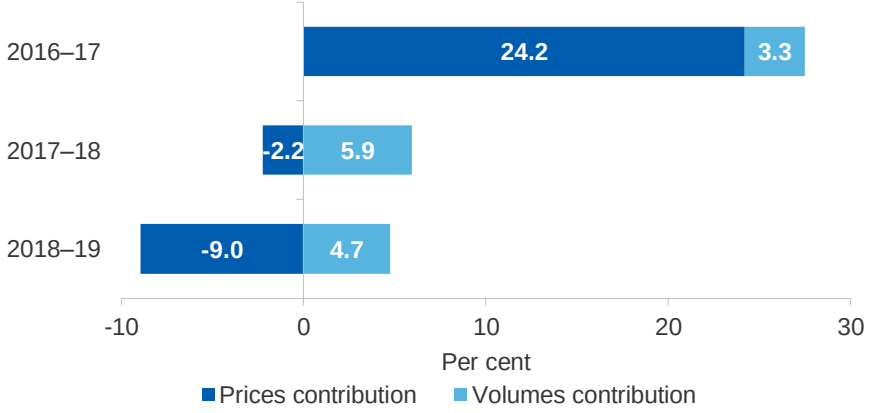
Any untoward Australian dollar strength could exacerbate the impact of the expected decline in US dollar-denominated resource and energy prices over the forecast period.

Figure 1.6: Australia's resources and energy export values and volumes



Source: ABS (2017) International Trade in Goods and Services, 5368.0;Department of Industry, Innovation and Science (2017)

Figure 1.7: Annual growth in Australia's resources and energy export values, contributions from prices and volumes



Source: ABS (2017) International Trade in Goods and Services, 5368.0;Department of Industry, Innovation and Science (2017)

The mining industry continued to support overall Australian economic growth in the June quarter 2017

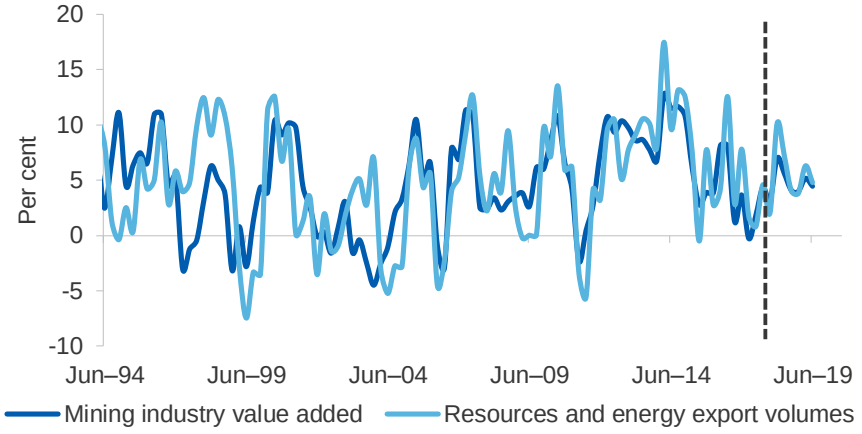
Australia's real Gross Domestic Product (GDP) grew by 0.8 per cent in the June quarter 2017, with mining industry value-added growing by 0.6 per cent. The mining industry directly accounted for 5 per cent of the growth in Australia's GDP in the quarter. Growth in mining industry value-added was driven entirely by oil and gas extraction, which grew by 8 per cent. Coal mining industry value-added fell by 5 per cent in the quarter, while iron ore mining value-add fell by 1 per cent, and value-add for all other mining fell by 5 per cent.

Oil and gas extraction has been the largest contributor to growth in mining industry value-added in the last two years, propelled by rapid growth in export volumes, and despite declining capital expenditure (from a high base, see Figure 1.12). Industry value-added for Australia's largest resource commodity exports — iron ore and coal — has been dampened by falling capital expenditure and slowing export volumes growth.

However, after years of declines, it now appears likely that the fall in mining capital expenditure may be coming to an end. The pace of decline in capex has eased markedly in recent quarters, and investment is starting to pick up for several commodities, including zinc, lithium and gold. This flattening out reflects the stabilisation of commodity prices, and some feed-through from recent surges in prices for some metal commodities.

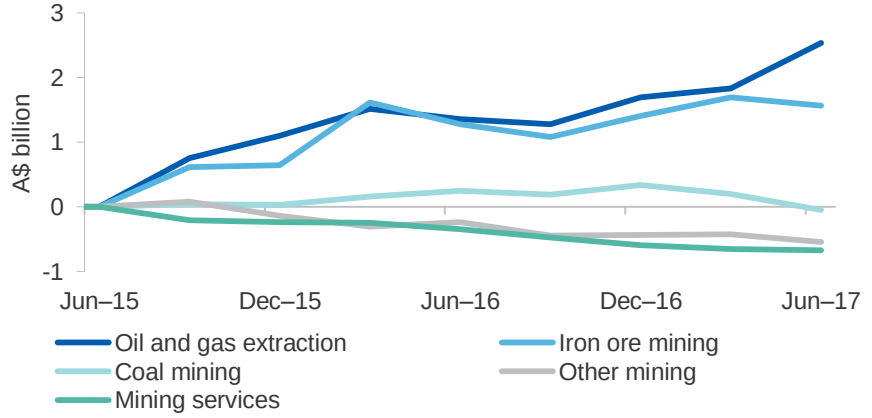
Resources and energy exports have a significant impact on mining industry value-added. Over the next two years, accelerated growth in resources and energy export volumes (primarily from LNG) is expected to underpin more rapid growth in mining industry value-added. However, mining's contribution to growth in the Australian economy is projected to slow considerably after 2018–19, as the last of the LNG plants currently under construction come online, and as the LNG industry approaches full capacity.

Figure 1.8: Mining industry value-added and resources and energy export volumes, year-on year percentage growth



Notes: Mining industry value-added is in seasonally adjusted chain volume measures
Source: ABS (2017) National Accounts, 5204.0; ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Figure 1.9: Cumulative growth in mining industry value-added since June quarter 2015



Notes: Chart data is in seasonally adjusted chain volume measures
Source: ABS (2017) National Accounts, 5204.0; ABS (2017) International Trade in Goods and Services, 5368.0

Mining industry capital spending remains on a trend of long-term decline

Real investment in Australia's mining industry edged down by 2.3 per cent in the June quarter 2017, as a result of a drop in investment in buildings and structures. Plant and machinery investment rose marginally, but remains a relatively small share (15 per cent) of total investment.

As can be seen in Figure 1.12, investment in oil and gas peaked in December quarter 2013 — considerably higher, and over a year later, than the investment peaks for metal ore and coal mining. Equally apparent is the dramatic decline in oil and gas investment since its peak. Weighing on investment in the oil and gas sector in the coming two years will be the $US54 Gorgon LNG project, which was completed in March 2017. While large LNG projects remain — most significantly the $US37 billion Ichthys and the $US34 billion Wheatstone projects — the list of major projects yet to be completed is forecast to rapidly diminish over the next two years.

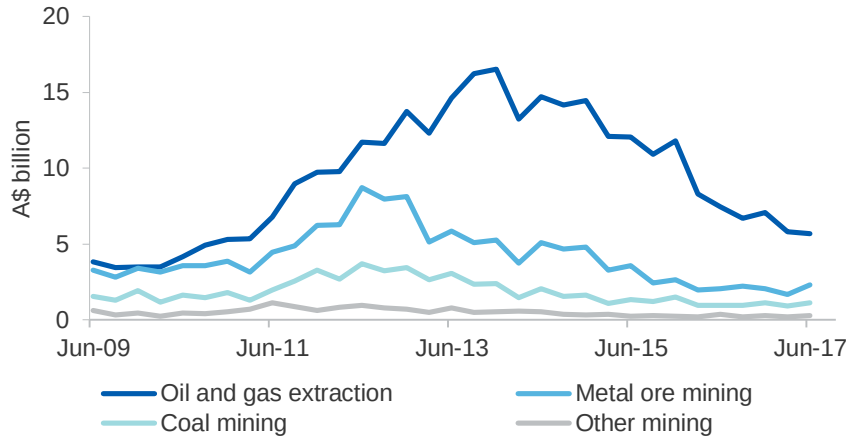
Exploration expenditure is growing, driven by gold

Exploration expenditure grew by 7.5 per cent (seasonally adjusted) in the June quarter 2017, to be 22.9 per cent higher year-on-year. Of note, minerals exploration expenditure grew for the fourth consecutive quarter, and was 15 per cent higher year-on-year.

The increase in minerals exploration in the past year has been largely driven by nickel, cobalt, and gold, all of which have been subject to recent favourable movements in commodity prices. Zinc, in particular, looks to hold strong prospects for producers over coming years, while the outlook for gold is solid and stable.

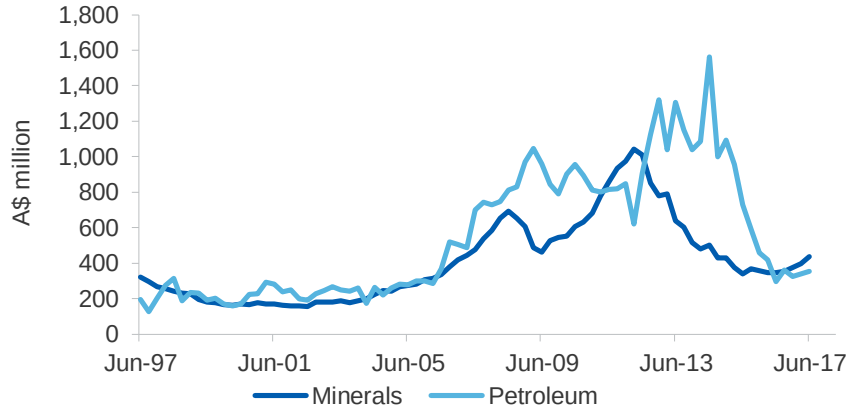
Exploration for coal fell by 14 per cent over the year. This likely reflects significant uncertainties around future movements in coal prices in light of some unfavourable price movements over the 2017 year-to-date.

Figure 1.10: Mining industry capital expenditure, fiscal year



Notes: Chart data is in nominal terms
Source: ABS (2017) Private New Capital Expenditure and Expected Expenditure, 5625.0

Figure 1.11: Australia's exploration expenditure, quarterly



Notes: Other mining includes non-metallic mineral mining and quarrying and exploration and other mining support services; chart data is in nominal terms
Source: ABS (2016) Private New Capital Expenditure and Expected Expenditure, 5625.0

Mining employment edged down in the September quarter 2017, as a result of lower exploration and mine construction

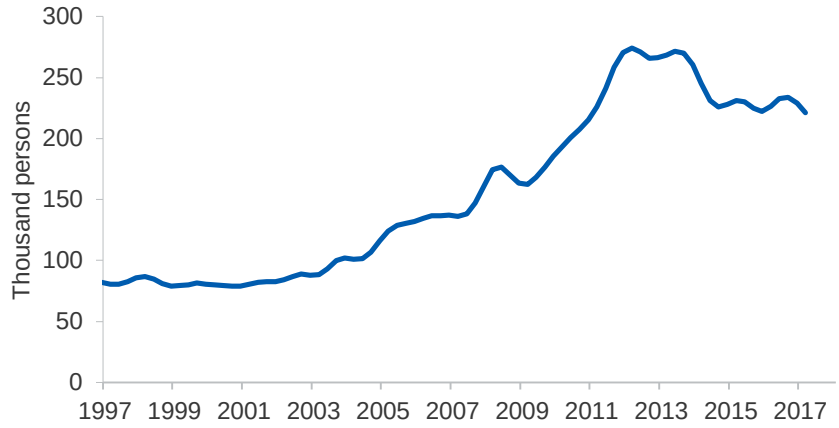
The mining sector employed 221,100 persons in the September quarter 2017, down by 3.6 per cent quarter-on-quarter and 2.4 per cent year-on-year. Mining industry employment managed slow growth in late 2016 and early 2017, but appears to have lost some momentum over the last six months.

Two sub-industries stand out in the employment statistics: employment rose by 4,000 persons in the oil and gas extraction sector during the quarter.

Offsetting this, employment in exploration and support services to mining fell by more than 15,000 persons in the September quarter. The mining industry has reduced exploration activity in recent years, as prices for most commodities have declined, and as global supply has ramped up. Construction jobs have also been reduced in the sector in recent years, as mine construction concludes across a range of sites.

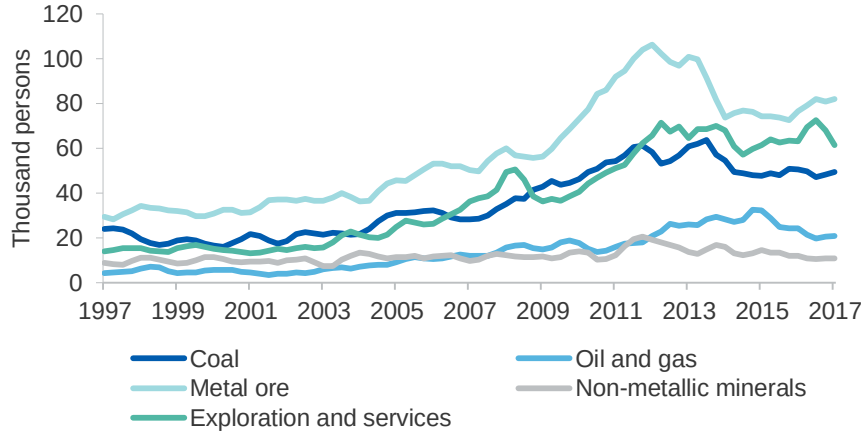
Some smaller commodities, such as zinc, are experiencing renewed price strength, which may support increased exploration and additional mine construction in the future. However, with larger commodities generally progressing further into the production phase of the commodity boom, it is likely that growth in overall mining employment will remain constrained for the foreseeable future.

Figure 1.12: Australia's mining industry employment



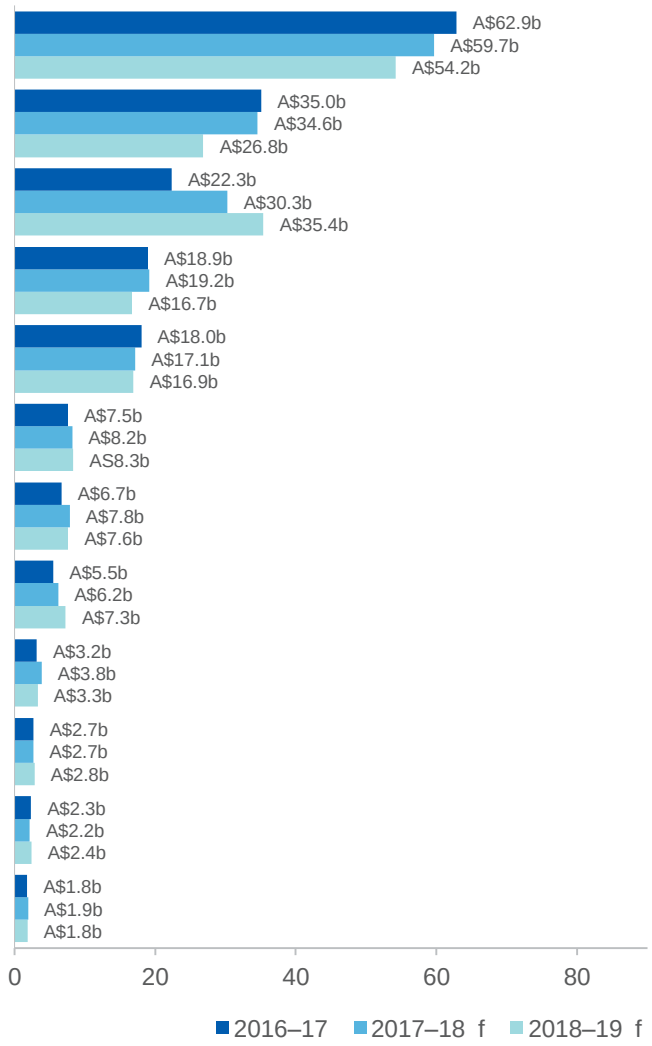
Notes: Trend data
Source: ABS (2017) Labour Force Australia, 6291.0.55.003

Figure 1.13: Australia's mining employment, by sub-industry



Notes: Data is a three quarter centred moving average of original data; non-metallic minerals includes quarrying; services is 'other mining support services'
Source: ABS (2017) Labour Force Australia, 6291.0.55.003

Figure 1.14: Australia's major resources and energy exports



	2017–18 f Per cent change			2018–19 f Per cent change		
	volume	EUV	value	volume	EUV	value
Iron ore	▲ 5	▼ -10	▼ -5	▲ 3	▼ -12	▼ -9
Metallurgical coal	▲ 10	▼ -11	▼ -1	▼ -1	▼ -21	▼ -22
LNG	▲ 21	▲ 12	▲ 35	▲ 17	→ 0	▲ 17
Thermal coal	→ 0	▲ 1	▲ 1	▼ -2	▼ -11	▼ -13
Gold	▼ -2	▼ -2	▼ -5	▲ 3	▼ -4	▼ -2
Copper	▲ 8	▲ 1	▲ 8	→ 0	▲ 1	▲ 1
Alumina	→ 0	▲ 17	▲ 18	▲ 1	▼ -4	▼ -3
Crude oil	▲ 2	▲ 11	▲ 13	▲ 16	▲ 1	▲ 17
Aluminium	▲ 6	▲ 14	▲ 21	▼ -1	▼ -14	▼ -14
Zinc	▼ -5	▲ 5	→ 0	▲ 17	▼ -9	▲ 6
Nickel	▲ 9	▼ -15	▼ -7	▼ -2	▲ 12	▲ 10
Lead	▲ 19	▼ -10	▲ 7	▲ 4	▼ -9	▼ -5

Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

*Notes: **f** Forecast; one year growth; EUV is export unit value*

Table 1.1: Outlook for Australia's resources and energy exports

						Annual percentage change		
	Unit	2015–16	2016–17	2017–18 f	2018–19 f	2016–17	2017–18 f	2018–19 f
Resources and energy	A$m	160,741	204,148	210,832	201,167	27.0	3.3	-4.6
– real b	A$m	167,043	208,588	210,832	196,476	24.9	1.1	-6.8
Energy	A$m	59,813	85,407	94,035	90,366	42.8	10.1	-3.9
– real b	A$m	62,158	87,264	94,035	88,259	40.4	7.8	-6.1
Resources	A$m	100,928	118,741	116,797	110,801	17.6	-1.6	-5.1
– real b	A$m	104,885	121,324	116,797	108,217	15.7	-3.7	-7.3

*Notes: **b** In 2017–18 Australian dollars; **s** Estimate; **f** Forecast*
Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

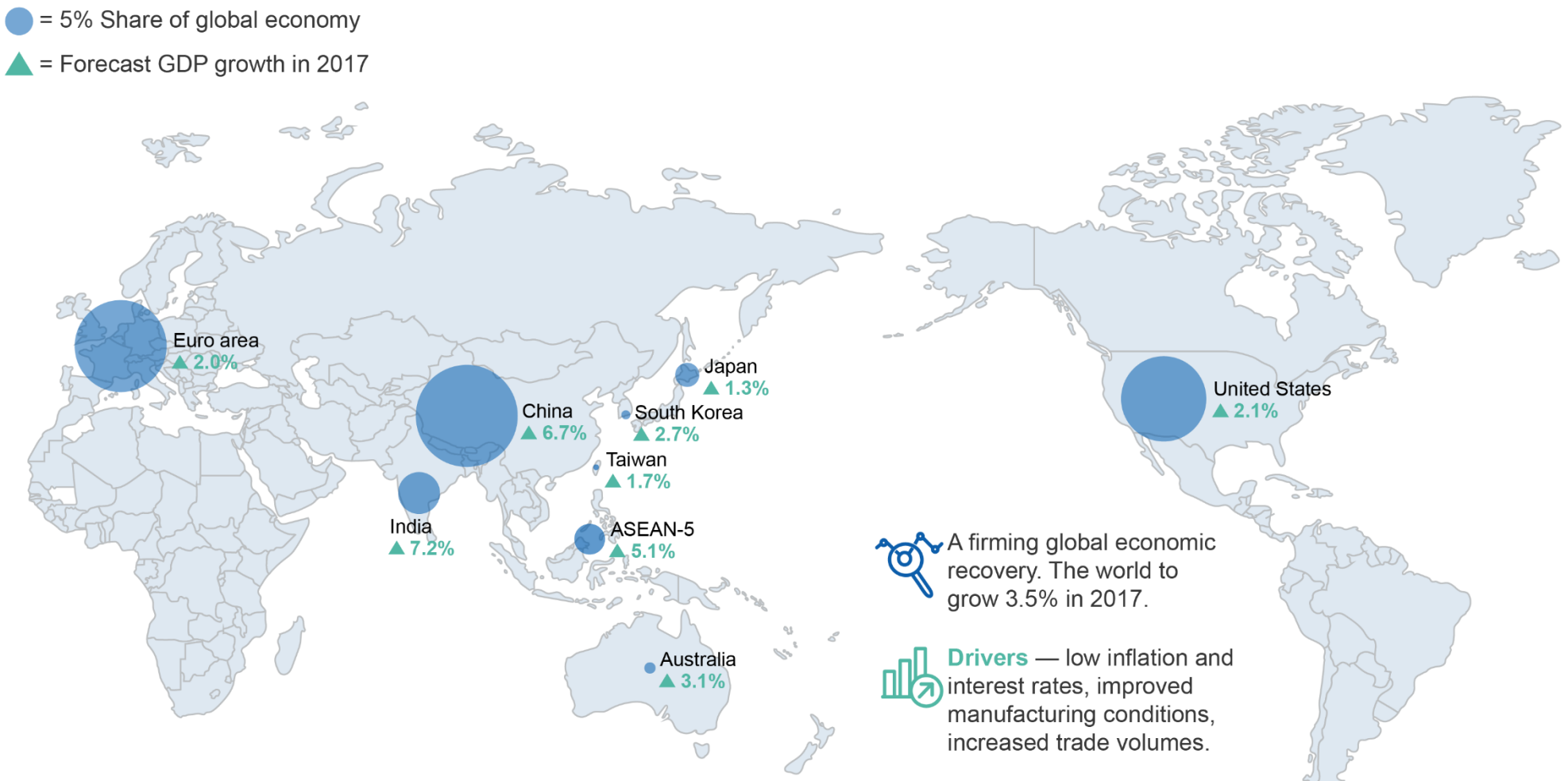
Table 1.2: Australia's resources and energy commodity exports, by selected commodities

	Volume				Value			
	Unit	2016–17	2018–19 f	CAGR	Unit	2016–17	2018–19 f	CAGR
Alumina	kt	18,230	18,413	0.5	A$m	6,655	7,595	6.8
Aluminium	kt	1,328	1,397	2.6	A$m	3,158	3,276	1.8
Copper	kt	922	1,006	4.5	A$m	7,544	8,288	4.8
Gold	t	334	335	0.2	A$m	18,013	16,879	–3.2
Iron ore	Mt	819	887	4.1	A$m	62,861	54,185	–7.2
Nickel	kt	172	183	3.2	A$m	2,334	2,389	1.2
Zinc	kt	1,009	1,118	5.3	A$m	2,667	2,826	2.9
LNG	Mt	52	74	18.9	A$m	22,332	35,397	25.9
Metallurgical coal	Mt	177	193	4.4	A$m	35,044	26,831	–12.5
Thermal coal	Mt	202	198	–1.0	A$m	18,937	16,691	–6.1
Oil	kbd	220	260	8.5	A$m	5,489	7,257	15.0
Uranium	t	7,724	8,450	4.6	A$m	894	1,004	5.9

*Notes: **s** Estimate; **f** Forecast; CAGR is compound annual growth rate in percentage terms from 2016–17 to 2018–19*
Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Macroeconomic outlook

Resources and Energy Quarterly September 2017



Summary

- The global economic recovery is firming, with world output forecast to grow by 3.5 per cent in 2017, 3.6 per cent in 2018, and 3.7 per cent in 2019 — supported by low inflation and interest rates.
- A sharp escalation of geopolitical tensions over North Korea's missile program could derail global economic growth projections.

Global outlook

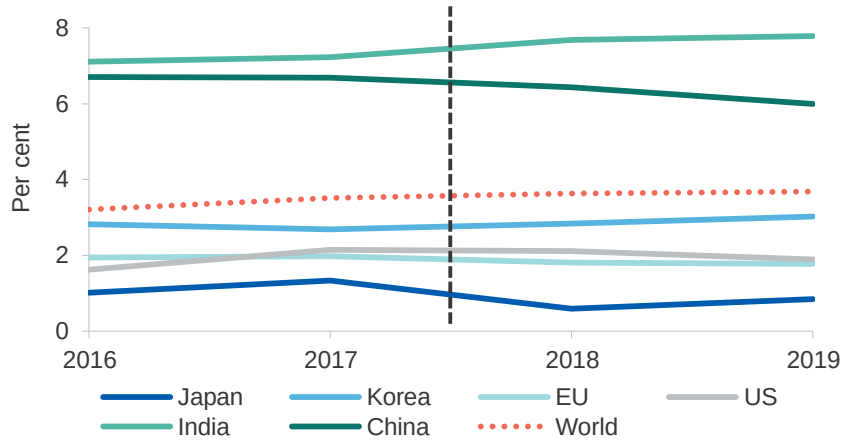
The global economic recovery has continued to build, evidenced by improved June quarter 2017 gross domestic product (GDP) figures from several major countries/regions. China recorded year-on-year GDP growth of 6.9 per cent, up from the growth rate in the March quarter 2017. In the United States, the economy grew by 2.1 per cent annualised in the June quarter. The European Union and Japan also recorded a year-on-year growth of 2.3 and 2.1 per cent, respectively.

The sustained recovery in global economic has been driven by rising business confidence and assisted by ongoing loose monetary conditions as inflation stays low. The world Purchasing Manager's Index (PMI) — an indicator of the economic health of the global manufacturing sector — hit a six-year high in August, at 53.1. This points to ongoing firm growth in the manufacturing sector in the short term, thus to rising global metal consumption.

The International Monetary Fund (IMF) did not change its global growth projections in its July 2017 economic update; the impact of upward revisions in GDP growth projections for China, the EU and Japan are expected to be offset by the downward revision in GDP growth projected for the US. Global economic growth is forecast to rise steadily further over the forecast period, reaching 3.7 per cent by 2019, up from 3.1 per cent in 2016.

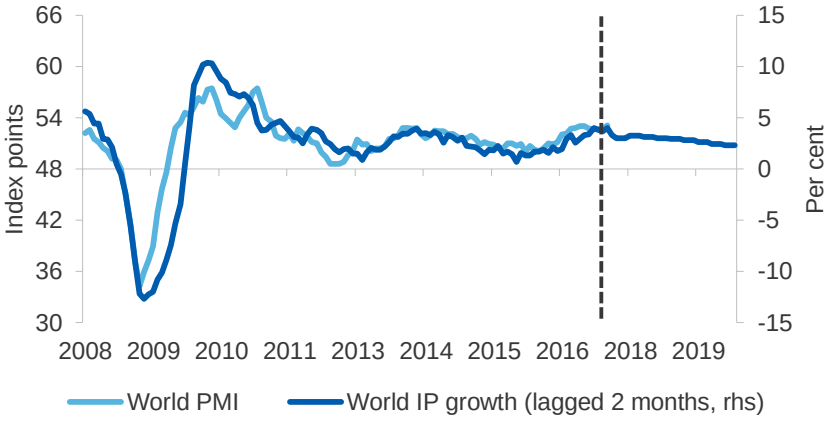
In China, fiscal support is expected to continue ahead of the 19th National Congress of the Communist Party of China in mid-October. In Japan and the EU, stronger economic activity in the first half of 2017 have been the catalyst for an upward revision to growth estimates. However, the IMF is less sanguine about the prospect of stimulatory US fiscal policy; reform appears to be much more difficult than expected, notwithstanding a Republican-controlled Congress.

Figure 2.1: Global and major economies real GDP, YoY growth



Source: International Monetary Fund (2017)

Figure 2.2: Industrial production vs World PMI, YoY growth



Source: Netherland CPB (2017); World Trade Monitor April; Markit (2017); JP Morgan Global Manufacturing PMI

Inflation in the Advanced economies remains low, and below or within the target range of 2–3 per cent set by most of the major central banks. This is allowing the central banks plenty of scope to withdraw their stimulatory monetary policy in a gradual fashion . World industrial production is forecast to grow at an annual average rate of slightly less than 3 per cent over the outlook period, supporting global GDP growth.

Any outbreak of hostilities on the Korean peninsula could have severe impacts on the global economy and Australian resource exports. China, Japan and South Korea are the main markets for Australia's resource commodity exports. In 2016–17, China, Japan and South Korea accounted for 51 per cent (or $61 billion), 7.1 per cent (or $8.4 billion), and 5.8 per cent (or $6.8 billion) of resource commodity exports, respectively.

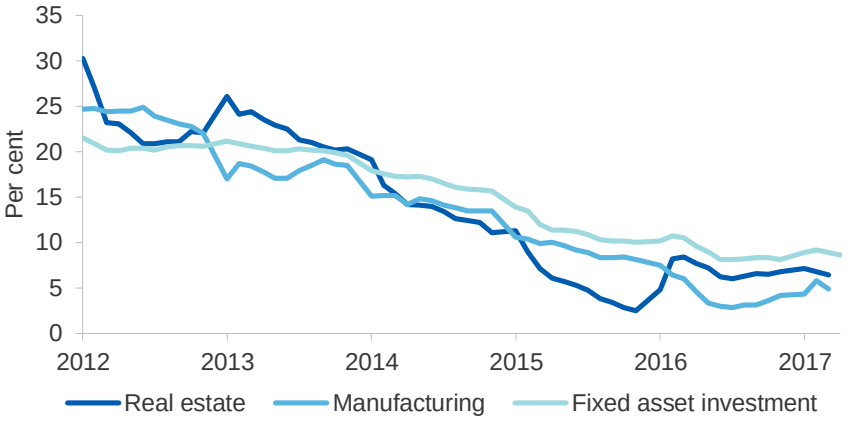
Rising debt levels in China and the uncertainty of fiscal policy in the US, pose additional risks to the global outlook. In China, total debt continues to rise (now at more than 250 per cent of GDP). Any sharp rise in bank bad debts could harm the country's medium term economic growth. In the US, there are uncertainties over the Trump administration's fiscal policies and the passage of proposed reforms. Any significant US fiscal stimulus would potentially add to demand and possibly inflation, putting pressure on the US Federal Reserve to raise official interest rates.

China

Chinese GDP growth was better than expected in the June quarter 2017 at 1.7 per cent (6.9 per cent annualised rate). This was up from 1.3 per cent in the March quarter, driven by the continued strong performance in the residential construction activity. Over this period, property new starts and sales increased at an average monthly year-on-year growth of 16 and 13 per cent, respectively.

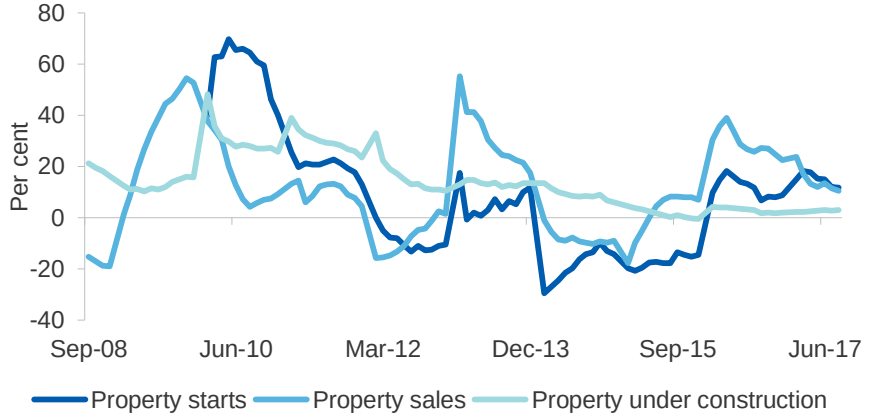
China's industrial production increased by 6.4 per cent year-on-year in July 2017, driven by increased output of electricity, gas and water (up 9.8 per cent year-on-year). Manufacturing production rose by 6.7 per cent year-on-year in August, a slower pace than in previous months. Mining output fell by 1.3 per cent year-on-year, reflecting the impacts of the government's shutdown of loss-making operations.

Figure 2.3: Breakdown of Chinese investment, YoY growth



Source: National Bureau of Statistics, China (2017)

Figure 2.4: Chinese monthly residential activity, YoY growth



Source: National Bureau of Statistics, China (2017)

There are a few factors behind the modest pick up in growth in recent months, including the change of the Chinese central government's 'one child' policy to two children that provides incentive to families to upgrade their homes; the shift in demand from big cities to smaller cities, due to purchase restrictions in the large cities; government subsidies to people who would like to relocate from a shanty (small and badly built property) to a better dwelling; and expectations of further gains in property prices. The sustained recovery of the real estate sector from the multi-year low at the end of 2015 has been a strong catalyst for the rise in steel production. This, in turn, has supported Australia's iron ore exports to China.

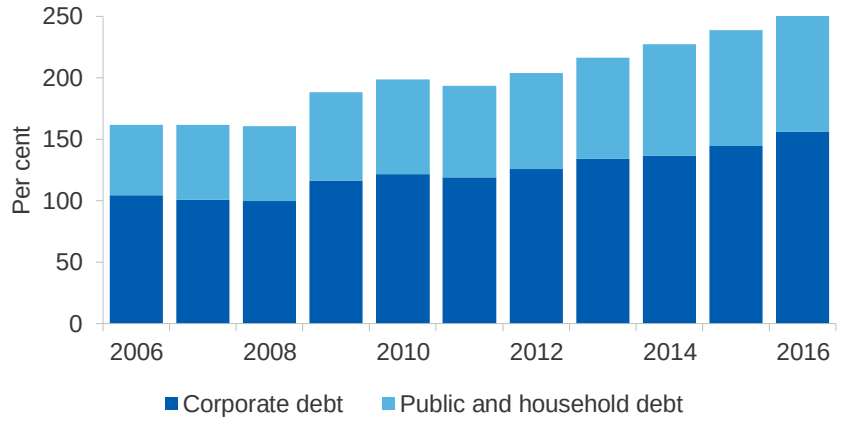
The transition from export and investment-led growth towards consumption-led growth economy in China has led to the outperformance of fixed asset investment (FAI) — investment in machinery, land, buildings, vehicles, and technology — over real estate and manufacturing investment. Despite falling from the high in 2012, FAI is still likely to grow at a monthly average of 8 per cent year-on-year growth in 2017.

China's Monetary Conditions Index points to lower activity readings as 2017 comes to an end. Money supply (M2) growth has been slowing for nine months.

Growing concerns over debt levels in China represent the main risk to this medium-term outlook. As of 2016, the ratio of debt to GDP was 258 per cent — with corporate debt (at 156 per cent of GDP), and public and household debt (at 102 per cent of GDP). To address the rising debt issue, the People's Bank of China has vowed to take 'prudent and neutral' measures. Large injections of support will be avoided, and more efforts will be made to deleverage the economy. Chinese GDP growth is expected to fall modestly in the short-term, from 6.7 per cent in 2017 down to 6 per cent in 2019.

Government measures to curb a further rise in debt are likely to have a direct impact on economic growth. This strategy, in turn, will affect commodity exporters like Australia, due to reduced demand for commodities. In the July 2017 economic update, the IMF advised commodity exporting countries to 'adjust to lower revenues'.

Figure 2.5: China's total debt



Source: International Monetary Fund (2017)

Figure 2.6: China — Monthly monetary conditions index

Source: National Bureau of Statistics of China (2017)

United States

US GDP rose by 2.1 per cent (annualised) in the June quarter, driven by strong consumption growth, and rising exports. The Institute of Supply Management (ISM) index of factory activity hit a 13-year high in September, pointing to strong commodity demand. 'Initial Jobless' claims recently reached multi-decade lows, which suggest further falls in unemployment may be in prospect over the coming few months. Such a decline would be helpful for consumer sentiment and spending.

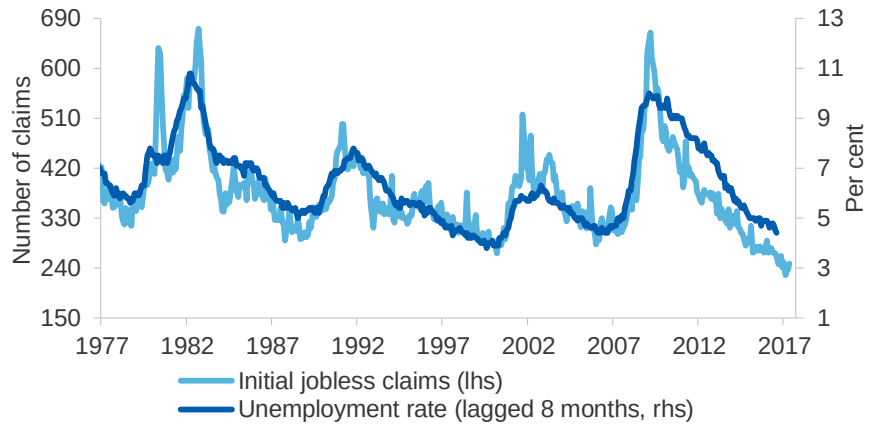
A succession of severe hurricanes have battered the southern United States in the past month. Hurricane Harvey wrought very significant damage around the city of Houston during the last week of August, disrupting the US economy. Houston is one of the United States' largest cities; the area in and around Houston is home to large energy, chemical and shipping industries and accounts for 3 per cent of the nation's GDP. The economic damage from Hurricanes Harvey and Irma has initially been estimated at US$150 billion, and significant effects on US GDP growth may be seen in the September quarter national accounts. August industrial output fell by 0.9 per cent in the month to be 1.5 per cent higher year-on-year. It was the first decline in industrial output since January 2017, and Hurricane Harvey is estimated to have reduced total output by 0.75 of a percentage point.

Inflation remains low: consumer prices rose by 1.9 per cent year-on-year in August, the highest inflation rate in three months. Despite staying below the target range of 2–3 per cent, inflation is expected to pick up over the next few months, fuelled by stronger demand pressures.

The US dollar has depreciated significantly in recent months, as persistently low inflation has reduced the prospect of a succession of quick interest rate hikes by the US Federal Reserve. It is expected that the US Fed will raise the Federal Funds rate once more before the end of the year, after a rate hike in June. Several rate hikes then seem likely in 2018. The US Fed will begin to gradually reduce its balance sheet from October 2017.

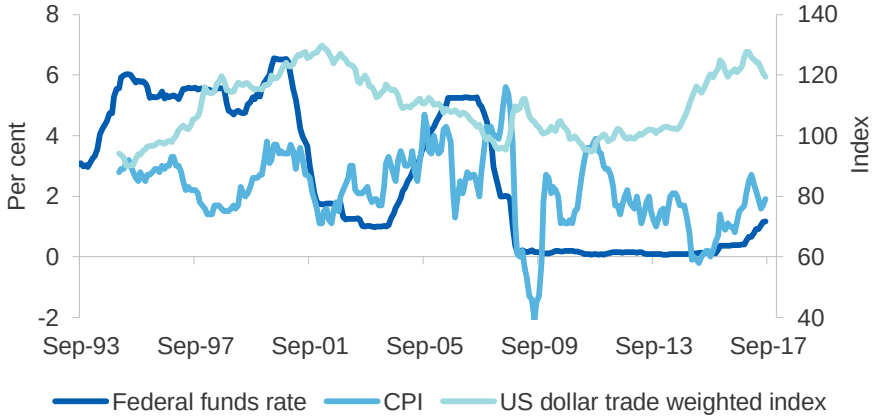
The IMF has lowered its economic growth projection for the US as a result of concerns over fiscal policy. US economic growth is expected to remain at around 2.1 per cent over 2017 and 2018, before edging down to 1.9 per cent in 2019.

Figure 2.7: US unemployment rate vs Initial jobless claims



Source: US Bureau of Labour Statistics (2017) Unemployment rate; US Department of Labour (2017) Initial jobless claims

Figure 2.8: US Federal funds rate, CPI and US dollar



Source: US Federal Reserve (2017) Federal funds rate; US Bureau of Labour Statistics (2017) US CPI Urban Consumers;

Japan

Japan's economy, the fourth largest in the world, grew by 1.4 per cent (annualised) in the June quarter 2017, driven by rising domestic business activity and stronger exports. Japanese Machine Tool Orders— a leading indicator for capital spending — increased by 10 per cent year-on-year in July. Higher investment is likely to support employment growth in the next few quarters.

The most recent Bank of Japan (BoJ) statement (released following the July BoJ Board meeting) forecast continued expansion in the Japanese economy in the short to medium-term, supported by Government fiscal stimulus. Inflation is likely to rise to around 2 per cent during the outlook period, as Japanese firms pass on the cost of rising wages. The BoJ is expected to continue with quantitative easing measures, to keep prices from falling and to encourage investment.

Despite a recent strengthening, Japan retains the slowest GDP growth among the advanced economies, and a military confrontation in its region — while unlikely — would push Japan into recession.

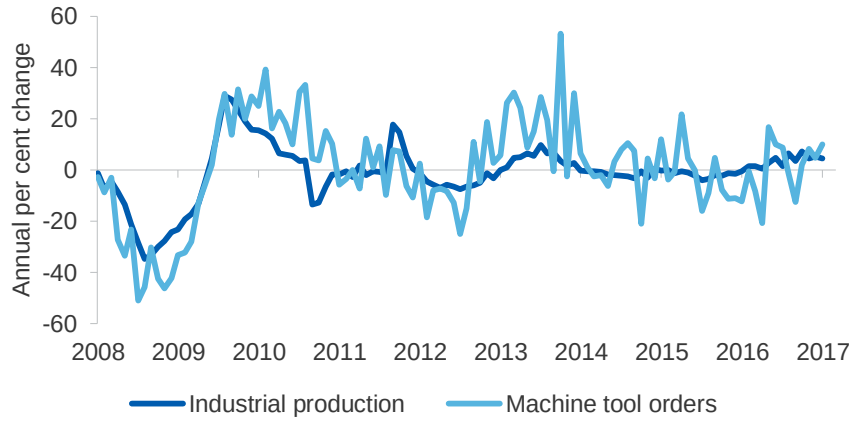
Growth is forecast to be 0.6 per cent in 2018 and 0.8 per cent in 2019. A scheduled doubling in the consumption tax — to 10 per cent effective in October 2019 — could boost 2019 growth artificially by bringing forward consumption from 2020.

South Korea

South Korea's real GDP growth rate decelerated to 2.7 per cent (annualised) in the June quarter, as a result of political instability, lower exports and falling vehicle production and sales.

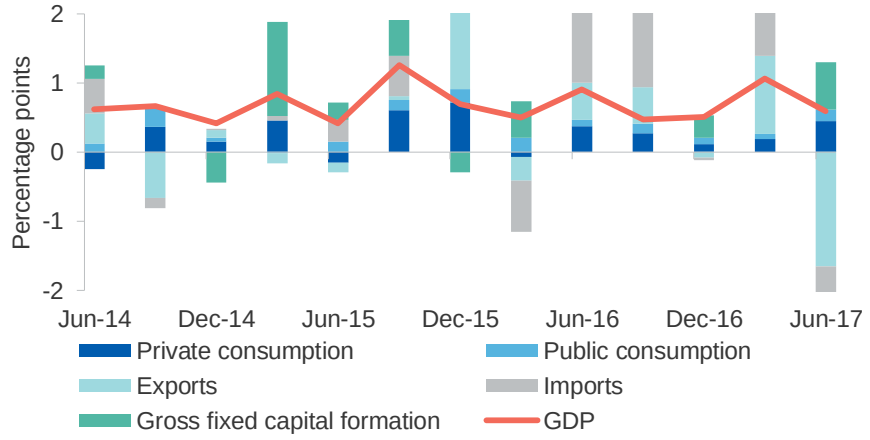
The recent decline in Korea's vehicle production is attributed to sluggish vehicle exports, high labour costs, and tense labour relations, which are driving Korean automakers to look to relocate their manufacturing facilities to other countries, such as China. Globally, Korean carmakers are facing stiff competition from China and the US, where their sedan models have lost market share to sport utility vehicles. In addition, the backlash over the deployment of a US missile defence system outside Seoul has reduced the sale of Korean cars in the Chinese market by over 50 per cent. The same driver has been blamed for lower tourist arrivals from China and other lost exports.

Figure 2.9: Japanese Industrial Production vs machine tool orders



Source: Ministry of Economy, Trade and Industry, Japan (2017) Indices of Industrial Production; Japan Machine Tool Builder's Association (2017) monthly Machine Tool Orders

Figure 2.10: Korea — Contribution to YoY GDP growth



Source: Bank of Korea (2017)

Geopolitical risks could also create significant uncertainty in South Korea in the short to medium term. The economy is forecast to grow by 2.8 per cent in 2018, and by 3 per cent in 2019, propelled by recovering private consumption and improved exports and investment. Increased demand for semiconductors and telecommunication products will boost exports. Exports of automobiles and ships are on a more lacklustre trajectory, however, and boosting household income remains an urgent issue for the Moon Jae-In administration.

India

India's GDP growth slowed to an annualised rate of 7.2 per cent in the June quarter, as the economy lost some momentum due to the roll-out of the goods and services tax (GST); the fallout of the demonetisation of high-value currency notes may have also had some residual impacts. The GST also appears to have weighed on growth in manufacturing output, which slowed to 1.2 per cent in the June quarter from 5.3 per cent in the March quarter. Mining activity declined by 0.7 per cent in the June quarter.

A recovery in growth is expected as 2017 comes to an end, supported by remonetisation and improved financial conditions. The Reserve Bank of India lowered its key lending rate by 0.25 per cent in early August, a move which is likely to boost consumption and economic activity into 2018. India's economy is forecast to grow at an annual rate of 7.8 per cent in 2018 and 2019, supported by rising consumption. The GST likely drew forward consumption from the second half of 2017 and early 2018.

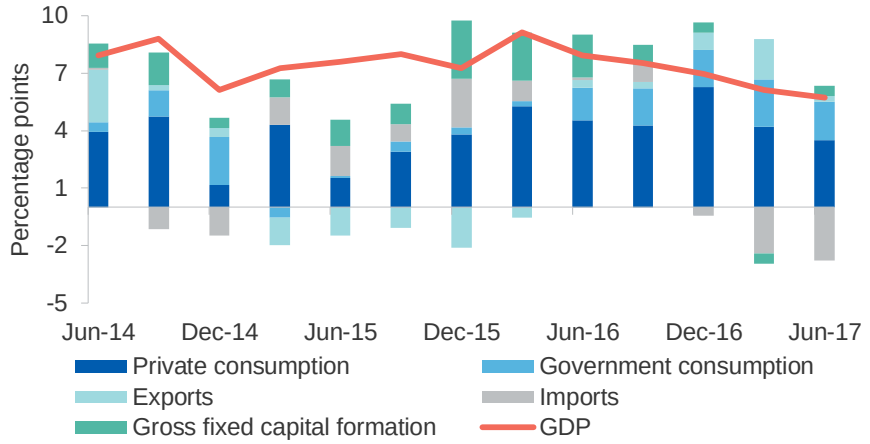
Further analysis on the Indian economy and its implications for exporters of Australian resource commodities can be found in the India Special Topic in this publication.

Europe

Eurozone GDP grew by 0.6 per cent in the June quarter 2017 and by 2.1 per cent through the year: this was the highest rate of GDP growth recorded since the start of the debt crisis in the second quarter of 2011.

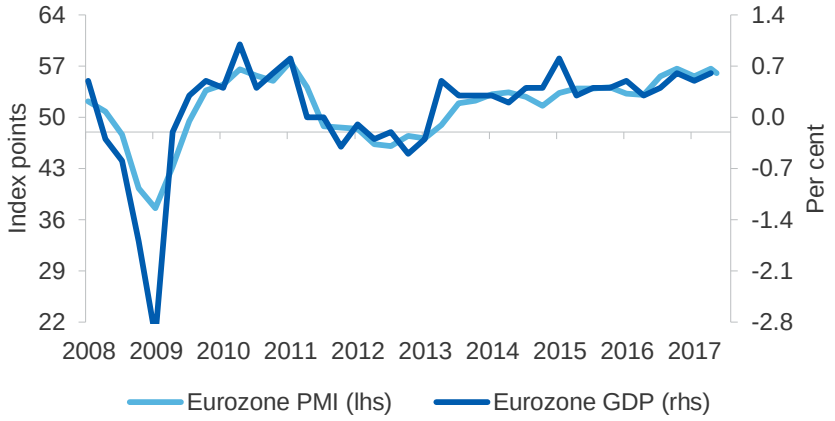
Recent election results in France and the Netherlands have eased financial market fears of a significant political shift to the right, and have generated positive economic momentum in the Eurozone. The Eurozone's Composite PMI remained high in September, pointing to ongoing relatively strong growth in the short term.

Figure 2.12: India — Contribution to YoY GDP growth



Source: India Central Statistical Organisation (2017)

Figure 2.13: Eurozone PMI vs Real GDP, QoQ growth



Source: Eurostat (2017) Euro Area Gross Domestic Product; Markit (2017) Eurozone Composite PMI

Factories in France are hiring at their best pace since 2000, and in Spain, at a rate not seen since the start of monetary union in 1998. The Spanish economy recorded a 0.9 per cent year-on-year rise in GDP in the June quarter 2017 (annualised rate of 3.1 per cent). It was the strongest expansion in nearly two years, and was mainly due to higher consumer spending.

Germany, the Eurozone's largest economy, recorded a 0.6 per cent rise in GDP in the June quarter 2017. German GDP has been supported by strong labour force conditions; the unemployment rate is now at its lowest level since Reunification. However, Germany continues to be heavily reliant on external demand, and could be negatively impacted by a slowdown in other major economies.

The Eurozone economy is forecast to grow at an annual rate of 1.8 per cent in 2018 and 2019, driven by stronger consumption and ongoing loose monetary policy. At its September meeting, the European Central Bank (ECU) Board reaffirmed its loose monetary policy stance by retaining rates at record lows, even keeping the door open to increasing bond purchases if needed. The ECU is expected to make a number of decisions on tapering its massive stimulus program in October 2017.

In the United Kingdom (UK), consumer spending fell for the third month in a row in July to be just 0.8 per cent higher year-on-year. This suggests the impact of Brexit vote is starting to ripple through households, leaving the UK vulnerable to a consumption-led slowdown. In addition, Brexit-related uncertainties are causing UK businesses to delay decisions about building new capacity. A deferral of investment is likely to lower industrial production activity, which may have consequences for short and medium term economic growth.

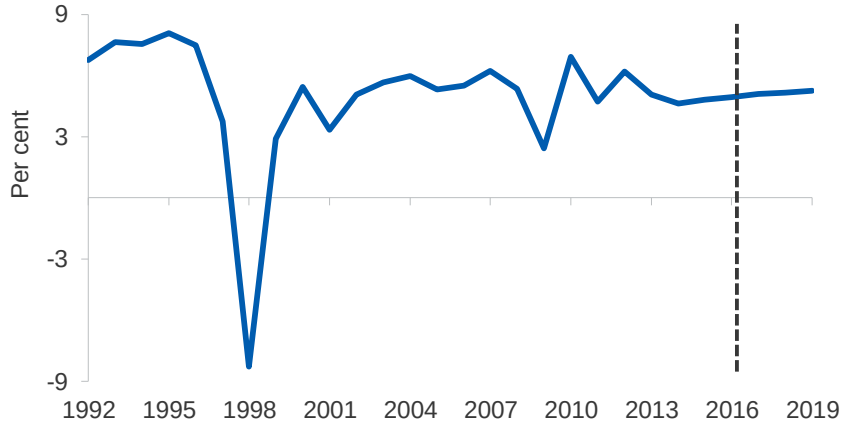
Italy's GDP advanced by 0.4 per cent in the June quarter 2017, driven by firm consumer spending, a rebound in fixed investment and inventory accumulation. The economy expanded by 1.5 per cent through the year, the strongest pace of expansion since the second quarter of 2011. On the back of sustained economic growth in the first half of 2017, the government of Prime Minister Paolo Gentiloni is expected to raise its forecast for 2017 GDP growth to around 1.4 per cent.

ASEAN-5

The ASEAN-5 group of nations — Indonesia, Malaysia, the Philippines, Thailand and Vietnam — is home to 559 million people, with a combined GDP of $US 2.1 trillion (as at 2016). ASEAN-5 is a significant export market for Australia's thermal coal, crude oil and refinery feedstocks, LNG, iron ore, aluminium, copper, and gold. ASEAN's commitment to spend more on infrastructure is vital in order to boost economic and social development through the improvement of basic necessities. According to the Asian Development Bank (ADB), ASEAN will need to spend US$950 billion on infrastructure projects by 2020. It is a major opportunity for Australia's resources and energy exports

ASEAN-5 recorded 5.4 per cent year-on-year growth in GDP in the June quarter 2017, lower than China's growth rate, but higher than the global growth rate of 3.2 per cent year-on-year. Over this period, the Indonesian economy grew by 5 per cent year-on-year, Malaysia by 5.8 per cent, the Philippines by 6.5 per cent, Thailand by 3.7 per cent, and Vietnam by 6.2 per cent. Growth in the ASEAN-5 is forecast to remain robust over the rest of 2017, and over 5 per cent in 2018 and 2019.

Figure 2.15: ASEAN-5 — Real GDP, YoY growth



Source: International Monetary Fund (2017)

Table 2.1 Key world macro-economic assumptions

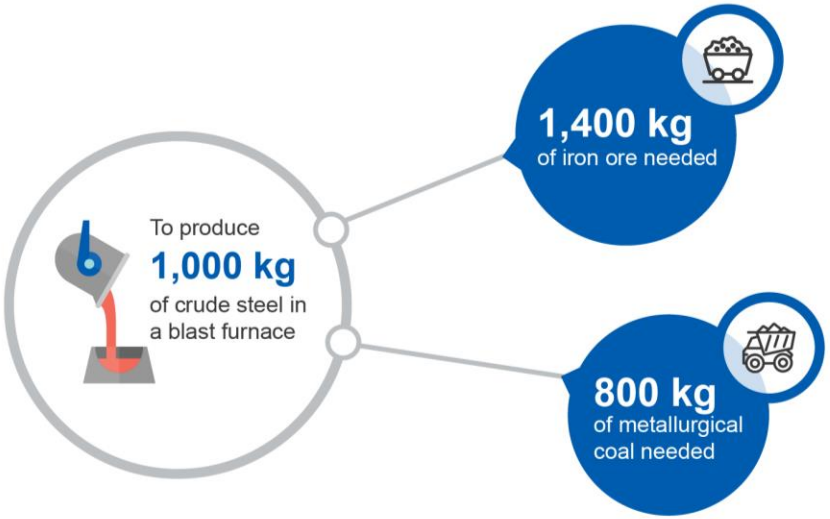
Per cent	2016	2017a	2018a	2019a
Economic growth b				
Advanced economies	1.7	2.0	1.9	1.9
United States	1.6	2.1	2.1	1.9
Japan	1.0	1.3	0.6	0.8
European Union 28	2.0	2.0	1.8	1.8
Germany	1.8	1.8	1.6	1.4
France	1.2	1.5	1.7	1.7
United Kingdom	1.8	1.7	1.5	1.6
South Korea	2.8	2.7	2.8	3.0
New Zealand	4.0	3.1	2.9	2.6
Emerging economies	4.3	4.6	4.8	4.9
Emerging Asia	6.4	6.5	6.5	6.3
ASEAN-5 d	4.9	5.1	5.2	5.3
China e	6.7	6.7	6.4	6.0
Chinese Taipei	1.4	1.7	1.9	2.0
India	7.1	7.2	7.7	7.8
Latin America	-1.0	1.0	1.9	2.5
Middle East	3.8	2.3	3.2	3.2
World c	3.2	3.5	3.6	3.7
Inflation rate b				
United States	1.3	2.0	2.1	2.2

Notes: ***a*** *Assumption;* ***b*** *Change from previous period;* ***c*** *Weighted using purchasing power parity (PPP) valuation of country gross domestic product by IMF;* ***d*** *Indonesia, Malaysia, the Philippines, Thailand and Vietnam;* ***e*** *Excludes Hong Kong*

Source: IMF (2017) World Economic Outlook; IMF (2017) Article IV Consultation with the United States of America - Concluding Statement of the IMF Mission; Department of Industry, Innovation and Science

Steel

Resources and Energy Quarterly September 2017



Key producers, 2016

50% China

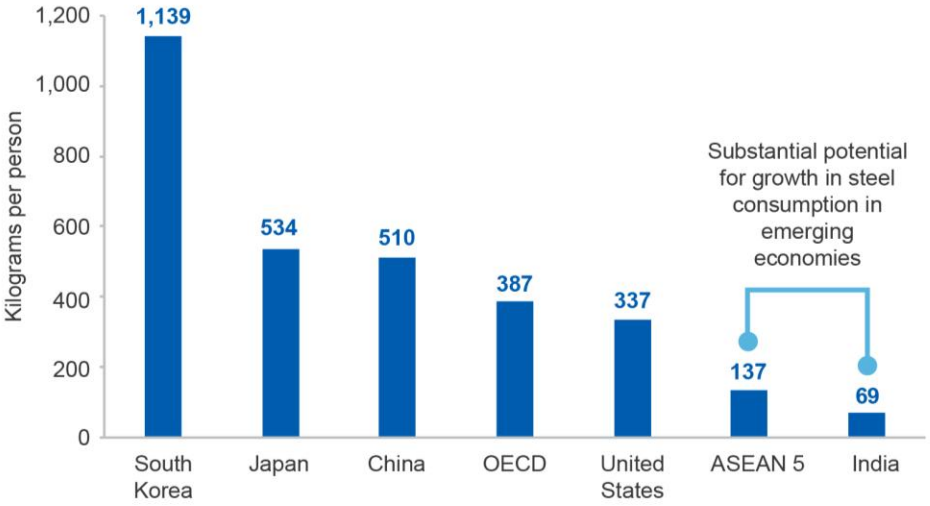
10% European Union

6.4% Japan

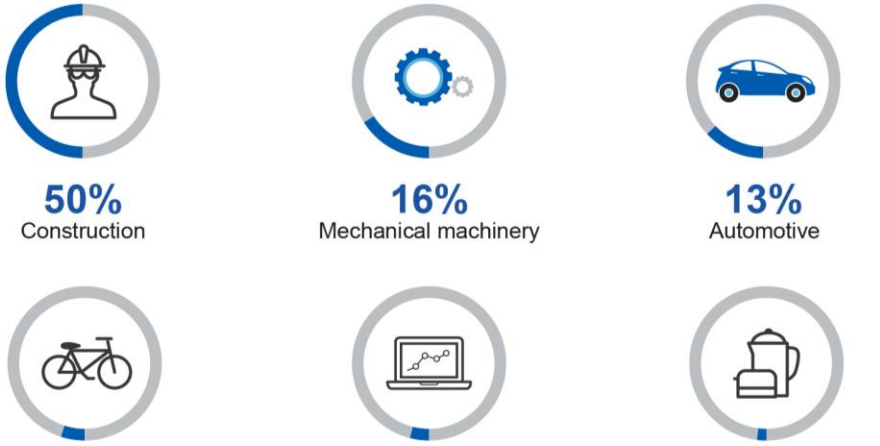
5.9% India

4.8% United States

Crude steel consumption per capita, 2015



Steel use by sector



50% Construction

16% Mechanical machinery

13% Automotive

5% Other transport

4% Electrical equipment

2% Domestic appliances

Summary

- Robust world steel production in 2017 to date has been supported by an ongoing pickup in global economic growth, and strong steel production in China — in response to high prices.
- However, China's steel production and consumption is forecast to decline in 2018 and 2019, as a result of a renewed focus on managing financial risks and progressing supply-side reforms.
- Outside of China, strong economic growth is expected to continue to support steel production and consumption, particularly in India, supporting import demand for Australia's two largest commodity exports — iron ore and metallurgical coal.

World production and consumption

China's steel production increases in response to higher prices

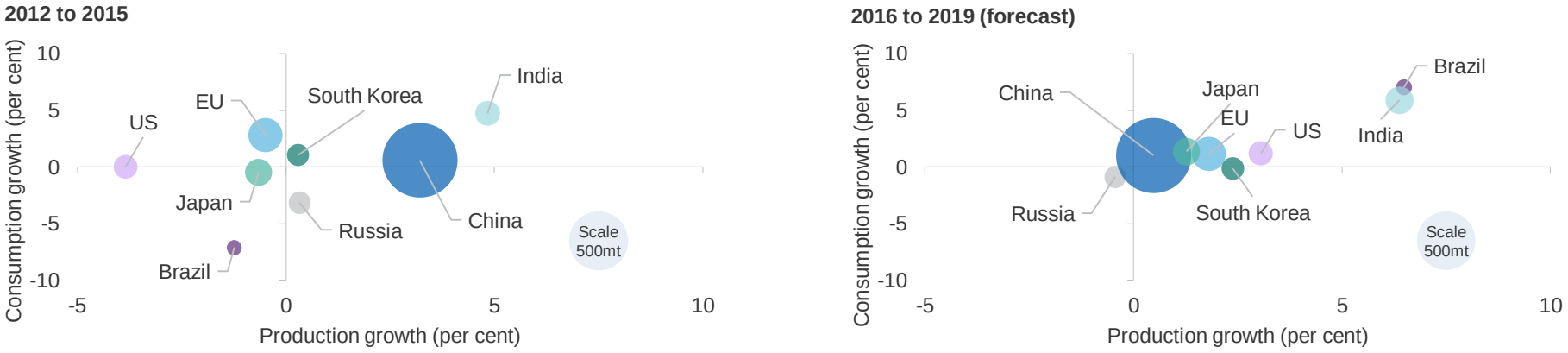
China's steel production was up 8.3 per cent year-on-year in the three months to August, and reached a new monthly record of 74.6 million tonnes in August 2017.

Steel prices and margins have increased sharply, as a result of ongoing cuts to outdated capacity and robust demand from construction and downstream consumption industries. Prices may have also been supported by speculative stockpiling and futures trading, due to concerns of supply shortages following government announcements on the winter curtailment policy and supply-side reforms.

The winter curtailment policy, which takes effect from mid-November 2017 to mid-March 2018, requires a 50 per cent reduction in steel production in major steel producing cities, in order to improve air quality.

It is highly likely that steel production has been brought forward, in order to stockpile for winter when production will be affected. Steel inventories have increased in the first half of September 2017, following several months of drawdowns. If shortages do not eventuate in line with expectations, there may be additional downward pressure on steel prices and production.

Figure 3.1: World trends in steel production and consumption, compound annual growth rates



Notes: Area of bubble represents absolute steel production in 2015 and 2019 (forecast), respectively.
Source: World Steel Association (2017); Department of Industry, Innovation and Science (2017)

China's steel consumption and production growth to gradually ease

China's steel production growth is expected to remain strong ahead of winter production curtailment in November. A strong August Steel Purchasing Managers Index (PMI) reading — a leading indicator of steel consumption — points to demand remaining robust in the short-term. The Central Government is also expected to continue to favour policies that maintain economic growth — ahead of the National Congress in mid-October — further supporting steel demand.

However, fixed asset investment (FAI) growth slowed in August, particularly in infrastructure, and the property sector has cooled in response to purchasing and lending restrictions, pointing to slowing demand towards the end of 2017.

Beyond 2017, a renewed focus on managing financial risks from the Central government is expected to dampen activity in investment and construction activity, leading to moderating steel demand in 2018 and 2019. Steel production is forecast to decline as a result of the winter curtailment and the progression of supply-side reforms, and in response to lower demand and prices.

India's steel production growth forecast to accelerate

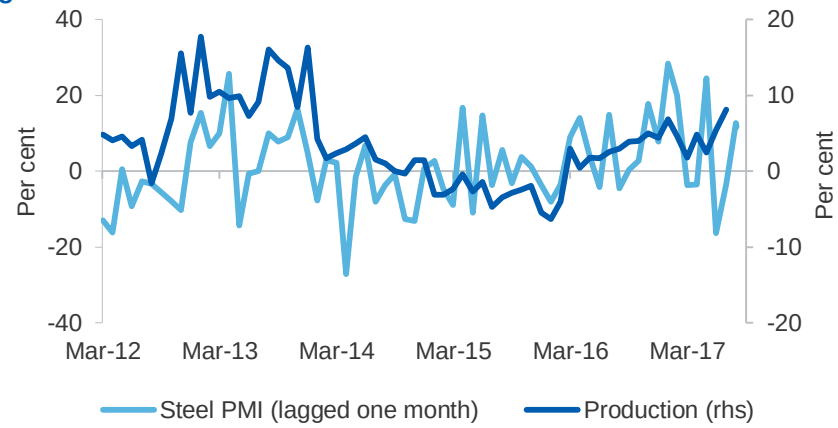
India's steel production growth has been relatively subdued, at 2.4 per cent year-on-year in the three months to July. This growth contrasts strongly with the double-digit growth of late 2016 and early 2017. India's steel sector has been under pressure, due to weak domestic demand and a high iron ore price.

Steel consumption is forecast to grow by 5 per cent in 2017, driven by stronger economic growth. Strong steel production growth is forecast for 2018 and 2019, supported by ongoing new additions to capacity, and accelerating demand growth from government investment in urban development and infrastructure . However, efforts to reach official targets laid out in the National Steel Policy 2017 will face challenges, including barriers in accessing infrastructure, raw materials and finance.

Japan and South Korea's steel production forecast to hold steady

Japan's steel production fell by 2.8 per cent year-on-year in the three months to July, affected by maintenance and other issues at mills. Japan's steel production is forecast to rebound and gain pace towards the end of 2017, in line with strong demand from the automobile and

Figure 3.2: China's monthly steel production and PMI, year-on-year growth



Source: Bloomberg (2017) Shanghai Metals Market; Bloomberg (2017) World Steel Association

construction sectors, as well as improved manufacturing indices.

Beyond 2017, Japan's steel production and consumption is forecast to be broadly stable, with the impact of improved prospects for growth and Olympics-related stimulus offset by other challenges, including slowing household income growth and an ageing and declining population.

South Korea's steel production increased by 4.5 per cent year-on-year in the three months to July. However, production growth is expected to slow and remain largely stable, weighed down by slower growth in industrial production, notably of vehicles.

Improved business conditions are supporting steel production elsewhere

There has been strong growth in steel production and consumption elsewhere in the world, with notable rises in Iran, Turkey, the EU and the rest of Asia. This has reflected an ongoing, steady improvement in global business confidence and industrial production indicators, and new additions to steel production capacity.

In 2018 and 2019 the pace of production growth across the rest of the world is forecast to slow but remain relatively robust, supported by an ongoing recovery in developed economies and accelerating growth in emerging markets and developing economies.

Table 3.1: World steel consumption and production

						Annual percentage change		
Crude steel consumption	**Unit**	**2016 s**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
European Union 28	Mt	171	174	175	177	1.5	1.0	1.0
United States	Mt	103	105	106	107	1.4	1.2	1.0
Brazil	Mt	20	21	23	25	4.3	8.2	8.7
Russia	Mt	43	42	42	42	-0.9	-1.3	-0.4
China	Mt	712	760	748	734	6.8	-1.6	-1.9
Japan	Mt	67	69	69	70	2.5	0.9	0.7
South Korea	Mt	59	58	59	59	-2.0	0.7	0.9
India	Mt	93	98	104	110	5.0	6.3	6.3
World steel consumption	Mt	1,632	1,699	1,707	1,715	4.1	0.5	0.5
Crude steel production		**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
European Union 28	Mt	162	168	170	171	3.9	0.7	0.9
United States	Mt	78	80	84	86	2.1	4.2	2.8
Brazil	Mt	31	35	36	38	10.6	4.4	4.6
Russia	Mt	71	70	70	70	-0.5	-0.6	-0.2
China	Mt	808	841	830	820	4.0	-1.2	-1.2
Japan	Mt	105	106	107	109	1.4	1.0	1.4
South Korea	Mt	69	71	72	74	3.6	1.5	2.1
India	Mt	96	101	108	115	5.4	7.0	6.8
World steel production	Mt	1,629	1,697	1,708	1,720	4.1	0.7	0.7

*Notes: **s** Estimate; **f** Forecast*

Source: World Steel Association (2017); Department of Industry, Innovation and Science (2017)

Iron ore

Resources and Energy Quarterly September 2017

1st

Australia is the largest exporter of iron ore in the world

819 million tonnes exported in 2016–17

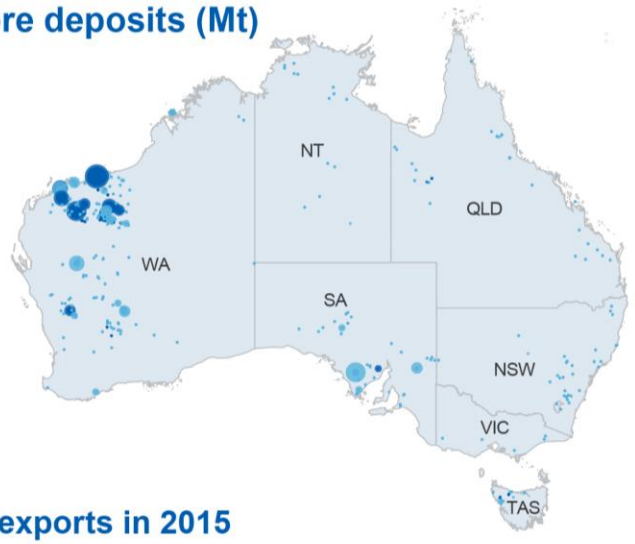
That's enough to build **9,700** Sydney Harbour bridges

$63 billion exported in 2016–17

28% of the world's iron ore reserves

Major Australian iron ore deposits (Mt)

- <229
- 230–813
- 814–1,777
- 1,778–3,042
- 3,043–5,446
- >5,447
- Deposit
- Operating mine



Global share of iron ore exports in 2015

52%	25%	4%	3%	3%	13%
Australia	Brazil	South Africa	Ukraine	Canada	Rest of world

Australia's iron ore key export destinations, 2016–17

83%	8%	6%	2%	1%
China	Japan	South Korea	Taiwan	Rest of the world

Global share of iron ore imports in 2015

65%	10%	9%	5%	11%
China	European Union	Japan	South Korea	Rest of the world

Summary

- Australia's iron ore export earnings increased by 32 per cent to $63 billion in 2016–17, driven in large part by higher prices. The value of Australia's iron ore exports is forecast to decline to $54 billion in 2018–19, as the impact of forecast lower prices offsets volume gains.
- The iron ore price is forecast to decline to US$49 a tonne (FOB Australia) in 2019, due to growing low-cost supply from Australia and Brazil and moderating demand from China.
- Australia's iron ore export volumes are forecast to rise from 819 million tonnes in 2016–17 to 887 million tonnes in 2018–19, as a result of ongoing productivity gains and new additions to capacity.

Prices

Rebound in the iron ore price supported by high steel margins in China

The iron ore price has rebounded from a low of US$47 a tonne (FOB Australia) in mid-June, to average an estimated US$65 a tonne in the September quarter. The iron ore price has been boosted by strong steel margins in China (see the Steel chapter), which has resulted in increased steel production and mill restocking of inputs.

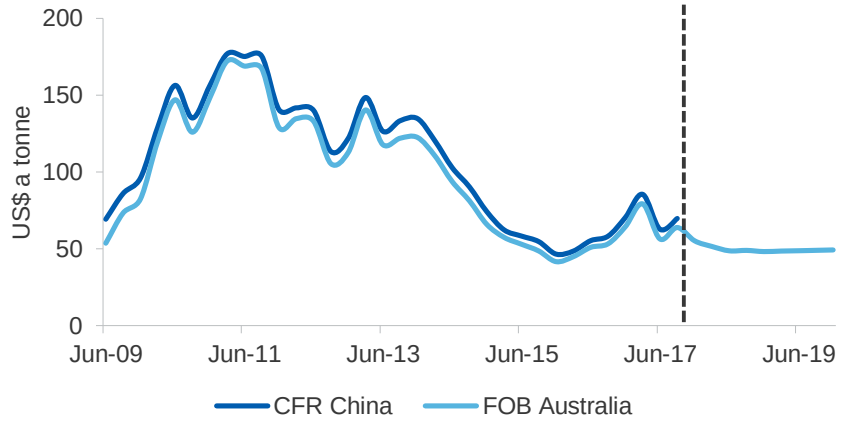
The iron ore price is forecast to average US$64 a tonne in 2017, with the price forecast to gradually decline in the December quarter. China's steel production is expected to remain strong in the lead up to China's winter months, providing some short-term support to the iron ore price, before the impact of inventory builds and weaker demand take effect.

Iron ore price forecast to decline

The iron ore price is forecast to decline to US$50 a tonne and US$49 a tonne in 2018 and 2019, respectively, broadly unchanged from the outlook in the June 2017 *Resources and Energy Quarterly*. Growing low-cost supply from Australia and Brazil and moderating demand from China, are expected to weigh on the iron ore price.

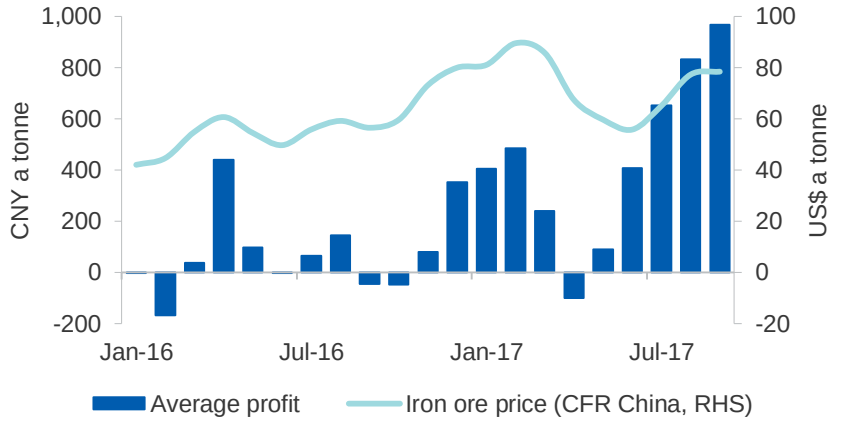
There are several uncertainties impacting the outlook for the iron ore price. The first is the pace and magnitude of the decline in China's steel production, which in turn largely depends on government policy. Second, companies have benefited from the recent price rally, and thus may be able to continue to produce at cash losses for a longer period of time. The resultant oversupply may bring on exaggerated price weakness.

Figure 4.1: Iron ore price, FOB Australia and CFR China, quarterly



Source: Bloomberg (2017) Metal Bulletin; Department of Industry, Innovation and Science (2017)

Figure 4.2: China steel margins and iron ore price, monthly



Notes: Profit is average monthly profit at integrated basic oxygen furnace steel plants in China.

Source: Bloomberg (2017) BBG; Bloomberg (2017) Metal Bulletin

Widening gap between prices received for high and low grade iron ore

The gap between prices received for high and low grade ores has widened in the September quarter. This rising differential reflects a range of factors, including a growing supply of lower grade ore, and a preference for high grade ore from China's steel mills. The use of higher grade ores improves the efficiency of steel mills. There has been a drive to improve efficiency in China's steel sector, due both to government anti-pollution initiatives, and mills trying to maximise output while steel prices are high. In addition, there is a push underway to make high quality steel products, which require higher grade ore. While Australia generally produces high quality iron ore (close to the 62 per cent benchmark), some producers of lower grade ore may be affected if prices received are relatively low on an ongoing basis.

World trade

World trade in iron ore is forecast to grow at an average annual rate of 1.7 per cent over the outlook period, to reach 1.6 billion tonnes in 2019. Supply growth will be driven by increased production from low-cost producers, particularly in Australia and Brazil, who will eventually displacing high-cost producers as prices decline. Despite an expected decline in consumption, China's iron ore imports are forecast to remain broadly steady, due to declining domestic production. Robust steel production from the rest of the world is also expected to support import demand.

The outlook for growth in world trade is characterised by a number of uncertainties, in particular, the role of government policy in countries like China and India, and the length of time that mines can sustain operating losses as prices decline.

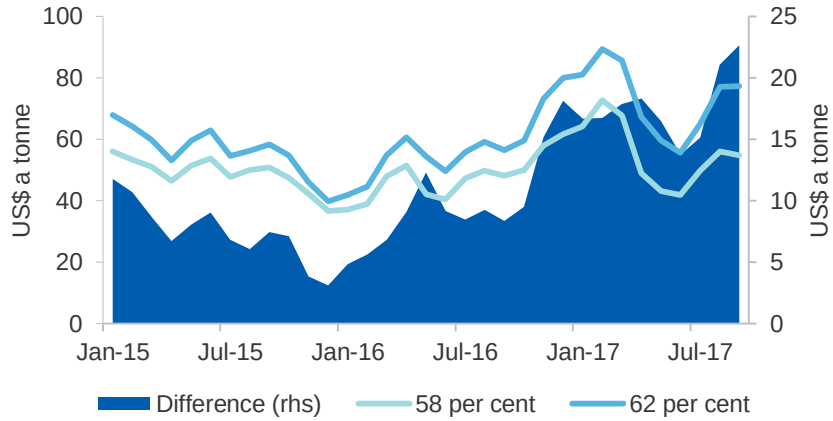
China's iron ore imports forecast to remain steady

China's iron ore imports increased by 4.6 per cent year-on-year in the three months to August. Iron ore import demand is expected to continue to be supported by robust steel production growth in the lead up to winter. China's iron ore imports are forecast to increase by 4.9 per cent to total 1.1 billion tonnes in 2017.

China's iron ore imports are forecast to be broadly stable, at 1.1 billion tonnes, over the outlook period to 2019. While consumption is forecast to decline in line with steel production over the same period, imports are expected to remain high because of a forecast decline in domestic output. The grades at China's iron ore mines are declining, making domestically-produced iron ore less competitive against imported ore.

There is potential for domestic iron ore production to decline slower than forecast, which would result in lower import demand than what has been forecast. China's iron ore operations tend to be highly responsive to prices, reflected in the 11 per cent increase in domestic iron ore production (adjusted for quality) in the year to July.

Figure 4.3: Iron ore prices for 58 and 62 per cent iron ore grades



Notes: Prices are for CFR China. Difference is in terms of absolute US$ a tonne.
Source: Bloomberg (2017) Custeel

India's iron ore exports surge in 2017 but are forecast to moderate

India's iron ore exports are forecast to reach 38 million tonnes in 2017 — almost double the volume from the previous year, but well below the peak of 101 million tonnes in 2008. Exports have surged on the back of increased domestic production, which has come about in response to higher prices and more supportive government policies (including the easing of mining and export restrictions).

India's iron ore exports are forecast to moderate over the rest of the outlook period, with India's rapidly growing steel industry expected to consume more domestic iron ore.

While domestic iron ore production is forecast to increase, the pace of growth is expected to slow, due to a number of challenges. A forecast decline in prices will weigh on the profitability of some producers. Further, a 30 per cent export duty is still in place for ore with iron content of 58 per cent and above. This has resulted in large stockpiles building up at mines this year, discouraging further exploration and development.

Australia and Brazil to continue to dominate seaborne trade

All three of the world's major iron ore producers — Rio Tinto, BHP and Vale — have indicated that iron ore production will be at the lower end of the range of their initial guidance this year. Vale have indicated that production will be at the lower end of the initial 360–380 million tonne guidance range in 2017. Rio Tinto have downgraded Australia's iron ore shipments to 330 million tonnes in 2017 (previously a range of 330–340 million tonnes). BHP produced 268 million tonnes in 2016–17, hitting the lower end of guidance of 268–272 million tonnes.

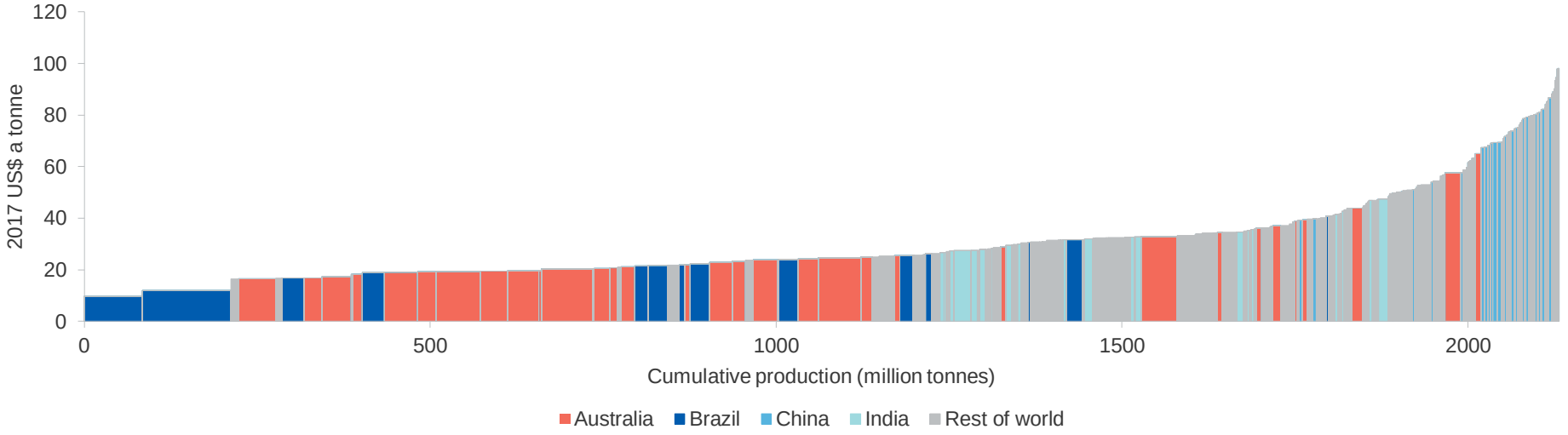
Nevertheless, iron ore exports from low-cost producers in Australia and Brazil are forecast to continue to grow through the outlook period, displacing supply from high-cost producers and supporting an increase in both countries' share of global seaborne trade. Australia is forecast to increase its market share from an estimated 52 per cent in 2016 to 55 per cent in 2019, while Brazil is forecast to increase its market share from 24 per cent in 2016 to 26 per cent in 2019. Brazil's iron ore export growth will be supported by the ongoing ramp up of Vale's S11D mine.

Australia

Iron ore exploration expenditure remained steady in 2016–17

After consecutive years of large declines since 2012, exploration expenditure has stabilised, remaining unchanged from 2015–16 levels. Australia's iron ore exploration expenditure totalled $291 million in 2016–17. Growing global supply and expectations of low prices have discouraged a rebound in exploration activity.

Figure 4.4: Forecast iron ore cash costs by mine and country in 2019



Notes: Based on FOB cash costs in 2017 terms, including on-site and off-site costs.
Source: AME Group (2017)

Iron ore export values forecast to decrease but volumes forecast to rise

Australia's iron ore export earnings increased by 32 per cent to $63 billion in 2016–17. This was driven by higher prices in 2016–17 and, to a lesser extent, growth in export volumes. Despite weather-related impacts at the start of the year and rail maintenance at Rio Tinto's operations, export volumes rose by 4.2 per cent to 819 million tonnes in 2016–17, while production rose by 4.5 per cent to 873 million tonnes.

Australia's iron ore exports earnings are forecast to decline over the next two years, by 5.1 per cent in 2017–18 to $60 billion, and by 9.2 per cent in 2018–19 to $54 billion. The decline in export earnings will be driven by a forecast decline in the iron ore price.

Export volumes are forecast to grow by 5.3 per cent in 2017–18 to 862 million tonnes, and by 2.8 per cent in 2018–19 to 887 million tonnes. Growth in export volumes is expected to be supported by ongoing productivity improvements and additions to capacity.

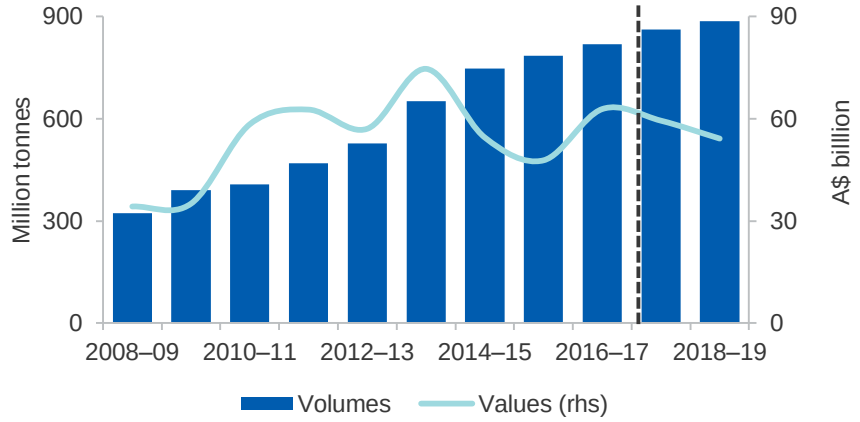
Rio Tinto's 10 million tonne a year Silvergrass mine was officially opened in August. Iron ore mined at Silvergrass will be used to maintain the ore grades in Rio Tinto's Pilbara blend. It is the first of several replacement operations — currently being scoped by all major producers — that are expected to come online beyond 2018–19 for depleting mines in the Pilbara.

There are relatively small risks to the outlook for production growth, with an estimated 95 per cent of Australia's iron ore production expected to remain profitable at the forecast prices in 2019. However, margins will be tight or even negative in some of the smaller, high-cost mining operations, and some producers may be exposed to persistently low prices or large discounts for lower grade ore.

The forecast for export values have been revised down for 2018–19

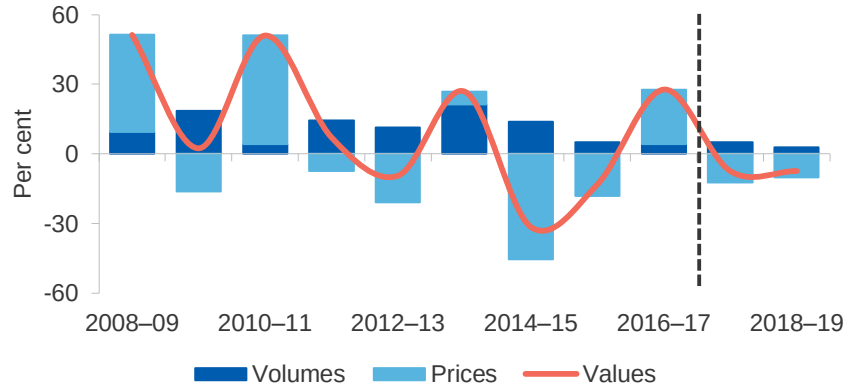
The forecast for Australia's iron ore export values in 2017–18 is broadly unchanged from the June *Resources and Energy Quarterly*, but has been revised down by $2.9 billion for 2018–19, driven by minor downwards revisions to production. The downwards revision to production reflects slower than expected production growth at several operations. Higher prices in the second half of 2017 are expected to offset the impact of lower production, while the price forecast for 2018 and 2019 is largely unchanged.

Figure 4.5: Australia's iron ore export volumes and values



Source: ABS (2017) International Trade, Australia, 5465.0; Department of Industry, Innovation and Science (2017)

Figure 4.6: Annual growth in Australia's iron ore export values, contributions from prices and export volumes



Source: ABS (2017) International Trade, Australia, 5465.0; Department of Industry, Innovation and Science (2017)

Table 4.1: World trade in iron ore

						Annual percentage change		
World trade in iron ore	**Unit**	**2016 s**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
World trade	Mt	1,545	1,567	1,599	1,626	1.4	2.1	1.7
Iron ore imports								
European Union 28	Mt	137	141	144	145	2.9	2.4	0.5
Japan	Mt	130	126	133	134	-3.2	5.3	1.4
China	Mt	1,024	1,074	1,068	1,066	4.9	-0.6	-0.2
South Korea	Mt	72	75	78	79	4.6	3.4	2.1
India	Mt	4	4	5	6	0.2	28.1	26.0
Iron ore exports								
Australia	Mt	808	839	872	895	3.8	3.9	2.7
Brazil	Mt	374	384	403	419	2.7	4.9	3.9
India	Mt	22	38	36	33	75.0	-4.5	-8.8
Ukraine	Mt	37	48	44	42	31.9	-8.2	-5.3

Notes: ***s*** *Estimate;* ***f*** *Forecast*

Source: World Steel Association (2017); International Trade Centre (2017); Department of Industry, Innovation and Science (2017)

Table 4.2: Iron ore outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Prices bc								
– nominal	Mt	53.5	64.0	49.5	49.0	19.7	-22.7	-0.9
– real d	Mt	54.6	64.0	48.5	47.0	17.3	-24.3	-3.1
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17 s**	**2017–18 f**	**2018–19 f**
Production								
– Steel hs	Mt	5.05	5.35	5.26	5.26	6.1	-1.7	-0.1
– Iron ore	Mt	836.0	873.3	902.5	929.1	4.5	3.3	3.0
Exports								
Steel	Mt	0.77	1.00	0.98	0.98	30.5	-2.1	-0.1
– nominal value	A$m	598	872	740	739	45.8	-15.1	-0.1
– real value hi	A$m	621	891	740	722	43.4	-16.9	-2.4
Iron ore	Mt	785.8	818.9	862.3	886.7	4.2	5.3	2.8
– nominal value	A$m	47,799	62,861	59,663	54,185	31.5	-5.1	-9.2
– real value i	A$m	49,673	64,229	59,663	52,921	29.3	-7.1	-11.3

Notes: ***b*** *fob Australian basis;* ***c*** *Spot price, 62 per cent iron content basis;* ***d*** *In 2017 US dollars;* ***h*** *Crude steel equivalent; Crude steel is defined as the first solid state of production after melting. In ABS Australian Harmonized Export Commodity Classification, crude steel equivalent includes most items from 7206 to 7307, excluding ferrous waste and scrap and ferroalloys;* ***i*** *In 2017–18 Australian dollars;* ***f*** *Forecast;* ***s*** *Estimate*

Source: ABS (2017) International Trade in Goods and Services, Australia, 5368.0; Bloomberg (2017) Metal Bulletin; World Steel Association (2017); AME Group (2017); Company Reports; Department of Industry, Innovation and Science (2017)

Metallurgical coal

Resources and Energy Quarterly September 2017

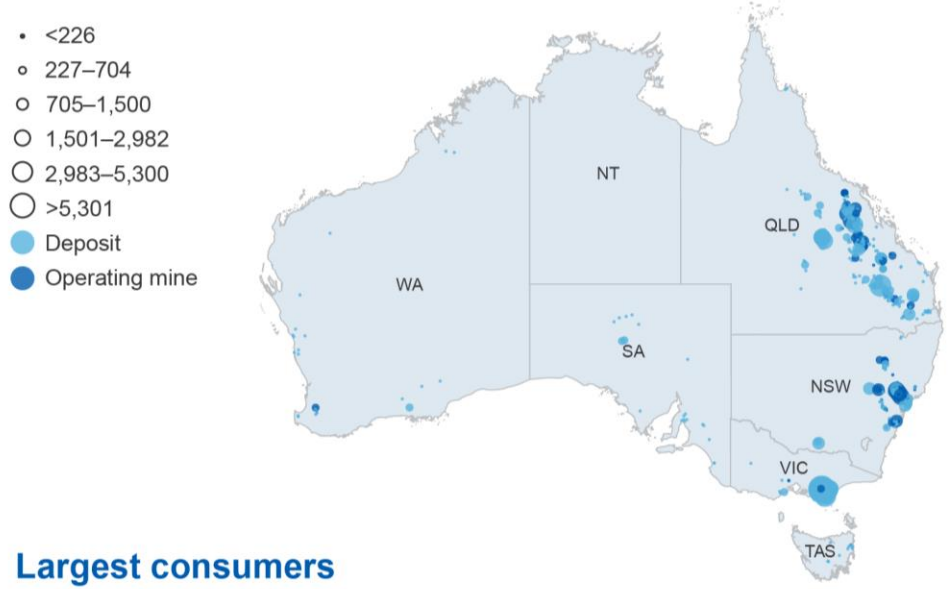
98%
Australia's metallurgical coal production is exported

189.3
million tonnes exported in 2016

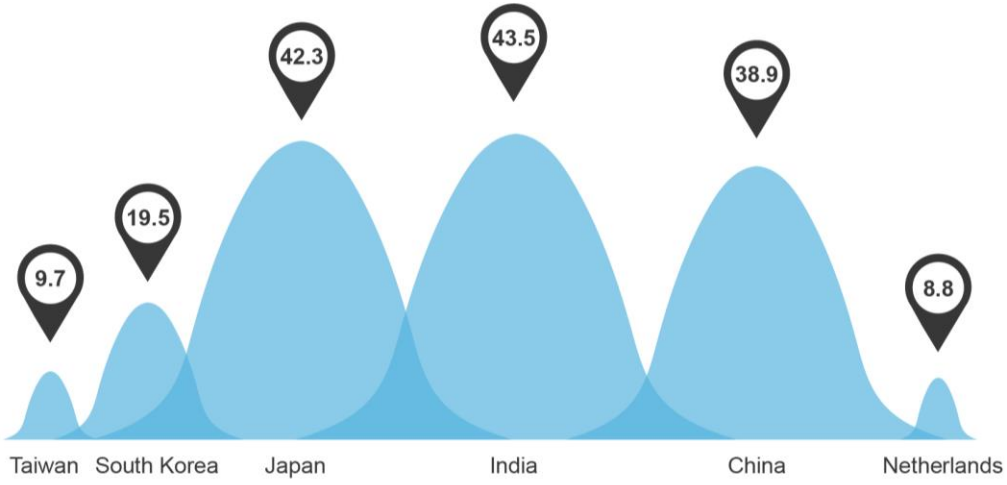
18%
of world metallurgical coal production is in Australia

1st
Australia is the largest exporter of metallurgical coal the world

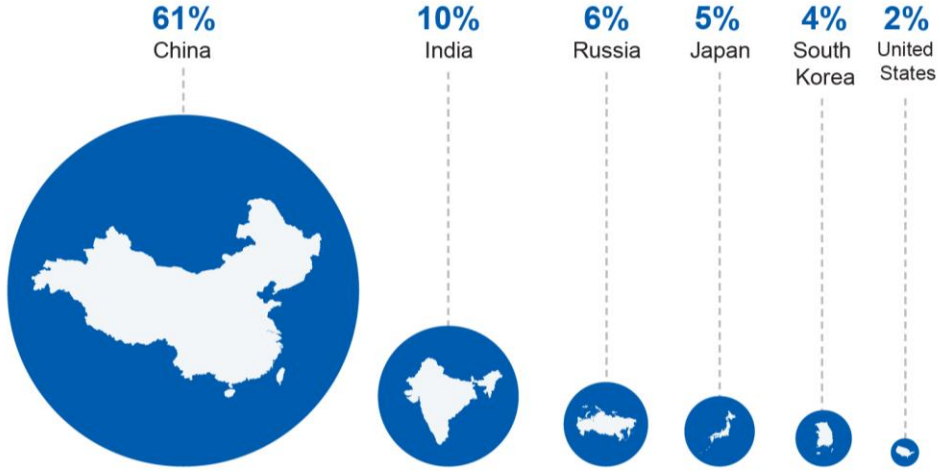
Major Australian black and brown coal deposits (Mt)



Australian metallurgical coal importers (million tonnes)



Largest consumers



Market summary

- Global metallurgical coal spot prices are estimated to have risen to an average of around US$190 a tonne in the September quarter, due to both production disruptions in Australia and China and strong import demand from China.
- Over the outlook period, prices are forecast to decline, as operations return to normal.
- Export earnings for 2016–17 hit a record $35 billion, driven by high prices.
- Robust prices are expected to contribute to continued strong export earnings in 2017–18, but moderating prices thereafter are expected to result in declining earnings in 2018–19.

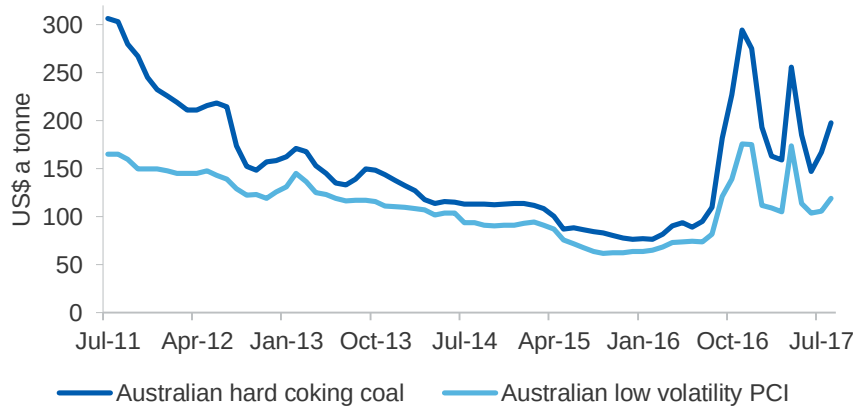
Prices

Spot prices spiked again in August

Spot prices rose sharply in August, taking the estimated average premium Australian hard coking coal price in the September quarter to around US$190 a tonne, similar to the June quarter. The strong price was largely driven by production disruptions in Australia, which reflected industrial action at Glencore's Oaky North mine, a temporary closure of South 32's Appin mine, as well as temporary closures of Chinese mines (due to safety concerns). Spot prices are expected to decline over the remainder of the year. However, the extent of the decline could be constrained by temporary closures and slower than expected re-starts of mines in China's coal rich Shaanxi region.

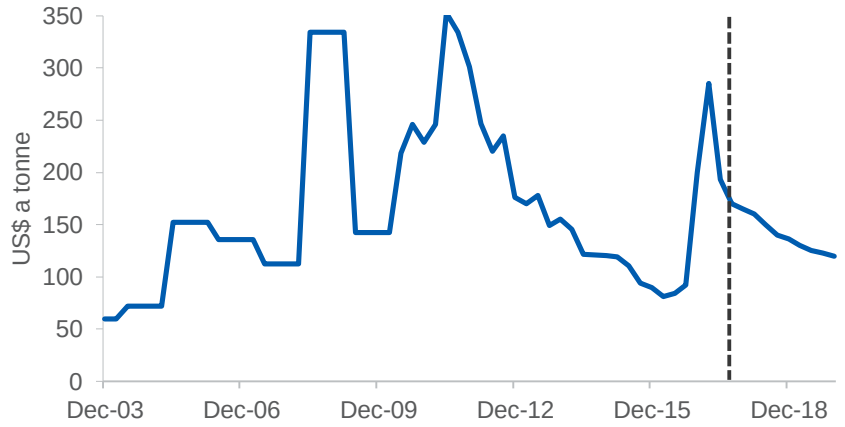
There was no formal settlement on June quarter benchmark contract prices paid to Australian metallurgical coal producers by Japanese steel producers. Reports suggested that in lieu of a contract price, producers and consumers adopted a pricing index approach (based on spot prices) to value sales in the June quarter. This index price is reported to be around US$193 a tonne.The September quarter contract price was also negotiated through a pricing index approach in mid-September — reported to be around US$170 a tonne (lower than the prevailing spot price for the quarter).

Figure 5.1: Monthly spot prices



Source: Platts Steel Analyzer (2017)

Figure 5.2: Benchmark contract prices for Australian metallurgical coal



Source: Department of Industry, Innovation and Science (2017)

Australian benchmark metallurgical coal contract prices are forecast to average US$203 a tonne in 2017 — a 78 per cent increase from 2016. This reflects the high March quarter contract price of US$285 a tonne and strong June quarter price of US$193 a tonne. Australian benchmark metallurgical coal contract prices are forecast to decline by 28 per cent in 2018, to US$147 a tonne. A further decline of 15 per cent, to $US125 a tonne, is forecast in 2019, as import demand and supply normalise. China will be a large contributor to the global supply and demand re-balance, as its metallurgical coal production increases, possibly slowing import demand. However, given any slower than expected re-launch of capacity in China, there is potential for the decline in the forecast metallurgical coal price to be less severe. Spot prices are expected to follow the same trend as contract prices, with an increase in price in 2017 followed by declines in 2018 and 2019.

Premium hard coking coal spot prices are forecast to increase by 26 per cent in 2017 to US$180 a tonne. In 2018, premium spot prices are forecast to decline by 22 per cent to US$141 a tonne, and decline a further 16 per cent to US$119 a tonne in 2019.

World trade

World metallurgical coal trade is forecast to increase by 20 per cent in 2017 to 377 million tonnes, as import demand from China strengthens. In 2018, trade is forecast to decline by 10 per cent to 339 million tonnes, as Chinese import demand softens. In 2019, world trade is forecast to decline at a slower rate than in 2018, down by 3.0 per cent to 329 million tonnes, as growing demand from India and ASEAN economies partly offset the impact of lower Chinese import demand.

World imports

China's metallurgical coal imports grew in the first half of 2017

China is estimated to be the world's largest metallurgical coal consumer, the world's second largest importer, and the fourth largest consumer of Australian metallurgical coal. China's metallurgical coal imports rose by 9.1 per cent year-on-year in the three months to August 2017.

The increase in imports was driven by strong domestic steel production and demand. Metallurgical coal imports are forecast to stay strong over the remainder of the year, with imports in 2017 expected to increase by 25 per cent year-on-year to 74 million tonnes. Growth in imports is expected to be driven by continued strong steel production and lower domestic metallurgical coal production — due to stringent safety inspections at coal mines in the Shaanxi province (a major coal producing region) because of safety concerns.

China's metallurgical coal imports are forecast to decline by 20 per cent in 2018 to 59 million tonnes, and by a further 10 per cent in 2019 to 53 million tonnes. The outlook for metallurgical coal imports in China is expected to be impacted by changing Government priorities, with strong signalling by the authorities that there could potentially be a suite of measures introduced — both to improve financial stability in the economy and to manage financial risks amidst slowing activity in the construction and industrial sectors.

India's metallurgical coal imports are forecast to increase

India is the world's largest importer of metallurgical coal. It is also the largest consumer of Australia's high quality metallurgical coal, and is expected to remain so over the outlook period. India's metallurgical coal imports increased by 3.5 per cent year-on-year in the June quarter. Imports over the remainder of the year are expected to remain stable, taking the total to 49 million tonnes in 2017, up by 1.5 per cent . The increase in imports is expected to be underpinned by an increased need for metallurgical coal for domestic steel production, which is expected to grow rapidly as steel producers expand and add new capacity. Government import duties on steel and increased infrastructure spending, should also support demand for domestically- produced steel and the metallurgical coal needed to produce it.

India's metallurgical coal imports are forecast to increase by 3.5 per cent to 50 million tonnes in 2018, and by a further 5.0 per cent to 53 million tonnes in 2019.

Japan's metallurgical coal imports hold steady

Japan is the third largest importer of metallurgical coal and the second largest consumer of Australian metallurgical coal. Despite maintenance and other issues at steel mills in the June quarter, Japan's metallurgical coal imports increased by 3.2 per cent year-on-year in the June quarter. This follows a year-on-year decline in the March quarter. Japan's metallurgical coal imports in 2017 are forecast to remain similar to 2016 levels, at 51 million tonnes, supported by steady steel production.

Japan's metallurgical coal imports are forecast to increase by 3.0 per cent to 53 million tonnes in 2018, and stay at a similar level in 2019. Growth in imports is expected to be supported by growing Japanese steel production and exports of steel-intensive goods.

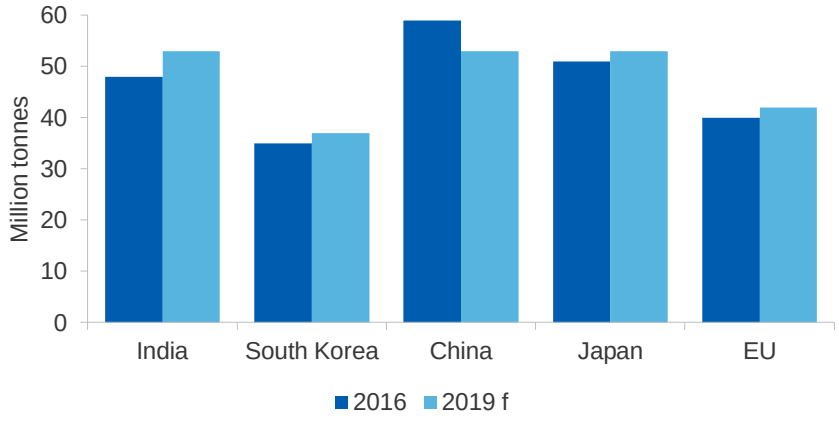
World exports

United States exports surge

The United States was the second largest metallurgical coal exporter in the world after Australia in 2016, making up around 12 per cent of the seaborne market. United States metallurgical coal exports increased by 43 per cent year-on year in the three months to July, as producers utilised latent capacity in response to higher metallurgical coal prices. In 2017, exports are forecast to increase by 25 per cent to 46 million tonnes, driven by both relatively high metallurgical coal prices and US producers' ability to meet rising demand at profitable prices.

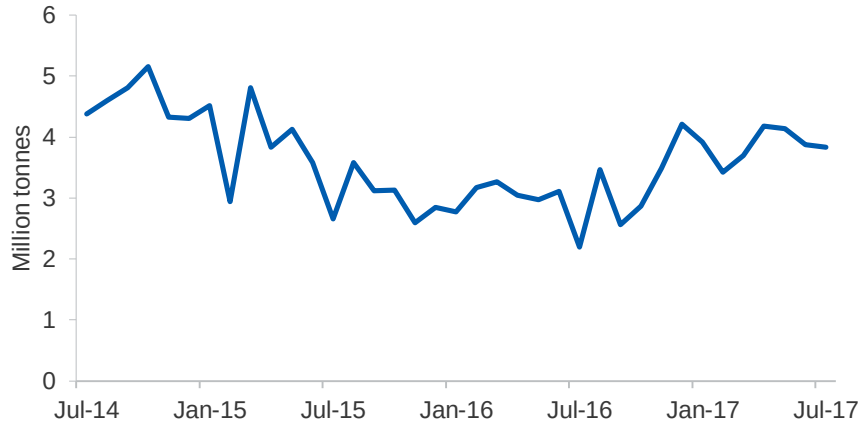
US metallurgical coal exports are forecast to decline by 22 per cent to 36 million tonnes in 2018, and by a further 3.0 per cent to 35 million tonnes in 2019. Declines will be underpinned by softer import demand from China and falls in the metallurgical coal price, which is likely to deter high-cost producers.

Figure 5.3: Major importers



Source: International Energy Agency (2017); Department of Industry, Innovation and Science (2017)

Figure 5.4: US monthly metallurgical coal exports



Source: IHS (2017)

Australia's production and exports

Australia's export earnings hit record high

Australia's metallurgical coal export volumes declined by 6.1 per cent to 177 million tonnes in 2016–17. The decline was due to export delays in the June quarter — caused by damage from Cyclone Debbie. Transport problems in the Bowen Basin (which is the world's largest metallurgical coal producing region), caused by Cyclone Debbie, more than offset the expected increase in export volumes induced by higher prices. Transport of tonnage for export to the Dalrymple Bay coal terminal (a major metallurgical coal export terminal in Australia) were affected by the temporary closure of the Goonyella rail line, which was damaged by flooding associated with Cyclone Debbie. Affected mines included Hail Creek, South Walker Creek, Isaac Plains, Carborough Downs, Caval Ridge, Peak Downs and Foxleigh.

Some of the export tonnage affected by the transport problems are expected to be distributed over the September and December quarters as delayed cargoes. However, the increase in export volumes expected in the September quarter — as Cyclone Debbie backlogs are cleared — are estimated to have been offset by the production disruptions at the Oaky North and Appin mines.

In 2017–18, Australia's export volumes are forecast to increase by 10 per cent from 2016–17 levels, to 195 million tonnes, underpinned by strong import demand from China and delayed cargoes from the previous financial year. Export earnings in 2017–18 are forecast to remain similar to 2016–17, as the impact of lower prices in the first half of 2018 — outweighs higher export volumes.

Table 5.1: World metallurgical coal trade

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Metallurgical coal imports								
– European Union 28	Mt	40	41	41	42	1.0	1.0	1.0
– Japan	Mt	51	51	53	53	-0.2	3.0	1.0
– China	Mt	59	74	59	53	25.0	-20.0	-10.0
– South Korea	Mt	35	36	37	37	4.0	2.0	1.0
– India	Mt	48	49	50	53	1.5	3.5	5.0
Metallurgical coal exports								
– Australia	Mt	189	180	194	194	-5.0	7.7	0.0
– Canada	Mt	28	28	29	29	1.2	1.2	1.2
– United States	Mt	37	46	36	35	25.0	-22.0	-3.0
– Russia	Mt	22	24	25	26	10.0	5.0	3.0
World trade	Mt	314	377	339	329	20.0	-10.0	-3.0

Notes: ***s*** *Estimate;* ***f*** *Forecast*

Source: IEA (2017) Coal Information 2017; Department of Industry, Innovation and Science (2017)

Export volumes in 2018–19 are forecast to decline by 1.1 per cent to 193 million tonnes, as China's import demand softens. Despite the decline in volumes, Australia's metallurgical coal exports are forecast to remain robust in historical terms , supported by import demand from traditional consumers including India and Japan, as well as from ASEAN economies. Export earnings in 2018–19 are forecast to decline by 22 per cent to $27 billion, as a result of falling export volumes and prices.

The forecast for export values has been revised up

Forecast export values have been revised up by around $3 billion in 2017–18 from the June *Resources and Energy Quarterly*. Upward revisions reflect a more favourable outlook for metallurgical coal prices, especially with a spike in prices in the September quarter 2017.

Australia's production to stay robust

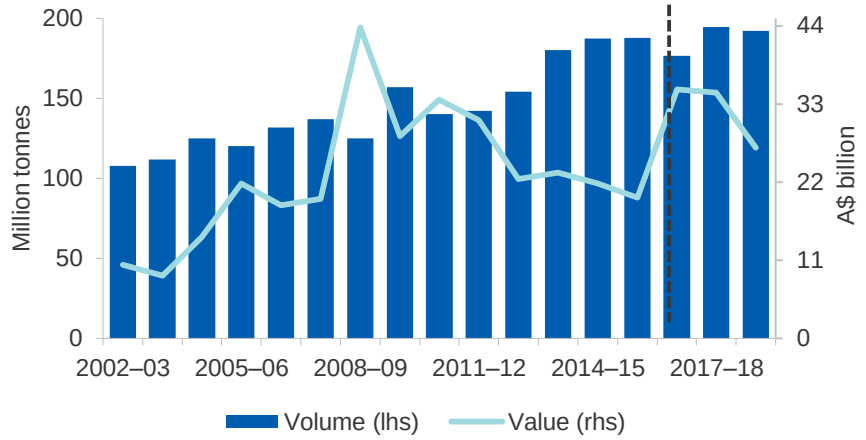
Australia's metallurgical coal production remained broadly unchanged in 2016–17, at 190 million tonnes, supported by strong metallurgical coal prices and import demand from China.

In 2017–18, production is forecast to increase by 3.0 per cent to 196 million tonnes, as production disruptions in the September quarter are outweighed by the impact of increased production at other mines — in response to strong import demand from China. Industrial action at Glencore's Oaky North mine — as well as the temporary shutdown of South 32's Appin mine due to gas leakages over most of the September quarter — were the main causes of production disruptions in the September quarter.

The Appin mine is now up and running, and industrial action pressures on the Oaky North mine are not expected to be sustained much further into 2017–18.

In 2018–19, Australia's metallurgical coal production is forecast to increase by 1.4 per cent to 199 million tonnes, as ramp-ups in production from Byerwen (3.5 million tonnes capacity) and the start-up of operations at Eagle Downs (1.4 million tonnes) — both in Queensland — take effect.

Figure 5.6: Australia's metallurgical coal export volumes and values



Source: IEA (2017); Department of Industry, Innovation and Science (2017)

Table 5.1: Australia's metallurgical coal outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Contract prices e								
– nominal	US$/t	114.4	203.3	146.5	124.5	77.8	-28.0	-15.0
– real d	US$/t	116.7	203.3	143.5	119.3	74.2	-29.4	-16.8
Spot prices g								
– nominal	US$/t	143.5	180.4	140.7	119.0	25.7	-22.0	-15.5
– real d	US$/t	146.5	180.4	137.9	114.0	23.2	-23.6	-17.3
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17 s**	**2017–18 f**	**2018–19 f**
Production		189.3	190.0	195.7	198.5	0.4	3.0	1.4
Export volume	Mt	188.0	176.6	194.7	192.5	-6.1	10.3	-1.1
– nominal value	A$m	19,790	35,044	34,556	26,831	77.1	-1.4	-22.4
– real value i	A$m	20,566	35,806	34,556	26,206	74.1	-3.5	-24.2

Notes: ***d*** *In 2017 US dollars;* ***e*** *Contract price assessment for high-quality hard coking coal;* ***i*** *In 2017–18 Australian dollars;* ***f*** *Forecast;* ***g*** *Hard coking coal fob Australia east coast ports;* ***s*** *Estimate*

Source: ABS (2017) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Innovation and Science (2017); Platts Steel Analyzer (2017)

Thermal coal

Resources and Energy Quarterly September 2017

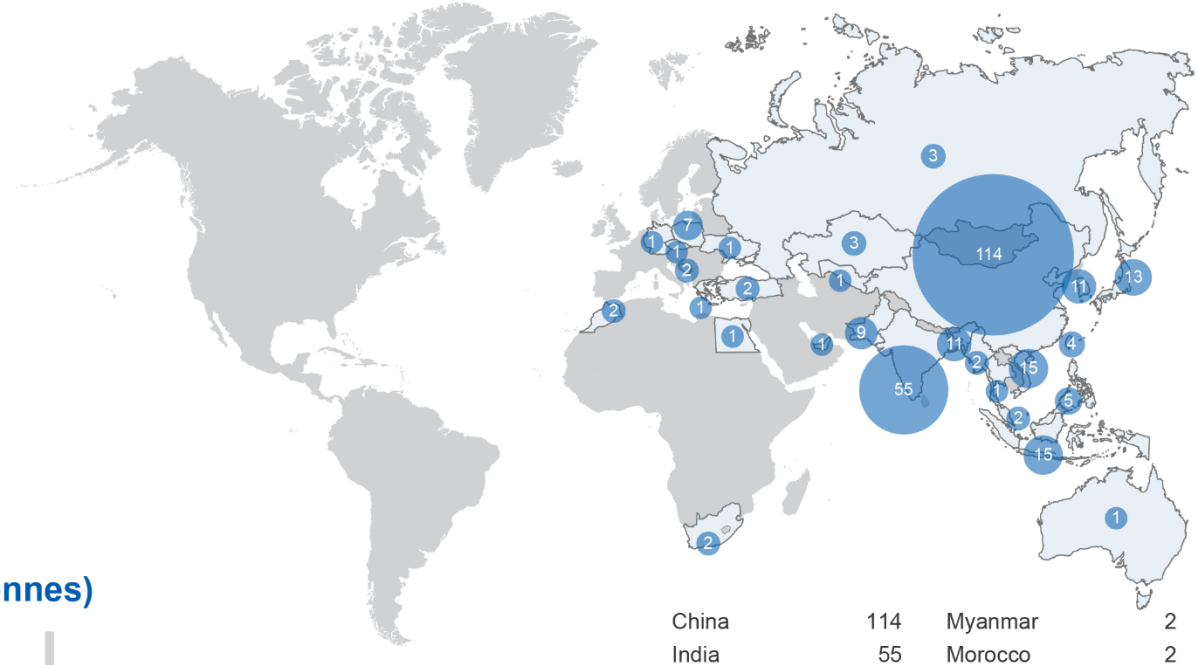
In 2016, **around 5%** of global thermal coal production was in Australia

202 million tonnes exported in 2016

Australia is the **2nd largest** thermal coal exporter in the world

Roughly 80% of Australia's thermal coal production is exported

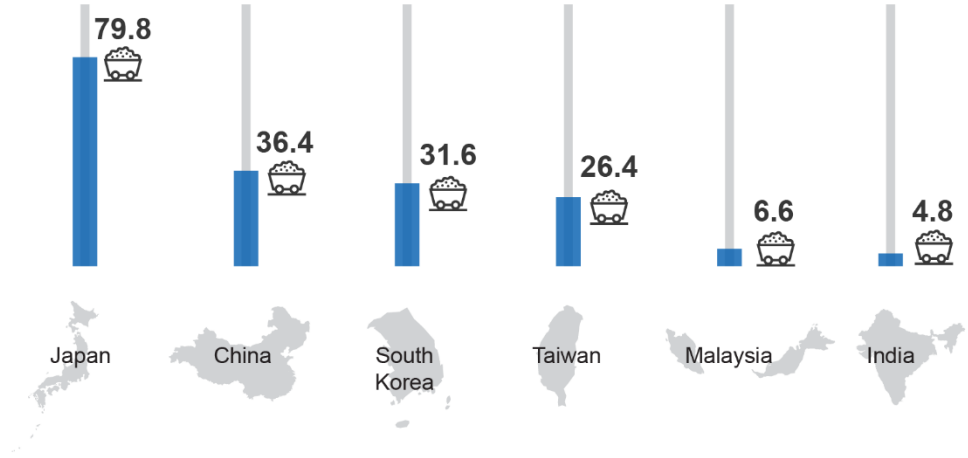
Number of advanced technology coal fired power stations planned or under construction



China	114	Myanmar	2
India	55	Morocco	2
Indonesia	15	South Africa	2
Vietnam	15	Bosnia-Herzegovina	2
Japan	13	Turkey	2
South Korea	11	Australia	1
Bangladesh	11	Thailand	1
Pakistan	9	Germany	1
Poland	7	Greece	1
Philippines	5	UAE	1
Taiwan	4	Ukraine	1
Kazakhstan	3	Uzbekistan	1
Russia	3	Czech Republic	1
Malaysia	2	Egypt	1
		Total	**286**

Data as of June 2017

Key importers of Australian thermal coal (million tonnes)



Market summary

- Thermal coal exports totalled $19 billion in 2016–17. The value of export earnings are forecast to be little changed in 2017–18.
- After declining over most of the first half 2017, prices rose sharply from mid-July, due to both stronger than expected import demand and industrial action affecting exports from key Australian mines.
- Spot prices are expected to decline from recent highs, dropping to US$69 a tonne in 2019, as industrial action eases and demand softens in key markets such as China.
- In 2017–18, Australia's exports are forecast to remain broadly unchanged and then decline by 2.0 per cent to 198 million tonnes, in 2018–19.

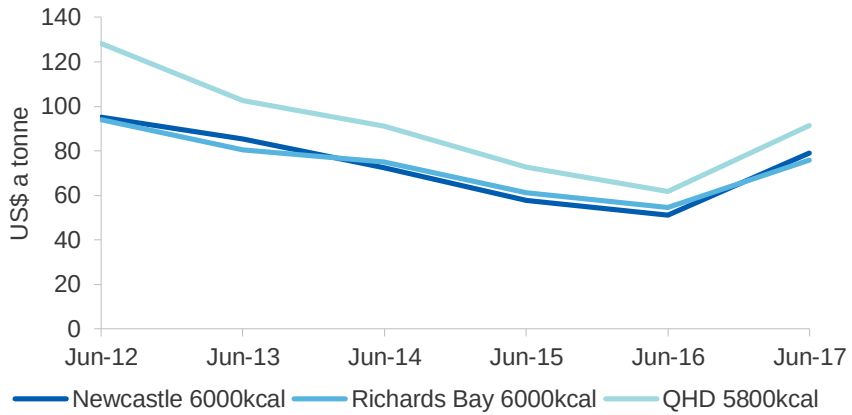
Prices

Prices spike over most of the September quarter

After declining over the first half of 2017 (averaging US$80 a tonne), the Newcastle FOB thermal coal spot price (Australia's benchmark thermal coal) rose sharply from around mid-July, increasing to US$99 a tonne by mid September. The price spike was driven by strong import demand from Asia and industrial action against dominant NSW coal hauler, Pacific National, and industrial action at some key thermal coal mines in Australia's Hunter Valley region. These events are expected to increase the Newcastle FOB spot price over the September quarter by an estimated 16 per cent (relative to the June quarter) to US$91 a tonne.

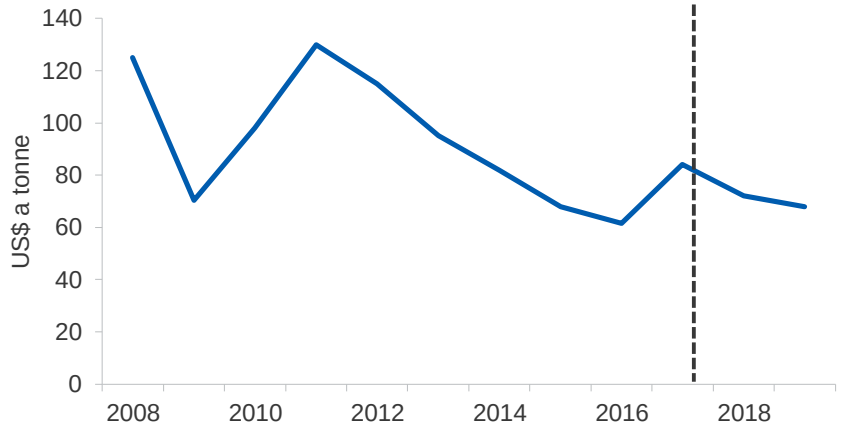
The Newcastle FOB spot price is forecast to average US$84 a tonne over 2017, an increase of 30 per cent from 2016. The year-on-year increase is reflective of the lower prices seen in the first half of 2016 — which dragged down the annual 2016 average price, and the sharp spike in price over the September 2017 quarter.

Figure 6.1: Quarterly thermal coal spot prices



Source: IHS (2017)

Figure 6.2: Japanese Fiscal Year contract prices



Source: Department of Industry, Innovation and Science (2017)

The Japanese Fiscal Year (JFY) 2017 (April 2017 to March 2018) benchmark price was settled in April this year at US$84 a tonne. The JFY contract price is projected to decline over the outlook period, falling by 12 per cent to US$74 a tonne in 2018, and by 4.1 per cent to US$71 a tonne in 2019. The falls in price are expected to be underpinned by declining import demand from China — as it moves to a more diversified energy mix — and lower demand in South Korea. Despite the unexpected uptick in spot prices in the September quarter — global benchmark spot prices are also expected to decline over the outlook period. In 2018, Australia's Newcastle FOB spot price is forecast to decline by 16 per cent to US$71 a tonne and decline by 2.8 per cent to US$69 a tonne, in 2019.

World trade

World thermal coal trade in 2017 is forecast to increase by 1.3 per cent to 1.1 billion tonnes: a sustained increase in imports from China and higher than expected imports in South Korea are expected to more than offset a decline in imports from India. Trade is forecast to decline by 1.9 per cent to 1 billion tonnes in 2018, and then to be little changed in 2019. Declines in trade volumes are expected to be driven by lower import demand from South Korea, China and India.

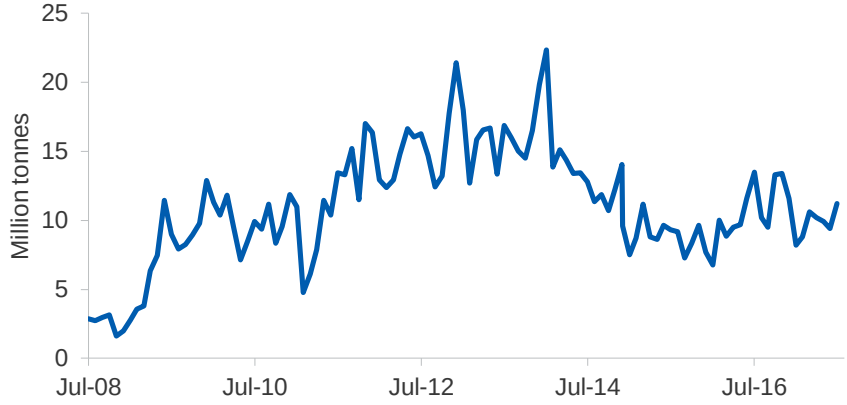
World imports

Increased import demand from China sustained into the first half 2017

China is currently the largest consumer and importer of thermal coal in the world, and was the second largest importer of Australian thermal coal in 2016. After rising over early 2017, China's thermal coal imports declined by 13 per cent in the three months to August.

The overall increase in China's imports in 2017 to date has been driven by relatively high domestic prices (increasing the attractiveness of imported coal). The higher domestic coal price has been caused by slower than expected capacity re-starts and temporary closures of some Chinese mines (due to safety issues and tighter coal mine safety inspections in the Shanxi region). China's thermal coal imports are forecast to increase by 2.0 per cent in 2017 to 200 million tonnes, assisted by the Central Government's new power plant coal stocking requirements.

Figure 6.3: China's monthly thermal coal imports



Source: IHS (2017)

New draft Chinese Central Government guidelines released in the September quarter state that power plants in major coal producing regions will be required to hold inventories of at least 15 days of consumption. This new inventory requirement is likely to change the buying patterns of power stations, and temporarily increase the volume of coal purchased, placing increased pressure on domestic coal prices and increasing the attractiveness of imported coal.

In September, reports from China indicated long delays in clearing thermal coal imports into ports. Many believe these delays to be a non-tariff trade barrier, introduced to lower thermal coal imports. How this plays out over the next few months remains to be seen, especially since China has signed Free Trade Agreements to which it needs to adhere.

Regardless, China's thermal coal imports are forecast to decline over 2018 and 2019, and this new strategy may reduce imports further. In 2018, thermal coal imports are forecast to decline by 1.0 per cent to 198 million tonnes, and decline by 7.0 per cent to 184 million tonnes in 2019. A gradual return of production capacity is expected over 2018 and 2019, as profitable capacity is brought online and safety inspections of mines are completed. Increased domestic supply availability is likely to reduce import demand.

India's production and imports decline

India is the second largest consumer of thermal coal in the world and the second largest importer. It is the sixth largest consumer of Australian thermal coal. India's thermal coal imports declined by 9.5 per cent year-on-year in the June quarter. The decline in imports came as the production of Coal India (a state-owned coal producer and the largest in the country) declined by 4 per cent in the three months to July.

However, domestic production in the seven months to July is still higher year-on-year. India's thermal coal imports are therefore forecast to decline by 15 per cent to 141 million tonnes in 2017. This decline in imports is largely due to the Indian Government's push for domestic power plants to use local coal as part of their agenda to achieve self-sufficiency. However, there could be some upside to India's thermal coal import forecast depending on the extent of the impact of monsoon rains on domestic production. Import declines are also expected in 2018 and 2019 — partly attributable to India's slow progress in power sector reform (expected to cause stock build-ups at power plants, as a lack of profitability impacts on plant load factors) and the Indian Government's likely ongoing push to reduce reliance on imported thermal coal. Despite the forecast declines, India is likely to require some level of imported thermal coal for coal fired power plants located on the west coast, many of which are designed to run on imported coal. In 2018, India's thermal coal imports are forecast to decline by 3 per cent to 137 million tonnes, and then decline by 1 per cent to 135 million tonnes in 2019.

Japan's thermal coal imports to increase in 2017 and remain stable thereafter

Japan is the third largest importer of thermal coal in the world and the largest consumer of Australian thermal coal. Japan's thermal coal imports rose by 7.0 per cent year-on-year, in the three months to July.

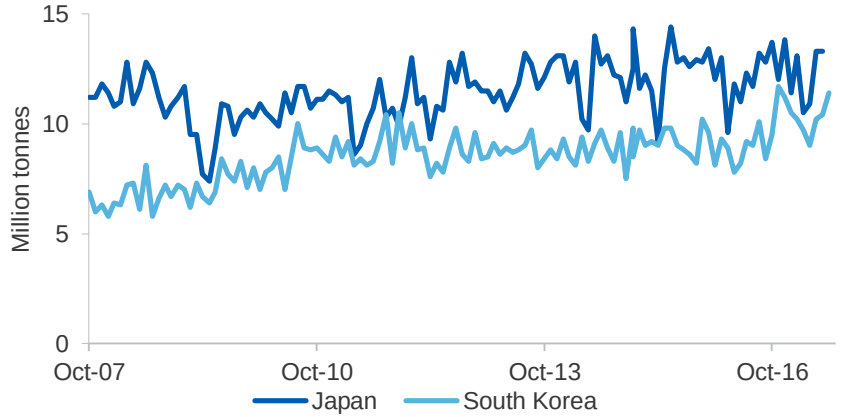
Thermal coal imports in 2017 are forecast to increase by 2.0 per cent to 141 million tonnes, supported by increasing utilisation of coal-fired power plants and an increase in installed coal-fired power generation capacity. Imports are forecast to increase slightly in 2018 and 2019, to 142 million tonnes and 143 million tonnes, respectively. Import demand in 2018 and 2019 is expected to be supported by steady coal-fired power generation.

South Korea's low quality thermal coal imports forecast to decline

South Korea is the third largest importer of thermal coal and third largest consumer of Australia's thermal coal. Despite newly-elected President Moon Jae-in's plans to curb coal-fired power generation to combat air pollution, thermal coal imports increased by 21 per cent year-on-year in the three months to August. Growth was driven by strong power demand and the outage of eight nuclear power stations.

Prior to his election and immediately after he was elected, President Moon Jae-in announced a suite of new policies to curb the use of coal in power generation to combat rising air pollution in the country. Despite announcing the temporary shutdown of coal fired power plants and an increase in the coal consumption tax, thermal coal imports have increased since his election, with Unit 2 of the 595 MW Bukpyeong coal-fired power plant also coming online in August. In 2017, South Korea's thermal coal imports are forecast to increase by 6.5 per cent to 106 million tonnes, supported by increased power demand and increased coal fired power generation.

Figure 6.4: Monthly imports of Japan and South Korea



Source: IHS (2017); Department of Industry, Innovation and Science (2017)

In 2018, South Korea's thermal coal imports are expected to decline by 2 per cent to 104 million tonnes, as the six remaining nuclear reactors currently idled gradually come back online. South Korea's thermal coal imports are forecast to be broadly unchanged in 2019, as newly installed coal fired power generation capacity offsets shutdowns of old coal fired power plants (part of the Government's agenda to reduce air pollution).

It remains to be seen how President Moon Jae-in's policy announcements/commitments play out in terms of the magnitude of imports to be affected over the outlook period.

World exports

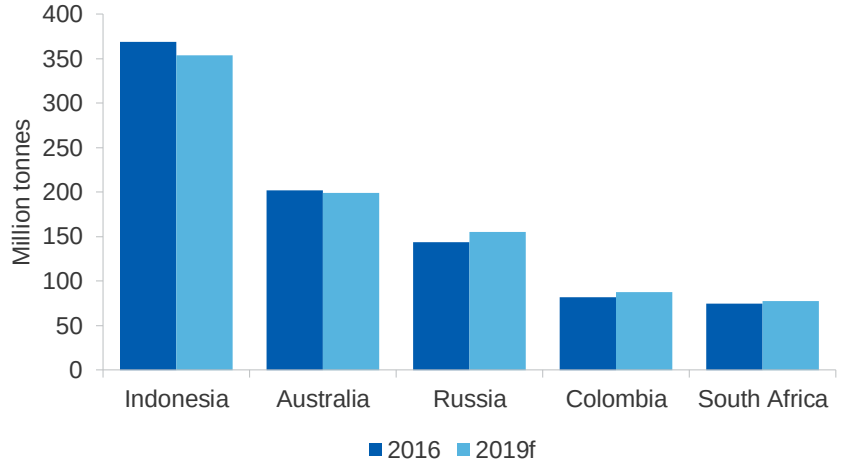
Indonesia's exports remain steady, year-on-year

Indonesia's thermal coal exports in the June quarter remained broadly unchanged year-on-year. Tighter coal quality checks by the Chinese Government and a ban on thermal coal imports at small Chinese ports appear to have had an impact on low quality coal producers in Indonesia. New Chinese Government quality tests and clearance procedures at ports have caused delays of up to eight weeks.

Over 2017, Indonesia's thermal coal (bituminous, sub-bituminous and lignite) exports are forecast to increase by 1.5 per cent to 374 million tonnes — as thermal coal import demand from South Korea increases (in 2016, roughly 35 per cent of South Korea's imports came from Indonesia). Indonesia's thermal coal exports are forecast to decline by 2 per cent to 367 million tonnes in 2018, and fall by 3.5 per cent to 354 million tonnes in 2019. The decline in exports over the forecast period is likely to be driven by falling thermal coal prices (which have been more pronounced for lower calorific value coal — a significant proportion of Indonesian production), which is expected to put pressure on Indonesia's high cost producers.

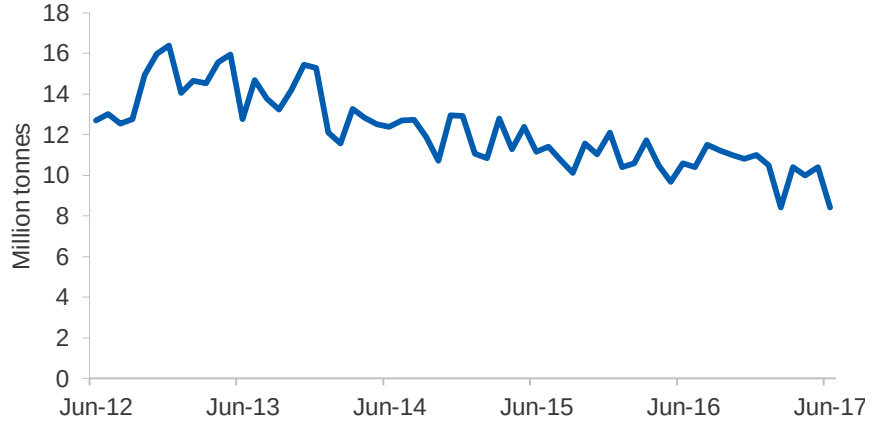
However, Indonesia's domestic coal usage is forecast to rise in 2017. State-electricity provider, PLN, expects a 16 per cent annual rise in coal required domestically in 2017, due to new power capacity having come online. Over the outlook period, it is possible that the Indonesian Government's mandated domestic coal obligation policy may play a part in reducing the amount of output available for export. The policy enforces a domestic reserve policy — a requirement that domestic coal mines fulfil most of the country's coal-fired power generation needs first.

Figure 6.5: Major thermal coal exporters



Source: IEA (2017); Department of Industry, Innovation and Science

Figure 6.6: Indonesia's monthly thermal coal (bituminous) exports



Source: IHS (2017); Department of Industry, Innovation and Science (2017)

Russia's exports continue to grow

Russian thermal coal exports increased by 18 per cent year-on-year in the three months to July. Exports are forecast to steadily increase over the outlook period, as Russian producers continue to benefit from the sharp drop in the Russian Rouble since 2014.

South Africa's thermal coal exports grow steadily

South African thermal coal exports increased by 17 per cent year-on-year in the three months to July. In 2017, South Africa's thermal coal exports are forecast to remain similar to 2016 levels — at around 76 million tonnes — as expected increases in output from operators such as Wescoal offsets expected declines in production from South 32 and others.

South Africa's thermal coal exports are forecast to be broadly unchanged in 2018 and 2019. While there may be more coal available for export — due to the South African Government's shift away from coal fired power plants to renewable forms of energy — infrastructure constraints and difficult regulatory processes are causing some operators to reassess their coal strategy within South Africa. This could potentially limit the amount of investment in the domestic industry in the short to medium term, but is likely to be more of a longer term constraint.

Australia's exploration, production and trade

Overall year-on-year coal exploration remains subdued

Australia's exploration expenditure increased by 8.8 per cent in the June quarter 2017 relative to the March quarter, to $6 million. However, exploration expenditure declined by14 per cent year-on-year and declined by 31 per cent in 2016–17 from 2015–16, to $120 million.

Australia's export earnings forecast to remain strong

Australia's thermal coal export earnings increased by 28 per cent year–on–year to $19 billion in 2016–17, driven by increased spot thermal coal prices. Export volumes in 2016–17 increased marginally year-on-year, to 202 million tonnes. The increase in export volumes was supported by increased import demand from China, notably in the first half of the year. Export values in 2017–18 are forecast to be similar to 2016–17 levels.

A large volume of Australia's thermal coal exports are sold on a contractual basis, therefore the higher negotiated price in JFY 2017 (36 per cent higher than JFY 2016) is likely to bode well for exporters in 2017–18. However, the impact of some of these gains is expected to be offset by lower spot prices.

Despite production disruptions in the first quarter of the financial year, stronger import demand in the first half of 2017–18 is expected to keep export volumes similar to 2016–17 levels. However, export volumes are forecast to drop off slightly in the second half of 2017–18, as South Korea's nuclear power reactors come back online, softening their import demand for coal.

Export values for 2018–19 are forecast to decline by 13 per cent to $17 billion, in line with lower export volumes and (spot and contract) prices. In 2018–19, export volumes are forecast to decline by 2.0 per cent to 198 million tonnes, due to expected subdued Chinese and Indian thermal coal import demand.

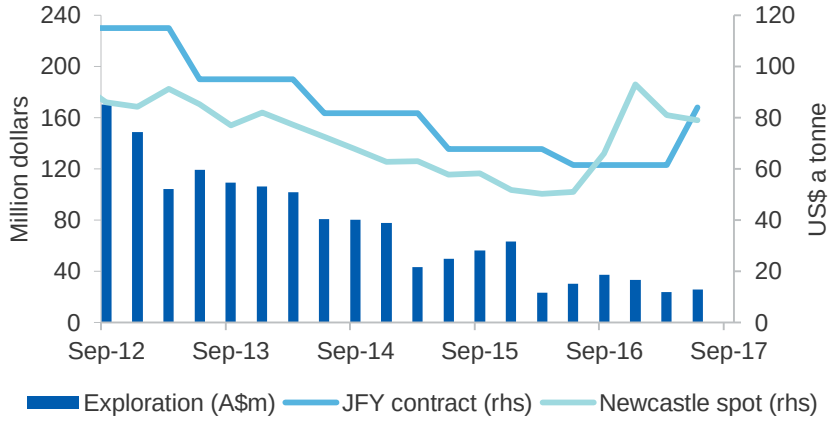
There is some potential for a higher export result, given China's slower than expected capacity re-starts and temporary closures of mines, due to safety concerns. If China's domestic supply availability remains low, in 2017–18 and 2018–19, Australian export volumes could be higher than forecast.

Australia's production forecast to decline before increasing in 2018–19

In 2016–17, Australia's production was unchanged at 250 million tonnes. In 2017–18, production is forecast to decline slightly — by 0.8 per cent to 248 million tonnes — due to production disruptions in the Hunter Valley and lower demand from China and South Korea, expected later in the financial year. The Rail, Tram, and Bus Union (RTBU) have been carrying out industrial action against dominant NSW coal hauler Pacific National over most of the September quarter. In addition, workers at six operations across Glencore's Hunter Valley Operations simultaneously downed tools for the first time, with at least 1,400 workers involved. However, despite the size of the industrial action, industry experts believe the production impact to be limited.

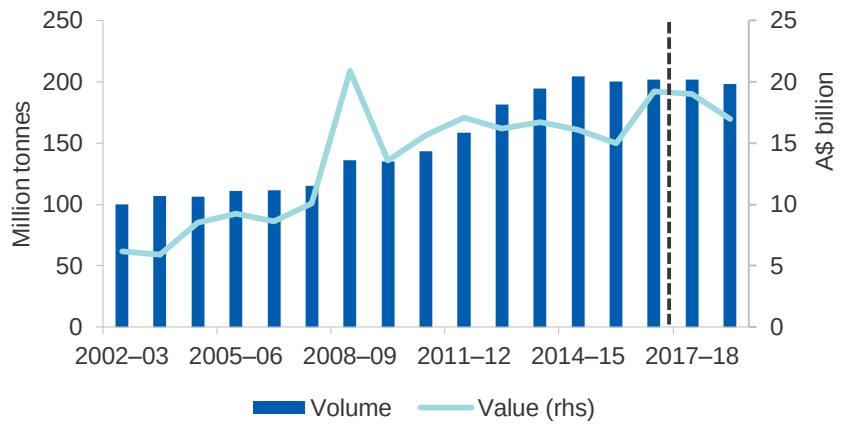
In 2018–19, production is forecast to increase by 1.4 per cent to 251 million tonnes. Production is expected to be supported by the ramp up in production at some mines, including Ravensworth (up to 9.3 million tonnes a year capacity).

Figure 6.7: Australia's coal exploration expenditure



Source: Department of Industry, Innovation and Science (2017)

Figure 6.8: Australia's thermal coal export volumes and values



Source: Department of Industry, Innovation and Science (2017)

Table 6.1: Thermal coal outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Contract prices b								
– nominal	US$/t	62	84	74	71	36.4	-11.9	-4.1
– real c	US$/t	63	84	72	68	33.5	-13.9	-6.4
Spot prices d								
– nominal	US$/t	65	84	71	69	29.6	-15.6	-2.8
– real e	US$/t	67	84	70	66	27.0	-17.4	-4.9
Coal trade	Mt	1,045	1,058	1,038	1,014	1.3	-1.9	-2.3
Imports								
Asia	Mt	759	759	760	751	-0.1	0.1	-1.1
China	Mt	196	200	198	184	2.0	-1.0	-7.0
Chinese Taipei	Mt	59	63	66	67	7.0	4.0	2.5
India	Mt	166	141	137	135	-15.0	-3.0	-1.0
Japan	Mt	138	141	142	143	2.0	1.0	0.5
South Korea	Mt	100	106	104	104	6.5	-2.0	-0.5
Europe	Mt	214	204	189	176	-5.0	-7.0	-7.0
European Union 27	Mt	163	155	144	134	-5.0	-7.0	-7.0
other Europe	Mt	51	49	45	42	-5.0	-7.0	-7.0
Exports								
Australia	Mt	202	199	199	199	-1.2	-0.2	0.0
Colombia	Mt	82	82	84	88	-0.1	2.0	5.0
Indonesia	Mt	369	374	367	354	1.5	-2.0	-3.5
Russia	Mt	144	151	153	155	5.0	1.1	1.3
South Africa	Mt	75	76	76	78	1.0	-0.2	2.6
United States	Mt	18	33	27	25	90.0	-20.0	-5.0
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17**	**2017–18 f**	**2018–19 f**
Production	Mt	250.8	250.0	248.0	251.4	-0.3	-0.8	1.4
Export volume	Mt	201.3	202.0	202.0	198.0	0.4	0.0	-2.0
– nominal value	A$m	14,751	18,937	19,181	16,691	28.4	1.3	-13.0
– real value h	A$m	15,330	19,348	19,181	16,302	26.2	-0.9	-15.0

*Notes: **b** Japanese Fiscal Year (JFY), starting April 1, fob Australia basis. Australia–Japan average contract price assessment for steaming coal with a calorific value of 6700 kcal/kg gross air dried; **c** In current JFY US dollars; **d** fob Newcastle 6000Kcal; **e** In 2017 US dollars; **f** Forecast; **g** Includes lignite; **h** In 2017–18 Australian dollars.*
Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; IHS Inc; IEA 2015 Coal Information; Coal Services Pty Ltd; Queensland Department of Natural Resources and Mines; Company Reports; Department of Industry, Innovation and Science.

Gas

Resources and Energy Quarterly September 2017

LNG is natural gas cooled to

–162°C

2nd

largest LNG exporter in the world

52 **million tonnes** of LNG exported in 2016–17

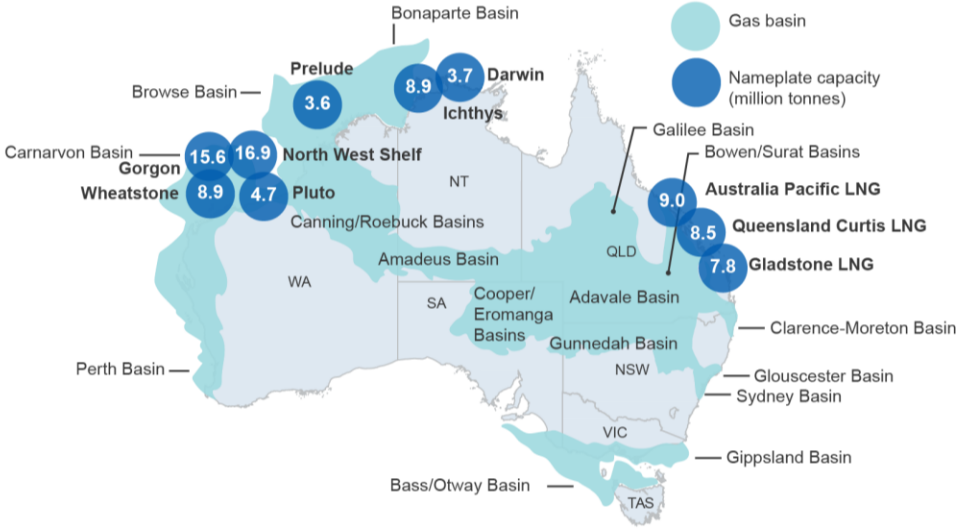
42%

rise from 2015–16

Combined nameplate capacity of Australia's 10 LNG projects is **88 million tonnes per annum**

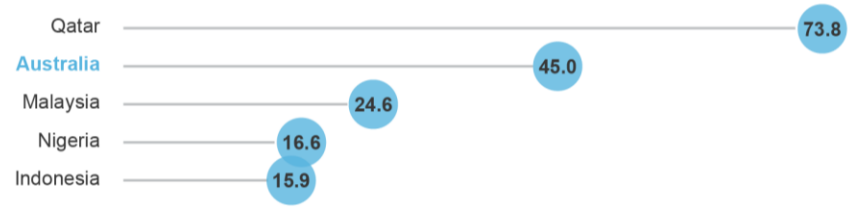
Most Australian LNG is sold on oil-linked contracts

Australia's LNG projects and gas basins

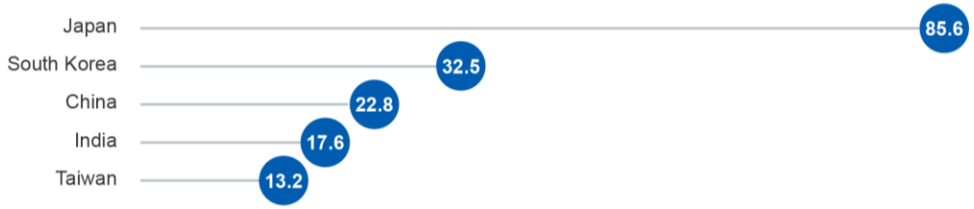


Largest LNG exporters and importers, 2016

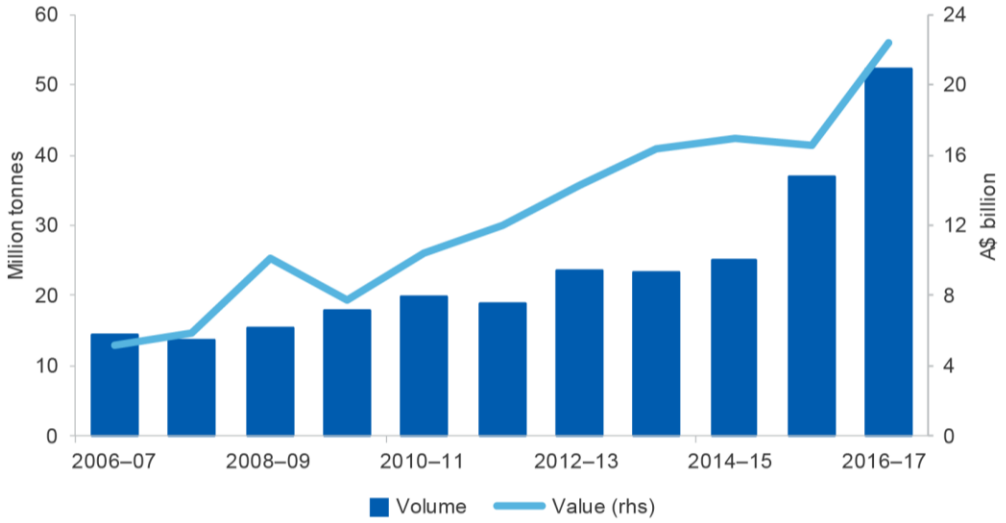
Largest exporters (million tonnes)



Largest importers (million tonnes)



Australia's LNG exports



Summary

- The value of Australia's LNG exports is forecast to increase from $22 billion in 2016–17 to $35 billion in 2018–19, driven by higher export volumes and, to a lesser extent, higher prices.
- The completion of the final three Australian LNG projects under construction will underpin strong growth in export volumes and bring total export capacity to 88 million tonnes. LNG is forecast to overtake metallurgical coal as Australia's second largest resource and energy export in 2018–19.
- LNG contract prices — under which most Australian LNG is sold — are forecast to increase in line with oil prices.
- The outlook for LNG export earnings is not without risks. Australia faces increasing competition in export markets. Oil prices are also a key sensitivity.

Prices

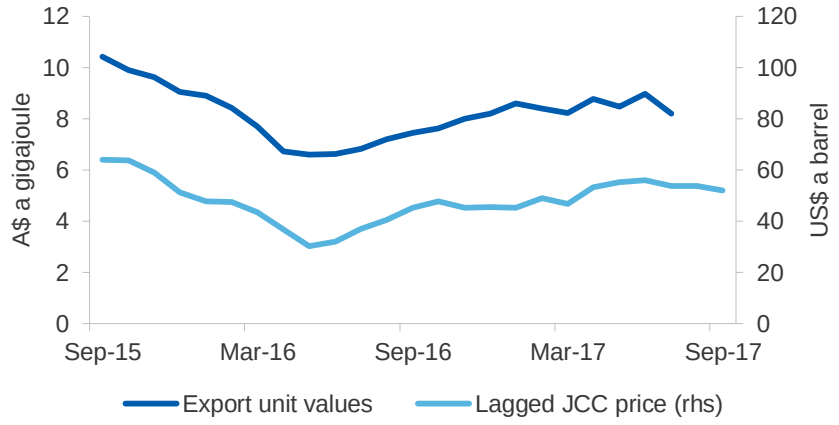
Oil price movements to drive Australian LNG prices

The latest available data shows that the average price of Australian LNG (FOB) declined from an 18-month high of $9 a gigajoule in June to $8.2 a gigajoule in July — or around US$6.8 per million British thermal units (MMbtu). The decline was driven by a fall in oil prices in April 2017, with the majority of Australian LNG sold on long-term contracts linked to the price of Japan Customs-cleared Crude (JCC) oil by a time lag of three months.

LNG spot prices in Asia have risen in recent months, bringing them more closely in line with long-term oil-linked contract prices. As Figure 7.2 shows, LNG spot prices (Delivered Ex Ship) averaged an estimated $8.2 a gigajoule in September (US$6.9 per MMbtu) while an indicative price for LNG on a long-term oil-linked contract (Delivered Ex Ship) was around $9.2 a gigajoule.

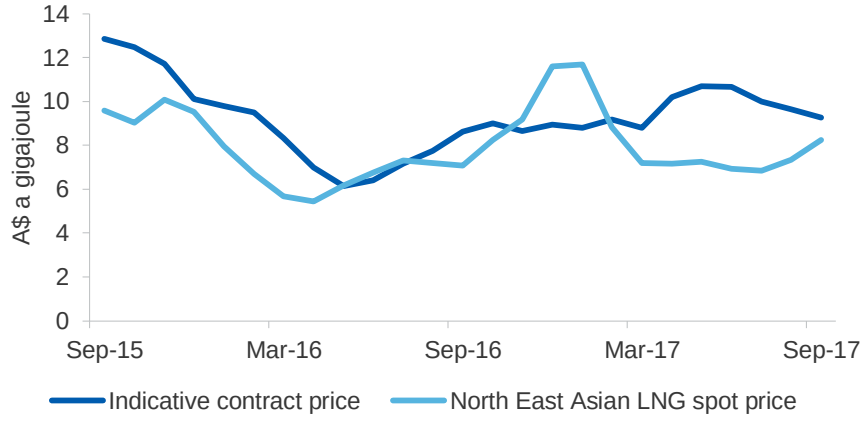
The average price of Australian LNG (FOB) is forecast to increase to average $9.1 a gigajoule in 2018–19, largely driven by higher prices on oil-linked contracts. The JCC oil price is forecast to average US$55 a barrel in 2018–19, up from an average US$50 a barrel in 2016–17.

Figure 7.1: Recent movement in export unit values, monthly



Notes: the JCC price is lagged three months.
Source: ABS (2017); Bloomberg (2017)

Figure 7.2: LNG contract price versus spot price, monthly



Notes: the contract price shown here is indicative only and is estimated as 14 per cent of the three month JCC price plus shipping. Des stands for Delivered Ex Ship.
Source: Argus (2017); Bloomberg (2017)

However, low spot prices will play some role in constraining the average export price realised, particularly if Australian exporters increase their share of sales at spot prices. Asian LNG spot prices (Delivered Ex Ship) are forecast to fall to an average $6.4 a gigajoule in 2019 (around US$5.2 per MMbtu), as additions to global supply capacity outstrip growth in LNG demand.

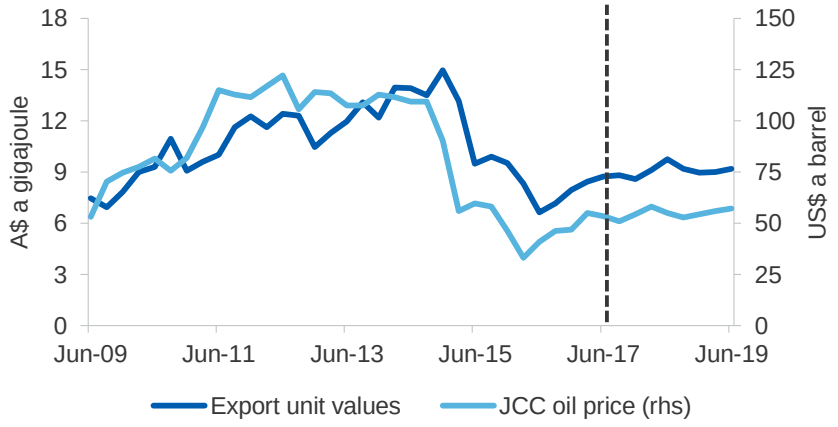
The forecast divergence between oil-linked contract prices and LNG spot prices is expected to encourage buyers to turn to the short-term contract or spot market, reducing purchases on long-term contracts to minimum 'take-or-pay' levels. A widening in the difference between spot and contract prices may also encourage buyers to seek changes to their contractual arrangements with sellers. In September, it was reported that India's Petronet LNG had negotiated a more favourable oil-linked pricing formula with ExxonMobil for LNG supplies from the Gorgon project.

World trade

Although growth in global gas demand is forecast to remain modest, it is expected to drive a major expansion in the relatively small LNG market. World LNG trade is forecast to increase at an average annual rate of 9.3 per cent a year, reaching 327 million tonnes in 2019. Emerging Asia — led by China — and Europe are expected to drive demand growth. Prospects for growth in the imports of the world's two largest consumers — Japan and South Korea — are more limited.

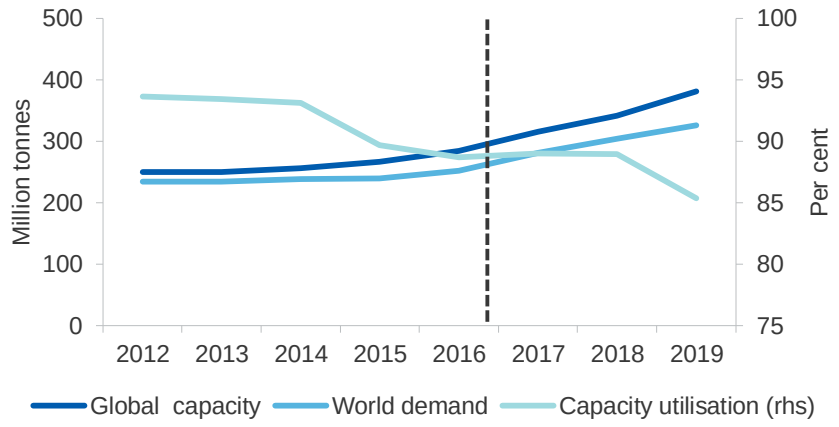
While LNG demand is forecast to grow rapidly over the next few years, it is expected to be outpaced by growth in supply capacity. Consequently, the average capacity utilisation of LNG plants is expected to fall.

Figure 7.3: Export unit value and JCC oil price forecasts



Source: ABS (2017); Bloomberg (2017)

Figure 7.4: Global liquefaction capacity and LNG demand



Notes: liquefaction capacity is nameplate less allowance for downtime and maintenance.
Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

World imports

The imports of the world's largest LNG buyer are set to decline

Japan's LNG imports increased by 5.5 per cent year-on-year in the first seven months of 2017, with gas demand supported by a hot summer and increased consumption in the industrial sector. Despite this, Japan's LNG imports are forecast to increase by only 3.1 per cent in 2017 to 88 million tonnes. By 2019, Japan's LNG imports are forecast to decline to 84 million tonnes.

Overall energy demand in Japan remains subdued. At the same time, LNG is expected to face increasing competition from other fuel sources in the power sector, which accounts for two-thirds of Japan's gas consumption.

The recent restart of idle nuclear power generation capacity — which competes with gas-fired power — is expected to weigh on LNG imports from mid-2017. Japanese utility Kansai Electric Power reactivated two reactors in the June quarter. Five of Japan's fleet of 42 reactors (combined capacity 4.4 gigawatts) are now operational.

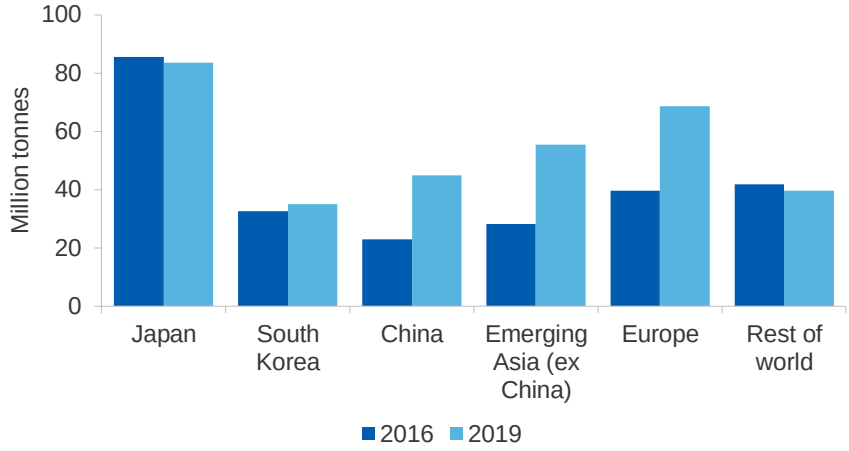
Further reactor restarts are possible within the outlook period. Four more reactors — with capacity totalling 4.7 gigawatts — have received approval from Japan's Nuclear Regulation Authority to restart. However, the timing and scale of nuclear restarts remains a key uncertainty affecting the outlook.

LNG also faces increasing competition in power generation from renewable energy. The Japanese Government's energy think-tank, the Institute of Energy Economics (IEEJ), expects renewable energy generation to increase at an average annual rate of 7.7 per cent between Japanese fiscal years (April to March) 2016–17 and 2018–19.

Recent announcements in South Korea could support LNG imports

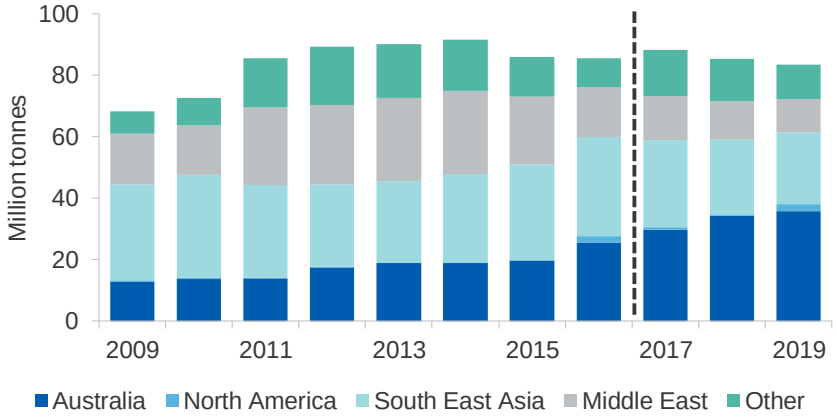
South Korea's LNG imports increased by 18 per cent year-on-year in the first seven months of 2017. With a number of nuclear reactors offline and nuclear-power generation down, gas-fired generation increased. South Korea's LNG imports are forecast to increase by 10 per cent in 2017 to 33 million tonnes, with the return of nuclear capacity weighing on LNG imports in the second half of 2017.

Figure 7.5: LNG import forecasts



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Figure 7.6: Japan's LNG imports



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

In 2018 and 2019, South Korea's LNG imports are forecast to be broadly steady. While gas use in the industrial sector is expected to decline, several announcements by the recently elected South Korean government could lead to a modest increase in the use of LNG in power generation.

From 2018, operations at six old coal-fired power stations will be suspended between March and June each year to reduce air pollution. There are also plans to close two coal-fired power stations before the end of 2017, with a further eight closures expected before mid-2022. South Korea's government will also raise its coal consumption tax by as much as 22 per cent from the start of 2018, increasing the cost-competitiveness of gas.

The South Korean government also has plans to reduce reliance on nuclear energy, given public concern about the safety of the technology. The government has paused the construction of two nuclear power stations, pending a review, and also intends to close the aged Wolsong 1 nuclear reactor, although a timeline for this has not been specified.

If gas-fired generation replaces reduced coal-fired and nuclear power capacity, increased LNG imports will be required.

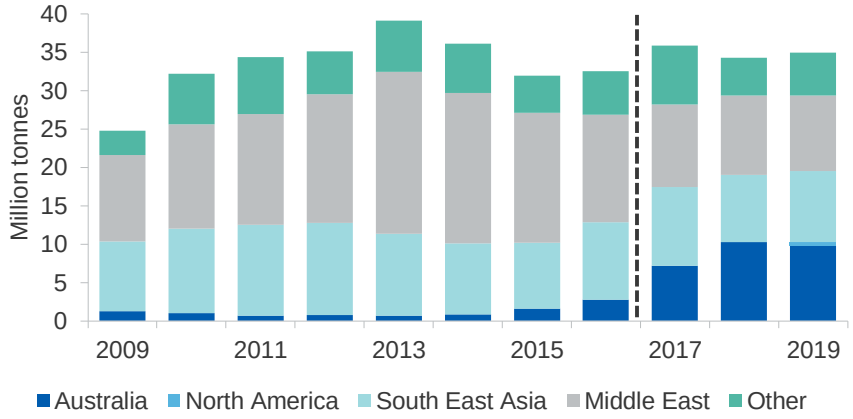
Emerging Asia, led by China, to drive growth in LNG demand

China's LNG imports increased by 60 per cent year-on-year in the first seven months of 2017. Natural gas consumption rose strongly, recording a seasonal record in each month of the year. Pipeline imports and domestic production also increased alongside LNG imports.

A combination of strong economic growth and energy policy targets are expected to support increased consumption. The Chinese government is aiming to increase the share of gas in the energy mix from 5.3 per cent in 2015 to 10 per cent by 2020, with the stated objectives of reducing air pollution and lowering carbon emissions.

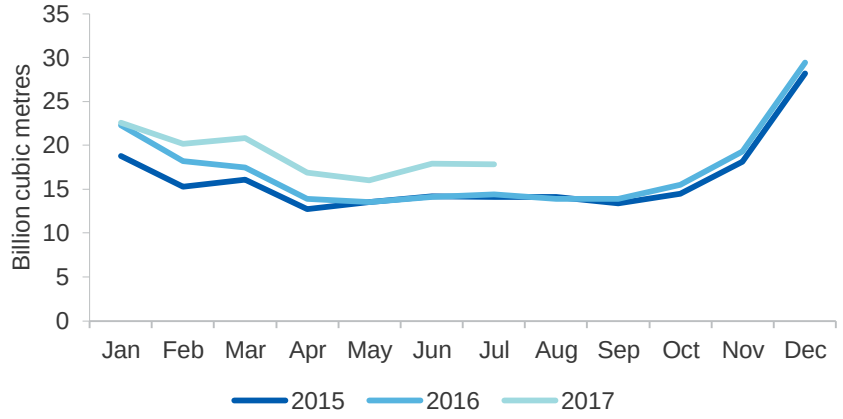
LNG is expected to play an important role in servicing rising gas demand. China's LNG imports are forecast to virtually double from 23 million tonnes in 2016 to 45 million tonnes in 2019. China has agreed to large contracts for LNG imports, starting over the next few years.

Figure 7.7: South Korea's LNG imports



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Figure 7.8: Natural gas consumption in China



Notes: Apparent natural gas consumption.
Source: Bloomberg (2017)

In addition, low LNG prices — especially on the spot market — should assist the cost competiveness of LNG vis-à-vis domestic production and pipeline gas imports.

Other emerging Asian economies are expected to make a large contribution to growth in global LNG imports. Growth will be underpinned by low LNG spot and short-term contract prices, and the availability of floating storage and regasification unit (FSRU) technology, which allows small volumes of LNG to be received more cheaply.

India, for example, is aiming to increase the share of gas in the energy mix from about 6 per cent to around 15 per cent, although a timeline for this remains unclear. With no pipeline import infrastructure, a combination of domestic production and LNG imports are expected to be required to meet growing demand.

Europe's LNG imports are expected to increase

European LNG imports are forecast to increase from 40 million tonnes in 2016 to 69 million tonnes in 2019. Rising gas consumption, falling domestic production, and a desire to diversify away from Russian pipeline supply are all expected to support LNG imports.

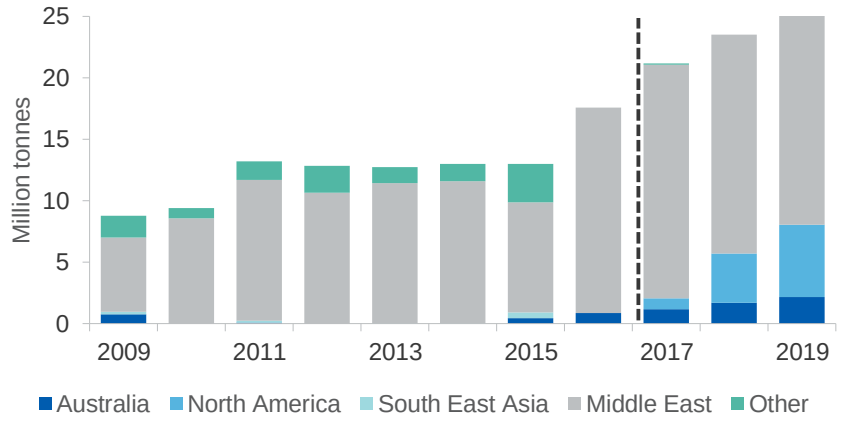
Europe is not a major destination for Australia's LNG exports. However, if LNG demand in Europe does not grow as strongly as projected, Qatari and US LNG may be displaced, potentially then bringing increased competition to the Asia-Pacific market.

World supply

Global supply capacity to rise

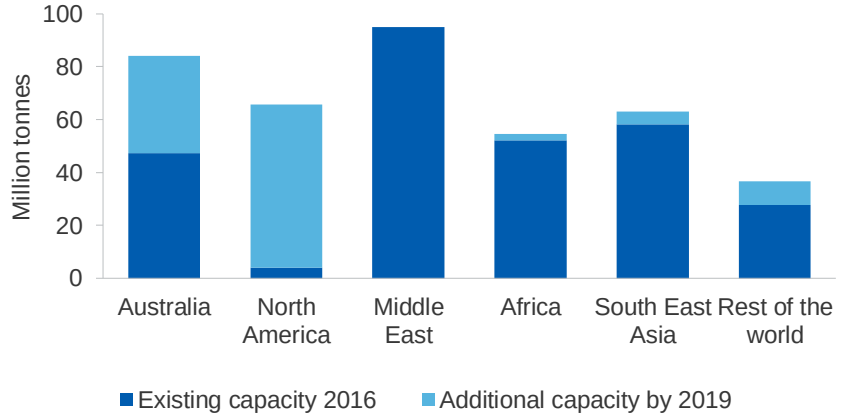
The next few years are expected to see a major expansion in global supply capacity. Around half of all new liquefaction capacity will come from the United States. By 2019, all five LNG projects currently under construction in the United States are expected to have started production, bringing nameplate capacity to around 64 million tonnes. However, US exports are only forecast to rise to around 37 million tonnes in 2019, with all of these projects scheduled for completion late in the outlook period.

Figure 7.9: India's LNG imports



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Figure 7.10: Global LNG supply capacity



Notes: liquefaction capacity is nameplate less allowance for downtime and maintenance.
Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

With the US expected to be a major source of new supply, it is possible that the cost of delivering US gas to Asia could cap LNG spot prices in the region. The cost of US LNG will be determined by the price for which US LNG exporters can purchase domestic gas for export, plus the cost of liquefaction and transportation.

If current prices persist, and if tolling fees (fixed charges paid by LNG buyers that cover the capital costs of US LNG plants) are treated as a sunk cost, US LNG could potentially reach Asian markets for around US$5 per MMbtu ($6.3 a gigajoule). Henry Hub spot prices — the reference price for US domestic gas — remain about US$3 per MMbtu mark (around $3.8 a gigajoule). Liquefaction and transportation costs from the US Gulf Coast are thought to be about US$2 per MMbtu ($2.5 a gigajoule) at present, although estimates for transport costs vary.

Qatar's exports are forecast to remain largely unchanged

Qatar is the world's largest LNG exporter. In 2016, Qatar exported 74 million tonnes of LNG. Qatar's LNG projects have the lowest short-run marginal production costs in the world, and Qatar's exports are forecast to be broadly stable over the outlook period at 74 million tonnes.

To date, Qatar's LNG exports have been largely unaffected by recent tensions with its Middle Eastern neighbours. Qatar's decision in April to lift the moratorium on new gas development at its North Field, and potentially expand its LNG production capacity, is not expected to affect its LNG exports within the two-year outlook period.

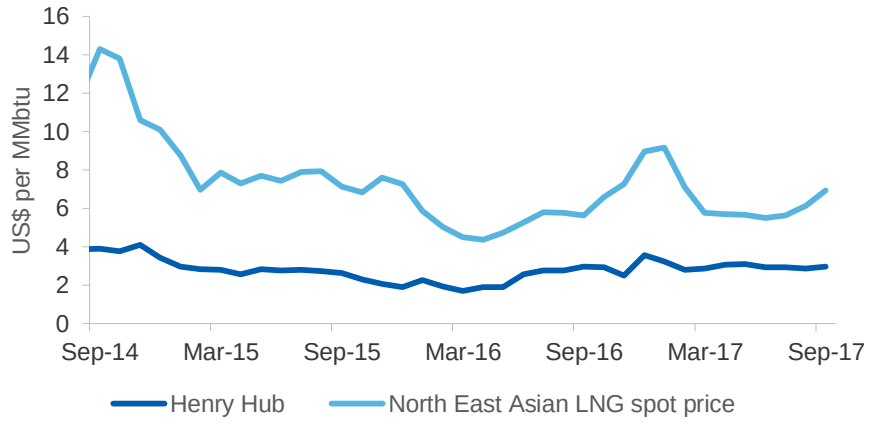
Australia

LNG export earnings to increase, driven by higher export volumes

Australia's LNG export earnings totalled $22 billion in 2016–17. The value of Australia's LNG exports is forecast to increase to $35 billion in 2018–19. Rising export values will be underpinned by higher export volumes and, to a lesser extent, higher prices.

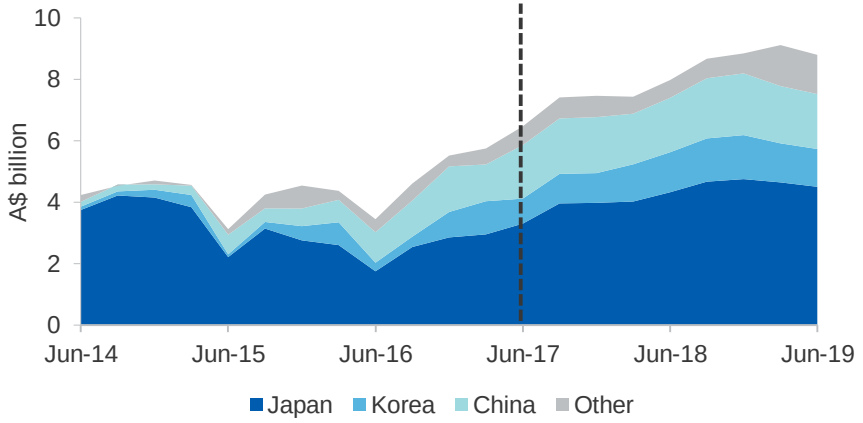
Australia's LNG export volumes are forecast to reach 74 million tonnes in 2018–19, up from an 52 million tonnes in 2016–17. Higher export volumes will be underpinned by higher production at Gorgon, as well as the completion of the three remaining LNG projects under construction — Wheatstone, Icthys and Prelude. These three projects will add around 21 million tonnes to Australia's LNG export capacity, bringing total

Figure 7.11: US Henry Hub price and Asian spot prices



Source: Argus Media (2017); Bloomberg (2017)

Figure 7.12: Quarterly value of Australian LNG exports



Source: Argus Media (2017); Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

nameplate capacity to around 88 million tonnes.

Woodside's Wheatstone project is likely to be the first of the three projects completed, with train 2 due online between March and May 2018. First LNG at Inpex's Icthys project is expected in the March quarter 2018, with some reports indicating that train 2 could commence operations a few months later. The Prelude Floating LNG project is likely to be the last of Australia's recent wave of seven LNG projects to be completed, with Shell indicating Prelude will be completed between May and August 2018.

Increased exports to Japan, South Korea and China are expected to drive the increase. While prospects for growth in the imports of Japan and South Korea are limited, Australian producers are expected to capture an increasing share of both country's imports.

The forecast for export values has been revised down

Forecast export values have been revised down by around $1.8 billion in 2017–18 and $3.3 billion in 2018–19 from the June 2017 *Resources and Energy Quarterly*. Downward revisions reflect a more subdued outlook for oil prices.

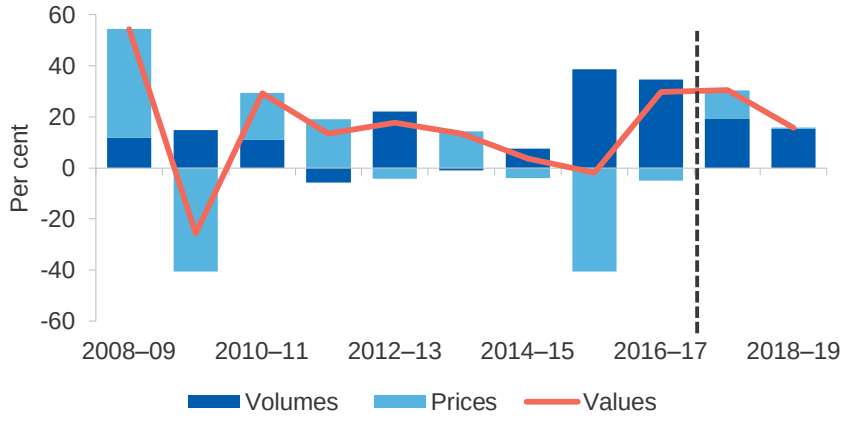
A number of uncertainties remain

Oil prices remain a key sensitivity to the outlook for LNG export earnings. If the JCC oil price forecast was reduced by US$5 a barrel, projected LNG export earnings would fall by $2.7 billion in 2018–19.

Some uncertainty also surrounds the outlook for export volumes. Competition in global LNG markets is set to intensify over the next few years, and the average capacity utilisation of Australian LNG plants is expected to edge down (as shown in Figure 7.14).

The extent of the decline will depend on the cost competitiveness of Australian LNG projects and the amount of flexibility in Australian LNG contracts. LNG contracts often include clauses which allow buyers to reduce purchases to minimum 'take-or-pay' levels. It is possible buyers may utilise these provisions if oil-linked contract prices remain higher than spot prices, or if they become over-contracted for LNG.

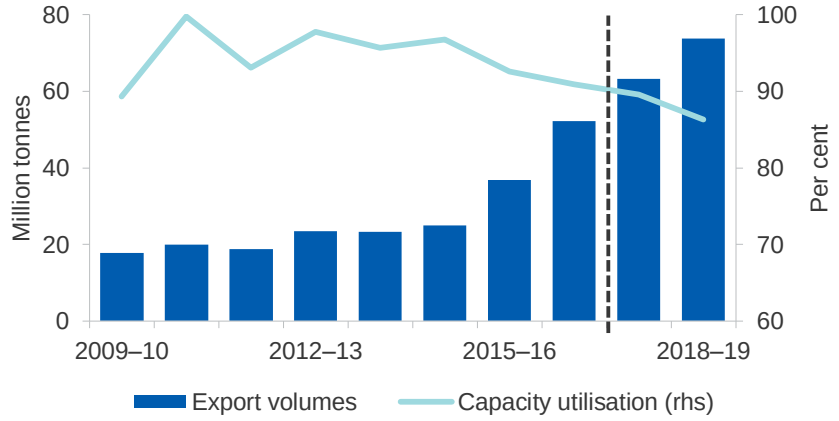
Figure 7.13: Annual growth in Australia's LNG export values, contributions from prices and export volumes



Notes: Log change is used to approximate percentage change. The approximation becomes less accurate the larger the percentage change.

Source: ABS (2017); Department of Industry, Innovation and Science (2017)

Figure 7.14: Australia's LNG exports and capacity utilisation



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Table 7.1: Gas outlook

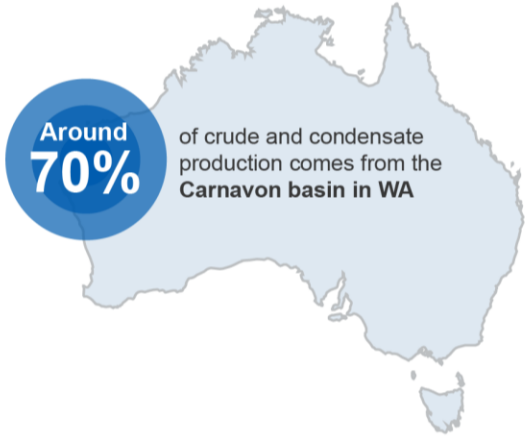
World	Unit	2016	2017 f	2018 f	2019 f	Annual percentage change 2017 f	2018 f	2019 f
JCC oil price a								
– nominal	US$/bbl	41.9	53.4	55.1	57.0	27.6	3.1	3.4
– real h	US$/bbl	42.7	53.4	53.9	54.6	25.1	1.0	1.2
Gas production t	Bcm	3,596.9	3,669.3	3,748.0	3,789.9	2.0	2.1	1.1
Gas consumption t	Bcm	3,595.7	3,670.1	3,750.9	3,794.0	2.1	2.2	1.1
LNG trade d	Mt	250.2	292.9	305.8	326.8	17.1	4.4	6.9
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17**	**2017–18 f**	**2018–19 f**
Production b	Bcm	88.2	105.2	123.1	137.6	19.3	17.0	11.8
– Eastern market	Bcm	43.4	54.3	57.1	55.3	25.1	5.0	-3.1
– Western market	Bcm	43.8	49.6	64.1	71.9	13.0	29.3	12.2
– Northern market c	Bcm	0.9	1.3	2.0	10.4	44.3	47.2	431.1
LNG export volume d	Mt	36.9	52.2	63.3	73.8	41.6	21.3	16.6
– nominal value	A$m	16,576	22,332	30,255	35,397	34.7	35.5	17.0
– real value e	A$m	17,225	22,818	30,255	34,572	32.5	32.6	14.3
LNG export unit value g								
– nominal value	A$/GJ	8.5	8.1	9.1	9.1	-4.9	11.7	0.3
– real value e	A$/GJ	8.9	8.3	9.1	8.9	-6.5	9.3	-2.0
– nominal value	US$/MMBtu	6.6	6.5	7.4	7.4	-1.5	14.0	0.3
– real value e	US$/MMBtu	6.8	6.6	7.4	7.2	-3.1	11.6	-2.0

Notes: ***a*** *JCC stands for Japan Customs-cleared Crude;* ***b*** *Production includes both sales gas and gas used in the production process (i.e. plant use) and ethane. Historical gas production data was revised in the June quarter 2017 to align with Australian Petroleum Statistics published by the Department of Environment and Energy;* ***c*** *Gas production from Bayu-Undan Joint Production Development Area is not included in Australian production. Browse basin production associated with the Ichthys project is classified as Northern market;* ***d*** *1 million tonnes of LNG is equivalent to approximately 1.36 billion cubic metres of gas;* ***e*** *In 2017–18 Australian dollars;* ***f*** *Forecast;****g*** *1 MMBtu is equivalent to 1.055 GJ;* ***h*** *In 2017 US dollars;* ***s*** *Estimate;* ***t*** *2016 is an estimate.*

Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Department of Industry, Innovation and Science (2017); Company reports; Nexant World Gas Model (2017)

Oil

Resources and Energy Quarterly September 2017



Australia's production of crude and condensate peaked in **2000**, at

41,300 ML

Around 17%

of refinery feedstock is domestically produced.
On average 83% is imported.

Australia's refinery production

45%
automative gasoline

35%
diesel

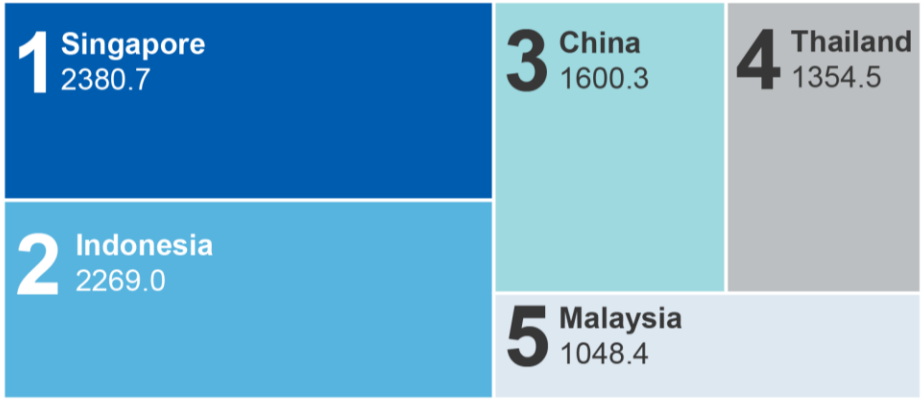
13%
aviation turbine fuel

3%
LPG

2%
fuel oil

2%
other

Top export destinations for Australia's crude oil, 2016–17 (million litres)



Historic price snap shot: Brent crude oil in the last five years (US$ per barrel)

Summary

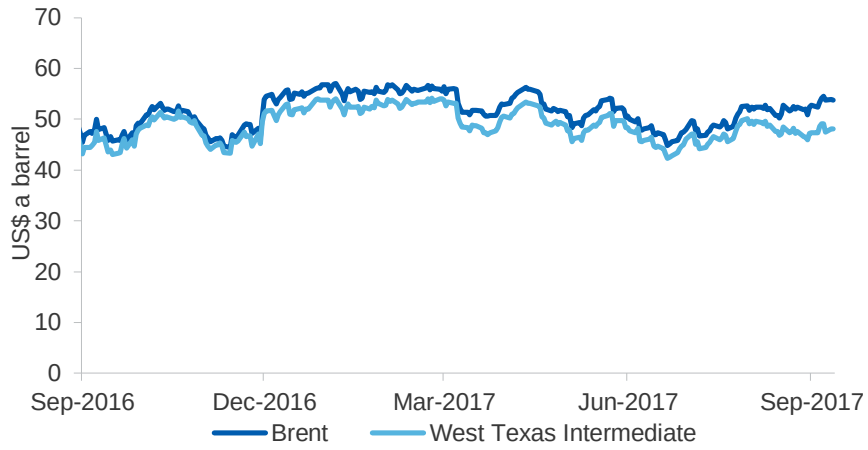
- Australia's crude oil and condensate export earnings are forecast to increase to from $5.5 billion in 2016–17 to $7.3 billion in 2018–19, an annual increase of 10 per cent.
- Australia's rate of crude oil and condensate export volumes is forecast to reach 224,000 barrels a day in 2017–18, before expanding 16 per cent to 259,000 barrels a day in 2018–19, as oil field decline is offset by higher condensate production from new LNG projects.
- Oil prices are expected to increase modestly over the outlook period, the Brent spot price is forecast to average US$52 a barrel in 2017 and to gradually rise to an average US$57 a barrel in 2019.
- The main uncertainties around the oil price outlook and Australia's export earnings are compliance with the OPEC Production Agreement and continued increases in US oil production.

Prices

During the September quarter, crude oil prices steadily increased from prices posted in the month of June, as expectations about a world oversupply of oil started to diminish. Brent crude oil averaged US$50 a barrel and West Texas Intermediate (WTI) crude averaged US$47 a barrel for the September quarter, showing little change on June quarter prices. Modest price increases have been supported by reductions in US commercial oil stocks, which have been falling since the March quarter. In the June and September quarters, the pick-up in seasonal refining activity and the redirection of Saudi Arabia's exports away from the US has contributed to a reduction in inventories. This perceived decrease in world oil oversupply has driven moderate price strengthening, as the OPEC 2017 Production Agreement has continued with mixed compliance outcomes.

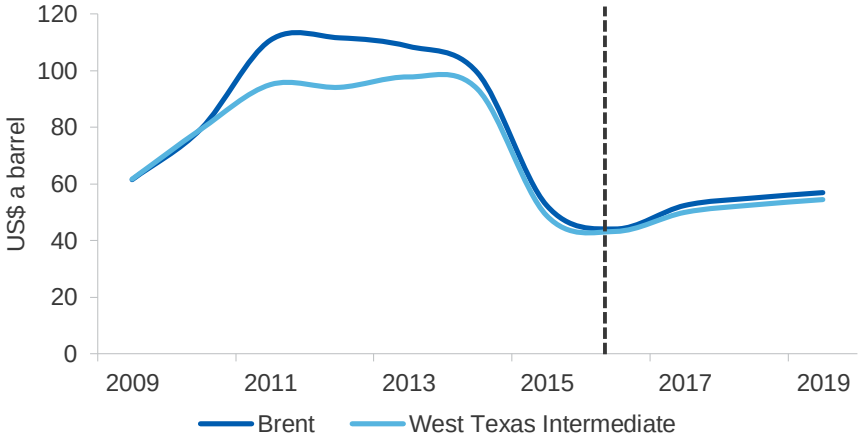
At the end of July, commercial stock levels were 35 million barrels above the five-year average level of 3,240 million barrels — the target stock level of the 2017 OPEC Production Agreement.

Figure 8:1 Recent movement in oil prices



Source: Bloomberg (2017); Brent and West Texas Intermediate spot prices

Figure 8:2 Annual oil prices



Source: Bloomberg (2017); Brent and West Texas Intermediate spot prices; Department of Industry, Innovation and Science (2017)

Modest price growth forecast as world market rebalances

Over the outlook period, oil prices are expected to increase at a moderate rate, as world production surpluses start to diminish. Brent crude oil is forecast to average US$52 a barrel in 2017, and WTI US$2 lower, as OPEC production constraints continue reducing an oversupplied world market. In 2018, average prices are forecast to be US$55 a barrel for Brent, and US$53 for WTI, as higher consumption from non-OECD countries exceeds production increases, despite growing US oil production. The 2019 price for Brent is forecast to average US$57 a barrel and US$55 a barrel for WTI.

World oil consumption

World oil consumption has risen faster than expected to date in 2017, supported by low oil prices, strong economic conditions in the US and high consumption in Europe. For 2017 as a whole, consumption is expected to increase by 1.7 per cent to 97.7 million barrels a day. Over the outlook period, consumption growth is expected to occur solely in Non-OECD markets, primarily China and India. In 2018, consumption is forecast to increase by 1.4 per cent to 99 million barrels a day, before reaching a forecast 100.4 million barrels a day in 2019.

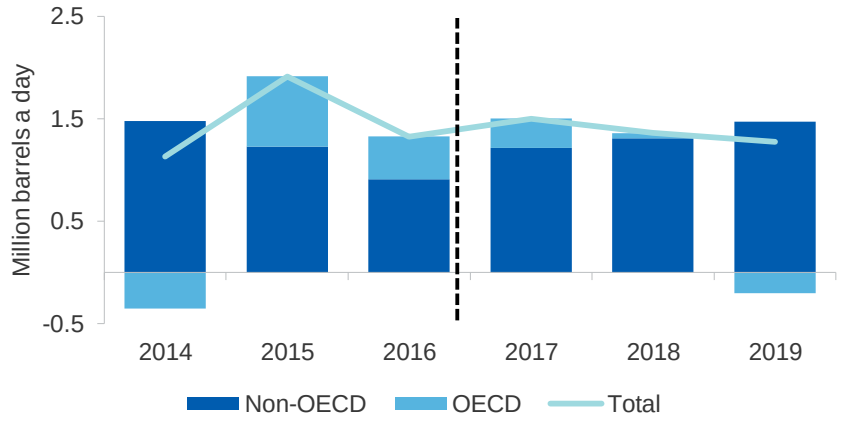
New consumption growth from Non-OECD markets

China accounts for around 12 per cent of world oil consumption, which is likely to expand 4.3 percent, to 12.4 million barrels per day in 2017. Consumption increases are expected to moderate over the outlook period, increasing by 2.6 per cent in 2018 and 2.4 per cent in 2019. Lower car sales and reduced vehicle miles travelled — resulting from significant congestion problems and tightening pollution controls — will contribute to this decline.

India's oil usage is forecast to rise by 2.5 per cent in 2017, to 4.7 million barrels a day. Over the outlook period, improved economic conditions and rising vehicle ownership is expected to accelerate consumption growth, by a forecast 5.9 per cent in 2018 and 6.3 per cent in 2019.

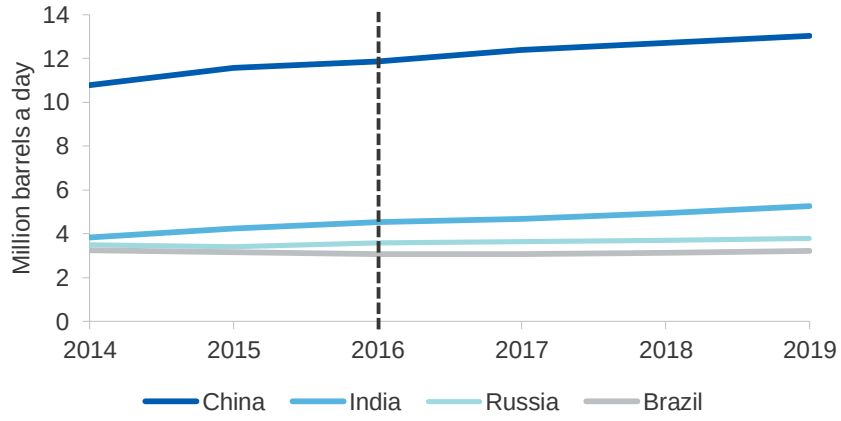
Total Non-OECD consumption is expected to increase at an average rate of 2.5 per cent in 2017 and 2018. So far in 2017, consumption growth in Indonesia and Malaysia has been negatively affected by changes to oil price mechanisms and taxation arrangements.

Figure 8:3 Annual growth in world oil consumption



Source: International Energy Agency Monthly Oil Data Service (2017); Department of Industry, Innovation and Science (2017)

Figure 8:4 Consumption growth in major Non-OECD economies



Source: International Energy Agency Monthly Oil Data Service (2017); Department of Industry, Innovation and Science (2017)

World oil production

World oil production was consistent in the June quarter before decreasing in August. Higher production from the US, Canadian oil sands and a new production platform in Brazil was outweighed by lower OPEC production. In August lower OPEC production and disrupted US production contributed to lower production.

For the year as a whole, 2017 world production is forecast to remain at a similar level to 2016, as OPEC declines are countered by higher Non-OPEC production. Annual production is forecast to be 97.4 million barrels a day in 2017.

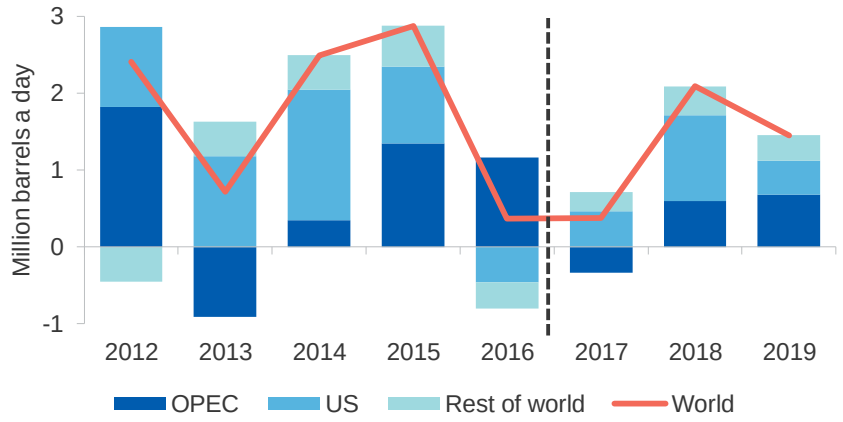
In 2018, production dynamics between OPEC and the US are expected to shift. Total world production is forecast to be 99.5 million barrels a day, 2.2 per cent higher than 2017. Provided the OPEC agreement ends at the end of the March quarter 2018 (as currently scheduled), production from participating countries — particularly Saudi Arabia and Russia — is expected to increase. Over the outlook period, US production is expected to reach record levels. World production is forecast to reach 100.9 million barrels in 2019.

Mixed compliance with OPEC Production Agreement

OPEC production has fluctuated in recent months, with some high production being outweighed by scheduled maintenance and ongoing supply issues in Libya and Venezuela. In July, total production was 39.8 million barrels a day, the highest level in 2017, before declining in August due to volatile production from Libya.

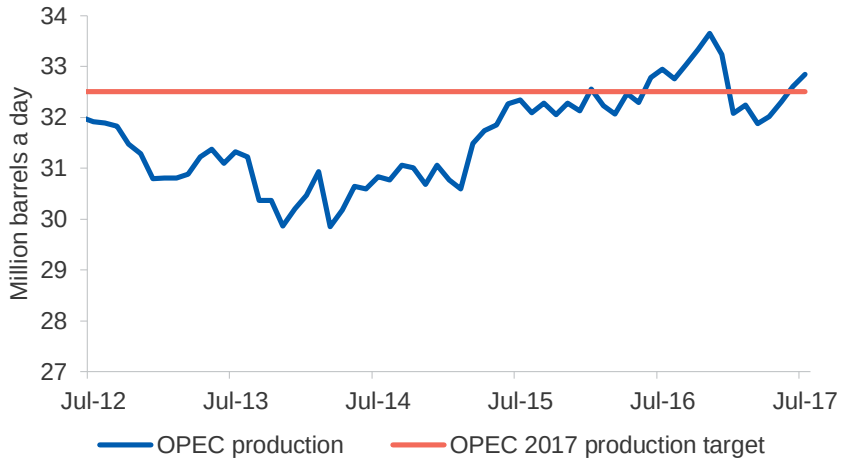
The validity of the 2017 Production Agreement is being stretched, as stagnant oil prices impose a heavy strain on producing nations. Compliance between agreeing OPEC and Non-OPEC members has continued to diverge. In recent months, Saudi Arabia and Qatar have reduced output by more than their committed amounts, Ecuador withdrew their support, and a number countries over-produced — notably Iran, Algeria and the UAE. In August however, agreement compliance improved, as Russia and Kazakhstan undertook seasonal oil field maintenance. The average compliance rate is 87 per cent for 2017.

Figure 8:5 Change in OPEC and US production



Source: International Energy Agency Monthly Oil Data Service (2017); Department of Industry, Innovation and Science (2017)

Figure 8:6 OPEC production and 2017 Production Agreement



Source: International Energy Agency Oil Market Report (June 2017); Department of Industry, Innovation and Science (2017)

Reviving output from Nigeria and Libya — OPEC members who are not part of the agreement — has also contributed to higher OPEC production. Libya's production reached 1 million barrels a day in July, however since then there have been a number of disruptions to production, including domestic unrest, industrial action at ports and militia blockades. Production from Nigeria has recovered in recent months, returning to 2016 levels. The Nigerian government has announced production targets that are supported by purchase contracts, however, both infrastructure and security threats remain as production risks. If output continues to grow, Nigeria may be pressured to join the OPEC Production Agreement and withhold further increases.

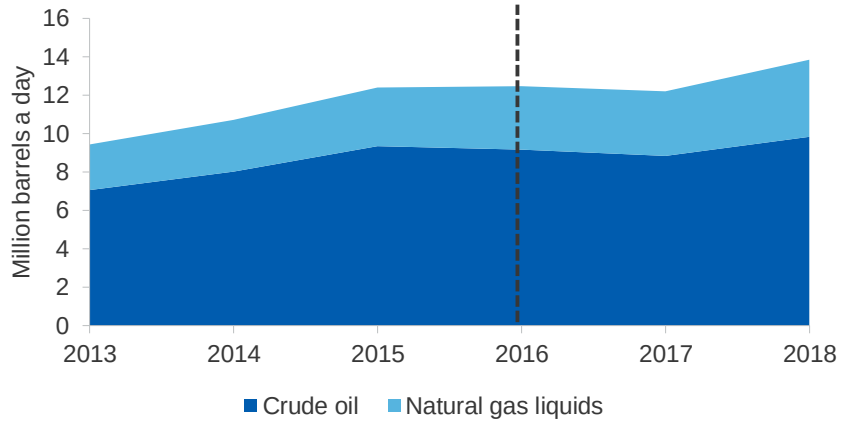
US production expectations continue be revised up

As operating costs have declined and the number of new rigs drilled steadily increased over the past year, US production forecasts have been continually revised upwards for the outlook period. With particularly strong growth from the Permian Basin, 2017 production is forecast to be to 13 million barrels a day, an annual increase of 3.8 per cent. Further increases in 2018 are expected to bring production to a record level of 14.1 million barrels a day, up 8.6 per cent.

The full impacts of Hurricane Harvey and Irma are still being realised. Oil production in the Gulf of Mexico was shut down, port movements were closed and 2.2 million barrels a day of refining capacity were closed and has only partially reopened. This will effect oil prices, stock levels and trade flows over the September and December quarters, and potentially longer.

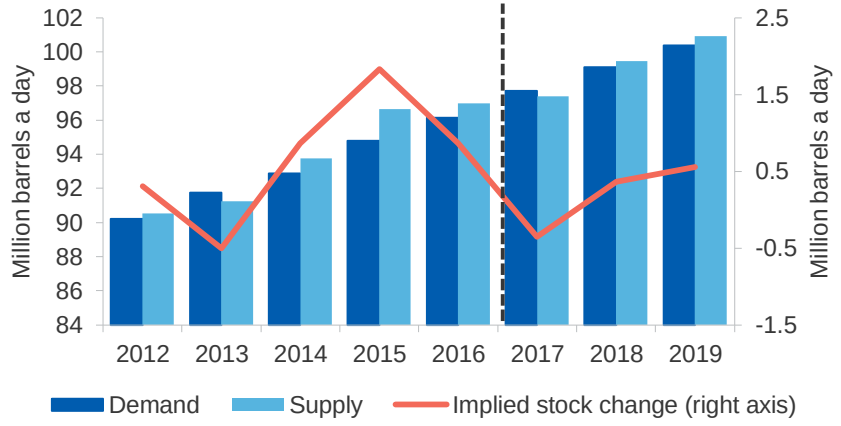
The modest outlook for oil prices is expected to dampen exploration and production expenditure over the outlook period, which is likely to weigh on productivity over the outlook period. The high rate of new rig drilling has been dampened by low WTI oil prices. In the first half of 2017 the rig count increased at an average monthly rate of 7 per cent, however it slowed considerably in July and August.

Figure 8:7 US crude and liquids production



Source: US Energy Information Administration (2017)

Figure 8:8 World production and consumption balance



Source: International Energy Agency Monthly Oil Data Service (2017); Department of Industry, Innovation and Science (2017)

Australian production and trade

Lower production contributes to reduced export volumes

Australia's exports of crude oil and condensate decreased at an annual rate of 8 per cent in 2016–17, to average 220,000 barrels a day. Lower production from declining oil fields contributed to this decrease.

Condensate production to support export growth over the outlook

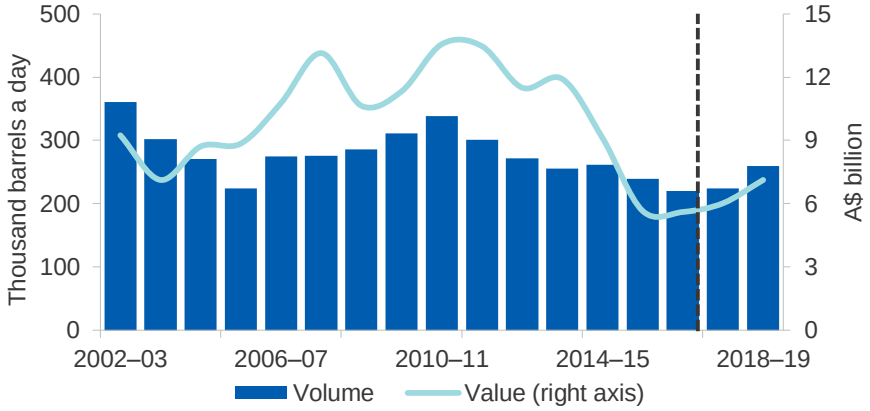
Crude oil and condensate export earnings were $5.5 billion in 2016–17. Over the outlook period, export earnings are forecast to reach $6 billion in 2017–18, an annual increase of 9.7 per cent, supported by higher oil prices. Export earnings are expected to increase considerably in 2018–19, reaching a forecast $7.3 billion.

Australia's crude oil and condensate export volumes are forecast to average 259 thousand barrels a day in 2018–19, almost 16 per cent higher than 2017–18 export volumes. Volume increases are expected from higher condensate production that is co-produced with LNG, almost all of which is expected to be exported.

Revisions to forecast export earnings

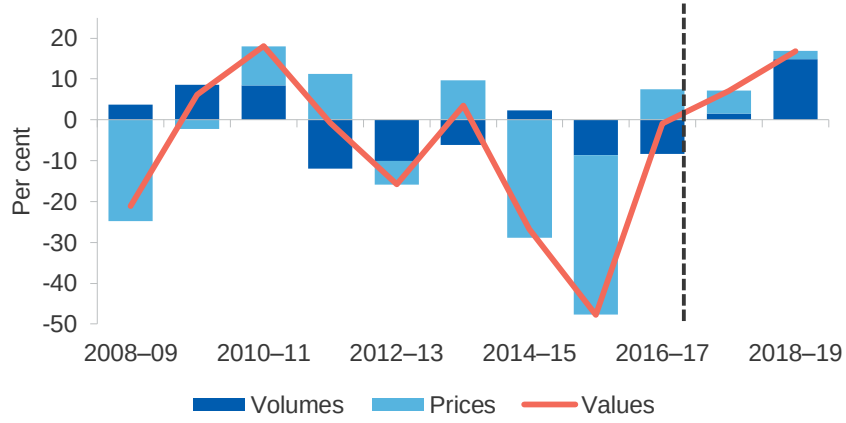
Forecast export earnings have been revised down by around $123.5 million in 2017–18 and $1.4 billion in 2018–19, from the June *Resources and Energy Quarterly*. Downward revisions to the oil price — prompted by higher expectations about US production and a lower realised oil price in the June quarter — have contributed to the revisions. Updated production schedules for condensate output, related the new LNG projects, also contributed to the lower forecasts.

Figure 8:9 Australia's exports of crude oil and condensate



Source: Department of Environment and Energy, Australian Petroleum Statistics (2017); EnergyQuest (2017); Department of Industry, Innovation and Science (2017)

Figure 8:10 Annual growth in crude oil and condensate export values, contributions from prices and export volumes



Notes: Log change is used to approximate percentage change. The approximation becomes less accurate the larger the percentage change.

Source: ABS (2017) International Trade, Australia, 5465.0; Department of Industry, Innovation and Science (2017)

Oil field production forecast to be exceeded by condensate production

Annual production for 2016–17 averaged 287,000 barrels per day, 9.5 per lower than the previous year. Lower oil production from the Bonaparte and Gippsland basins was outweighed by higher production from Gorgon LNG, which has increased at an average rate of 50 per cent per quarter since production started in the March quarter 2016.

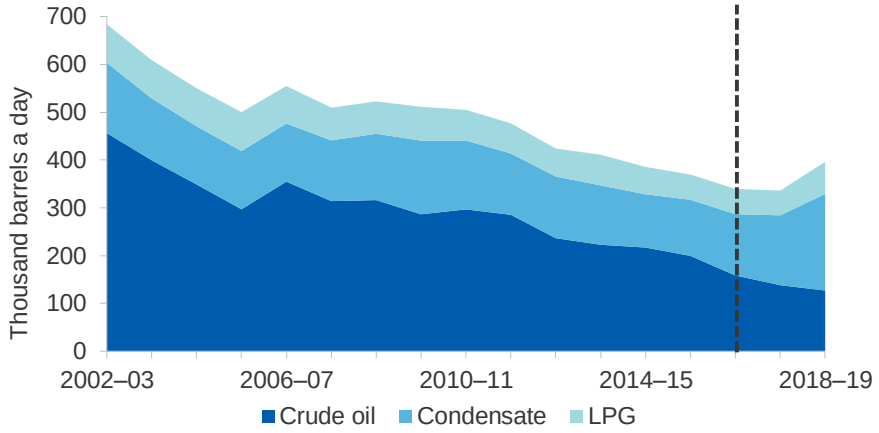
Over the outlook period, Australia's production profile will be characterised by declining oil field production and higher condensate production generated from the new LNG projects. Australia's total crude oil and condensate production rate is forecast to average 284,000 barrels a day in 2017–18 and 329,000 barrels a day in 2018–19. The Wheatstone and Icthys LNG projects — with a combined condensate capacity over 100,000 barrels a day — are expected to start producing before the end of 2017. Prelude LNG, with condensate capacity of 35,000 barrels a day, is likely to start production mid-2018. These new projects are expected to contribute to condensate production overtaking crude oil production in Australia during 2017–18.

Australia's Refinery Activity

Output from Australia's refinery activity averaged 422,000 barrels a day in 2016–17, as strong production at some refineries balanced temporary shut-downs at other refineries. Over the last three years, the four major Australian refineries — Kwinana, Geelong, Lytton and Altona — have undertaken improvement works, significant maintenance or added additional capacity. With higher operating capacity and fewer scheduled shut-downs over the outlook period, 2017–18 refinery production is forecast to be 435,000 barrels a day, 3 per cent higher than the previous year.

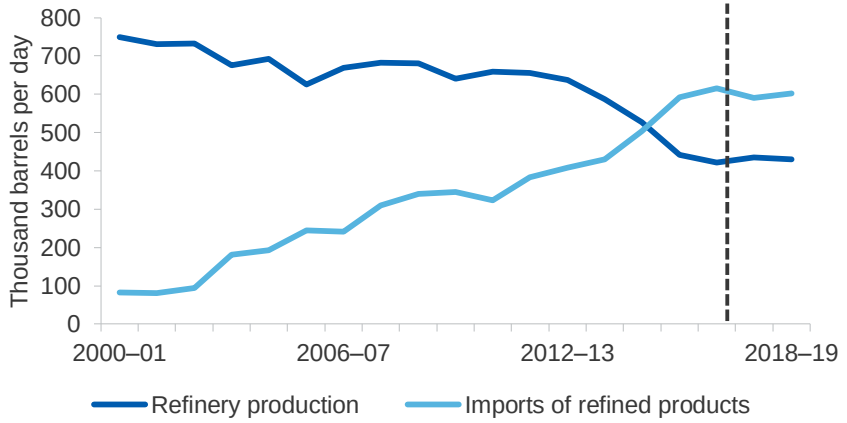
As refinery capacity utilisation improves imports of refinery products are expected adjust over the outlook period. At the end of the outlook period imports of refined products is forecast to reach 609,000 thousand barrels a day, as domestic consumption continues to expand.

Figure 8:11 Australia's petroleum production



Source: Department of Environment and Energy ,Australian Petroleum Statistics (2017); EnergyQuest (2017); Department of Industry, Innovation and Science (2017)

Figure 8:12 Australia's production and imports of refinery products



Source: Department of Environment and Energy (2017) Australian Petroleum Statistics; Department of Industry, Innovation and Science (2017)

Table 8:1 Oil outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Production a	mb/d	97.0	97.4	99.5	100.9	0.4	2.2	1.5
Consumption a	mb/d	96.1	97.7	99.1	100.4	1.7	1.4	1.3
WTI crude oil price								
– nominal	US$/bbl	43.2	50.0	52.6	54.5	15.6	5.3	3.6
– real b	US$/bbl	44.1	50.0	51.5	52.2	13.3	3.1	1.3
Brent crude oil price								
– nominal	US/$bbl	44.1	52.4	55.1	57.0	18.8	5.1	3.4
– real b	US$/bbl	45.0	52.4	53.9	54.6	16.4	2.9	1.2
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17**	**2017–18 f**	**2018–19 f**
Crude oil and condensate								
Production a	kb/d	317	287	284	329	-9.5	-0.9	15.8
Export volume a	kb/d	239	220	224	259	-8.0	1.5	15.9
– nominal value	A$m	5,444	5,489	6,020	7,295	0.8	9.7	21.2
– real value g	A$m	5,658	5,608	6,020	7,125	-0.9	7.3	18.3
Imports a	kb/d	342	351	384	365	2.5	9.4	-5.0
LPG								
Production ac	kb/d	53	53	53	66	0.1	0.3	24.2
Export volume a	kb/d	34	38	45	54	12.0	16.8	20.4
– nominal value	A$m	547	629	838	1 018	14.9	33.3	21.5
– real value g	A$m	569	642	838	994	12.9	30.5	18.6
Petroleum products								
Refinery production a	kb/d	442	422	435	430	-4.5	3.0	-1.1
Exports ad	kb/d	10	18	12	9	73.7	-34.1	-24.2
Imports a	kb/d	593	615	577	609	3.8	-6.2	5.5
Consumption ae	kb/d	950	982	969	986	3.4	-1.4	1.8

Notes: ***a*** *Number of days in a year is assumed to be exactly 365. A barrel of oil equals 158.987 litres;* ***b*** *In 2017 calendar year dollars;* ***c*** *Primary products sold as LPG;* ***d*** *Excludes LPG;* ***e*** *Domestic sales of marketable products;* ***f*** *Forecast;* ***g*** *In 2016–17 financial year Australian dollars;* ***s*** *Estimate;* ***z*** *Projection*

Source: ABS (2017) International Trade Statistics Service, cat. no.5464.0 ; Energy Information Administration (2017); Department of Industry, Innovation and Science (2017)

Uranium

Resources and Energy Quarterly September 2017

Australia holds **31%** of the world's proven uranium reserves

Australia is the **3rd** largest producer of uranium in the world

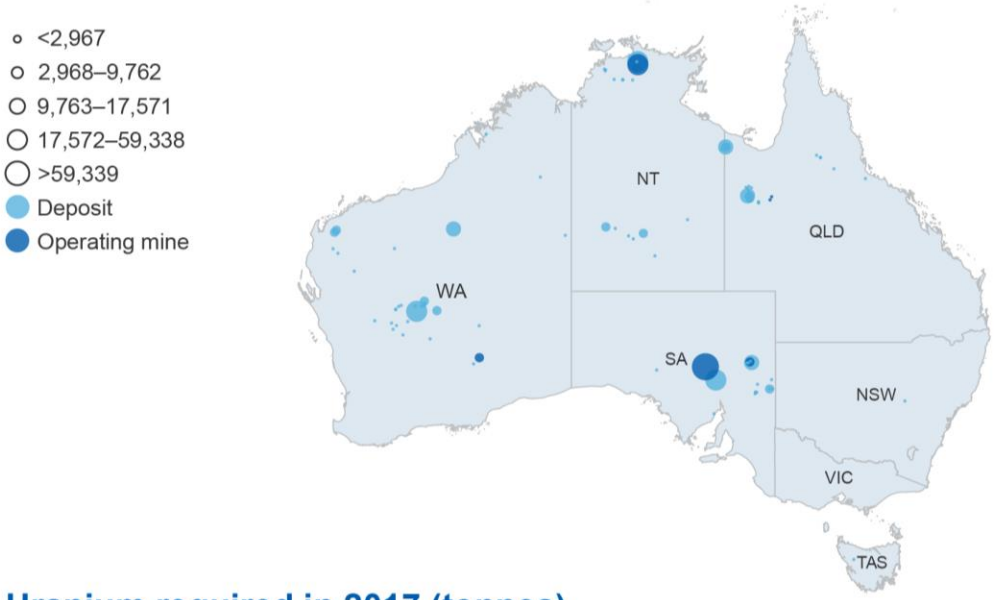
Uranium exports are expected to earn **>$1 billion** for Australia in 2018–19

Uranium makes up **11%** of global electricity generation

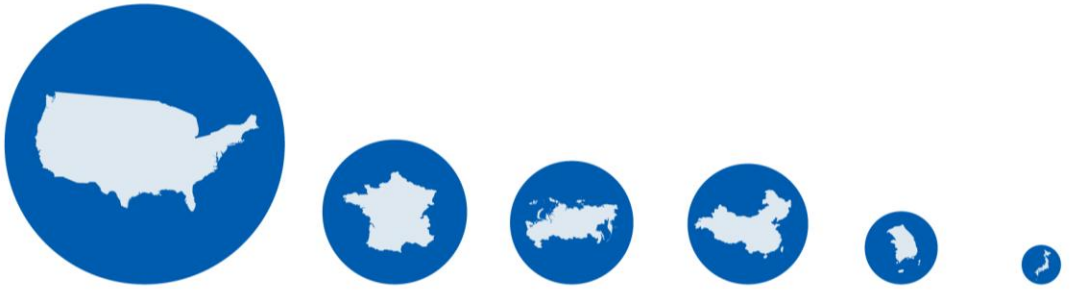
There are **447** nuclear power reactors across 31 countries, with 60 more being built

There are **245** civil research reactors operating across 55 countries

Major Australian uranium deposits (tonnes)



Uranium required in 2017 (tonnes)



USA	France	Russia	China	South Korea	Japan
17,847	**9,216**	**7,767**	**7,757**	**4,816**	**2,517**

Summary

- Uranium markets remain oversupplied, with prices expected to remain low, averaging $US22 a pound in 2017. Prices are expected to recover to $US25 a pound in 2018 and $US29 a pound in 2019, as production cutbacks slowly take effect and Asian demand rises.
- Supply disruptions are expected to reduce Australian uranium production to 6,986 tonnes in 2017–18. However, rising demand in Asia and a resumption of normal production should support a rebound to 7,950 tonnes produced in 2018–19.
- Australia's uranium exports are expected to pick up from $857 million in 2017–18 to just over $1 billion by 2018–19, driven by higher production and a lift in uranium prices from their current historic low.

Prices

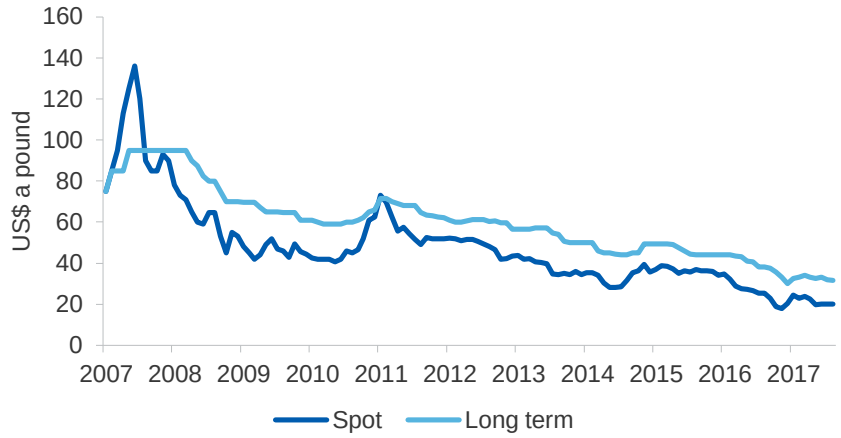
New capacity will support gradual price growth over the next few years

There was little movement in prices during the September quarter, with a lift of 5 cents to $US20.2 per pound in July and a fall of 7 cents to $US20.13 per pound in August. At these prices, most producers are making a loss, though thus far production cuts have been relatively contained and slow to take effect. Uranium prices are estimated to average $US22.01 per pound over 2017.

Prices have remained low, in part, because rising demand has been met by a rundown in inventories. Inventories and secondary markets have proven to be more robust than expected, and the resulting impact on producers has been exacerbated by ongoing market uncertainty and the gradual departure of generalist investor funds from the sector.

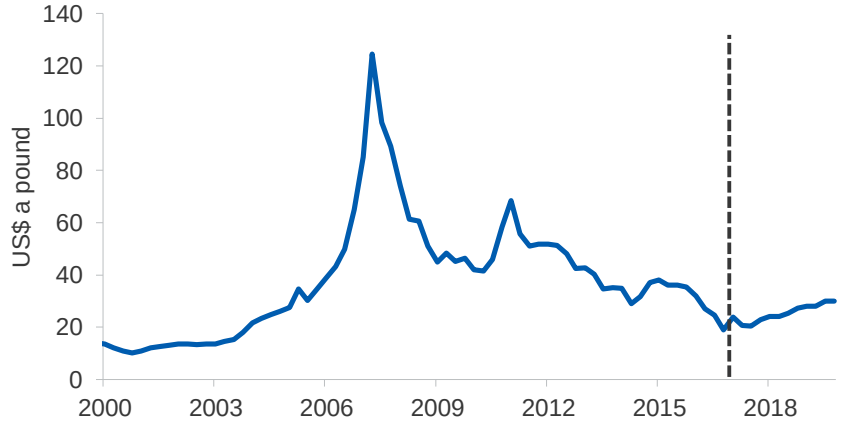
With inventories expected to remain substantial, it is likely that prices will continue the gradual, slow increase recorded during the September quarter. Production cuts will continue to feed through the market, and the pace of reactors coming online will continue to rise. Spot prices are expected to lift from their 2017 average of around $US22 per pound, to $US25 per pound in 2018 and $US29 per pound in 2019. Price growth may be slower if construction schedules are not met in China nor India, or if recently announced production cuts take longer than expected to impact on inventories.

Figure 9.1: Uranium prices, monthly



Source: Cameco Corporation (2017) Uranium Spot and Long Term Prices

Figure 9.2: Quarterly uranium spot price and outlook



Source: Cameco Corporation (2017) Uranium Spot Price; Ux Consulting (2017) Uranium Market Outlook

Large uranium producers typically sell most of their output through long term contracts rather than the spot market. The Ux Consulting long term indicator contract price is forecast to have dropped to around $US33 per pound in 2017, but is expected to recover to $US37.75 per pound in 2018 and $US40.6 per pound in 2019. Long term contracts typically vary across producers because of differences in contract lengths, volumes and terms, based on market conditions at the time of signing. Australia's average export returns are generally much lower than the world indicator contract price.

Consumption

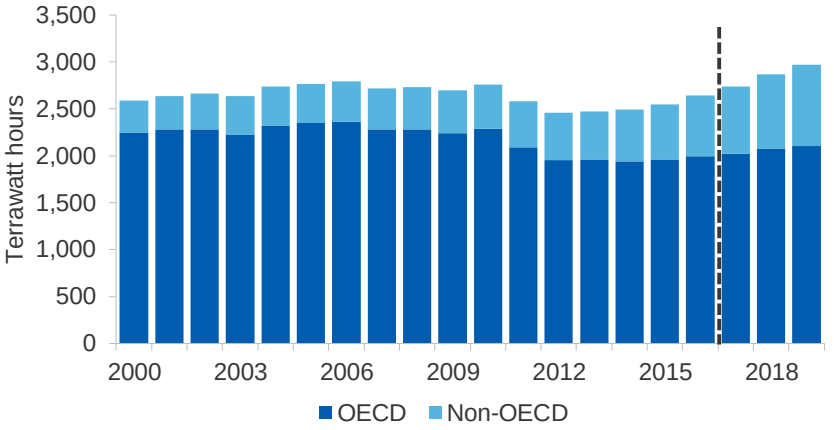
Nuclear power generation is shifting towards developing nations

World uranium consumption is expected to edge up from 83,400 tonnes in 2016 to 88,300 tonnes in 2017, supported by the development of new nuclear power generation capacity. Commissioning a new reactor requires more uranium for its initial core than operating plants. Annual requirements decline as a reactor reaches a steady state level of operation. Most reactors are refuelled at intervals of one to two years, when a quarter to a third of the fuel assemblies are replaced.

Events in the September quarter provide the strongest signs yet that global uranium markets are entering a period of significant change. Research into small modular reactor technology is picking up in Western nations: the Canadian Nuclear Laboratories request for development of small modular reactors attracted more than 70 expressions of interest. August also saw the US Concurrent Technologies Corp and the UK Nuclear Advanced Manufacturing Research Centre announce new R&D facilities to study modular reactor technology.

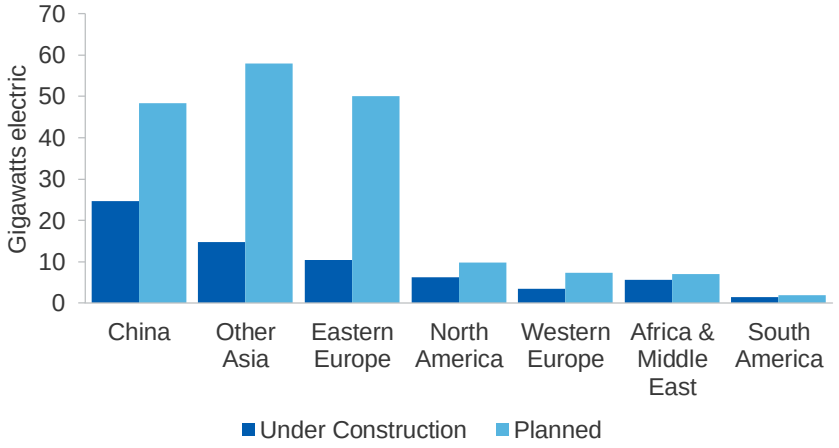
However, although research into new reactor forms is accelerating, actual reactor development has become increasingly stalled in the West. At the start of August, South Carolina Electric & Gas announced that construction of two AP1000 reactors in the US would cease, effectively ending the largest US nuclear construction in over 30 years. The demise of the $US9.8 billion project has been linked to ongoing delays and cost blowouts, and follows large-scale shutdowns of reactors in Japan and Germany. Several proposed reactors have also been cancelled in South Korea. The fate of a further project — the Vogtle units 3 and 4 in Georgia — remains unclear, although Georgia Power has recommended their completion to the State's Public Service Commission.

Figure 9.3: World nuclear power generation



Source: International Energy Agency (2017); World Nuclear Association (2017), Department of Industry, Innovation and Science estimates

Figure 9.4: New nuclear capacity



Source: World Nuclear Association (2017)

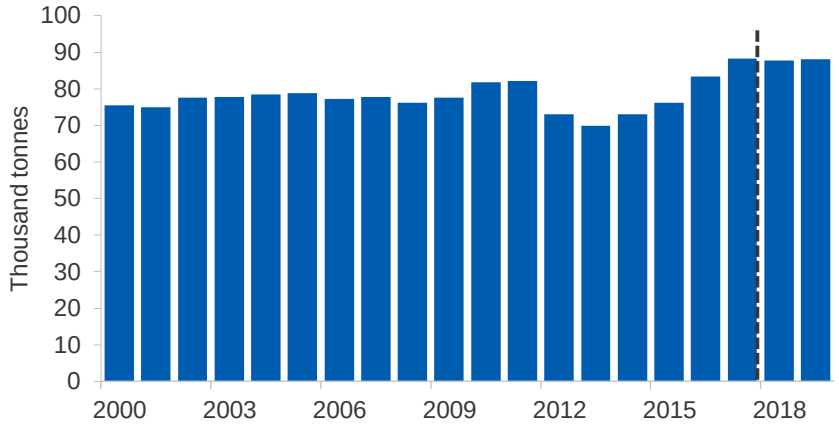
While reactor programs have largely stalled across most developed countries, developing countries are moving to strongly expand nuclear capacity, creating a re-alignment of the global uranium market. Chinese and Russian nuclear industries have stepped up plans to expand and export nuclear technology, capitalising on the advantages of being state-owned enterprises and operating in political environments where the technology is strongly supported. China and Russia have built competitive advantages through the construction of dozens of reactors in their territory over the past 20 years — a pace of construction which sits in marked contrast to the stagnation evident in the US and other Western countries.

China completed the construction of Unit 4 of its Fuqing nuclear power plant in August, with grid connection set to deliver 1,020 megawatts of power. The plant is China's 37th, with a further 20 under development. A number of Chinese reactors under development also achieved important milestones in the September quarter: the Sanmen 1 reactor passed its final safety check in August; the Haiyang 2 reactor passed its containment integrity tests, and the Yangjiang 5 reactor passed cold function tests. All three reactors are expected to be grid-connected in the near future.

India also announced final approval of its plan to build 10 additional large pressurised heavy water reactors. These reactors have a combined capacity of more than 7,000 MWe, and will more than double India's total nuclear capacity. Russia and India's co-development of new units at the Kudankulan plant is also nearing completion, with the 'practical implementation phase' getting underway in the September quarter.

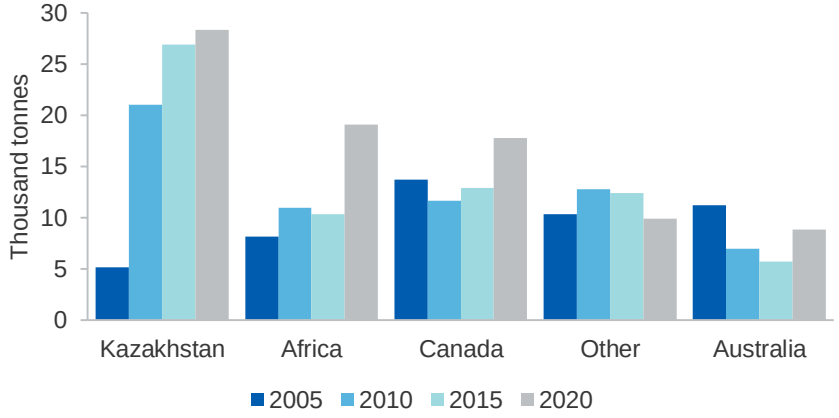
Recent delays and cancellations of reactor projects in developed countries will act as a temporary offset against the longer-term rise in use of nuclear power among developing countries. As a result, uranium consumption is expected to remain largely steady over the next two years, falling slightly to 87,800 tonnes in 2018, then rebounding to 88,100 tonnes in 2019. Beyond this, the outlook for uranium leans towards moderate but steady growth, with the rate of growth rising slowly over time.

Figure 9.5: World uranium consumption (U3O8)



Source: International Energy Agency (2017); World Nuclear Association (2017)

Figure 9.6: World uranium production (U3O8)



Source: Nuclear Energy Agency (2017); Ux Consulting (2016) Uranium Market Outlook World Nuclear Association (2017)

Production

Mine production is expected to increase steadily

In 2017, world production is forecast to remain stable at 73,100 tonnes. Increased production is expected at Rio Tinto's Rössing mine and CGN/Swakop Uranium's Husab mine in Namibia, Peninsula Energy's Lance mine in the US and Cameco's Cigar Lake mine in Canada. Offsetting this, Kazakh production is expected to decline, following the late 2016 announcement of reduced output by Kazatomprom — the largest producer in the country.

Uranium supply is increasingly being met by the rundown of inventories. Over the past 25 years, consumption of uranium has exceeded supply by almost 1.4 billion pounds, with the difference accounted for by a huge and increasingly sophisticated secondary market in recycled and stored product. Ux Consulting has estimated that there are sufficient inventories held by nuclear utilities to cover forward demand for around 5 years in Japan, 30 months in both the United States and Europe, and around seven years in China. The existence of a substantial secondary market has prevented rising demand from pulling prices up immediately. However, the long-term price trajectory is likely to be favourable, with a supply gap growing each year, due to the lack of incentive for new mines to emerge. This supply gap is likely to persist into the 2020s.

As uranium inventories gradually decline, it is likely that primary production will pick up. World uranium production is projected to increase to 79,700 tonnes by 2019. This will be underpinned by continued increases in production at CGN/Swakop Uranium's Husab mine, Peninsula Energy's Lance mine, and Cameco's Cigar Lake mine.

Australia's exploration, production and exports

Australia's uranium exploration expenditure remains low

Australia's uranium exploration expenditure remains minimal, with $5.2 million spent in the June quarter. This compares to $5.1 million in the March quarter.

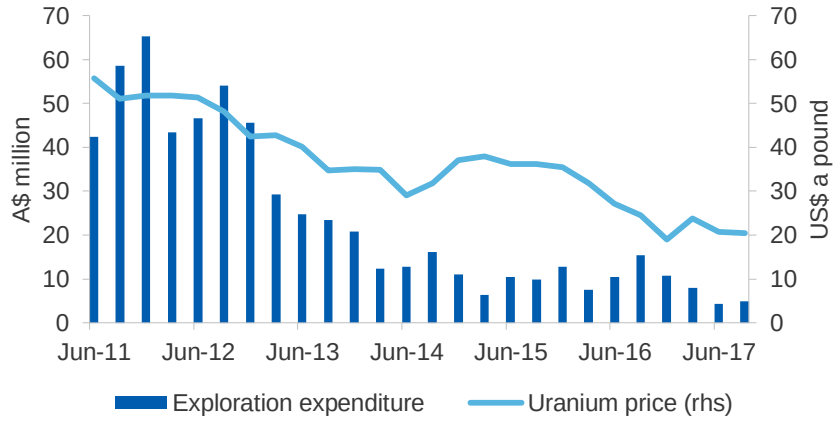
Exploration has fallen progressively, due to historically low prices, and now stands well below levels recorded during the 2010 peak, when exploration spending reached $190 million over the year. There is little immediate prospect for an increase in uranium exploration, especially in light of the recent decision by the Western Australian Government to cease further uranium mine approvals in the State.

Australia's production outlook is mixed, with countervailing pressures

Australia faces a mixed but relatively solid production outlook, with short-term disruptions expected to give way to longer term growth.

The first sample shipment of Australian uranium was dispatched to India in mid-July. Although the quantities being shipped are currently modest,

Figure 9.7: Australia's uranium exploration



Source: ABS (2017) Mineral and Petroleum Exploration, cat. No. 8412.0; Cameco Corporation (2017) Uranium Spot Price

the recent bilateral agreement on supply and the Civil Nuclear Transfers Act 2016 provide mechanisms for expanding supply.

Although new mines have recently been banned in Western Australia, the Federal Government granted environmental approval for the proposed expansion of Toro Energy's Wiluna project in July, which should lead to rising output from the mine. Four uranium projects approved prior to the election have also been allowed to proceed.

BHP is temporarily shutting down its Olympic Dam project — which produces copper and uranium — for more than three months, starting in August. The shutdown has been planned for some time, and will allow the company to upgrade its copper smelting facilities. However, it is expected to lead to substantially lower uranium output from Olympic Dam during the September and December quarters.

Australia's uranium production is forecast to decrease from 7,320 tonnes in 2016–17 to 6,986 tonnes in 2017–18, affected by the production pause at Olympic Dam. In 2018-19, rebounding production at the Olympic Dam mine and a ramp-up of production in Quasar Resources' Four Mile Mine are expected to support a rebound in production to 7,950 tonnes.

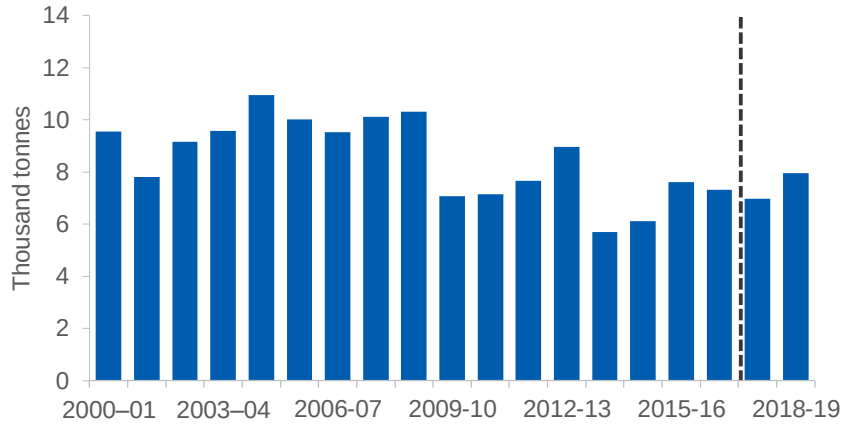
Some long-term supply contracts will expire during 2017, meaning a larger share of global demand will be met from the spot market, where prices are below production costs for Australian producers. Conditions will thus remain challenging for Australian producers in the short-term.

Nuclear power growth across Asia will support uranium exports

Australia exported 7,724 tonnes of U308 in 2016–17, and this is expected to edge down to 7,673 tonnes in 2017–18 before recovering to 8,450 tonnes in 2018–19. Export values fell to $894 million in 2016–17, reflecting the impact of ongoing weak prices. Prices are expected to continue to weigh on export earnings in 2017–18, with overall export revenue declining to $857 million. Subsequently, rising prices and increased output at the Olympic Dam and Four Mile mines are expected to support a rise in export values to $1,004 million in 2018–19.

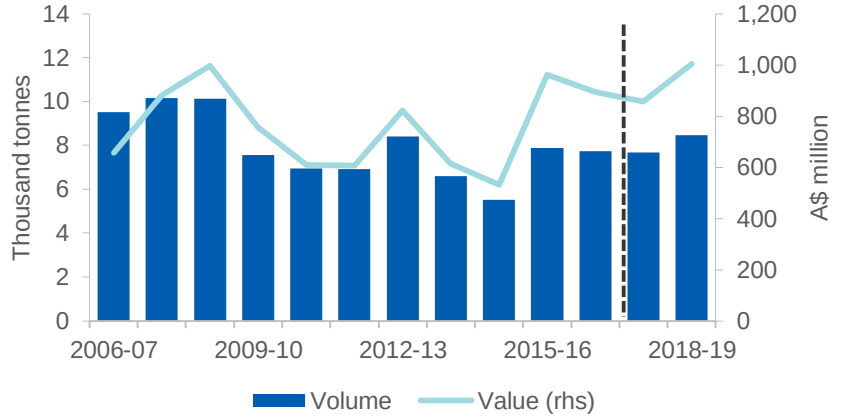
Future consumption growth is likely to be concentrated in developing countries including India and China. Consequently, developments such as the recent agreement on supply to India are likely to become more important, as these nations will be the engine of future demand growth.

Figure 9.8: Australia's uranium production



Source: BHP (2017); Operational Review, DIIS (2017); Energy Resources of Australia (2017); ASX Announcements — Operations Review; company media announcements (2017)

Figure 9.9: Australia's uranium exports



Source: Department of Industry, Innovation and Science (2017)

Table 9.1 Uranium outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Production	kt	73.1	73.1	77.6	79.7	0.1	6.1	2.7
Africa b	kt	9.5	11.4	13.1	14.9	20.1	14.7	13.9
Canada	kt	15.9	16.2	16.7	16.7	2.1	2.8	0.0
Kazakhstan	kt	28.1	26.7	27.4	27.4	-5.0	2.7	0.0
Russia	kt	3.6	4.0	4.2	4.3	9.4	5.7	2.7
Consumption	kt	83.4	88.3	87.8	88.1	5.9	-0.6	0.4
China	kt	13.8	17.1	17.5	18.7	24.0	2.3	6.7
European Union 28	kt	22.2	22.4	24.3	22.2	1.0	8.7	-8.9
Japan	kt	0.5	1.2	1.7	2.0	162.9	42.0	17.9
Russia	kt	6.1	6.6	6.9	7.0	7.0	4.6	2.5
United States	kt	23.0	22.5	22.1	22.5	-1.9	-1.9	1.6
Price								
– nominal	US$/lb	25.6	22.0	25.2	29.0	-13.3	14.7	13.7
– real c	US$/lb	26.2	22.0	24.6	27.8	-15.0	12.3	11.3
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17**	**2017–18 f**	**2018–19 f**
Export volume	t	7,889	7,724	7,673	8,450	-2.1	-0.7	10.1
– nominal value	A$m	963	894	857	1,004	-7.1	-4.2	17.1
– real value d	A$m	1,000	914	857	980	-8.7	-6.2	14.4
Average price	A$/kg	122.0	115.8	111.7	118.8	-5.1	-3.5	6.4
– real d	A$/kg	126.8	118.3	111.7	116.0	-6.7	-5.6	3.9

*Notes: **b** Includes Niger, Namibia, South Africa, Malawi and Zambia; **c** In 2017 US dollars; **d** in 2017–18 Australian dollars; f forecast.*
Source: Australian Department of Industry, Innovation and Science (2017); Cameco Corporation (2017); Ux Consulting (2017) Uranium Market Outlook.

Gold

Resources and Energy Quarterly September 2017

288 tonnes

of gold produced by Australia in 2016–17

Australia is the **2nd largest** producer of gold in the world

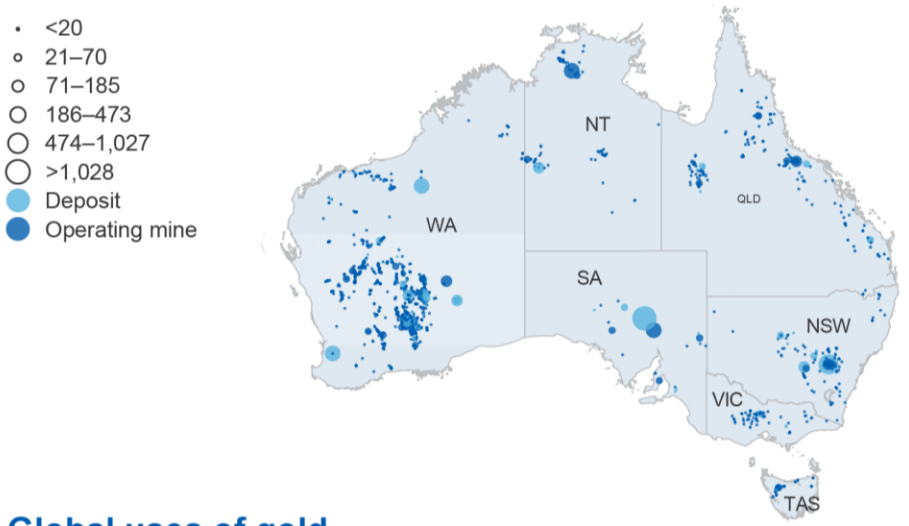
8.9%

of world mine gold supplied by Australia in 2016–17

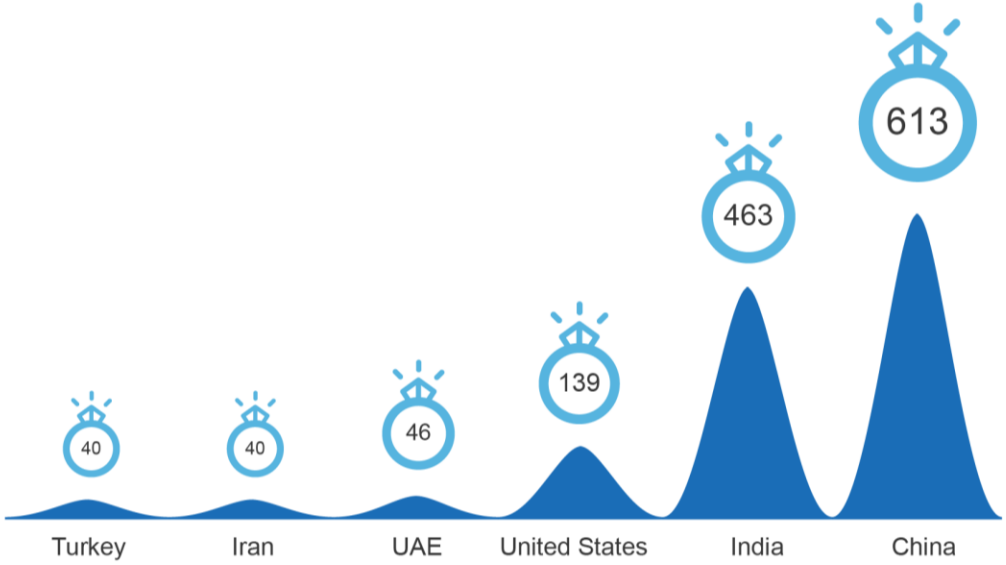
world record find

Australia holds the record for the world's largest gold nugget weighing 72 kg, found in Victoria in 1869

Major Australian gold deposits (t)



Key jewellery consumer markets (tonnes)



Global uses of gold

47%
Jewellery

24%
Gold coins and bars

12%
Gold backed Exchange Traded Funds

8.7%
Central Bank Reserves

7.1%
Electronics and Industrial

0.4%
Dental and medical

Summary

- The gold price is expected to average US$1,260 a troy ounce in 2017, supported by lower real US treasury bond yields, safe haven demand and a weaker than expected US dollar over the rest of 2017. The gold price is expected to decline to US$1,190 a troy ounce in 2019, driven by higher real yields.
- The value of Australia's gold exports is forecast to decrease from $18 billion in 2016–17 to $17 billion in 2018–19. Lower export earnings will be weighed down by lower gold prices while export volumes are expected to remain relatively flat.
- Australia's gold exports are forecast to be little change over the forecast period, rising from 334 tonnes in 2016–17 to 335 tonnes in 2018–19.

Prices

Gold prices continued to rise in September quarter of 2017

The London Bullion Market Association (LBMA) gold price averaged US$1,280 in the September quarter, up from US$1,260 in the June quarter. Driving the gold price in the September quarter was a weaker than expected US dollar, falling US treasury bond yields and increased investor demand for safe haven assets, as tensions rose over North Korea's missile program.

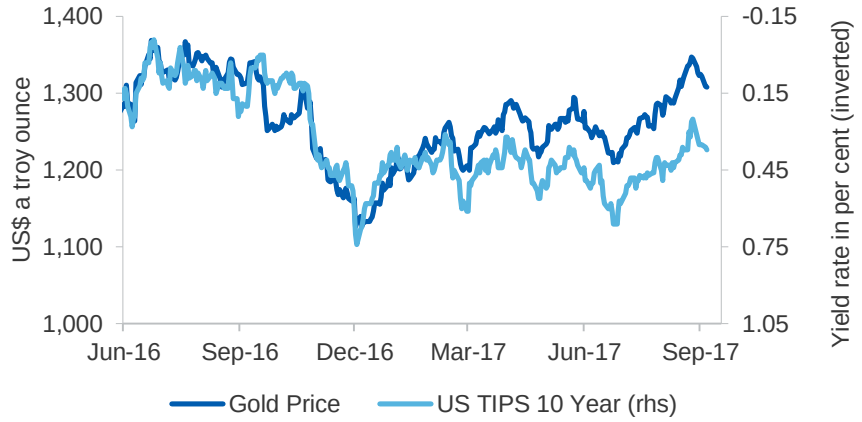
Gold prices expected to decline over the outlook

The LBMA gold price is forecast to decrease to US$1,190 a troy ounce in 2019. Increased safe haven demand and higher jewellery consumption will be more than offset by the impact of lower investment demand, as investors react to rising real yields on US Treasury bonds — which offer a higher near default-free risk return. The opportunity cost of holding Treasuries rises, causing investors to switch away from gold.

Real Treasury yields are expected to rise as the US Federal Reserve raises Fed Funds to as high as 2 per cent by end 2018, and begins to shrink its balance sheet. US inflation declined in the June quarter, and is expected to remain low over the next three quarters, thus supporting higher real yields.

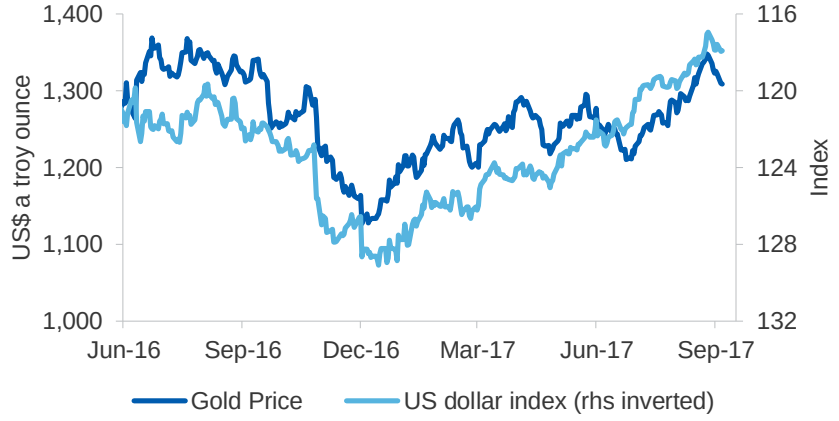
Another factor putting downward pressure on gold prices is likely to be the rising US dollar. The US dollar is expected to rise in line with higher US interest rates. However, better safe haven demand — underpinned by ongoing geo-political uncertainty and rising tensions on the North Korean peninsula — will provide some support to gold prices over the near term.

Figure 10.1: Gold prices and US Treasury bond yields



Source: LBMA (2017) Gold Price PM; Thompson Reuters (2017) US 10 year Treasury Income Protected Securities constant maturity middle rate

Figure 10.2: Gold prices and the US dollar



Source: LBMA (2017) Gold Price PM; Thompson Reuters (2017) US dollar index

Notes: The US dollar index is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners

World consumption

Global gold consumption is forecast to rise by 1.5 per cent annually to 4,270 tonnes in 2019. Higher gold consumption will be supported by increased jewellery purchases and higher use in industrial fabrication, while the outlook for investment demand is likely to be somewhat more subdued.

Jewellery consumption improves led by Indian demand

Gold jewellery consumption increased by 6.7 per cent year-on-year in the June quarter, led by a strong turnaround in India — where consumption increased by 166 per cent year-on-year. Indian gold jewellery consumption increased as customers brought forward purchases to beat the introduction of a Goods and Services Tax (GST). Jewellery consumption in India was also supported by a higher number of auspicious wedding days in 2017.

Gold jewellery consumption is forecast to increase by 4 per cent a year over the outlook period, from around 2,150 tonnes in 2017 to 2,323 in 2019. Rising incomes in India and China — the world's two major jewellery markets — will support higher discretionary spending on gold throughout 2018 and 2019.

Industrial consumption continues to rise

Gold used in electronics increased by 1.5 per cent year-on-year in the June quarter — the third consecutive quarter of growth. Gold consumption in industrial applications is forecast to increase by 2 per cent annually, from 328 tonnes in 2017 to 342 tonnes in 2019.

Higher industrial demand will be underpinned by growth in demand for gold bonding wire and gold used in memory chips, particularly for producing smartphones. Increased industrial consumption will also be supported by the use of gold in production and sensor technology and LED lighting in the automotive industry.

Central bank purchases grow in the June quarter 2017

Central bank buying increased by 21 per cent year-on-year in the June quarter, lifted by Russia — who added 36 tonnes mostly from domestic supply. Central bank purchases are forecast to be 370 tonnes in 2017.

Central bank demand for gold is forecast to taper over the outlook period, declining to 360 tonnes in 2019.

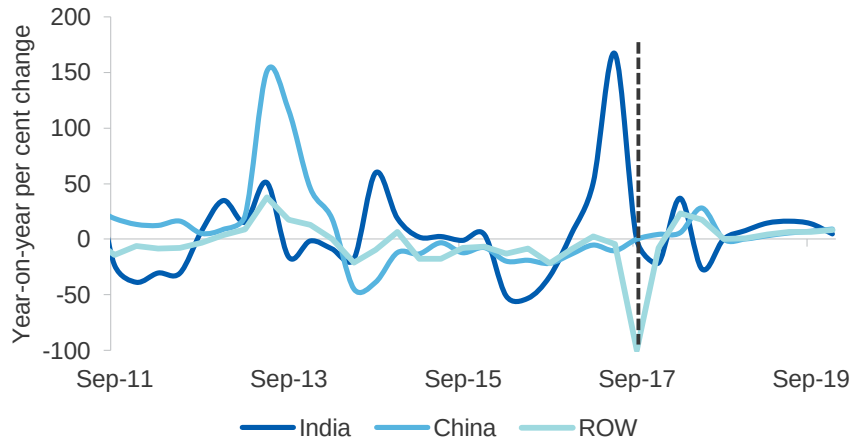
EFT holdings rise and retail investment improves in June quarter

Investors increased ETF holdings by 56 tonnes in the June quarter, representing a 76 per cent annual decline, largely due to an exceptional June quarter in 2016. Investor demand for gold ETFs is expected to improve in the September quarter 2017 but decline thereafter, as rising real bond yields put downward pressure on gold prices.

Retail demand for gold bars and coins increased by 13 per cent year-on-year in the June quarter, reaching 241 tonnes. Higher retail demand was supported by a strong rebound in the Indian gold market, where cultural festivals and the introduction of the GST encouraged increased purchases.

Total investment in gold — including gold bars, coins and bullion-backed Exchange Traded Funds (ETFs) — is forecast to decrease by 7.7 per cent annually from 1,580 tonnes in 2016 to 1,240 tonnes in 2019. Lower world gold prices will discourage, rather than stimulate investor demand over the outlook.

Figure 10.3: Gold jewellery consumption



Source: Thompson Reuters (2017) quarterly jewellery consumption; Department of Industry, Innovation and Science (2017) Note: ROW Rest of World

World production

Total world gold supply is forecast to increase by 0.3 per cent annually in the outlook period, from 4,590 tonnes in 2016 to 4,630 tonnes in 2019. Higher total gold supply will be supported by higher mine production, with scrap production forecast to remain steady over the outlook.

Mine production expected to rise

World mine production decreased by 0.3 per cent year-on-year in the June quarter to 791 tonnes. Lower production was weighed down by forced closures at several gold mines in China, for environmental breaches. China's production declined by 4.7 tonnes (or 4 per cent year-on-year) in the June quarter. Production was also lower in South Africa — down 2.9 tonnes year-on-year — and Tanzania which declined 0.8 tonnes in the June quarter, due to a government-imposed ban on exports from Acacia Mining, which last year supplied 45 per cent of Tanzania's gold production. Mine production in the United States increased by 4.6 tonnes year-on-year, while production in Argentina and Ghana both increased by 3.6 tonnes each.

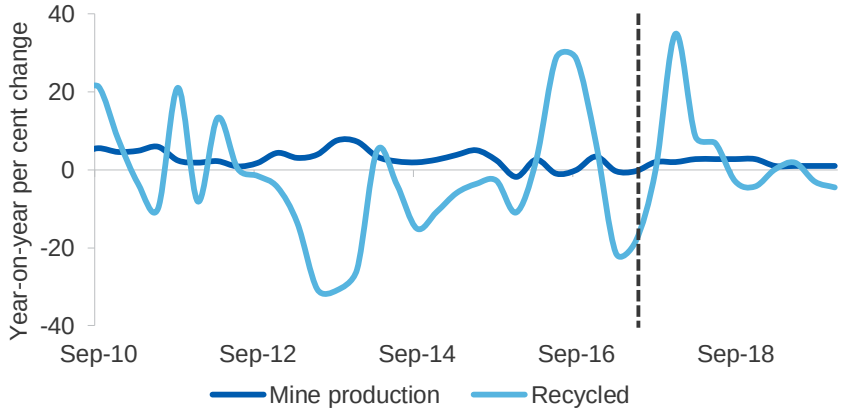
World mine production is forecast to increase by 1.5 per cent annually in the forecast period from 3,260 tonnes in 2016 to 3,413 tonnes in 2019. Higher production will be supported by new projects and mine expansions.

Several new projects are expected to add up to 65 tonnes to world mine supply this year — mostly in Canada. Looking further out, an additional 100 tonnes is expected to be added to world mine supply in 2018, and a further 30 tonnes in 2019. Much of the expected additional supply comes from new projects, with only a small number of expansion projects in the pipeline.

Recycled supply falls in the first half 2017

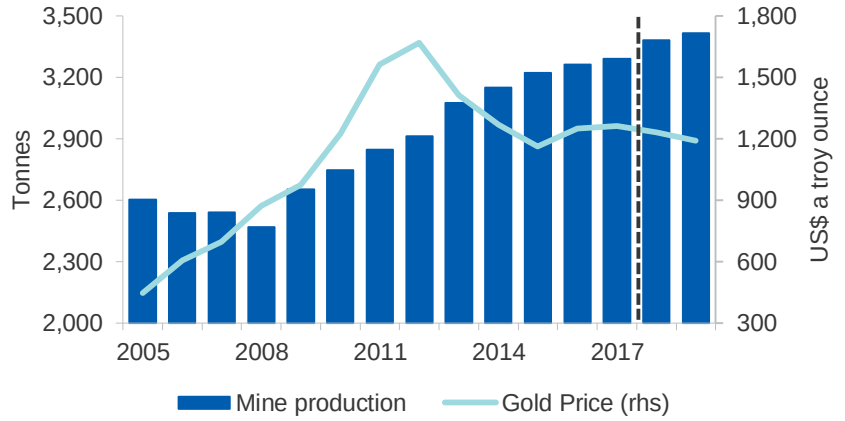
World recycled supply declined by 18 per cent year–on–year in the June quarter of 2017, to 280 tonnes. The decline is largely due to the exceptional start to 2016, when rising gold prices encouraged greater recycled supply. Recycled gold is expected to contribute 1,247 tonnes to world supply in 2017, and remain around 1,250 tonnes until 2019, due to the subdued outlook for world prices.

Figure 10.4: Growth in world gold supply (quarterly)



Source: World Gold Council (2017) Gold Demand Trends Q2 2017; Department of Industry, Innovation and Science (2017)

Figure 10.5: World mine supply and gold price



Source: World Gold Council (2017) Gold Demand Trends Q2 2017; Department of Industry, Innovation and Science (2017)

Australia's production and exports

Export values expected to taper in 2018–19

The value of Australia's gold exports is forecast to decrease from $18 billion in 2016–17 to $17 billion in 2018–19. The modest fall in export values will be driven by lower gold prices offsetting higher local mine production.

Export volumes are forecast to reach 335 tonnes in 2018–19, up from an estimated 334 tonnes in 2016–17. Export volumes will be underpinned by higher local mine production in Western Australia and the Northern Territory. Export volumes will also be supported by imports of gold doré for refining, as production ramps up in Papua New Guinea.

The Australian gold price is forecast to decrease from an average of A$1,720 a troy ounce in 2016–17 to A$1,570 a troy ounce in 2018–19. The lower domestic price will be weighed down by lower world gold prices, with the AUD/USD exchange rate forecast to remain around A$0.77 over the outlook.

Improved outlook for Australian gold mine production

Australian gold mine production declined by 0.5 per cent year-on-year in the June quarter to 72.4 tonnes. Production was led lower by declines at Newcrest's Cadia Valley and Telfer gold mines, which fell by 57 and 18 per cent, respectively, year-on-year in the June quarter. Operations at Cadia were impacted by a seismic event on the 14 April 2017, while operations at Telfer continue to recover from heavy rainfall in the March quarter. Newcrest expects production in September quarter to be higher than June but below pre-seismic levels.

Australia's gold mine production is forecast to increase by 5.5 per cent annually, from an estimated 288 in 2016–17 to 319 in 2018–19. Higher mine production will be driven by the addition of several new gold projects and mine expansions.

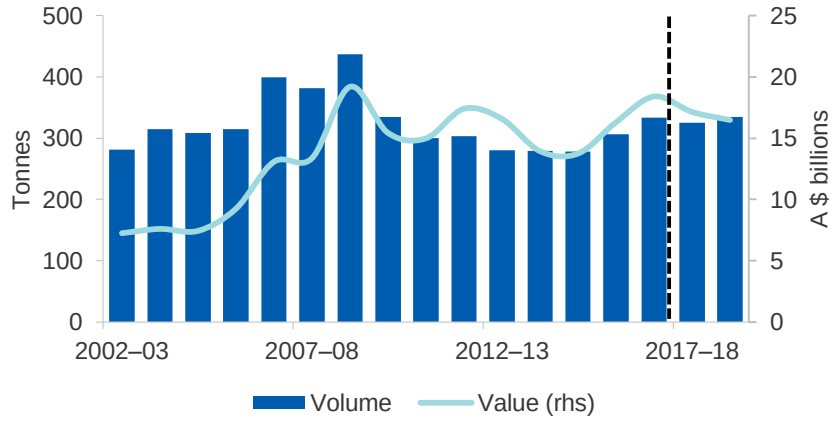
Mount Todd, owned by Vista Gold, is the largest new gold project under development, and is expected to commence production in 2018. Mount Todd is expected to become the largest gold mine in the Northern Territory, producing over 13 tonnes annually from 2018–19. Other new additions include Dacian Gold's Mount Morgans project in Western Australia, which is expected to commence production in 2018 and produce 5 tonnes annually.

Several mines are expected to ramp up production over the outlook period, including Newmont's Tanami in Western Australia and Fosterville, operated by Kirkland Lake Gold in Victoria. Fosterville increased production to over 2.4 tonnes of gold in the June quarter, and revised their production guidance higher for the rest of 2017, due to higher mill grades. Fosterville is expected to ramp up production over 2017–18 and produce 8 tonnes.

Exploration expenditure continues to increase

Australia's gold exploration expenditure increased by 26 per cent to $689 million in 2016–17, accounting for 44 per cent of Australia's total minerals exploration expenditure during the financial year. Gold exploration expenditure was supported by higher world gold prices. Western Australia remains the largest centre of gold exploration activity in Australia, accounting for $510 million of exploration expenditure. Expenditure increased in most States, reaching $51 million in Queensland and $46 million in New South Wales.

Figure 10.6: Australia's gold exports



Source: ABS (2017) International Trade, 5464.0; Department of Industry, Innovation and Science (2017)

Table 10.1 Gold outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Total demand	t	4,337	4,139	4,129	4,265	-4.6	-0.3	3.3
Fabrication Consumption b	t	2,370	2,476	2,569	2,665	4.5	3.7	3.7
Mine production	t	3,260	3,289	3,380	3,413	0.9	2.8	1.0
Price c								
Nominal	US$/oz	1,248	1,260	1,232	1,190	1.0	-2.3	-3.4
Real d	US$/oz	1,274	1,260	1,206	1,141	-1.1	-4.3	-5.4
Australia	**Unit**	**2015–16**	**2016–17 s**	**2017–18 f**	**2018–19 f**	**2016–17 s**	**2017–18 f**	**2018–19 f**
Mine Production	t	285	288	302	319	1.1	4.8	5.6
Export volume	t	306	334	326	335	8.9	-2.4	2.9
Nominal value	A$m	15,687	18,013	17,145	16,879	14.8	-4.8	-1.6
Real value e	A$m	16,302	18,405	17,145	16,486	12.9	-6.8	-3.8
Price								
Nominal	A$/oz	1,602	1,720	1,638	1,567	7.4	-4.8	-4.3
Real e	A$/oz	1,664	1,757	1,638	1,530	5.6	-6.8	-6.6

*Notes: **b** Includes jewellery consumption and industrial applications; **c** London Bullion Market Association PM price; **d** In 2017 calendar year US dollars; **e** In 2017–18 financial year Australian dollars; **f** Forecast; **s** Estimate*

Source: ABS (2017) International Trade, 5465.0; London Bullion Market Association (2017) gold price PM; World Gold Council (2017); Department of Industry, Innovation and Science.

Aluminium, alumina and bauxite

Resources and Energy Quarterly September 2017

Australia's global ranking

1st — Alumina exporter

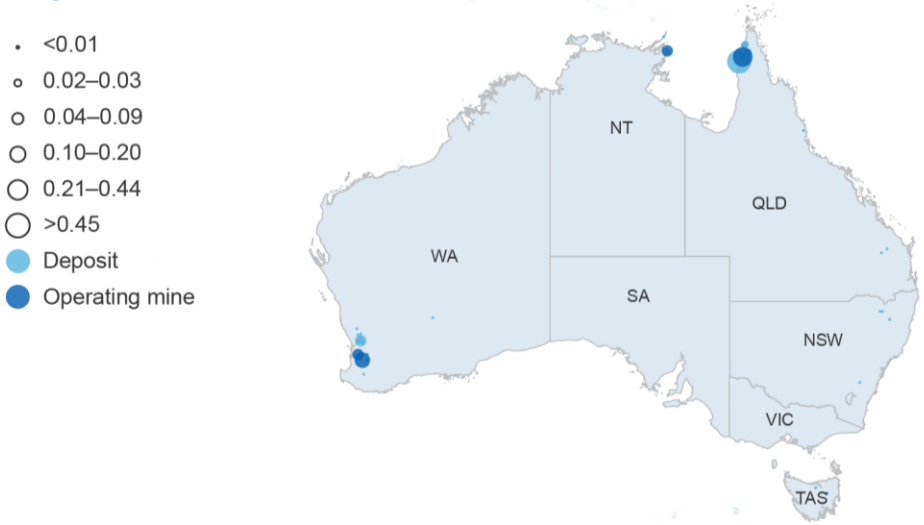
1st — Bauxite producer

2nd — Alumina producer

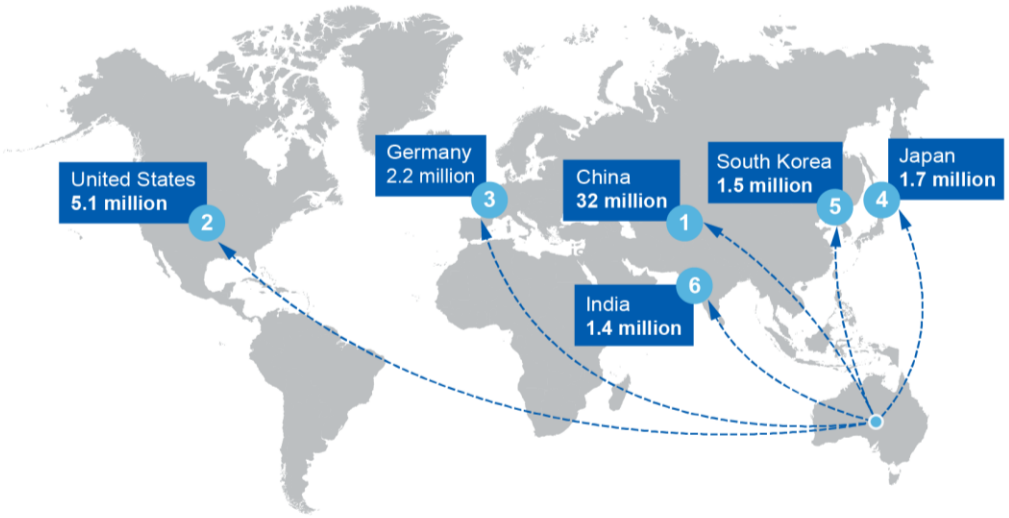
3 stages of producing aluminium

1. **Mining** bauxite ore
2. **Refining** to recover alumina
3. **Smelting** to make aluminium

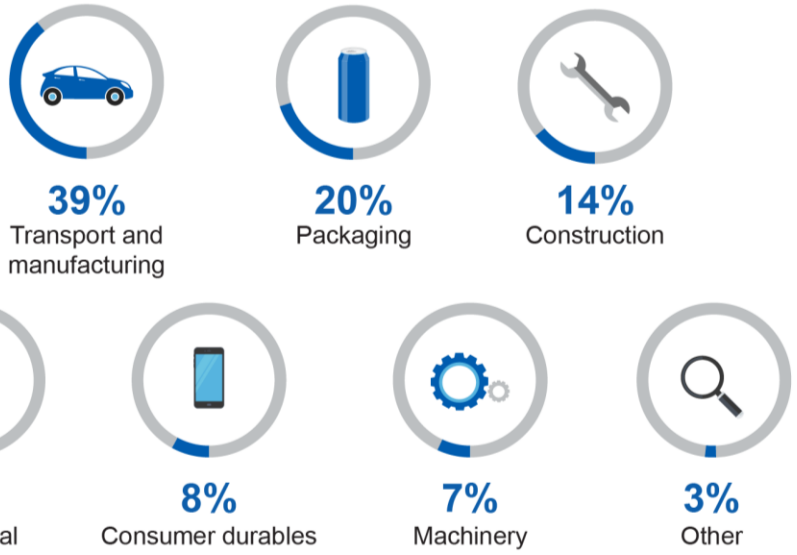
Major Australian alumina deposits (Gt)



Key consumer markets for aluminium (tonnes)



Global uses of aluminium



Aluminium

Summary

- The value of Australia' s aluminium exports is forecast to increase from $3.2 billion in 2016–17 to $3.8 billion in 2017–18, with prices and volumes growing.
- Aluminium prices are forecast to rise until early 2018, driven by production cuts in China.
- With a return to pre-outage production levels at Portland Aluminium, Australia's aluminium production is forecast to recover to normal capacity of 1.6 million tonnes in 2017–18.

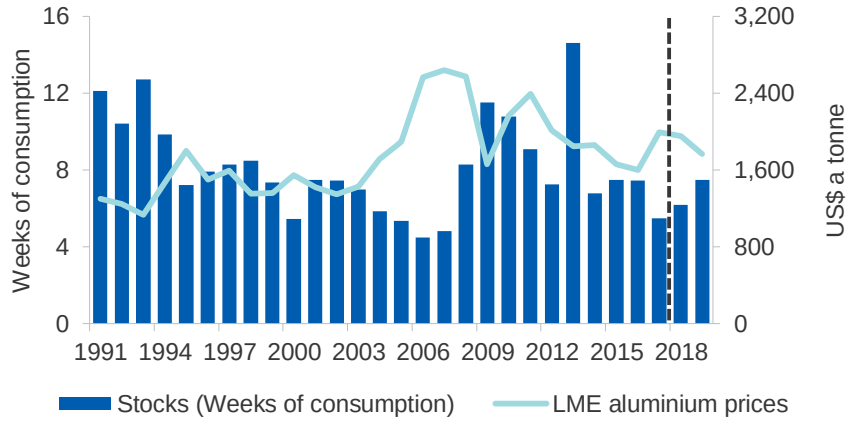
Prices

The average London Metal Exchange (LME) spot aluminium price increased by 21 per cent year-on-year in the first eight months of 2017, to US$1,902 a tonne. The daily spot LME price also reached a 56-month high on 31 August 2017. Driving the rise in prices was a significant production capacity cut in China, following the government's crackdown on illegal aluminium capacity. The price increase has been further escalated by the Chinese Government's request to cut production over the 2017–18 winter period, in order to address air pollution: this is expected to see Chinese output fall by 30 per cent. The global aluminium market balance (production less consumption) was in deficit in the June quarter, which also contributed to higher prices.

Likely reflecting the Chinese production cuts, LME stocks decreased by 36 per cent from the beginning of the year, reaching around 1.4 million tonnes in late June 2017. This trend of lower production growth and declining stocks is expected to continue over the remainder of 2017, placing upward pressure on aluminium prices.

For the year as a whole, aluminium prices are estimated to increase by 24 per cent from the 2016 level, averaging US$1,995 a tonne. The global aluminium market is forecast to be in deficit by around 2 million tonnes in 2017. World inventories of aluminium are forecast to decline by 30 per cent, to 6 million tonnes — or around 5.2 weeks of consumption. As the world's largest aluminium producer, China's production curtailments are expected to continue driving

Figure 11.1: Aluminium prices and stocks



Source: LME (2017) spot prices; Department of Industry, Innovation and Science (2017)

aluminium prices higher for the remainder of 2017 and potentially into 2018. However, upside momentum is likely to be limited by the impact of new capacity starts, which is estimated to be around 4.4 million tonnes in 2017. Production in other Asian nations and the Middle East countries is also forecast to rise by 21 and 2.3 per cent, respectively.

Average LME spot aluminium prices are forecast to decline by 1.9 per cent in 2018 and by 9.8 per cent in 2019, to US$1,957 a tonne and US$1,766 a tonne, respectively. The forecast is based on the assumption that Beijing's 'air pollution control' policy — which requires Chinese aluminium smelters to cut production by 30 per cent during the winter period — will not be extended beyond 2017–18. This will depend on how quickly the industry can cut emissions near heavily populated cities.

Prices may also be constrained by increased supply from new low-cost capacity additions in China, India, Vietnam and Russia. 'Committed' and 'probable' new and expansion projects are expected to add 3.2 million tonnes per annum in China, 330,000 tonnes in India, 300,000 tonnes in Vietnam, and 150,000 tonnes in Russia in 2018.

Consumption

World aluminium consumption to remain strong

World aluminium consumption increased by 4.8 per cent year-on-year in the June quarter 2017, to over 15 million tonnes, propelled by increases in vehicle sales in Japan, and increased fixed asset investment (FAI) in China. Over this period, Japan's vehicle sales rose by 12 per cent, driven by strong domestic and overseas demand for new models. In China, the sustained growth (average 8 per cent a year) in the FAI — machinery, land, buildings, vehicles, and technology — underpinned aluminium demand.

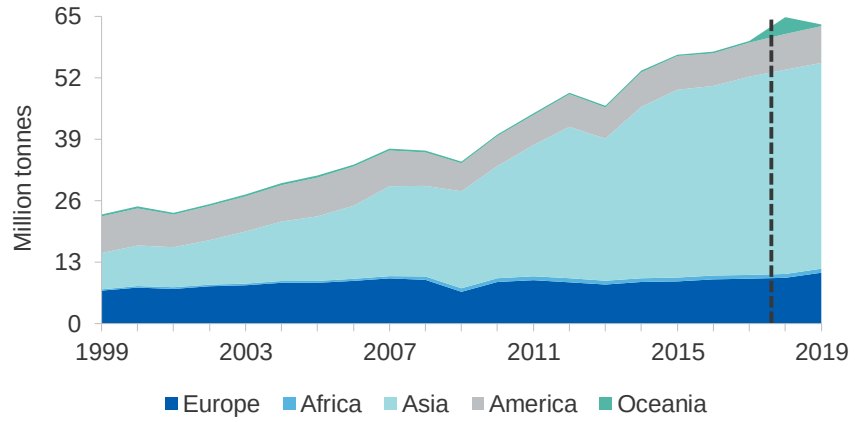
Global industrial production — a significant driver of commodity demand — is forecast to increase by 3.3 per cent in 2017. As a result, world aluminium consumption is forecast to grow by 3.3 per cent in 2017 to 60 million tonnes. Vehicle demand remains key to Chinese demand for aluminium, with car sales growing by 4.6 per cent over the year to July. This follows declines in April and May. The vehicle tax rate was increased to 7.5 per cent in 2017, and is scheduled to rise to 10 per cent by the start of 2018. Chinese consumers may seek to buy before the tax will hike to 10 per cent in January 2018.

Transport and housing sectors to drive future aluminium consumption

World aluminium consumption is forecast to rise at an average annual rate of 2.8 per cent over the next two years, to 62 million tonnes in 2018 and 63 million tonnes in 2019. Consumption growth is likely to track trends in global industrial production, which is forecast to grow by almost 3 per cent in 2018 and in 2019. The global transport sector and the Chinese housing sector are projected to be key drivers of growth in aluminium usage. Increased vehicle sales and higher aluminium intensity in vehicle production will drive the rise in transport demand.

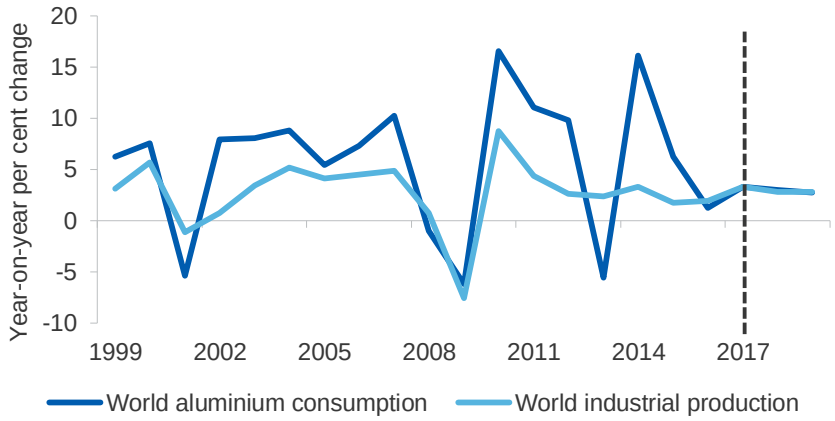
Global vehicle sales are expected to increase by 4 per cent and 3.2 per cent in 2018 and 2019, respectively, led by rises in vehicle sales in some Developed and Emerging automotive markets (such as North America, China, and Latin America). In China, growth in vehicle sales is estimated to fall from the double-digit growth rate recorded in 2016. Aluminium consumption in the European vehicle industry is expected to increase, as the commission of the 200,000 tonnes per year Hydro Aluminium's automotive aluminium sheet facility in Germany in July

Figure 11.2: World aluminium consumption



Source: World Bureau of Metal Statistics (2017); Department of Industry, Innovation and Science (2017)

Figure 11.3: Aluminium usage and industrial production, growth



Source: CPD Netherlands Bureau for Economic Policy Analysis; Department of Industry, Innovation and Science (2017); World Bureau of Metal Statistics (2017)

2017 will support higher demand for aluminium. Aluminium demand from North America is expected to grow at an annual average rate of over 3 per cent over the next few years, to 7.5 million tonnes in 2019, buoyed by stronger motor vehicle production. Latin America is expected to be the fastest growing regional automotive market in the world. This is partly due to more stable currencies in Brazil and Argentina, and partly to stronger economic growth in other Latin American countries.

Global automotive makers are increasingly using aluminium to reduce vehicle weights and curb emissions. According to the International Aluminium Institute, aluminium content per vehicle is expected to account for 16 per cent (or 565 pounds) of curb weight by 2028. This represents a rise of 42 per cent over the past 13 years.

In China, investment in machinery, land, buildings, vehicles and technology is expected to grow by at least 8 per cent year-on-year, contributing to higher aluminium consumption in that nation .

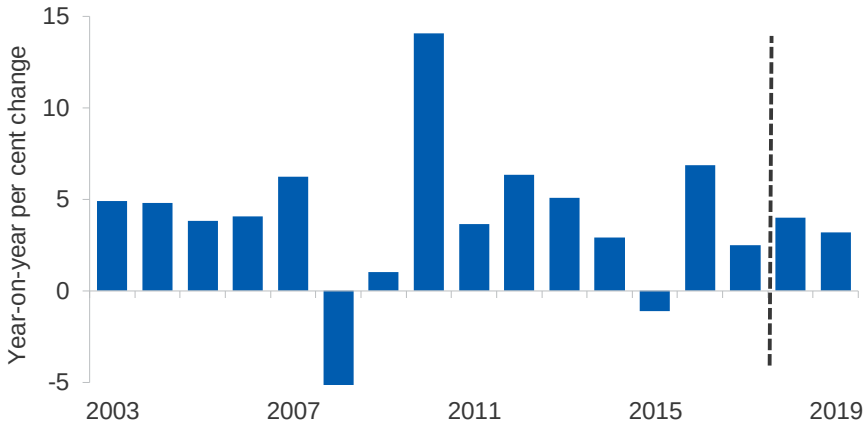
Production

New capacity should offset China's production cuts

World aluminium production increased by 5.8 per cent year-on-year in the first eight months of 2017, to over 40 million tonnes. This was driven by strong growth in China (7.7 per cent year-on-year), ex-China Asian countries (14 per cent year-on-year), and South America (3 per cent year-on-year). Over this period, production in Oceania fell by 11 per cent year-on-year, due to reduced capacity at Portland Aluminium in Australia (following a power outage in December 2016). Crackdowns on air pollution and illegal capacity are expected to reduce China's aluminium production by 4.3 per cent in 2017 to 30 million tonnes. However, offsetting China's production cut are expected rises in other Asian countries (up 21 per cent) and the Middle East (up 2.3 per cent). As a result, world aluminium production is forecast to fall by just 0.3 per cent in 2017 to 58 million tonnes.

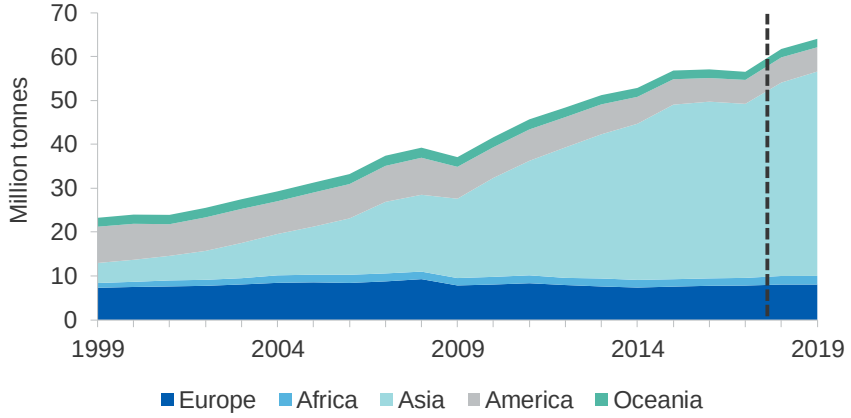
Global aluminium production is projected to resume growing in 2018 and 2019. Output should reach 65 million tonnes by 2019, driven by increased capacity in China and other Asian countries. A forecast increase in aluminium prices in 2017 will encourage some idle plants to restart, while, in China, existing and new capacities that have been closed by regulators will be allowed to reopen after the 2017–18 winter season.

Figure 11.4: Growth in global vehicle sales



Source: Business Monitor International (2017); Department of Industry, Innovation and Science (2017)

Figure 11.5: World aluminium production



Source: International Aluminium Institute (2017); Department of Industry, Innovation and Science (2017)

In July 2017, Alcoa Corporation announced plans to restart three of five potlines at its Warrick aluminium smelter in Indiana. The process to restart the three lines— with over 161,000 tonnes of annual capacity— started two months ago, and is expected to be completed in the second half of 2017. This brings to an end a decade of closures, which have reduced production from the 2008 peak of 2.7 million tonnes.

In India, Vedanta announced plans to increase its aluminium production by 50 per cent over the coming two years, to 2.3 million tonnes by 2019. India's National Aluminium Company (Nalco) also announced the expansion of the 500,000 tonnes per annum Angul smelter project in Odisha.

China's winter and illegal capacity cut policies

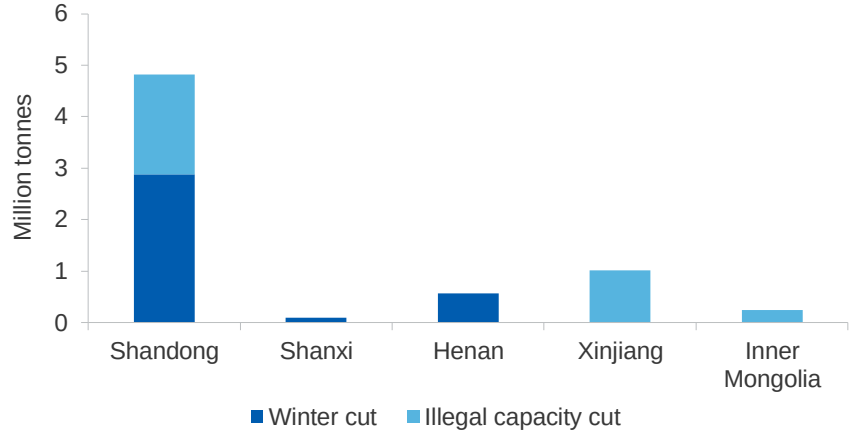
The total production cut from the winter curtailment and illegal aluminium capacity policies is estimated to be around 7 million tonnes in 2017, of which, Shandong Province is expected to account for 70 per cent (or 4.8 million tonnes). China Hongqiao Group, the world's largest aluminium producer, removed 3.2 million tonnes of illegal smelting capacity in Shandong province in July 2017. Another 3.8 million tonnes of operating capacity is expected to be cut by year's end.

Chinese aluminium producers have tried to compensate for the winter production cut by increasing output in 2017. Production in the first half of 2017 increased by 11 per cent year-on-year, to nearly 17 million tonnes. China is forecast to add 4.4 million tonnes of new capacity in 2017. This new addition will be a challenge to the Chinese authorities' attempt to remove excess capacity.

Similar polices in the past have not succeeded in curbing excess capacity. In 2015, 'supply-side reform' failed to achieve production cuts. In fact, China's aluminium production rose by 12 per cent in 2015 to nearly 32 million tonnes, and remained at this level in 2016.

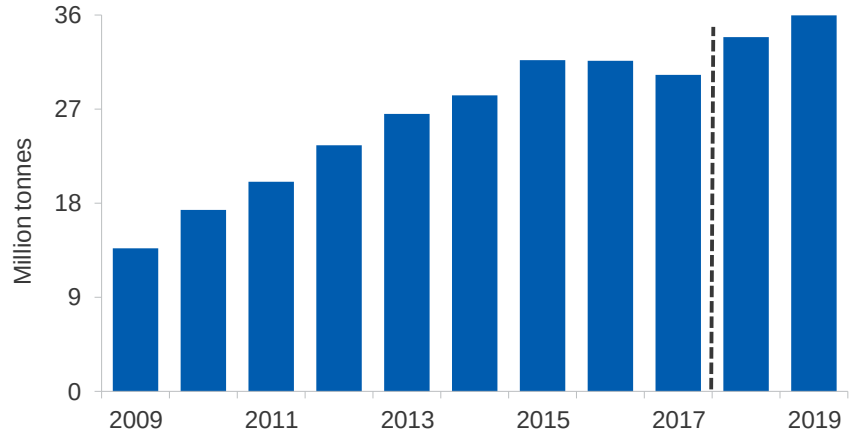
Looking beyond 2017, Chinese aluminium smelters will ramp up production after the 2017–18 winter season (April to September 2018). As a result, aluminium production in China is forecast to increase by 12 and 6 per cent in 2018 and 2019, to 34 and 36 million tonnes, respectively.

Figure 11.6: Production cuts in China in 2017



Source: Macquarie Research (2017)

Figure 11.7: China's aluminium production



Source: International Aluminium Institute (2017); Department of Industry, Innovation and Science (2017)

Australia's exports and production

Aluminium exports lower in 2016–17 due to reduced capacity

In 2016–17, Australia exported $3.2 billion worth of primary aluminium. This was 2.6 per cent lower than 2015–16, with higher aluminium prices only partly offsetting lower volumes. Export volumes decreased by 7.9 per cent to 1.3 million tonnes, due to reduced production capacity from Portland smelter.

Aluminium exports to rise strongly in 2017–18

Australia's primary aluminium exports are estimated to increase by 21 per cent in 2017–18 to $3.8 billion, driven by expected high aluminium prices. The average London Metal Exchange (LME) spot aluminium price reached a 3 year high in August 2017, at US$1,986 a tonne, and is expected to remain at or above this level during the first three quarters of 2017–18. Export volumes are estimated to return to the normal annual export capacity level of 1.4 million tonnes, supported by the expected return to full production at Portland Aluminium.

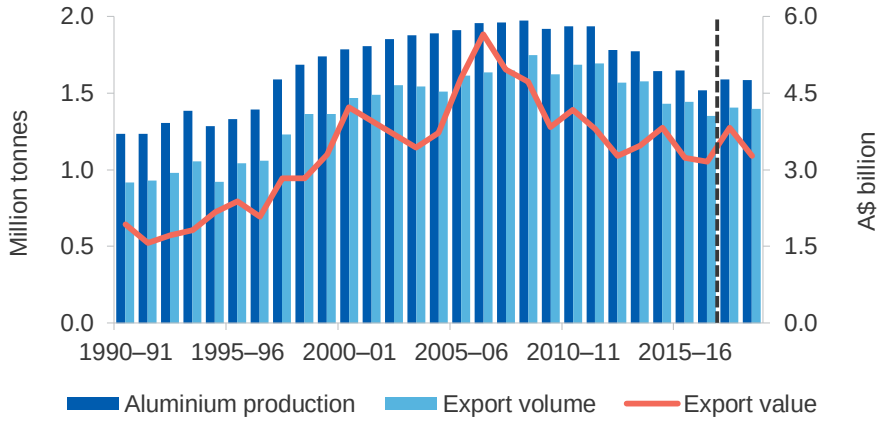
Nevertheless, Australia's primary aluminium exports are forecast to fall by 15 per cent in 2018–19 to $3.3 billion, due to an expected drop in aluminium prices. Notwithstanding the winter 2017–18 production cut in China, the global aluminium market is expected to be in surplus supply, and this surplus will lower aluminium prices. Export volumes are forecast to be stable, at 1.4 million tonnes.

Aluminium production to increase in 2017–18 as Portland Aluminium's production to recover

Australia produced 1.5 million tonnes of primary aluminium in 2016–17, 7.9 per cent down from the previous financial year. The decline in production was the result of reduced capacity at Australia's third largest aluminium smelter, Portland Aluminium, following a power outage in December 2016. Over this period, Portland's output declined by 35 per cent to 191,000 tonnes. Also contributing to the fall in aluminium production was the decision by Rio Tinto to reduce output at the Boyne Island smelter, in response to higher power prices. In 2016–17, Boyne Island's production fell by 5.5 per cent to 552,000 tonnes.

However, offsetting Portland and Boyne Island output loss and production cut is a slight increase (0.8 per cent) in Tomago's aluminium production, to 591,000 tonnes.

Figure 11.8: Australia's aluminium exports and production



Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Australia's aluminium production is estimated to increase by 4.8 per cent in 2017–18 to around 1.6 million tonnes. The growth will be propelled by Portland Aluminium's expected return to pre-outage production levels of around 300,000 tonnes in 2017–18. In 2018–19, aluminium production is forecast to remain stable, with no major additions or closures to capacity .

Production costs remain a challenge

Production costs have been an ongoing concern for Australian aluminium smelters, and will remain a challenge for years to come— the driving force has been rising power prices . Aluminium smelter cash costs are forecast to rise over the next few years. Given the estimated average LME aluminium prices of US$1,995 and US$1,957 a tonne in 2018 and 2019 , Australian aluminium smelters will be operating at a loss.

Alumina

Summary

- The value of Australia' s alumina exports is forecast to increase from $6.7 billion in 2016–17 to $7.8 billion in 2017–18, driven by higher prices.
- Alumina prices are forecast to rise until early 2018, on the back of production cuts in China.
- Australia's alumina production is forecast to be steady, at 21 million tonnes, with no planned closures/expansions or major disruptions at existing operations.

Prices

Alumina prices forecast to grow strongly in 2017, but come under pressure in 2018 and 2019

The average FOB Australia alumina price increased by 37 per cent year-on-year in the first eight months of 2017 to average US$316 a tonne, driven by Chinese production cuts. Refineries have been asked to cut production by 30 per cent during the 2017–18 winter season, and an illegal capacity investigation is under way. Chinese aluminium smelters have ramped up aluminium production ahead of the winter curtailment. In the June quarter 2017, rising world aluminium production boosted alumina demand— aluminium production increased by 6.3 per cent year-on-year.

Despite the production curtailment in China, global aluminium production is expected to fall by just 0.3 per cent in 2017, thanks to new capacity addition from major aluminium producers. This reduction in aluminium production is expected to have little impact on alumina demand for the remainder of 2017. As a result, the average FOB Australia alumina price is estimated to rise by 28 per cent in 2017, to average $US324 a tonne.

Further out, FOB Australia alumina prices are forecast to come under pressure, falling by 0.6 per cent and 5.4 per cent in 2018 and 2019, to $US322 a tonne and $US305 a tonne, respectively. New capacity additions in China and other major producing countries are expected to put downward pressure on prices. It is projected that China will add over 6.8 million tonnes of refinery capacity in 2018, from greenfield and

Figure 11.9: Alumina price

Source: Bloomberg (2017) alumina monthly price; Department of Industry, Innovation and Science (2017)

expansion projects. In particular, industrial heavyweights Shandong and Shanxi are forecast to add 2 million tonnes and 1.8 million tonnes per annum, respectively, to the country's alumina capacity by 2018. Outside of China, India and the UAE are projected to add another 3 million tonnes of new refinery capacity in 2018.

Consumption

Growth in alumina consumption in line with aluminium production growth

World alumina consumption increased by 6.3 per cent year-on-year in the June quarter 2017, to over 29 million tonnes, driven by strong growth in aluminium production. In China — the world's largest alumina consumer — alumina consumption increased by 7.5 per cent year-on-year, to 16 million tonnes, in line with the rise in China's aluminium production.

Alumina demand from China is estimated to fall in the fourth quarter of 2017, as the winter production curtailment comes into effect. However, offsetting the drop in Chinese demand is an expected rise in consumption from the North American region.

In the US, Alcoa Corporation is expected to restart three of five potlines— with over 161,000 thousand tonnes of annual capacity— at its Warrick aluminium smelter in the second half of 2017. These potlines will require around 320,000 tonnes of alumina a year. For 2017 as a whole, global alumina consumption is estimated to be unchanged from the 2016 level, at 110 million tonnes.

Alumina demand is driven by aluminium production. Over the next two years, global aluminium production is forecast to grow at an annual average rate of 6 per cent, driven by the addition of new capacity in China, the Middle East, and the US. In China, following the winter production curtailment, aluminium production is expected to escalate, rising by at least 12 per cent a year in 2018 and 2019. In the Middle East, Iran's aluminium production is forecast to rise by 46 per cent in 2018, driven by a production increase at the Al-Mahdi and Hormazal aluminium smelters. In the US, rising aluminium prices have provided aluminium smelters with the confidence restart idle capacity. As a result, global demand for alumina is forecast to increase by about 6 per cent a year (in line with aluminium production growth), to 123 million tonnes.

Production

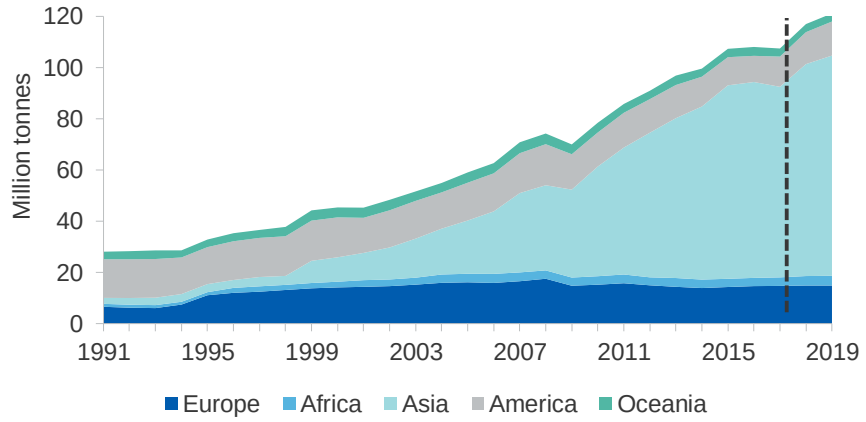
Alumina production to fall in 2017, but return to growth in 2018 and 2019

World alumina production increased by 15 per cent year-on-year in the first eight months of 2017, to 86 million tonnes. This was driven by strong growth in China (up 27 per cent year-on-year), and African and other Asian countries (up 40 per cent year-on-year). The rise in Chinese production reflected Chinese refineries' strategy to maximise output ahead of production cuts in the 2017–18 winter season. Outside of China, the 650,000 per annum Nhan Co refinery in Vietnam started production in December 2016, and the plant has continued to ramp-up through the first half of 2017.

For 2017 as a whole, global alumina production is forecast to fall by 0.7 per cent to 114 million tonnes, largely due to production cuts in China. This fall is smaller than expected in the June 2017 *Resources and Energy Quarterly*; Chinese refiners have responded to higher prices by building stocks.

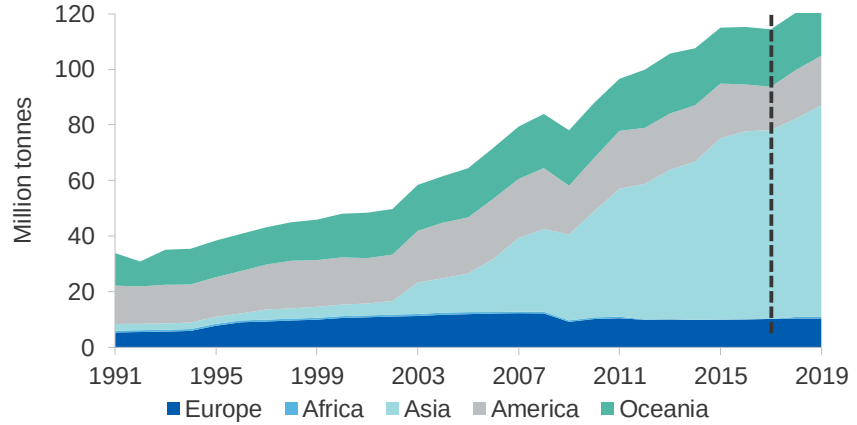
In 2018 and 2019, world alumina production is projected to resume growing, at an annual rate of 5 per cent, to reach 125 million tonnes by 2019. The gains will be driven by a return to production growth in China.

Figure 11.10: World alumina consumption



Source: AME Group (2017); Department of Industry, Innovation and Science (2017); World Bureau of Metals Statistics (2017)

Figure 11.11: World alumina production



Source: International Aluminium Institute (2017); Department of Industry, Innovation and Science (2017)

It is possible that the Chinese production cuts will be a one-off, with no further extension beyond 2017. For this reason, China's alumina production is forecast to increase by 2 and 3.6 per cent in 2018 and 2019, to 61 million and 63 million tonnes, respectively.

Outside of China, India's production is forecast to increase by 8.5 per cent in 2018, and by 2.6 per cent in 2019, supported by a 14 per cent rise in production at the Lanjigarh Mettur Alumina refinery. The Ma'aden Ala Refinery in Saudi Arabia will reach full production capacity of 1.8 million tonnes in 2018, up 20 per cent from 2016. The Al Taweelah Alumina project in the United Arab Emirates is expected to commence operation in late 2018 or early 2019, with start-up capacity of 1.5 million tonnes.

China's winter cut policies

Chinese alumina refiners are facing less scrutiny than aluminium smelters. The total cut from the winter curtailment policy is estimated to be around 9.3 million tonnes of alumina — a 25 per cent cut in operating capacity. The cut will be focused on the Shandong province (accounting for 61 per cent), and Henan province (38 per cent), as these provinces have a bigger share in national alumina production than in aluminium production.

Australia's exports and production

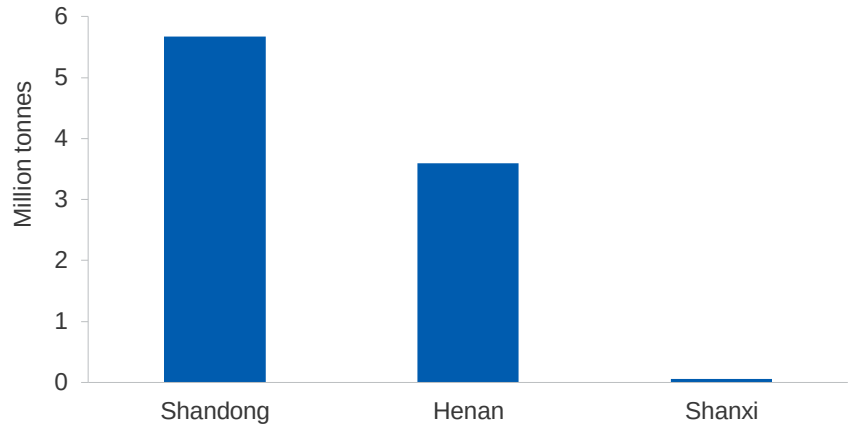
Alumina exports higher in 2016–17, driven by higher prices and volumes

Australia exported $6.7 billion worth of alumina in 2016–17. This was 11 per cent higher than in 2015–16, with growth driven by higher alumina prices and volumes. Export volumes increased by 3.1 per cent, to over 18 million tonnes. Over this period, alumina prices rose by 15 per cent, to average US$296 a tonne.

Alumina exports to rise strongly in 2017–18, but fall modestly in 2018–19

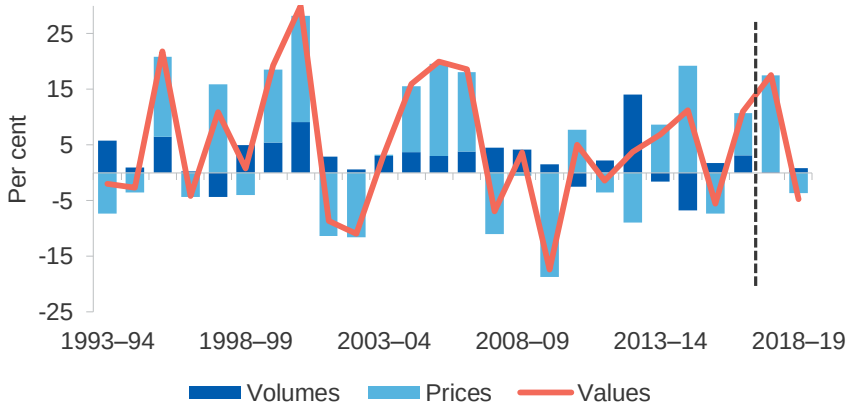
Australia's alumina exports are estimated to increase by 18 per cent in 2017–18 to $7.8 billion, driven by expected gains in alumina prices. The average FOB Australia alumina price increased by 28 per cent year-on-year in July 2017, to US$308 a tonne, and is forecast to remain at or above this level for the next six months. The production curtailment in China is the main catalyst for the expected increase in prices.

Figure 11.12: Production cuts in China in 2017



Source: Macquarie Research (2017)

Figure 11.13: Annual growth in Australia's alumina export values, contributions from prices and export volumes



Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Since the June 2017 *Resources and Energy Quarterly*, the value of Australia's alumina export earnings for 2017–18 has been revised up by $1.8 billion (28 per cent) to $7.8 billion. The upward revision primarily reflects a stronger than expected rise in alumina prices in the first seven months of 2017.

Australia's alumina exports are forecast to fall by 4.7 per cent in 2018–19 to $7.5 billion (in 2017–18 dollars), due to an expected drop in alumina prices. Following the winter 2017–18 production cut in China, the global alumina market is expected to be in surplus, thus putting downward pressure on aluminium prices. Export volumes are forecast to remain stable, at around 18 million tonnes.

There is an emerging bauxite quality issue in China that will have implications for Chinese refineries' usage of imported bauxite and alumina. As the world's second largest producer and largest exporter of alumina, Australia has capacity to respond to this opportunity.

Australia's alumina production to remain steady

Australia produced 21 million tonnes of alumina in 2016–17, down by just 0.2 per cent from the previous financial year. The slight decline in production was the result of reduced output from Rio Tinto's Queensland Alumina Limited (QAL) refineries. Cyclone Debbie hit the northern Queensland region at the end of March, disrupting the operation of QAL for a number of days.

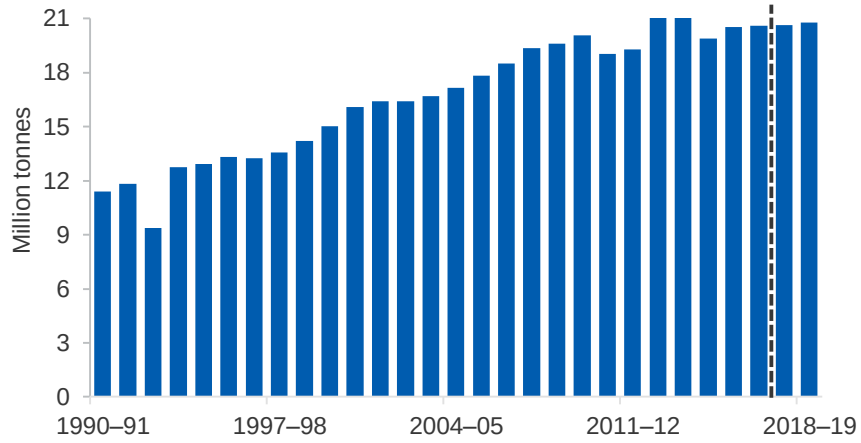
For 2017–18 and 2018–19, Australia's aluminium production is forecast to remain steady, at 21 million tonnes, with no planned closures/expansions or major disruptions expected at existing operations.

Risks to Australia' alumina exports and production

Australia's alumina exports are likely to be constrained by production capacity limits, with no major additions scheduled until 2018–19. Australia exports more than 88 per cent of its alumina production; the rest is used domestically.

Competition from other alumina producers and exporters is expected to intensify, as new capacity additions from China and else where continue to come online: an estimated of 19 million tonnes a year of additional capacity is expected.

Figure 11.14: Australia's alumina production



Source: Department of Industry, Innovation and Science (2017)

China's debt reduction strategy and the reduction in excess capacity and closure of inefficient state-owned enterprises, is likely to have a direct impact on the country's economic growth. Slower growth in China will impact commodity exporters like Australia. As a result, the International Monetary Fund (IMF) has recently asked commodity exporting countries to 'adjust to lower revenue'.

Bauxite

Summary

- The value of Australia' s bauxite exports is forecast to increase from $1.0 billion in 2016–17 to $1.1 billion in 2018–19, driven by higher volumes.
- Australia's bauxite production is forecast to reach 94 million tonnes in 2018–19, with the Bauxite Hills and Amrun projects due online in the next two years.
- Regulatory changes in China and an increase in illegal mining in Malaysia, are short-term challenges to Australia's bauxite exports.

Production

World bauxite production to rise strongly in 2018 and 2019

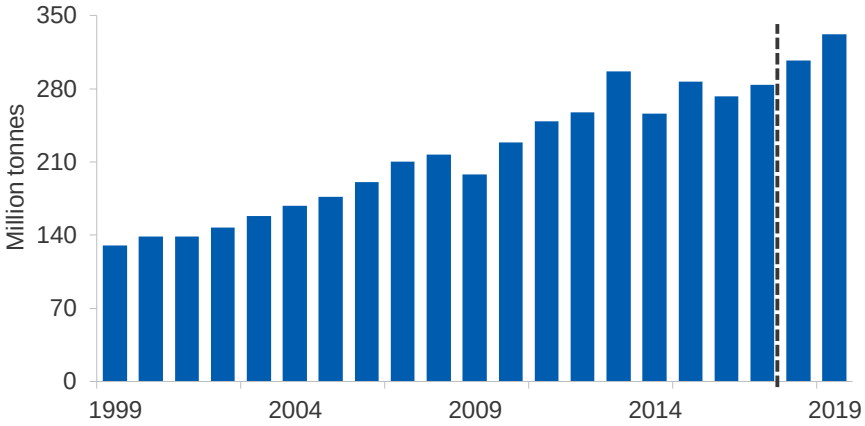
World bauxite production increased by 9.3 per cent year-on-year to 74 million tonnes, as production in Australia — the world's largest bauxite producer — rose by 5.1 per cent to 22 million tonnes. Over this period, production in Africa rose by 51 per cent year-on-year, to 11 million tonnes. Production in China, the world's second largest bauxite producer, was unchanged at 15 million tonnes.

For 2017 as a whole, Chinese bauxite production is forecast to fall by 10 per cent to around 58 million tonnes, due to curtailed alumina production in the 2017–18 winter season. Offsetting the fall in Chinese production is an expected rise in Australia's bauxite output (with an estimated increase of 1.7 per cent), Guinea (up 38 per cent), and South America (up 11 per cent). As a result, world bauxite production is forecast to rise by 4 per cent to around 283 million tonnes.

India's bauxite production is estimated to increase from 22 million tonnes in 2016 to 26 million tonnes in 2017, driven by an increase in the domestic demand for aluminium. The country has 3,100 million tonnes of bauxites (or about 5 per cent of the world's bauxite resources). To encourage bauxite development, the Ministry of Mines recently increased the lease area for mining of bauxite from 10 to 50 square kilometres in the Indian State of Odisha.

World bauxite production is forecast to rise by 8 per cent in 2018 and 2019, to 306 and 331 million tonnes, respectively, primarily driven by

Figure 11.15: World bauxite production



Source: World Bureau of Metal Statistics (2017); Department of Industry, Innovation and Science (2017)

new capacity additions in Australia. With the addition of Metro Mining's Bauxite Hills project in 2018, and Rio Tinto's Amrun project in 2019, Australian bauxite output is forecast to increase at annual rate of at least 6 per cent, to 92 million tonnes by 2018–19.

Other contributors to increased global bauxite production include Guinea, Malaysia and Indonesia. In Malaysia, the government imposed a complete mining ban at the start of 2016, in order to limit supply growth and address socio-environmental concerns. The ban has been extended four times, and is expected to stay in place for the remainder of 2017. However, bauxite mining in Pahang, Malaysia's largest bauxite producing area, is still occurring despite the moratorium. The ban has largely been ineffective, as illegal miners respond to strong demand from China.

In Indonesia, the government recently lifted the ban on bauxite exports implemented from 2014 to 2016. The removal of the export ban is likely to be a stimulus for increased bauxite production in Indonesia. Indonesia's bauxite production was 57 million tonnes in 2013.

Guinea has emerged as a major bauxite producer, producing more than 19 million tonnes in the first half of 2017. This is up 51 per cent year-on-year. The remarkable rise of Guinea's bauxite production will lift African bauxite production by at least 23 per cent annually, to 68 million tonnes by 2019. A growing pipeline of bauxite projects with high grade reserves is bolstering Guinea's bauxite productive capacity.

China

Production in China, the world's second largest bauxite producer, is unlikely to rise significantly over the short to medium term. Influences include the curtailment of the alumina production over the 2017–18 winter season, the declining quality of domestic bauxite, and the depletion of resources in China. China's bauxite imports rose by 53% year-on-year in the June quarter 2017. The trend of lower production growth and higher imports is expected to continue in the outlook period.

Chinese bauxite producers and importers currently prefer to make large investment in foreign countries such as Guinea, and ship the bauxite products back to China. The major bauxite importers of China are located in Shandong, with Weiqiao and Xinfa the largest. From their Guinean project, Shandong Weiqiao shipped over 10 million tonnes of bauxite back to China. The volume is expected to rise to 20 million tonnes in 2017, and to 25 million tonnes in 2018. Moreover, Aluminium Corporation of China plans to invest US$500 million in a project to produce bauxite in Guinea starting next year.

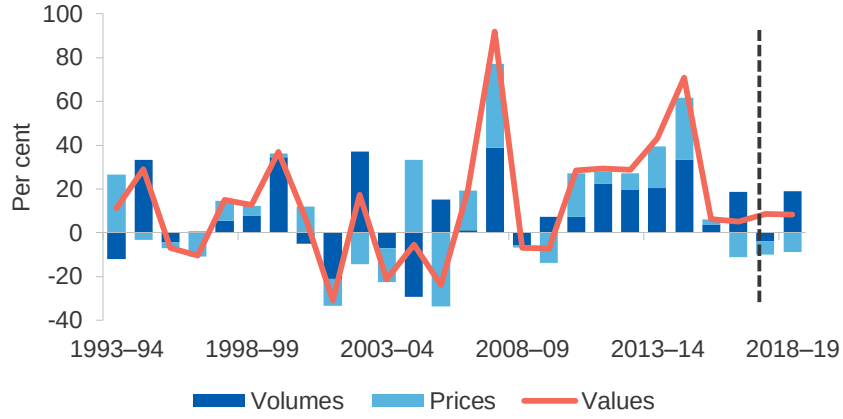
Ghana is another potential bauxite producer in Africa. In June 2017, the Chinese government pledged a US$15 billion loan to the government of Ghana for the construction and development of bauxite processing facilities.

Australia's exports and production

Bauxite exports higher in 2016–17

In 2016–17, Australia exported $1 billion worth of bauxite, 5.1 per cent higher than in 2015–16, as higher volumes offset the impact of lower prices. Export volumes increased by 19 per cent to 25 million tonnes, driven by increased exports to China.

Figure 11.16: Annual growth in Australia's bauxite export values, contributions from prices and export volumes



Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Bauxite exports to continue increase in 2017–18 and 2018–19

Australia's bauxite exports are estimated to increase at an annual average rate of 8 per cent over the next two financial years, to $1.2 billion by 2018–19. Growth will be driven by an expected rise in alumina production in China. The Chinese government's winter production cut and clampdown on illegal capacity may not be extended after the 2017–18 winter season. If so, Chinese alumina production should return to its pre-curtailment levels in 2018–19, driving demand for Australian bauxite. Export volumes are forecast to increased by 13 per cent to 28 million tonnes.

Chinese alumina refineries are facing a decline in the availability of quality domestic bauxite. This emerging issue is an opportunity for Australian bauxite exporters to ship more quality output to China.

Australia's bauxite production escalates in 2018–19

Australia produced 85 million tonnes of bauxite in 2016–17, up 4.2 per cent from the previous financial year. This was driven by increased production at Rio Tinto's Gove (up 18 per cent) and Weipa mines (up 6.9 per cent) in the Northern Territory and Queensland.

Australia's bauxite production growth is expected to rise in 2018–19, buoyed by the commissioning of the 5 million tonnes a year Metro Mining's Bauxite Hills project in the June quarter 2018, and the 23 million tonnes a year Rio Tinto's Amrun project in the March quarter 2019. These new additions will increase Australian bauxite output by 1.2 per cent and 10 per cent in 2017–18 and 2018–19, to 85 and 94 million tonnes, respectively.

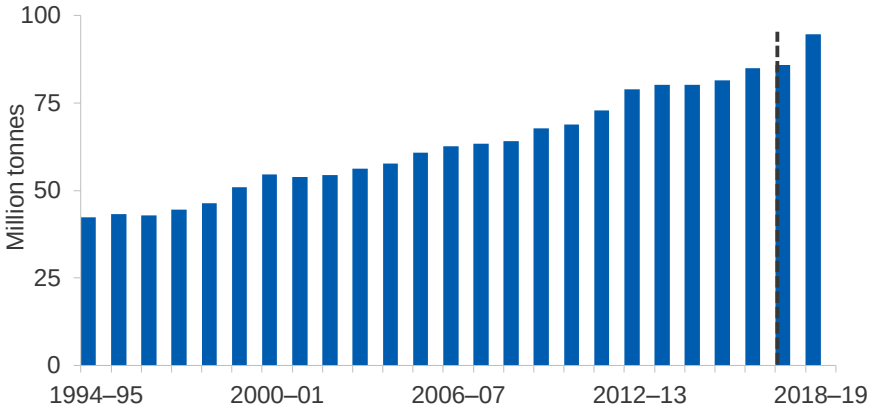
Australian Bauxite Limited has teamed up with Indian marketing partner Rawmin to request a grant from the Australian Government's Regional Jobs and Investment Fund to develop the 28 million tonnes Binjour bauxite project in Central Queensland. If approved and commissioned, the project will produce high quality bauxite for export to the Indian market for the first time in many years.

Risks to Australia's bauxite exports and production

Australia's bauxite exports are facing short-term challenges because of regulatory changes in China — Australia's largest bauxite exporting market. It is still unclear whether or not the winter production cut and illegal capacity cut policies will be extended after 2017. An extension is likely to affect Australia's bauxite export values and volumes, as demand from China's alumina refineries declines. In addition, the 19th National Congress of Communist Party of China, to be held in mid-October 2017, will be important for the medium term direction of the Chinese economy and industry.

Another risk to the Australian bauxite export outlook is illegal mining activity in Malaysia. Despite the mining ban being implemented for almost two years, the country has exported over 9 million tonnes of bauxite to China. Before the moratorium, Malaysia was the largest bauxite exporter to China. The uncontrolled illegal mining in Pahang is likely to put Australian bauxite exporters under pressure, due to cheaper prices.

Figure 11.17: Australia's bauxite production



Source: Department of Industry, Innovation and Science (2017)

The return of exports from Indonesia, increased volumes from Guinea, and the decision by Chinese refiners to invest in bauxite export opportunities in Africa, are additional risks that will challenge Australia's market share in China.

Rising power costs in Australia will have a considerable impact on operational costs and profitability of Australian aluminium smelters, and hence bauxite demand.

Table 11.1: Aluminium, alumina and bauxite outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 s**	**2018 f**	**2019 f**	**2017 s**	**2018 f**	**2019 f**
Primary aluminium	kt							
Production	Kt	58,158	57,963	62,805	65,117	-0.3	8.4	3.7
Consumption	Kt	58,061	59,977	61,754	63,407	3.3	3.0	2.7
Closing stocks b		2,762	2,705	2,651	2,598	-2.0	-2.0	-2.0
– weeks of consumption		7.5	5.5	6.2	7.5	-26.5	13.2	19.9
Prices aluminium c								
– nominal	US$/t	1,604	1,995	1,957	1,766	24.4	-1.9	-9.8
– real d	US$/t	1,637	1,995	1,917	1,692	21.9	-3.9	-11.7
Prices alumina spot								
– nominal	US$/t	253.2	324.3	322.2	304.7	28.1	-0.6	-5.4
– real d	US$/t	258.3	324.3	315.5	292.0	25.5	-2.7	-7.4
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 s**	**2018–19 f**	**2016–17**	**2017–18 s**	**2018–19 f**
Production								
Primary aluminium	kt	1,649	1,518	1,591	1,588	-7.9	4.8	-0.2
Alumina	kt	20,550	20,599	20,639	20,792	0.2	0.2	0.7
Bauxite	Mt	81.5	84.9	85.9	94.6	4.2	1.2	10.1
Consumption								
Primary aluminium	kt	207	164	183	191	-20.9	11.6	4.2
Exports								
Primary aluminium	kt	1,442	1,328	1,408	1,397	-7.9	6.0	-0.8
– nominal value	A$m	3,241	3,158	3,831	3,276	-2.6	21.3	-14.5
– real value e	A$m	3,368	3,226	3,831	3,199	-4.2	18.7	-16.5
Alumina	kt	17,676	18,230	18,267	18,413	3.1	0.2	0.8
– nominal value	A$m	5,995	6,655	7,822	7,595	11.0	17.5	-2.9
– real value e	A$m	6,231	6,800	7,822	7,418	9.1	15.0	-5.2
Bauxite	Kt	20,971	24,856	25,158	28,380	18.5	1.2	12.8
– nominal value	A$m	992	1,043	1,134	1,229	5.1	8.7	8.4
– real value e	A$m	1,031	1,065	1,134	1,200	3.4	6.4	5.9
Total value								
– nominal	A$m	10,228	10,856	12,786	12,100	6.1	17.8	-5.4
– real e	A$m	10,629	11,092	12,786	11,818	4.4	15.3	-7.6

*Notes: **b** Producer and LME stocks; **c** LME cash prices for primary aluminium; **d** In 2017 calendar year US dollars; **e** In 2017–18 financial year Australian dollars; **f** Forecast; **s** Estimate*

Source: ABS (2017) International Trade in Goods and Services , 5368.0; AME Group (2017); LME (2017); Department of Industry, Innovation and Science (2017); International Aluminium Institute (2017); World Bureau of Metal Statistics (2017)

Copper

Resources and Energy Quarterly September 2017

Australia is the world's **3rd largest exporter** of copper ores and concentrates

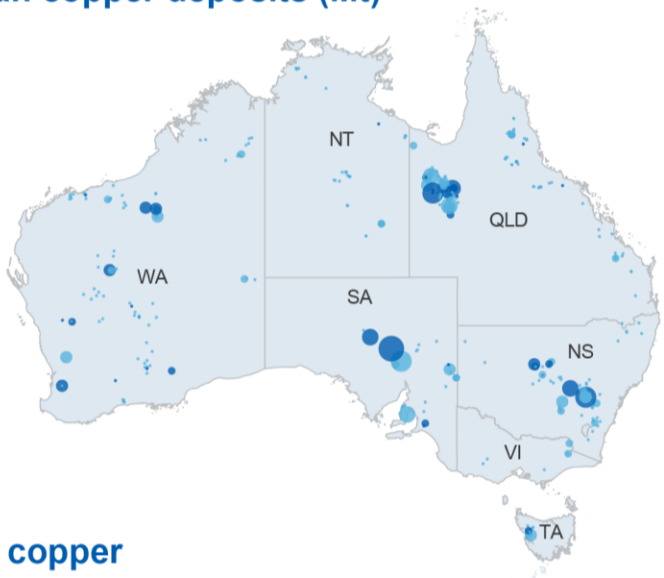
Australia is the **7th largest** producer of copper in the world

Copper is **100% recyclable** and nearly **80%** of the copper that has ever been produced is still in use today

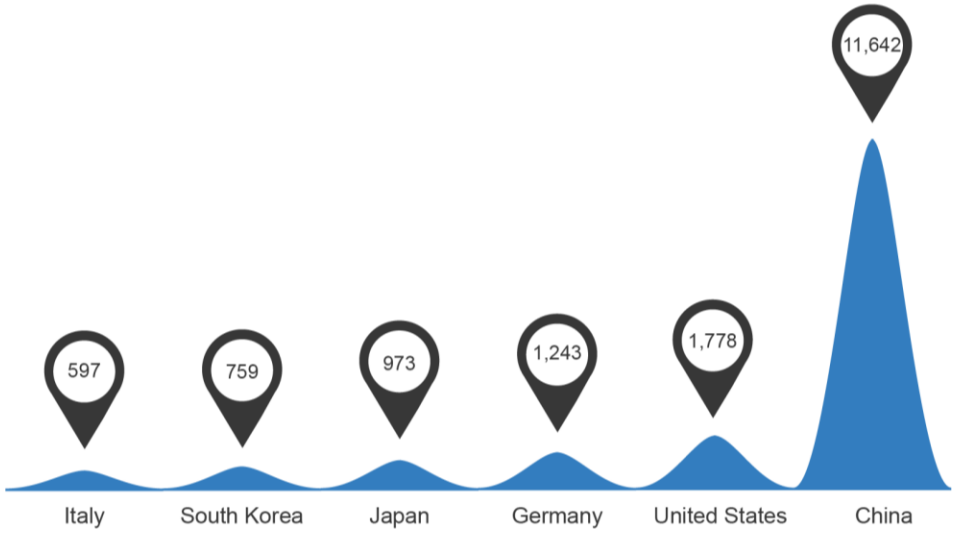
The average home contains **180 kg** of copper

Major Australian copper deposits (Mt)

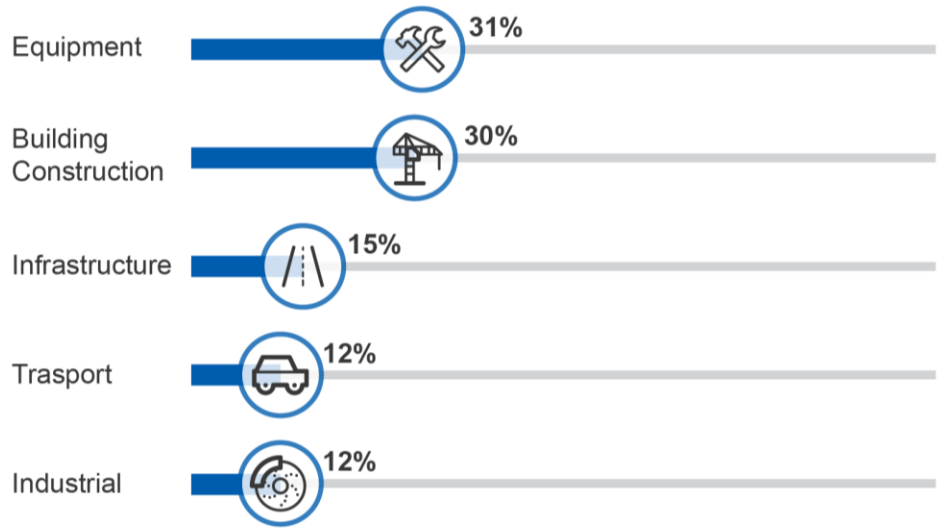
- <0.01
- 0.02
- 0.03–0.8
- 0.9–2.1
- 2.2–6.8
- >6.9
- Deposit
- Operating mine



Key copper consumer markets (thousand tonnes)



Global uses of copper



Summary

- World prices are expected to average US$6,050 a tonne in 2017, supported by steady demand from China and stronger industrial production. Copper prices are expected to decline to US$5,630 a tonne in 2018, as a result of firm growth in mine supply, and then rebound as consumption growth outpaces supply in 2019.
- The value of Australia's copper exports is forecast to increase from $7.5 billion in 2016–17 to $8.3 billion by 2018–19. Growth in export earnings will be supported by higher export volumes, while copper prices are forecast to rise in 2019 .
- Australia's copper exports are forecast to rise from 922,000 tonnes in 2016–17 to 1 million tonnes in 2018–19, supported by new mines and expansion projects over 2018 and 2019.
- Rising energy costs remain a key risk to the outlook for Australia's exports of refined copper. Electricity costs are expected to rise over the outlook period, adversely impacting energy-intensive smelters and refineries. Higher energy costs will drive the export of more copper ores and concentrates and less refined copper.

Prices

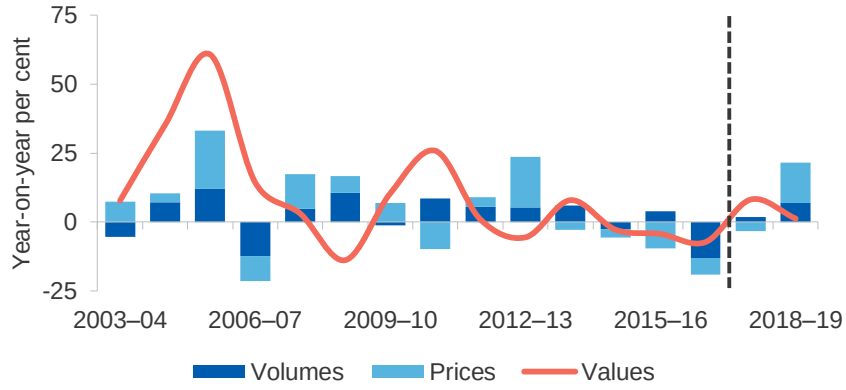
Copper prices reach a three year high in August

The London Metal Exchange (LME) copper price averaged US$6,350 a tonne in the September quarter, up from US$5,665 in the June quarter. The copper price was propelled higher by an improved outlook for copper consumption in China, a lower US dollar and news of industrial action in Chile and Peru — the world's two largest copper producers. The September quarter price gain came despite ample copper inventories. Copper inventories on the major global exchanges averaged 630,000 tonnes in the September quarter. While stock levels have fallen somewhat over the last two quarters, they remain near a three-year high.

Copper prices expected to taper in 2018

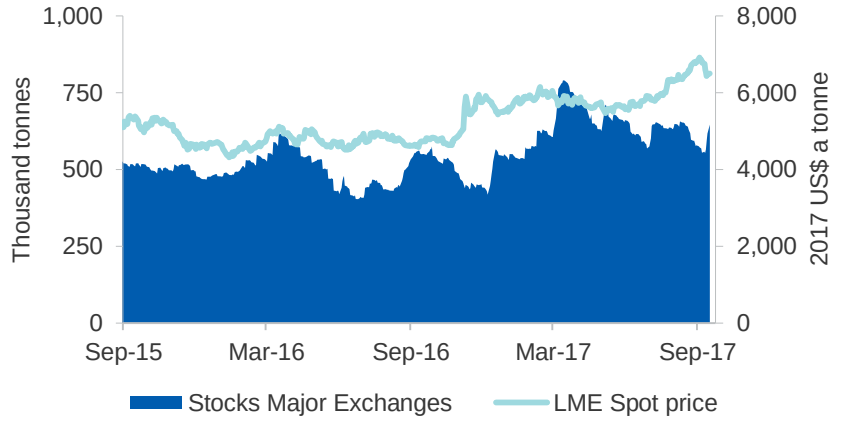
The LME copper price is forecast to decline to US$5,630 a tonne in 2018, driven by firm growth in mine supply, which will significantly outpace consumption growth. The copper price is forecast to rise to US$6,025 a tonne in 2019, as consumption outpaces supply.

Figure 12.1: Annual growth in Australia's copper export values, contributions from prices and export volumes



Source: ABS (2017) International Trade, 5465.0; LME (2017) official cash price; Department of Industry, Innovation and Science (2017)

Figure 12.2: Copper prices and stocks on major exchanges



Source: LME (2017) official cash price; Bloomberg (2017) stock inventory at LME, COMEX and SHFE

Higher mine supply is expected to result in a market surplus of 478,000 tonnes in 2018. Copper inventory — in terms of the number of weeks of consumption — is forecast to rise from 2.6 weeks in 2017 to 2.9 weeks in 2018. Consumption growth is expected to outpace growth in mine supply in 2019, resulting in a market surplus of 295,000 tonnes, with stock levels falling to 2.7 weeks of consumption.

China's demand for copper remains a key risk to the forecast. China's copper consumption intensity may start to taper over the outlook period, as the economy transitions more towards services and consumer driven growth. On the upside, an acceleration in demand for electric cars and renewable energy globally will lead to stronger growth in copper consumption. The average electric vehicle contains 85 kilograms of copper, compared to 25 kilograms for regular vehicles. Global sales of eclectic vehicles increased by 40 per cent year-on-year in the first eight months of 2017 to nearly 600,000 sales.

World consumption

Copper consumption weighed down by key markets

World refined copper consumption decreased by 1 per cent year-on-year in the June quarter 2017, to 6.1 million tonnes. Consumption was weighed down by lower usage in China and Europe, where demand fell by 2.9 and 1.7 per cent, respectively. Nonetheless, better than expected results for China's June quarter GDP (which grew by 6.9 per cent), firm growth in global industrial production, and a rising world Purchasing Manufactures Index (PMI) in August, point to a healthier outlook for copper consumption as 2017 comes to an end.

Consumption outlook improves

Global copper consumption is forecast to rise from 23 million tonnes in 2016 to 25 million tonnes in 2019, representing an average increase of 2 per cent each year. Higher copper consumption will be supported by firm growth in global industrial production and higher investment in energy infrastructure. Emerging economies are expected to drive much of the growth in copper consumption over the next two years.

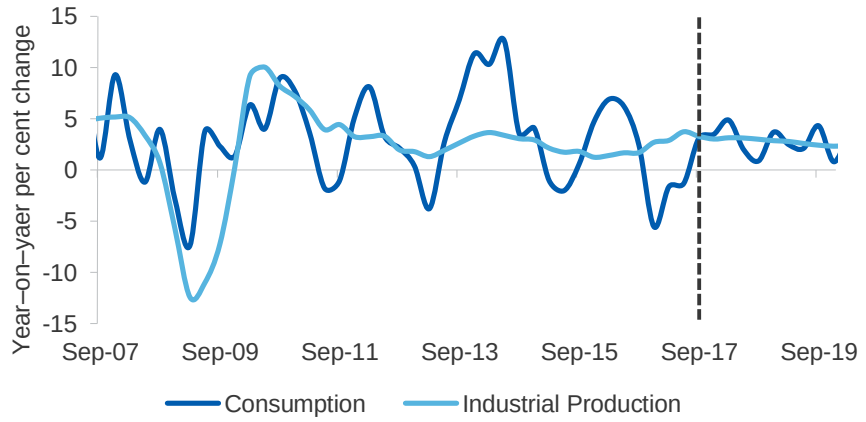
China's copper consumption — which accounts for 50 per cent of global demand — is expected to increase over the outlook period, driven by investment in the nation's power grid and firm growth in the construction and manufacturing sectors.

Growth in investment in the power grid has picked up after a slow start to the year, and is expected to rise in the second half of 2017.

Expenditure on China's power grid increased by 9.1 per cent year-on-year in the three months to August. China's copper consumption will also be supported by growth in the construction sector. Commercial 'floor-space started' — a leading indicator for China's construction sector — increased by 3.2 per cent year-on-year in the three months to August, pointing to higher copper consumption over the next 12 months.

Copper is used extensively in renewable energy technology and infrastructure, spending on which is expected to increase strongly over the outlook period. South Korea's new President, Mr Moon Jae-In's energy policy is expected to sharply increase the share of renewable energy in the country's electricity grid, from around 5 per cent to 20 per cent by 2030. South Korea was the world's fifth largest copper consumer in 2016.

Figure 12.3: World Copper Consumption Vs Industrial Production



Source: World Bureau of Metal Statistics (2017); Netherland CPB (2017); Department of Industry, Innovation and Science (2017)

World production

World copper mine production continues to grow at a steady pace

World mine copper production increased by 0.7 per cent year-on-year in the June quarter of 2017 to 5,249,000 tonnes. The steady rise in production was led by increased supply from Africa and Kazakhstan, which offset declines in Canada and Chile. Industrial action in Chile and Peru threatened to disrupt supply in July, but appears to have proven largely immaterial. New labour agreements averted strikes at Antofasgasta's Centinela and Zaldívar copper mines in Chile, while there was little impact on production from a five day nationwide strike in Peru.

World mine production expected to rise

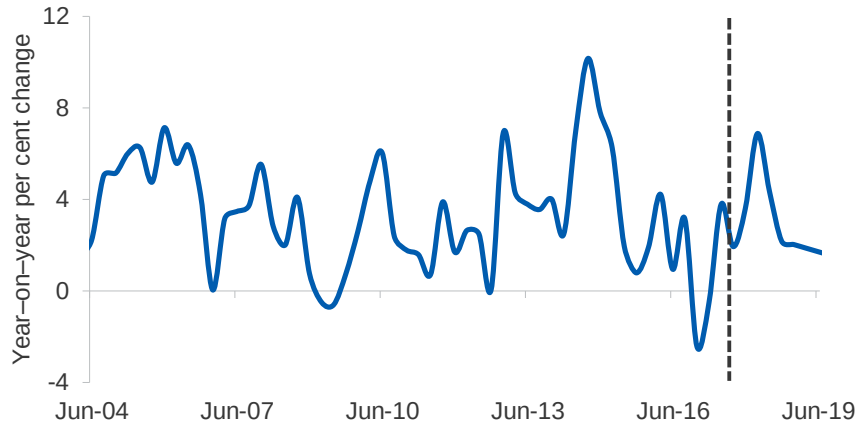
Global copper mine production is forecast to rise from 21 million tonnes in 2016 to 22 million tonnes by 2019, representing an average increase of 1.7 per cent per year. Growth in world mine supply will be driven by new mines and expansions across most of the major producing nations.

Eight out of thirteen expected new mines and expansion projects for 2017 are currently producing — accounting for almost half of the additional 430,000 tonnes of copper expected to come on line in 2017.

Mine production is expected to rise significantly in 2018, with over 1 million tonnes of additional supply (equal to a 4.1 per cent rise in total mine supply) expected to come on line. Cobre Panama, operated by First Quantum Minerals is expected to make the largest contribution to new mine supply, with an estimated annual capacity of 330,000 tonnes. The Qulong copper mine, operated by Tibet Julong Mining, is expected to be the second largest new project in 2018, with an annual production capacity of 120,000 tonnes. The two largest expansion projects — Codelco's Radomiro in Chile and Southern Copper's Toquepala in Peru — are expected to each contribute an additional 100,000 tonnes in 2018.

Mine expansions and new projects are expected to increase production capacity by a further 450,000 tonnes in 2019. The expansion of Chinalco's Toromocho copper mine in Peru will be the largest source of new supply, with an expected additional 100,000 tonnes to come on line in 2019. Several Australian mines are expected to contribute a further 87,000 tonnes of new and expanded production capacity in 2019, including Oz Minerals Carrapateena and BHP's Olympic Dam.

Figure 12.4: World Copper Refined Production



Source: World Bureau of Metal Statistics (2017); Department of Industry, Innovation and Science (2017)

World refined copper production rises in June

World refined copper production increased by 2.8 per cent year-on-year in the June quarter 2017, to 5.9 million tonnes. Higher production was led by China and Europe, which increased production by 183,000 and 92,000 year-on-year in the June quarter, respectively.

World refined copper output expected to rise over the outlook

Global refined copper production is forecast to rise from 23 million tonnes in 2016 to 25 million tonnes by 2019, representing an average increase of 2.5 per cent each year. Higher refined production will be driven by new refineries and expansion projects in China. New refineries and expansion projects in China are expected to raise production capacity by 600,000 tonnes in 2017. The expansion in China's refinery output is expected to continue over the rest of the outlook period, with an additional six projects expected to provide a combined output of 570,000 tonnes in 2018. Yunnan Copper in China is expected to add 675,000 tonnes in 2019, by expanding their Chifeng refinery and new Dongnan copper project.

Australia's production and exports

Copper exports set to increase over the outlook

Australia's copper export earnings increased by 3.5 per cent year-on-year in the June quarter to $2.1 billion. Higher earnings were underpinned by higher world prices, which offset a year-on-year fall in export volumes (down by 2.9 per cent). Exports of refined copper and copper ores and concentrates to China declined by 45 and 11 per cent year-on-year in the June quarter, respectively.

The value of Australia's copper export earnings is forecast to increase from $7.5 billion in 2016–17 to $8.3 billion in 2018–19. Australia's copper exports (in metal-content terms) are forecast to increase by 4.5 per cent annually from 922,000 tonnes in 2016–17, to 1 million tonnes in 2018–19. Australia's export earnings from copper will be supported by new projects and mine expansions.

Rising electricity costs will be a key risk to the outlook for Australia's export earnings from refined copper. Rising electricity costs reduce the competiveness of Australia's smelter and refinery operations, and will encourage producers to export larger quantities of ores and concentrates.

Production was declines in the June quarter

Australia's mine production declined by 7.3 per cent year-on-year in the June quarter, weighed down by interruptions at several mines including seismic activity at Newcrest's Cadia Valley, where production fell by 52 per cent year-on-year in the June quarter. Operations at Cadia Valley are expected to return to normal levels later this year.

Improved outlook for mine production

Australian production is forecast to increase by 5.7 per cent annually from 917,000 tonnes in 2016–17, to 1,025,000 tonnes by 2018–19.

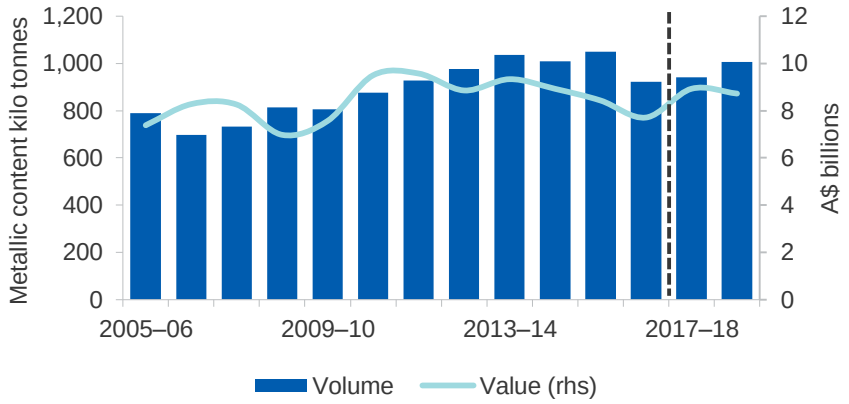
Higher Australian production will be driven by improved output at BHP's Olympic Dam — Australia's largest copper mine. BHP is investing $350 million on improvements to the Olympic Dam smelter. Production is expected to decline to 150,000 tonnes in 2017–18 while the changes take place; upon completion production from the smelter will increase, with output expected to rise to 215,000 tonnes in 2018–19.

Exploration expenditure improves

Australia's copper exploration expenditure increased by 31 per cent year-on-year in the June quarter 2017, to $42 million. This was likely driven by an improved outlook for copper prices.

The rise in the June quarter took 2016–17 copper exploration expenditure to $136 million, an increase of 4 per cent. This was the first yearly improvement since low prices triggered a steady decline in 2012. Higher exploration expenditure in 2016–17 was led by Queensland and New South Wales, where spending increased by 5 per cent and 11 per cent, respectively. Expenditure is expected to rise in 2017, as higher prices encourage new exploration.

Figure 12.5: Australian copper export volume and values



Source: ABS (2017) International Trade, 5465.0; Department of Industry, Innovation and Science (2017)

Table 12.1 Copper outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Production								
– mine	kt	20,794	20,688	21,537	21,890	-0.5	4.1	1.6
– refined	kt	23,343	23,858	24,767	25,173	2.2	3.8	1.6
Consumption	kt	23,411	23,618	24,289	24,878	0.9	2.8	2.4
Closing stocks	kt	1,095	1,203	1,367	1,273	9.8	13.6	-6.9
– weeks of consumption		2.4	2.6	2.9	2.7	8.9	10.5	-9.1
Price LME								
– nominal	US$/t	4,863	6,054	5,630	6,025	24.5	-7.0	7.0
	USc/lb	221	275	255	273	24.5	-7.0	7.0
– real b	US$/t	4,962	6,054	5,514	5,774	22.0	-8.9	4.7
	USc/lb	225	275	250	262	22.0	-8.9	4.7
Australia	**Unit**	**2015–16**	**2016–17 s**	**2017–18 f**	**2018–19 f**	**2016–17 s**	**2017–18 f**	**2018–19 f**
Mine production	kt	990	917	969	1,025	-7.3	5.7	5.7
Refined production	kt	514	448	480	478	-12.9	7.2	-0.3
Export volume								
– ores and conc. c	kt	1,870	1,759	1,703	1,971	-5.9	-3.2	15.7
– refined	kt	507	413	444	444	-18.5	7.6	-0.1
– total metallic content	kt	1,050	922	940	1,006	-12.2	1.9	7.1
Export value								
– nominal	A$m	8,110	7,544	8,185	8,288	-7.0	8.5	1.3
– real d	A$m	8,428	7,708	8,185	8,095	-8.5	6.2	-1.1

*Notes: **b** In 2017 calendar year US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2017–18 financial year Australian dollars; **f** Forecast; **s** Estimate.*
Source: ABS (2017) International Trade, 5465.0; LME (2017) spot price; World Bureau of Metal Statistics (2017) World Metal Statistics; Department of Industry, Innovation and Science (2017).

Nickel

Resources and Energy Quarterly September 2017

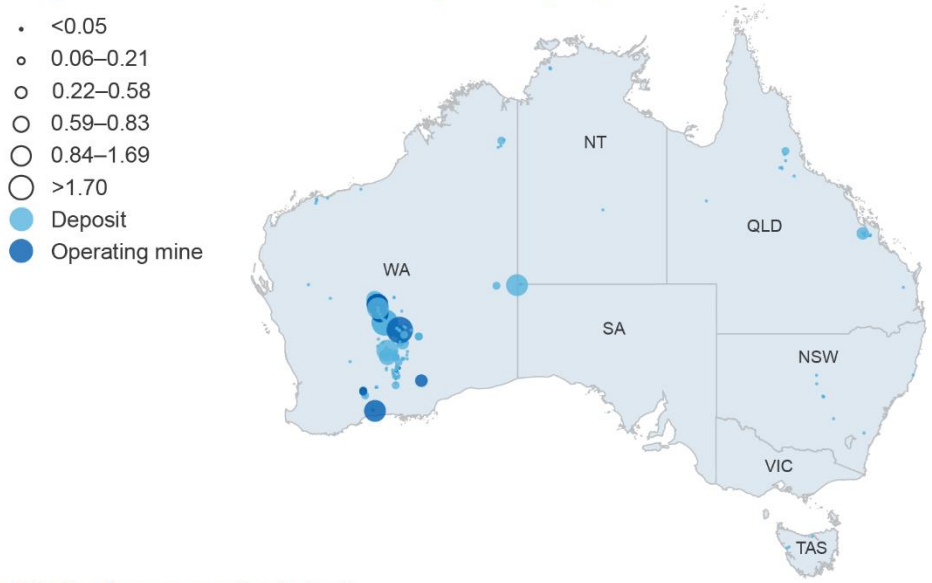
5th largest miner in the world

Australia produces **>200** thousand tonnes of nickel each year

Nickel exports earned **>$2.3b** in 2016–17

10% of world nickel mined is in Australia

Major Australian nickel deposits (Mt)



Key nickel consumer markets (tonnes)

Global uses of nickel

68%
Stainless steel

16%
Alloys

9%
Plating

3%
Casting

3%
Batteries

1%
Other

Summary

- Australia's nickel export earnings declined by 20 per cent to $2.3 billion in 2016–17, largely reflecting a decline in export volumes.
- Earnings are forecast to fall slightly to $2.2 billion in 2017–18, before rising to $2.4 billion in 2018–19, supported by rising prices and the ramping up of production at Independence Group's Nova mine.
- Export volumes fell by 31 per cent to 172,000 tonnes in 2016–17, as production at Queensland Nickel's Yabulu refinery ceased and several mines were closed in Western Australia. Volumes are expected to lift to 194,000 tonnes by 2018–19.
- The nickel price is forecast to fall by around 1 per cent to $US9,671 per tonne in 2017, but subsequently increase in 2018 and 2019.

Prices and stocks

Nickel prices are expected to rise from their present low level

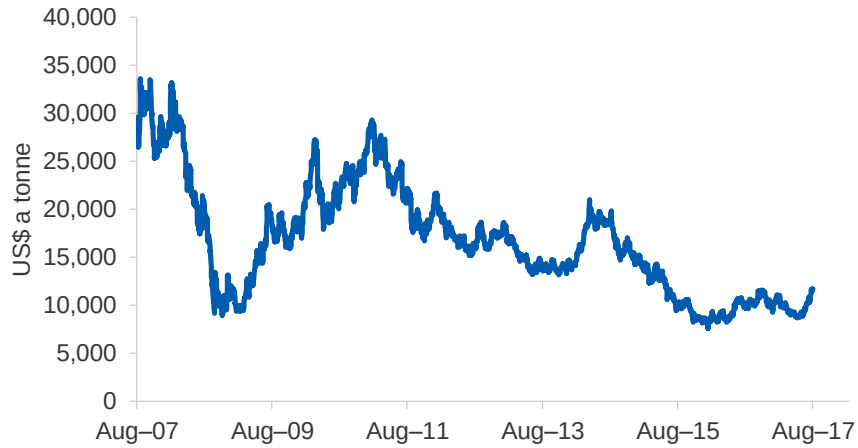
LME nickel prices rose in July and August, and are estimated to have averaged around $US9,437 per tonne in the September quarter. This is around 2.2 per cent higher than the June quarter, but 8.1 per cent lower than in the September quarter 2016. The recent rise reflects expectations of higher Chinese demand — in line with its recent stimulus push — and some recent falls in nickel inventories.

The outlook for nickel prices over the next two years has been revised up, following stronger-than-expected demand growth in China, which is seeking to increase its output of stainless steel.

Output from the Philippines remains relatively low, following a crackdown on environmental mismanagement at some nickel minesites. Stockpiles at LME registered warehouses fell in the September quarter to their lowest level since January 2017.

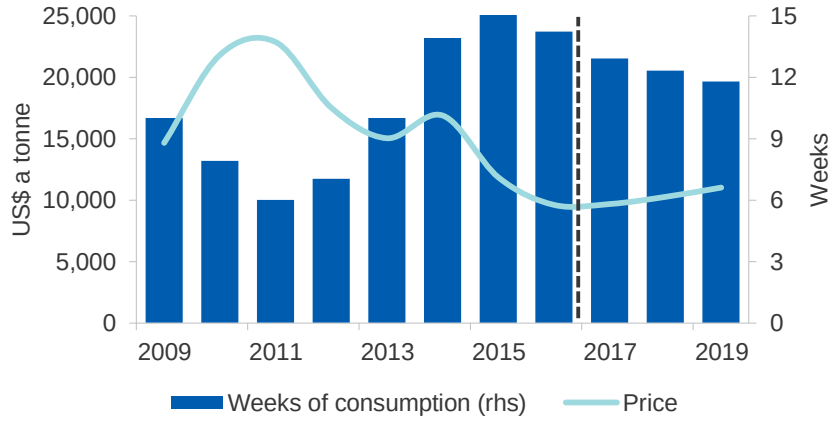
On balance, nickel prices are forecast to increase slowly but steadily over the next two years, though significant uncertainty over supply could lead to periods of volatility, with the potential for prices to drop below the low end of the consensus range. Prices are expected to rise, from $US9,670 per tonne in 2017 to $US10,250 per tonne in 2018, and $US11,000 per tonne in 2019.

Figure 13.1: LME nickel spot price



Source: Bloomberg (2017) London Metal Exchange

Figure 13.2: Nickel stocks and price



Source: ABS (2017) International Trade in Goods and Services, 5368.0;Department of Industry, Innovation and Science (2017)

World consumption

Stainless steel production is driving increased nickel consumption

World nickel consumption increased by 3.2 per cent year-on-year in the June quarter 2017. Growth was driven by stronger consumption in South Africa, the US, India and Japan. World nickel consumption is forecast to grow by 5.1 per cent in 2018, and by 4.4 per cent in 2019.

Nickel consumption growth has been supported by a rapid increase in stainless steel production in China (69 per cent of the China's nickel use is in the manufacture of stainless steel). India replaced Japan as the world's second largest stainless steel producer in 2016, and its demand for nickel is expected to rise by around 3 per cent year-on-year in the June quarter 2017.

World production

Production is rising as governments seek to remove constraints

World mined nickel production rebounded sharply in the June quarter, increasing by 21.2 per cent to 549,000 tonnes, up by 10.4 per cent year-on-year. The result was driven in large part by a substantial rise in production in Indonesia, the Philippines and New Caledonia.

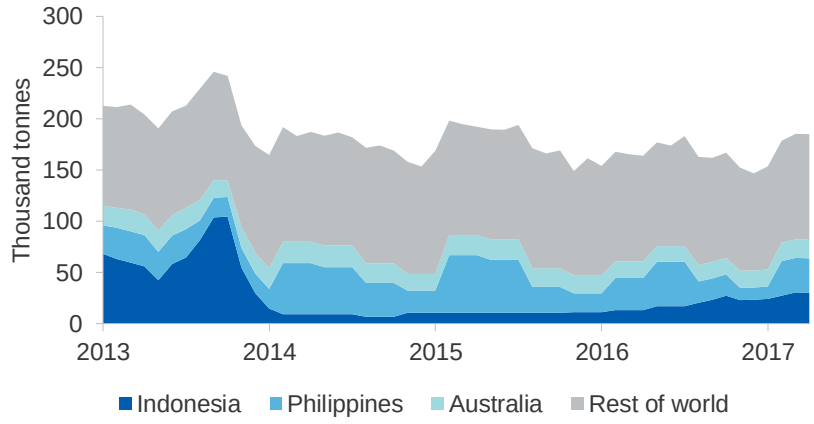
In the Philippines, Regina Lopez — who as acting Secretary of the Department of Environment and Natural Resources ordered 23 mine closures, cancelled 75 mining exploration contracts and banned new open-pit mines — was dropped from her position on 2 May. Subsequently, mine production has lifted substantially. Nickel exports from Indonesia have also increased, as the ban on nickel ore exports was conditionally eased in January 2017. The ban had been introduced in January 2014, to provide support to 'higher value added' refining industries.

Australia's exploration, production and exports

Exploration expenditure rebounded in the June quarter

Nickel and cobalt exploration expenditure increased by 80 per cent year-on-year to $A21.6 million in the June quarter 2017 — the highest quarterly expenditure on nickel and cobalt exploration since 2011.

Figure 13.3: World mined nickel production, monthly



Source: International Nickel Study Group (2017)

Figure 13.4: Australia's nickel and cobalt exploration expenditure, quarterly

Source: ABS (2017) Mineral and Petroleum Exploration 8412.0

Australian production is falling due to a series of mine closures

Australia's refined and intermediate nickel production fell by 23.5 per cent to 142,000 tonnes in 2016–17, while mined production fell by 7.2 per cent to 201,000 tonnes.

The decline in Australia's nickel production in 2016–17 reflects the closure of both Queensland Nickel's Yabulu refinery in 2016 and several mines in Western Australia, including Mincor's Kambalda mine and Panoramic Resources' Savannah and Lanfranchi mines.

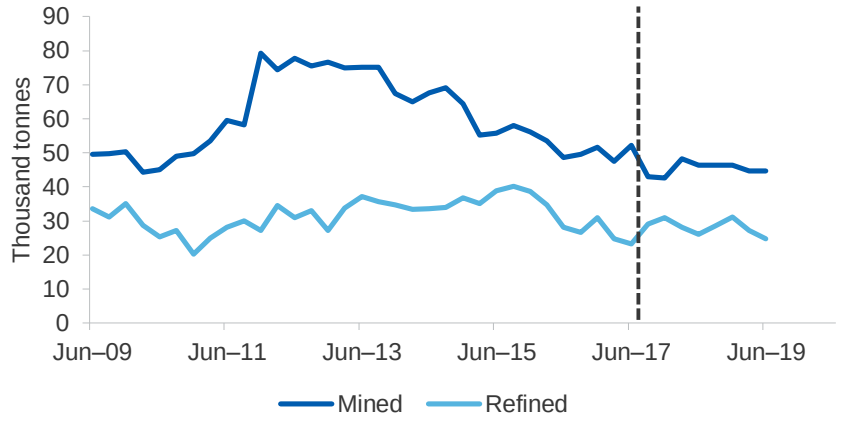
Declining nickel production during 2017 is also attributed to temporary disruptions. Glencore's Murrin Murrin mine reported a 33 per cent year-on-year drop in own-source nickel production in the March quarter 2017, which it attributed to maintenance stoppages. Nickel metal production at BHP's Nickel West facility declined early in the year, but production across most mines has subsequently picked up, with BHP expecting production at the Nickel West facility to increase further following recent debottlenecking activities.

In August, First Quantum Minerals announced that its Ravensthorpe nickel mine in Western Australia would close in early September. In a statement, the company noted, 'Ravensthorpe is an excellent operation with an outstanding workforce and supportive community, but the continuing depressed nickel market conditions, over some years, leaves us no option.' Around 270 jobs will be lost at the site, and nickel production in Australia will be reduced by about 4 per cent as a result.

Export earnings are expected to bottom out in 2017–18

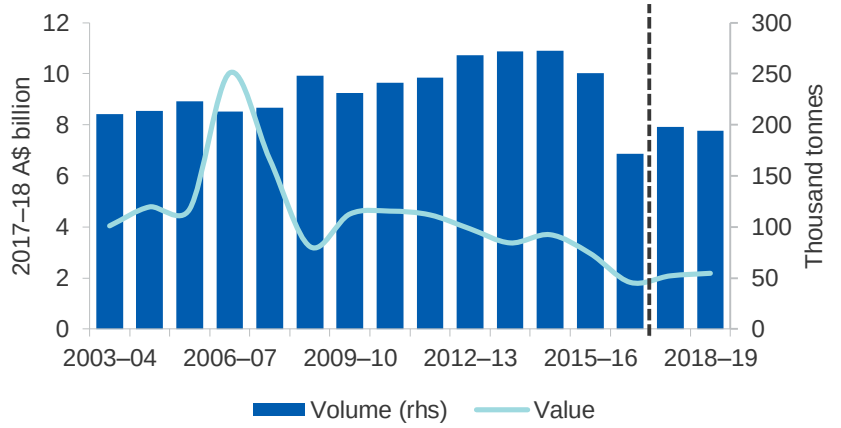
Australia's nickel export earnings declined by 20 per cent to $2,334 million in 2016–17, largely reflecting a sharp decline in export volumes. The decline in export values reflects falls in both refinery and mine output, and particularly sharp declines in ores and concentrate exports. Export values are forecast to decline by a further 7 per cent, to $2,166 million in 2017–18, due to the closure of Ravensthorpe and falls in production at other mines. However, some recovery is expected in 2018–19, with export values expected to rise by 10 per cent to $2,389 million, as prices recover and production ramps up at Independence Group's Nova mine.

Figure 13.5: Australia's nickel production



Source: Department of Industry, Innovation and Science (2017)

Figure 13.6: Australia's nickel export volumes and values



Source: ABS (2017) International Trade in Goods and Services, 5368.0;Department of Industry, Innovation and Science (2017)

Table 13.1 Nickel outlook

						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Production								
– mine	kt	1,990	2,150	2,278	2,378	8.0	5.9	4.4
– refined	kt	1,984	2,135	2,266	2,366	7.6	6.1	4.4
Consumption	kt	2,033	2,146	2,256	2,356	5.6	5.1	4.4
Stocks	kt	555	533	533	533	-4.0	0.0	0.0
– weeks of consumption		14.2	12.9	12.3	11.8	-9.0	-4.5	-4.1
Price LME								
– nominal	US$/t	9,599	9,671	10,253	11,008	0.8	6.0	7.4
	Usc/lb	435	439	465	499	0.8	6.0	7.4
– real b	US$/t	9,795	9,671	10,042	10,549	-1.3	3.8	5.0
	Usc/lb	444	439	456	478	-1.3	3.8	5.0
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17**	**2017–18 f**	**2018–19 f**
Production								
– mine cs	kt	216	201	180	182	-7.2	-10.3	1.0
– refined	kt	142	106	114	111	-25.5	8.1	-2.4
– intermediate	kt	44	36	40	38	-16.9	10.2	-4.6
Export volume ds	kt	250	172	186	183	-31.4	8.6	-1.9
– nominal value s	A$m	2,909	2,334	2,166	2,389	-19.8	-7.2	10.3
– real value es	A$m	3,023	2,384	2,166	2,334	-21.1	-9.1	7.7

Notes: ***b*** *In 2017 calendar year US dollars;* ***c*** *Nickel content of domestic mine production;* ***d*** *Includes metal content of ores and concentrates, intermediate products and nickel metal;* ***e*** *In 2017–18 financial year Australian dollars;* ***f*** *Forecast,* ***s*** *Estimate,* ***z*** *Projection*

Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Innovation and Science; International Nickel Study Group (2017); LME (2017); World Bureau of Metal Statistics (2017).

Zinc

Resources and Energy Quarterly September 2017

843,000 tonnes
of zinc were mined in Australia in 2016–17

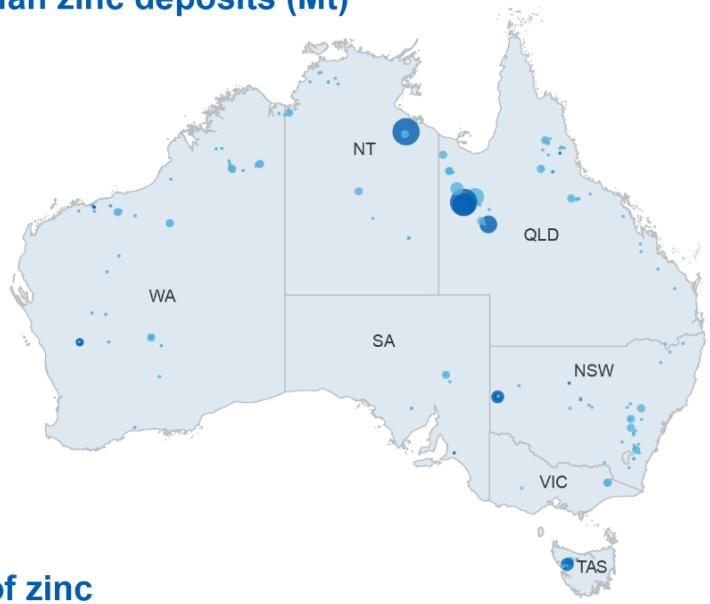
Zinc exports will earn
$2.7 billion
for Australia in 2016–17

Australia is the
3rd highest
producer of zinc
in the world

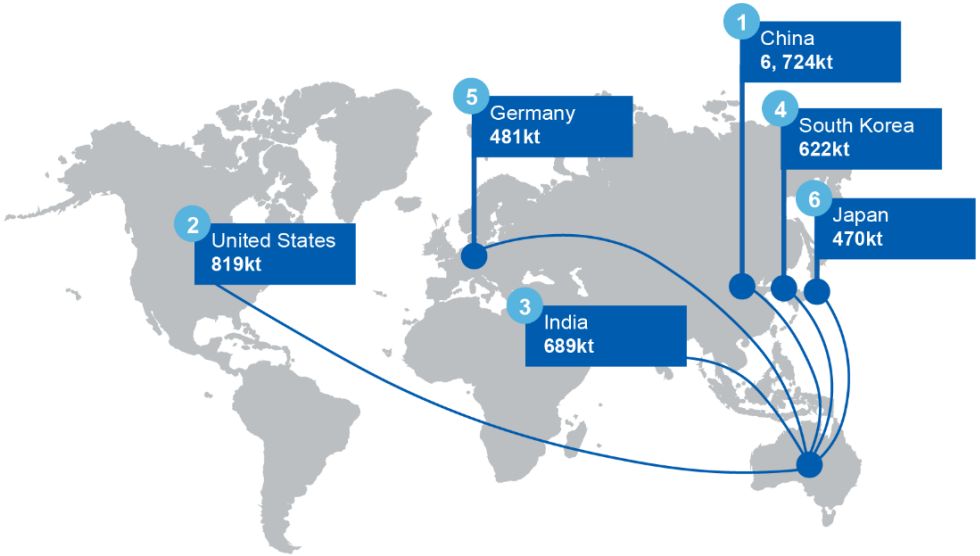
Australia holds
20%
of the worlds
known zinc
resources

Major Australian zinc deposits (Mt)

- <0.01
- 0.02–0.03
- 0.04–0.09
- 0.10–0.20
- 0.21–0.44
- >0.45
- Deposit
- Operating mine



Key zinc consumer markets



Global uses of zinc

50%
galvanise steel

17%
diecasting

17%
make brass and
bronze alloys

6%
rolled zinc

6%
chemicals

4%
other

Summary

- Market fundamentals continue to strengthen for zinc producers, with the price lifting to 10-year highs over the past 12 months.
- Export earnings are forecast to decline slightly to $2.66 billion in 2017–18, due to falls in zinc production. A recovery in Australian production is expected to lift zinc exports to $2.83 billion in 2018–19.
- Australia's ability to capitalise on high prices has been hampered by mine closures over the past two years. Exports of zinc (metallic content) are expected to bottom out at 959,000 tonnes in 2017–18, before recovering to 1,118,000 tonnes in 2018–19, as three new mines commence operation.

Prices and stocks

Zinc prices have lifted strongly due to supply constraints

The LME zinc price is forecast to average $US2,800 per tonne in 2017 — 34 per cent higher than the average for 2016. The price reached 10-year highs during August and September, rising above $3,100 a tonne, with potential to rise further before the end of the year. This follows an announcement of lower-than-expected Chinese production in July. Repeated price spikes reflect acute shortages in global production, which have led to inventory drawdowns and relatively low global stocks.

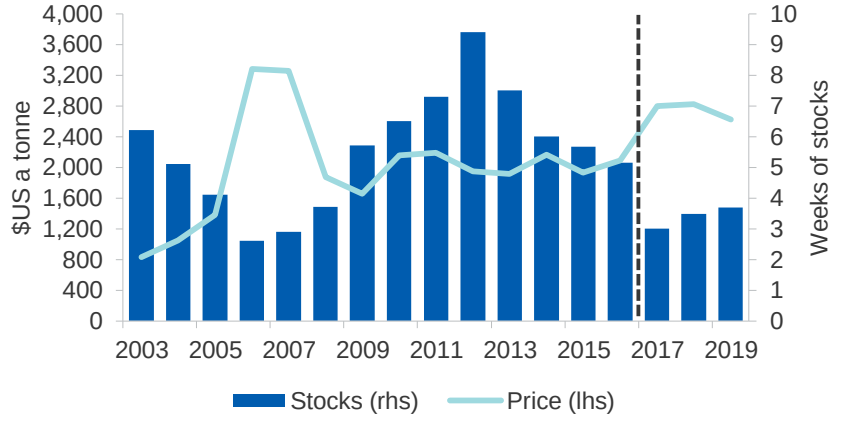
Prices regularly fell below $US2,000 a tonne during 2015 and 2016; however, no return to this price level is expected in the foreseeable future. Although efforts are being made to expand production in a number of countries, consumption growth is also rising rapidly. Infrastructure development and growing use of automobiles in China and India are creating huge new markets for zinc, which will lift the base price to a higher floor. Increased production in China and elsewhere should help to stabilise prices at around $2,820 per tonne in 2018, and then bring prices down slightly to $US2,625 per tonne in 2019.

Some risks to the outlook are evident: infrastructure spending in the United States may not materialise, or may occur at a slower rate than planned. The Chinese Government may also prioritise increased production on a scale which significantly increases global supply. However given present market fundamentals , even substantial change on those fronts is unlikely to bring prices down sharply.

Figure 14.1: Zinc monthly price

Source: LME (2017) zinc spot price

Figure 14.2: Annual zinc spot price and weeks of stocks



Source: LME (2017) zinc price; Department of Industry, Innovation and Science (2017)

World consumption

Automobile and infrastructure sectors are the key to consumption growth

World refined zinc consumption is expected to rise by 3.3 per cent to 14.4 million tonnes in 2017. China, which consumes around half of the world's refined zinc, is expected to continue driving demand, through ongoing public sector investment. There is also a potential for higher zinc demand in the US, as a result of healthy manufacturing activity and the potential for substantial new government infrastructure investment. Global consumption is forecast to rise by 3.4 per cent to 14.9 million tonnes in 2018 and by 3.6 per cent to 15.4 million tonnes in 2019. Inventories are expected to remain under pressure, though a ramp up in supply should allow some inventory rebuild by 2019.

Rising incomes in China and India, and falling fuel prices, are creating the conditions for rising car ownership. And there is substantial potential for car ownership to rise: per capita car ownership in the US is four times higher than in China, and twenty times higher than in India.

Concerns over air pollution — which causes nearly 3 million premature deaths each year across China and India — will muddy the outlook for zinc. On the automotive front, air pollution concerns are likely to lead to a push for fuel efficiency, which will support a shift from steel-made cars to lighter aluminium-based models. This will reduce the per-unit use of zinc in automobile construction.

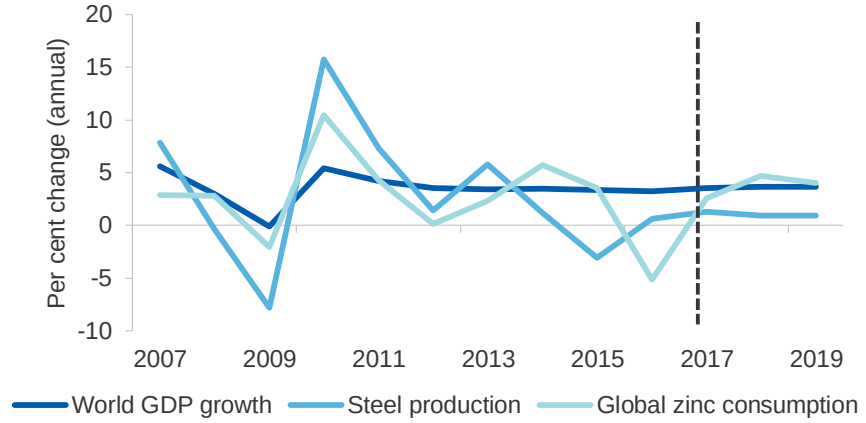
However, efforts to reduce urban pollution are also driving substantial investment in mass transit systems in China and India, which will create substantial new demand for zinc. Zinc is essential for steel, and also plays a role in improving corrosion resistance in train carriage bodies and rails. In India, corrosion currently reduces the life of rail by half, creating significant disruption and extra costs. Governments in India and China have committed more than $US200 billion towards new investment in rail networks over the next five years.

World production

World mined production is expected to pick up

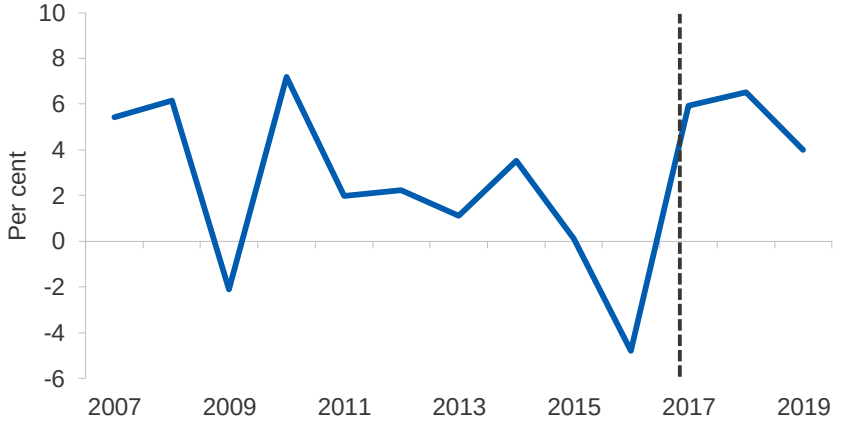
Zinc mine production is expected to lift by 6 per cent to 13.6 million tonnes in 2017. Global production will be supported by strong growth (of around 8 per cent) in Chinese output. Indian output is also expected to lift, following Hindustan Zinc's successful transition to underground

Figure 14.3: Annual change in global GDP, steelmaking and zinc use



Source: IMF (2017), Department of Industry, Innovation and Science estimates

Figure 14.4: Global mined zinc production (annual change)



Source: IMF (2017), Department of Industry, Innovation and Science estimates

operations at its Rampura Agucha mine. Output at the large Antamina mine in Peru also appears set to exceed expectations for the year.

Investment in new and expanded capacity in China is expected to drive further increases in supply, to 14.5 million tonnes in 2018 and 15.1 million tonnes in 2019. Stocks are expected to remain tight, though pressures may ease somewhat in 2019 as new supply builds.

Refined production is constrained, but the outlook is improving

For several years, refined production has been affected by mine closures and the suspension of smelter operations. Production is expected to edge down to 13.8 million tonnes in 2017, affected by strikes in Canada and floods in Peru. However, the impacts of these disruptions are already passing, and significant new capacity in China is expected to come online in 2018. Indian output is also expected to rise, supported by the improving availability of concentrates in its domestic market. These factors should help support a rise in production — by 6.3 per cent to 14.7 million tonnes in 2018 and a further 4.1 per cent to 15.3 million tonnes in 2019.

Australia's exploration, production and exports

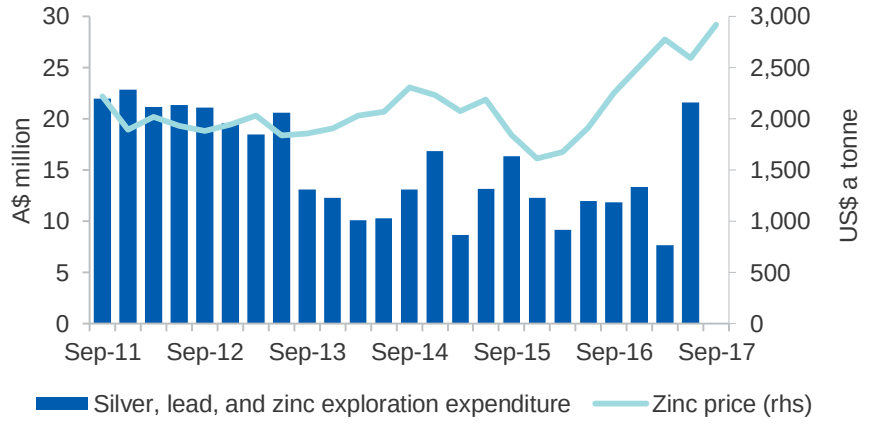
Higher prices have led to a strong rebound in exploration expenditure

Australia's expenditure on zinc, lead and silver exploration rebounded in the June quarter, after several quarters of decline. Expenditure almost tripled in the June quarter, rising to $21.6 million from $7.7 million in the March quarter. Strong zinc prices are the likely cause of this renewed interest among resource companies. Expenditure picked up most notably in the north and west of Queensland.

Australian mined production is forecast to decrease

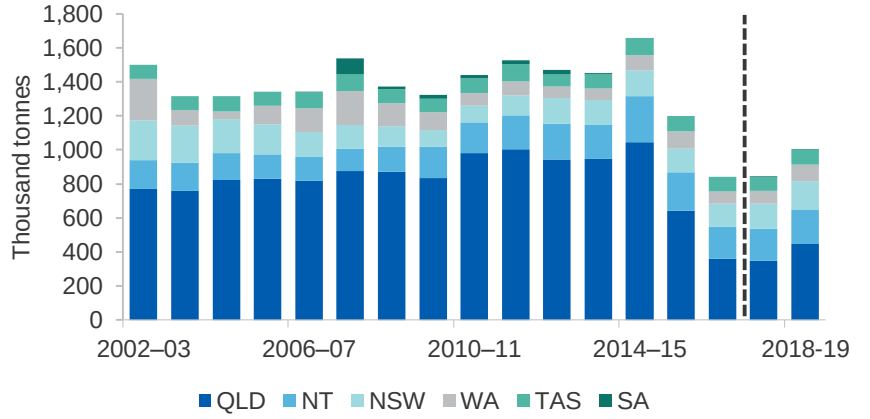
Australia's mined zinc production is expected to be stable in 2017–18, edging up from 843,000 tonnes to 846,000 tonnes. Production is expected to rise much more strongly in 2018–19 to 1,003,000 tonnes. This will be driven, in large part, by the commencement of MMG's Dugald River mine, which is expected to become one of the ten largest zinc mines in the world. KBL's Sorby Hills mine and Heron Resources' Woodlawn mine are also expected to commence operations in 2018–19, with Independence Group's Stockman operation following in the second half of 2019.

Figure 14.5: Australia's silver, lead & zinc exploration expenditure



Source: ABS (2017) Mineral and Petroleum Exploration, cat. no. 8412.0; LME (2017)

Figure 14.6: Australia's mine production by state



Source: Company reports; Department of Industry, Innovation and Science (2017)

Australia's refined production is set to increase marginally

Australia's refined production increased by 7 per cent to 466,000 tonnes in 2016–17, supported by increased production at Sun Metals' Townsville smelter in the first half of the year. A further small increase to around 500,000 tonnes is expected in 2017–18, supported by additional mined production from Dugald Diver and Sorby Hills. Refined production is expected to remain at around 500,000 tonnes in 2018–19.

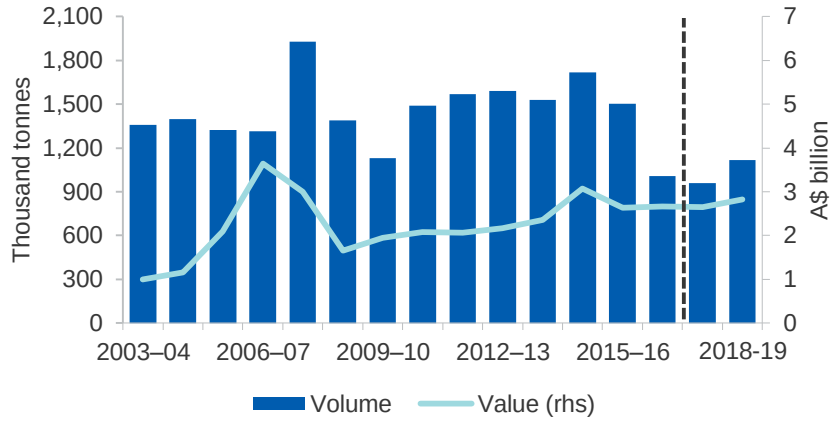
Export earnings are set to grow, supported by rising production

Export earnings are expected to edge down from $A2,667 million in 2016–17 to $2,655 million in 2017–18, due to constraints on mined output. However, strong prices should stimulate increased production in 2018–19, pushing export earnings back up to $A2,826 million.

Export volumes of metallic content are expected to fall from 1,009,000 tonnes in 2016–17 to 959,000 tonnes in 2017–18, reflecting the delayed impact of earlier mine closures and production cuts. Additional output from substantial new mines (Dugald River and Sorby Hills) should support a recovery in production to 1,118,000 tonnes in 2018–19.

Infrastructure development, automotive expansion and a rollout of rail in nearby Emerging economies will create strong demand for Australian zinc over the next few years. However, Australia's export capacity remains constrained, following the closure of MMG's 500,000 tonne Century mine in 2016. This constraint should ease in 2018–19, as new mines open in Western Australia, Queensland, and NSW.

Figure 14.7: Australia's zinc exports



Source: ABS (2017) International Trade in Goods and Services, cat. No. 5368.0; Department of Industry, Innovation and Science (2017)

Table 14.1 Zinc outlook

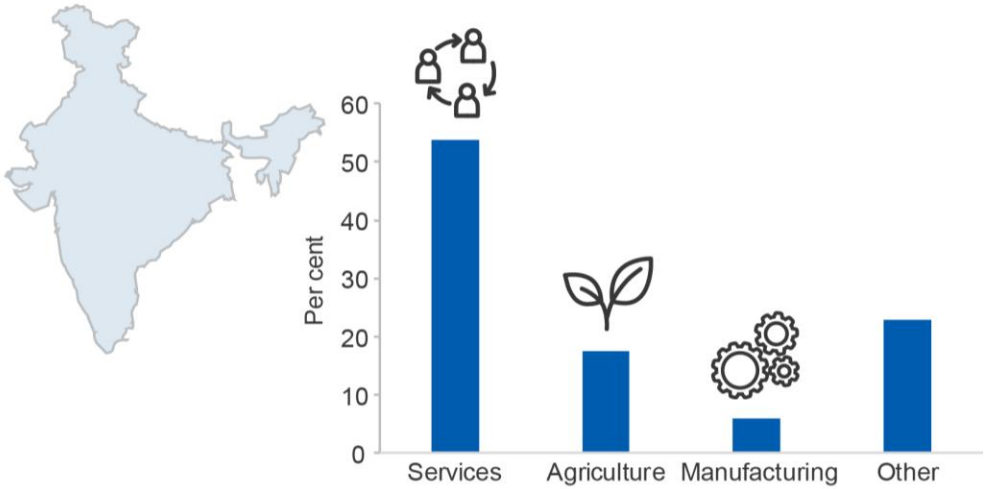
						Annual percentage change		
World	**Unit**	**2016**	**2017 f**	**2018 f**	**2019 f**	**2017 f**	**2018 f**	**2019 f**
Production								
– mine	kt	12,838	13,599	14,485	15,063	5.9	6.5	4.0
– refined	kt	14,004	13,819	14,693	15,299	-1.3	6.3	4.1
Consumption	kt	13,914	14,369	14,858	15,398	3.3	3.4	3.6
Closing stocks	kt	1,375	825	990	1,089	-40.0	20.0	10.0
– weeks of consumption		5	3	3	4	-41.9	16.1	6.1
Price								
– nominal	US$/t	2,092	2,799	2,820	2,625	33.8	0.7	-6.9
	USc/lb	95	127	128	119	33.8	0.7	-6.9
– real b	US$/t	2,135	2,799	2,762	2,516	31.1	-1.3	-8.9
	USc/lb	97	127	125	114	31.1	-1.3	-8.9
Australia	**Unit**	**2015–16**	**2016–17 s**	**2017–18 f**	**2018–19 f**	**2016–17 s**	**2017–18 f**	**2018–19 f**
Mine output	kt	1,197	843	846	1,003	-29.6	0.4	18.6
Refined output	kt	459	466	500	500	1.6	7.3	0.0
Export volume								
– ore and conc. c	kt	2,222	1,481	1,478	1,845	-33.3	-0.2	24.9
– refined	kt	497	372	325	327	-25.1	-12.8	0.6
– total metallic content	kt	1,507	1,009	959	1,118	-33.1	-4.9	16.6
Export value								
– nominal	A$m	2,628	2,667	2,655	2,826	1.5	-0.4	6.4
– real d	A$m	2,731	2,725	2,655	2,760	-0.2	-2.5	3.9

*Notes: **b** In 2017 US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2017–18 Australian dollars; **f** Forecasts*
Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Innovation and Science; International Lead Zinc Study Group (2017); LME (2017); World Bureau of Metal Statistics (2017)

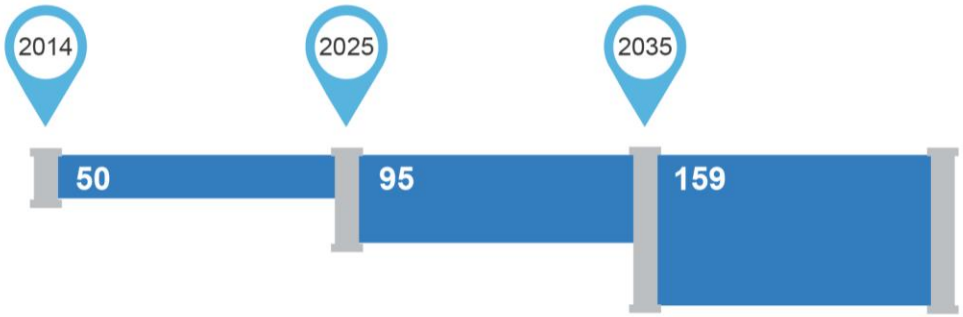
India – the other population superpower

Resources and Energy Quarterly September 2017

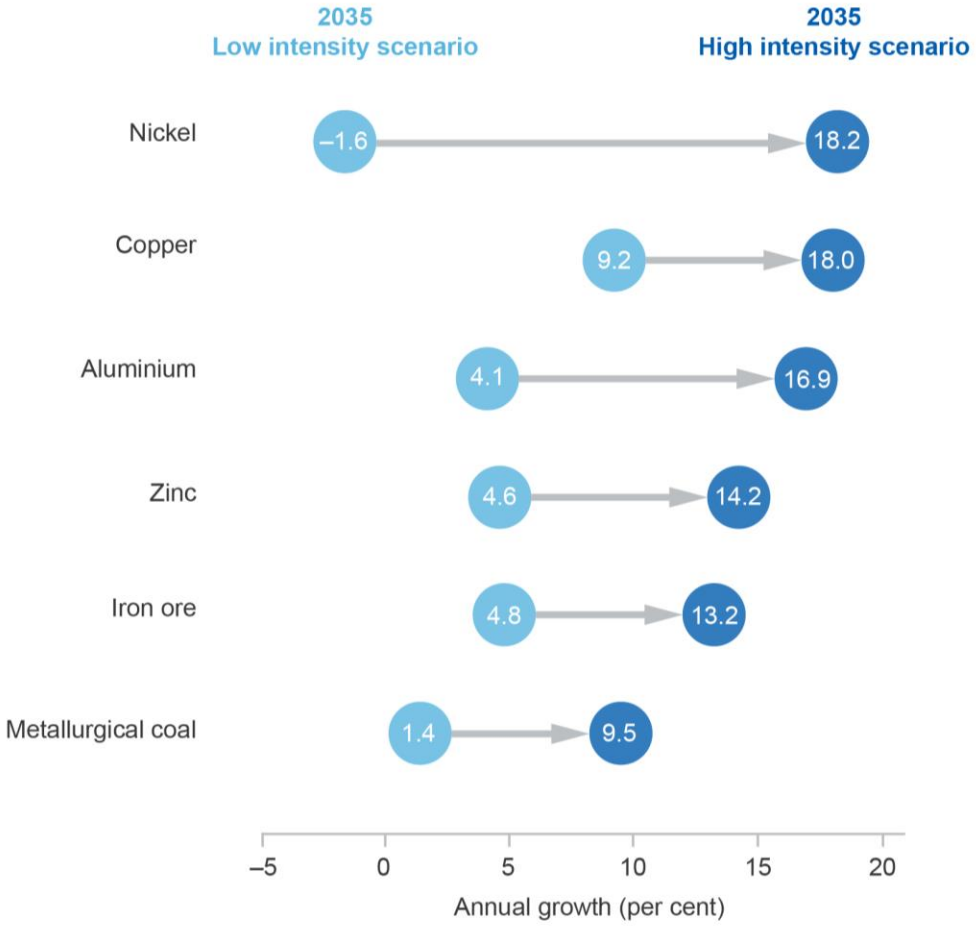
India's GDP by industry share



India's projected gas consumption (billion cubic meters)



At what rate will India's commodity use grow?



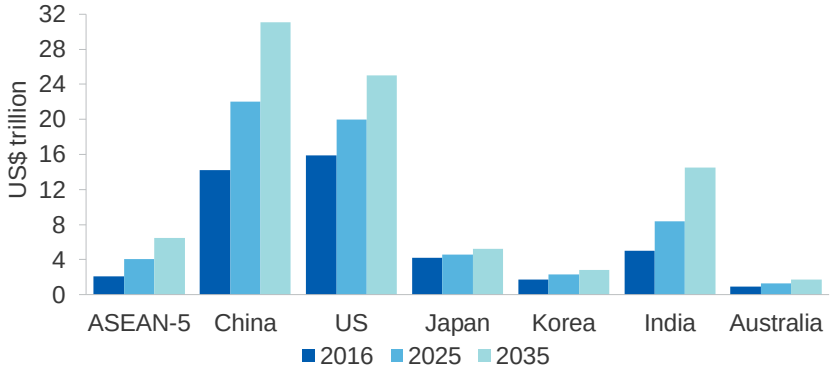
India — prospects for resource commodity usage

As the Chinese economy continues to consume staggering amounts of resource commodities — many of them from Australia — questions arise about the potential volume of resource commodities that India — the world's other population 'superpower' — might consume in the coming two decades. In contrast to China, India's economy is much more services-based, and currently tends to use much fewer resource commodities than China. This chapter aims to give likely upper and lower bounds of Indian resource commodity usage over the next 20 years, and tries to quantify how much of that usage might be satisfied from India's own supplies or be imported.[1]

To estimate possible future metal consumption, the study uses historical per capita commodity consumption data of other nations, and combines these with population projections for India to estimate total tonnages. For energy commodities, the chapter relies on estimates by the International Energy Agency (IEA). The IEA considers a range of factors when forecasting a nation's energy use, including that nation's energy policy, its pollution concerns and its commitments to international climate change accords. A significant factor also considered by the IEA is already chronic air pollution in some major India cities, which has come at a very early stage of the industrialisation process. The IEA estimates also consider the likelihood that India may take a non-traditional path to energy usage and production: the widespread use of renewables could allow India to use much less coal and biomass fuels than it otherwise might have.

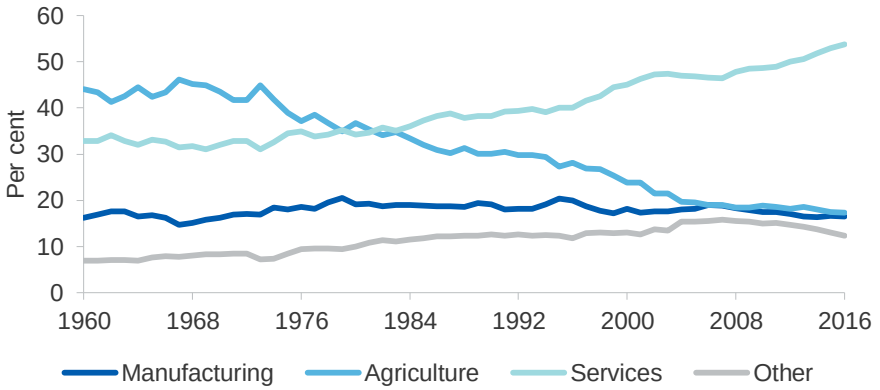
As well as being a large consumer of some resource commodities, India is also a significant producer — and holds large reserves — of some of those resource commodities. For example, State-owned Coal India is the world's largest coal producing entity; however, India's coal reserves are of relatively low grade compared with nations such as Australia. India also has significant iron ore reserves. This chapter considers these factors when determining whether India might import large quantities of resource commodities. It also examines India's push for self sufficiency in the consumption of resource commodities.

Figure 15.1: GDP



Source: International Monetary Fund (IMF) (2017) World Economic Outlook; The Organisation for Economic Co-operation and Development (OECD) (2017) GDP long term forecast

Figure 15.2: India — industry share of GDP



Source: World Bank (2017) World Development Indicators

1. *Gold is not included in this chapter. For cultural and historical reasons, gold use in India is much higher than in other comparable nations. Gold has long been heavily used for wedding dowries and as a means of saving (particularly in rural areas) in the absence of a widespread bank branch network.*

Economic and political context

From an economic standpoint, China's rise has been the dominant theme of the 21st century thus far. The genesis of its rise was a move towards a more market-orientated, open economy in the late 1970s, followed by the move to allow the development of private enterprises in the late 1990s, and finally its entry into the World Trade Organisation in 2001. China currently consumes more than 3.5 billion tonnes of coal, 1.2 billion tonnes of iron ore, over 11 million tonnes of copper and 31 million tonnes of aluminium. With a population of 1.32 billion, India's population is now on par with China's. However, unlike China, India's population continues to grow, and the Indian population is projected to reach 1.6 billion by 2035.

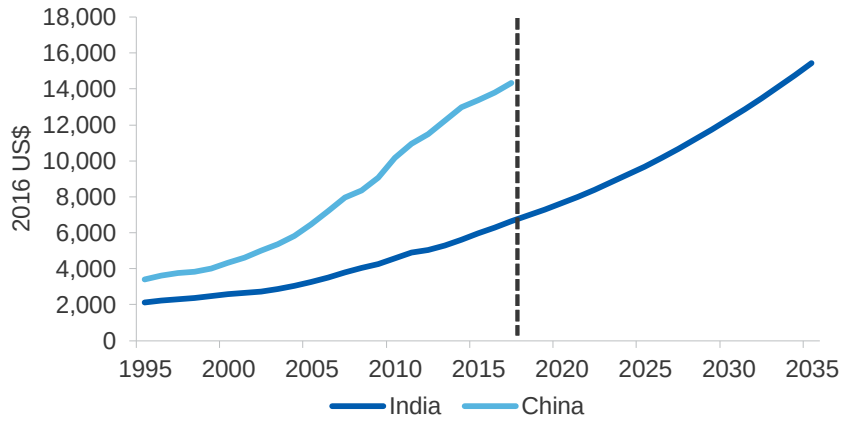
India is a rapidly growing, middle-income country; Indian GDP per capita was around $US6,600 in 2016 — roughly equalling China's level of GDP per capita in 2005. Like many other middle-income nations, India's economy is largely services based. The *financial, real estate professional services* and *trade, hotel, transport and communication* sectors are the largest in India, accounting for a combined 40 per cent of India's gross industry value-added (IVA). These sectors' share of India's economy has risen from 36 per cent of India's IVA in 2012.

Agriculture is also a large industry in India, accounting for 17 per cent of the country's IVA, although its share has fallen from 19 per cent in 2012. This trend is typical for developing economies, which usually transition away from primary industries (such as agriculture) toward secondary industries (such as manufacturing), and then finally to services.

Although the general trend in India's economy is not unusual, the scale of change is historically large. Like China since the start of this century,[2] India is in the midst of a huge wave of urbanisation, the scale of which has few parallels in history. India's urban population is projected to increase from its current (estimated) level of 439 million in 2016, to reach around 642 million by 2035, or around 10 million persons per year. By 2035, India's Gross Domestic Product (GDP) per capita is projected to roughly equal China's current level, though the Indian population is expected to be 12 per cent larger than China's present population.

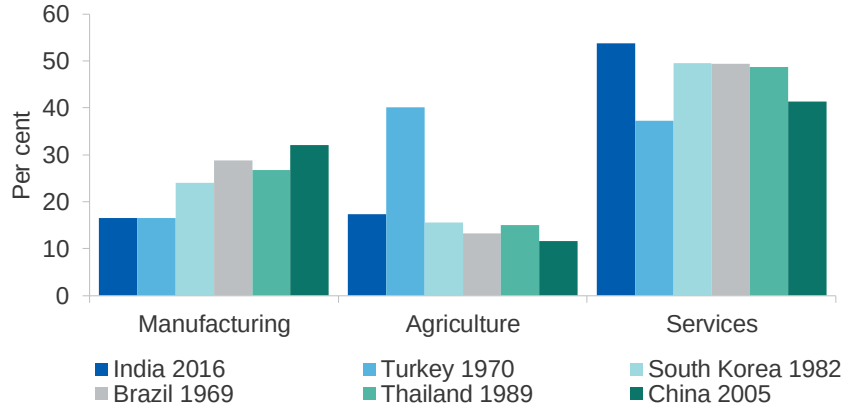
2. *Between 1995 and 2015, the urban population of China rose by over 400 million, or 22 million persons per year*

Figure 15.3: Gross Domestic Product per capita



Notes: GDP is in 2016 US$ (converted to the 2016 price level with updated 2011 PPPs). GDP data has been adjusted by the Conference Board for rapidly falling ICT prices
Source: The Conference Board (2017); Total Economy Database (adjusted version); OECD (2014) Long-term baseline projections, No.95

Figure 15.4: Industry share of GDP, at times where their GDP per capita was equal to approximately US$6,500



Notes: GDP is in 2016 US$ (converted to the 2016 price level with updated 2011 PPPs).
Source: The Conference Board (2017) Total Economy Database (adjusted version), May 2017; World Bank (2017) World Development Indicators

It is tempting to draw parallels between the rise of India and the rise of China. However, India's development path is likely to be noticeably different, and this has implications for its demand for resources over the next 20 years. For example, thanks to its relatively high English-speaking population, India is more likely to have a larger proportion of its working population employed servicing the English speaking world — including the technology sector — and in software development.

The outlook for India's metal demand depends on its growth path

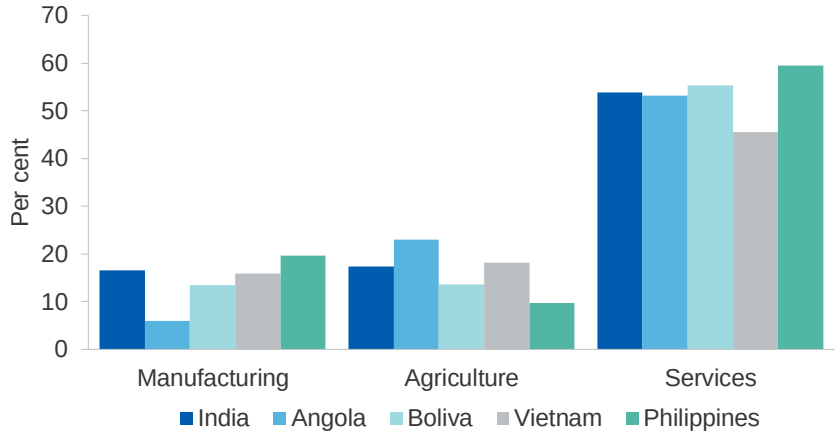
It is likely that India's construction and manufacturing sectors will largely determine India's overall demand for metals and the commodities used to make them. As middle-income nations develop, they typically invest heavily in construction (to spur infrastructure development), and in manufacturing, which capitalises on their low-cost labour force.

A number of East Asian countries have also utilised an export-led growth model, which led to particularly metals-intensive manufacturing output and exports. India may prove a notable exception to this trend. As can be seen in Figure 15.4, India's manufacturing industry is considerably smaller than that of China, Brazil, Thailand and South Korea when they were at a similar level of economic development (as measured by real GDP per capita). India's manufacturing industry is similar in size to Turkey's in 1970, but Turkey had a much larger agricultural sector.

India's relatively low manufacturing base (which is domestic focused) may be attributed to the global trend towards de-industrialisation which has emerged recent decades. As Figure 15.5 shows, the manufacturing sector in India is similar in size to the current tranche of middle-income countries, all of whom have undergone de-industrialisation in recent times. The de-industrialisation trend likely reflects both globalisation and labour-saving technological progress. Globalisation is a driving force for specialisation — nations with a comparative advantage in manufacturing are able to export and dominate markets globally. Technological progress has allowed for replacement of cheap, low-skilled labour in middle income nations with automated production in wealthier nations.

Opportunities to industrialise in the manner of other East Asian nations — like China, South Korea and Japan — appear to be diminishing. Rather, India may 'leap frog' the manufacturing-intensive development stage, and move more quickly towards a services-based economy, with major consequences for India's future resource commodity demand.

Figure 15.5: Industry share of GDP for selected middle-income countries at similar GDP per capita, 2016



Source: World Bank (2017) World Development Indicators

India's desire for self sufficiency

Not only might India leap-frog the manufacturing stage, but even if it does not — and so becomes a relatively high intensity metal consumer — the Indian Government's determination to be self-sufficient in commodities could limit how much it imports from countries such as Australia. Such a determination was part of the Chinese Government's policy too for many years, but this didn't stop that country from importing large amounts of resources. Accessing to the lowest cost goods and services helps to maintain competitiveness and facilitate a nation's development.

India is committed to growing its manufacturing industry

Growth in high metal-intensity countries, such as China, Japan and South Korea, was supported by substantial export growth, with exporters sometimes receiving government assistance. It is not clear at this stage whether India can achieve the same level of success in its own manufacturing sector: India has a relatively undeveloped financial system, an unwillingness/inability to attract large amounts of foreign investment (which brings technology and capital), limited scope for fiscal support and a more decentralised system of government.

The 'Make in India' campaign aims to increase the share of the manufacturing sector to 25 per cent of GDP by 2022. Reform to improve regulatory and operating conditions aims to promote this goal. The campaign has emphasised resource-intensive sectors, such as capital goods (heavy transport, machinery, mining equipment and earthmoving), automobile, defence equipment, shipping and aerospace.

Competitiveness in India's manufacturing sector is supported by some key advantages, including low-cost labour, a ready supply of high and low skilled workers, and a large internal consumer market fuelled by rising incomes. However, the sector also faces significant productivity challenges. These challenges include: rigid labour laws, a lack of on-the-job training and vocational education options, which lower workforce productivity; inefficient supply chain panning and management, leading to excess inventory across the value chain; infrastructure and structural impediments caused by State-level taxation, which has extended lead times for investment in new equipment, automotive technologies and facilities; and finally, less emphasis on continuous improvement and the quality control process.

Ambitious plans to boost infrastructure spending

Indian demand for commodities is also expected to be bolstered by substantial government investment in infrastructure and urban upgrades. There are major programs currently underway to provide housing, power and transport to the rapidly growing urban population. The Smart Cities Mission involves the retrofitting, redevelopment and expansion of cities. In addition to private developments of residential and commercial property, the government plans to build almost 9.5 million dwellings from 2015–16 to 2019–20.

A total of US$2.9 trillion in infrastructure spending is projected for the period between 2016 and 2035. (Even with this spending, an infrastructure investment gap of US$386 billion has been projected for the period between 2016 and 2035.) Despite these ambitious plans, the growth of India's resource intensive sectors face headwinds from regulatory, political, financial and economic factors. The development of new infrastructure not only requires resources, but it also facilitates the development of a competitive manufacturing sector.

Metals intensity

Metals usage rises as middle-income countries like India develop

Middle-income countries typically become more 'metals intensive' — defined as kilograms of metal consumption per capita — as they develop. This is particularly apparent during periods of rapid economic growth. 'Industrial' (as opposed to precious) metals are used in the construction of buildings and infrastructure that are required for urbanisation, and as household incomes grow, demand for durable consumer goods (with a high metal content) such as vehicles, laundry appliances, air-conditioners and refrigerators also grows. Rapid growth in manufacturing exports also plays in a part in driving metals intensity in some nations — notably those in East Asia. Government assistance for each nation's manufacturing industry in its infancy was critical, but was withdrawn as they developed competitiveness on a word scale.

As nations move from middle to high-income status, intensity of metal use typically peaks and falls, finally tracing an inverse U-shaped curve over the development cycle. This is the 'intensity-of-use' hypothesis.

China is an example of a middle-income nation that has recently gone through rapid growth in metals intensity. China's massive spending on construction and infrastructure, as well as its focus on developing its manufacturing industry, contributed to this growth. China's metal intensity path so far has been very close to that of other advanced nations at the same level of per capita GDP several decades ago.

Countries which have developed more recently may experience a lower metals intensity over their development cycle. These countries may 'leapfrog' obsolete technologies and employ the latest modern technologies in producing goods and services; for example, favouring fibre optics and satellites over copper cables in telecommunications.

The intensity of metal consumption varies noticeably across nations

The metals intensity growth path of various economies is shown in Figures 15.6 to 15.15. East Asian countries have experienced highly metal-intensive periods of development. (Some of this consumption may be overstated by the fact that most of the production of ships — South Korea — and motor vehicles — Japan and South Korea — is exported, so are not actually consumed in those countries.) By contrast, Latin American countries are far less metals intensive than East Asia.

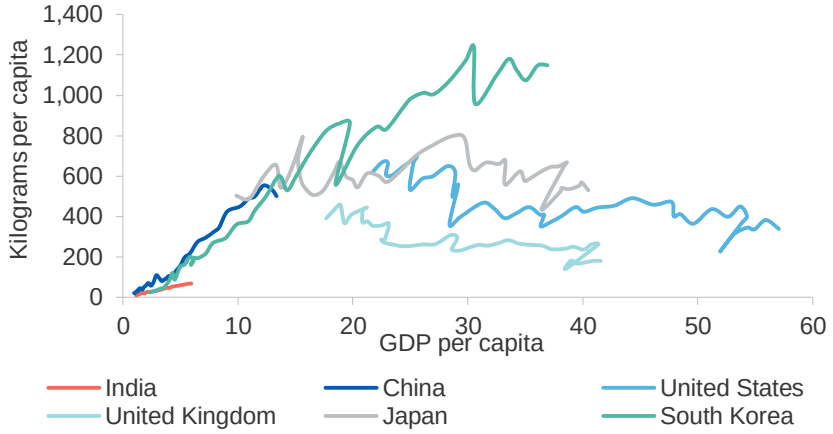
One reason for the strong metal consumption of East Asia is that globalisation has driven a shift in manufacturing activity toward East Asia and away from the rest of the world in recent decades. This trend appears to have impacted other middle-income nations more than high-income nations in Western Europe and North America. In particular, Latin American and sub-Saharan African nations are less manufacturing intensive than what may otherwise have been expected for their level of economic development.

Intensity of use tends to peak at different times by metal type

The rate of increase in metal intensity, and where it peaks, is relatively similar across all of the metals. Relative to the other metals, copper, steel and zinc are early development cycle commodities. This is because steel and copper are heavily used in construction and infrastructure — sectors that grow rapidly when populations urbanise. Zinc is primarily used to galvanize steel used in the manufacture of motor vehicles and in the construction of buildings and plants.

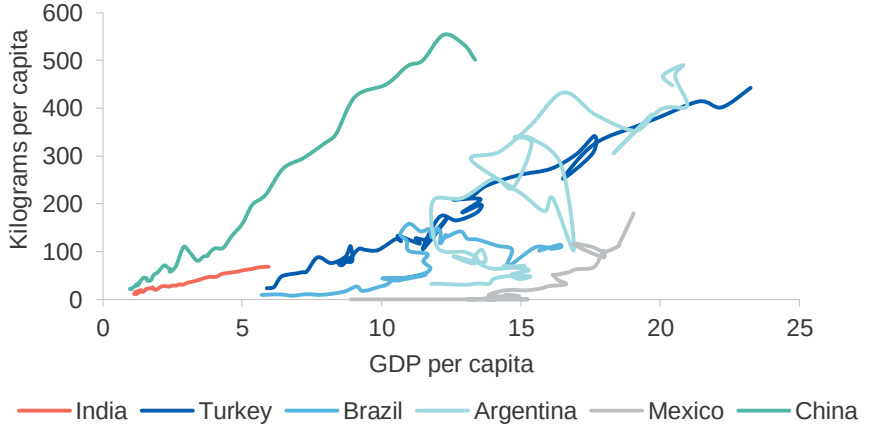
Nickel, which is mainly used to make stainless steel, is a late development cycle metal. Stainless steel has many applications, including various household items, industrial equipment, surgical instruments, and as an automotive and aerospace structural alloy. Similarly, aluminium — mainly used in manufacturing, packaging and transport — tends to reach peak intensity later in the development cycle.

Figure 15.6: Steel usage intensity 1950 to 2017: high intensity path countries and India



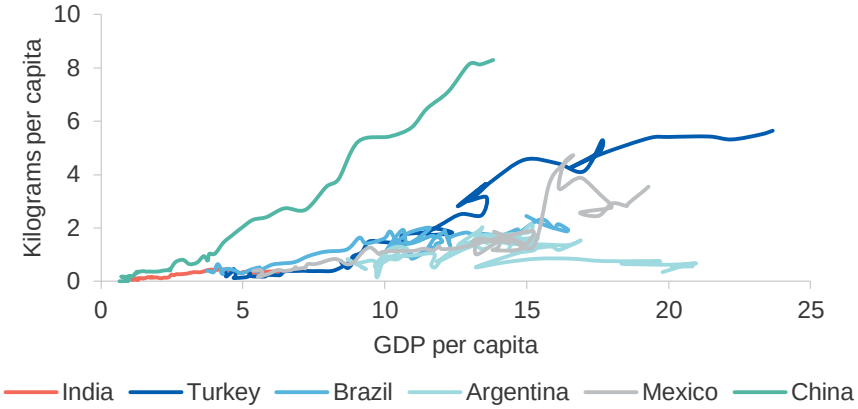
Source: World Steel Association; The Conference Board (2017) Total Economy Database

Figure 15.7: Steel usage intensity 1950 to 2017: low intensity path countries in China



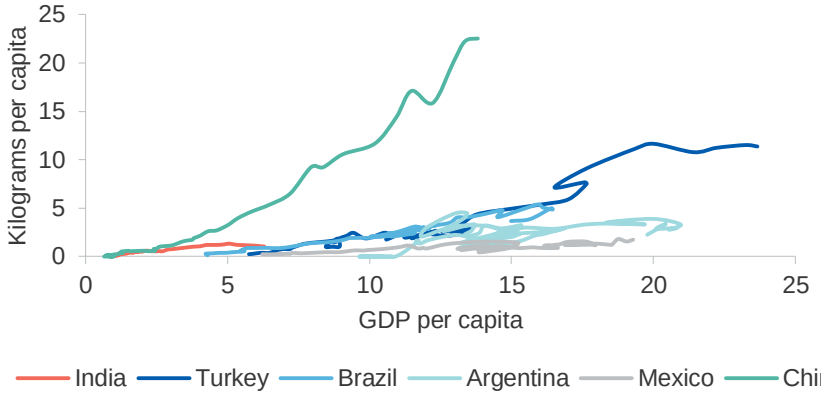
Source: World Steel Association; The Conference Board (2017) Total Economy Database

Figure 15.8: Copper consumption intensity 1950 to 2017: low intensity path countries in China



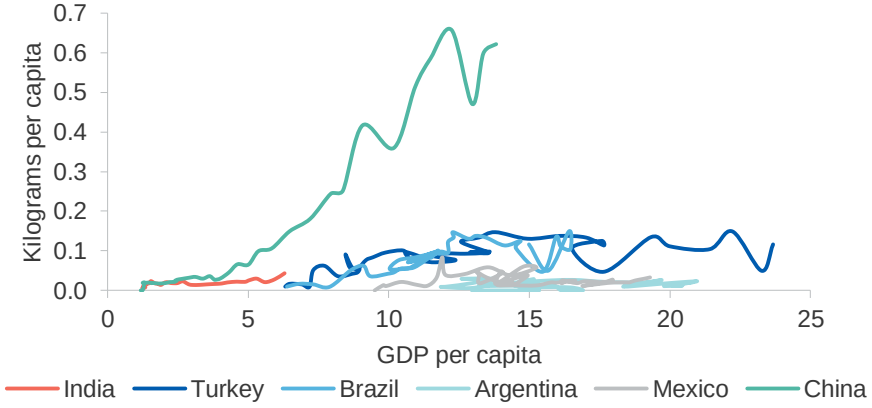
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.9: Aluminium consumption intensity 1950 to 2017: low intensity path countries in China



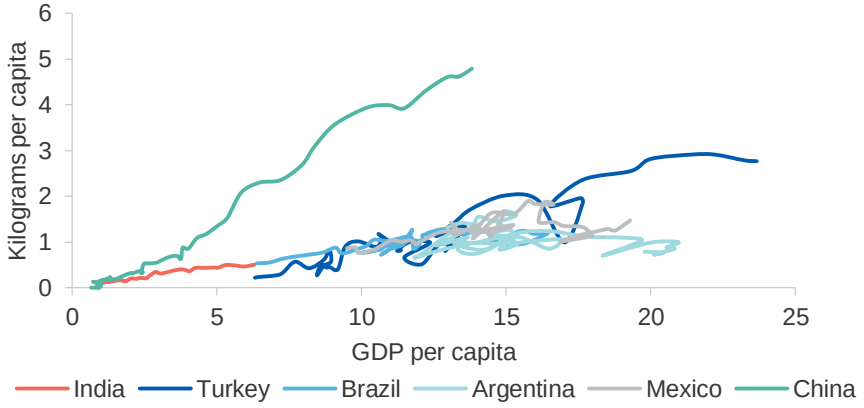
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.10: Nickel consumption intensity 1950 to 2017: low intensity path countries in China



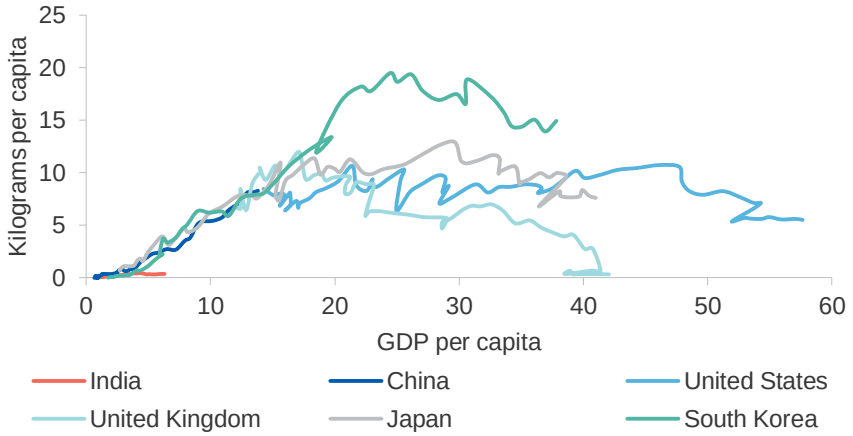
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.11: Zinc consumption intensity 1950 to 2017: low intensity path countries in China



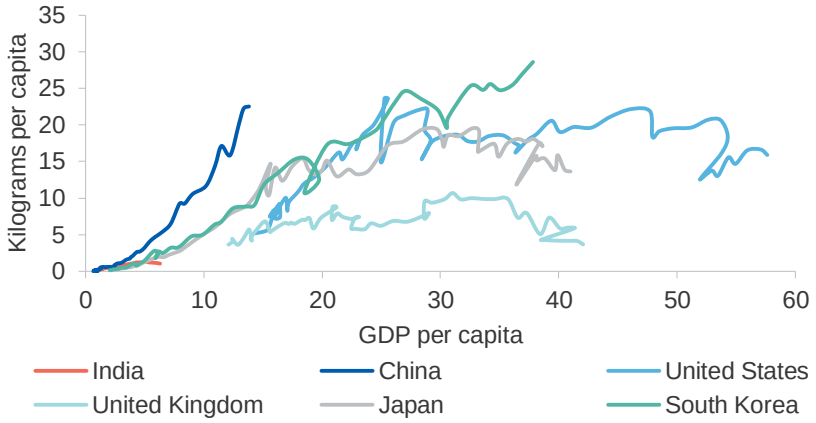
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.12: Copper consumption intensity 1950 to 2017: high intensity path countries and India



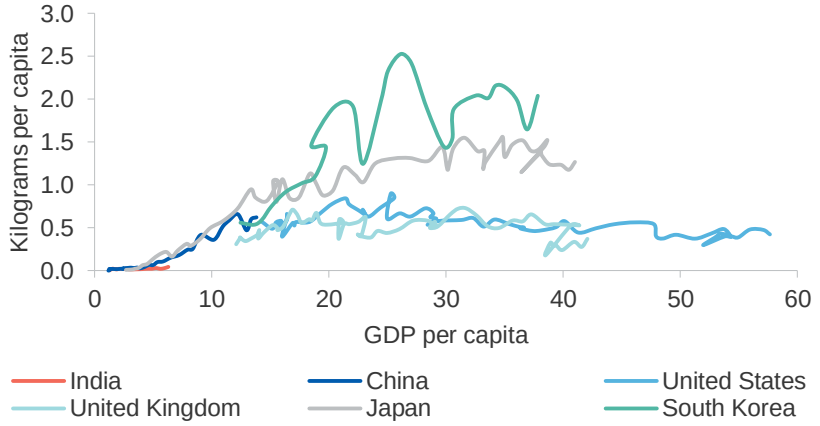
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.13: Aluminium consumption intensity 1950 to 2017: high intensity path countries and India



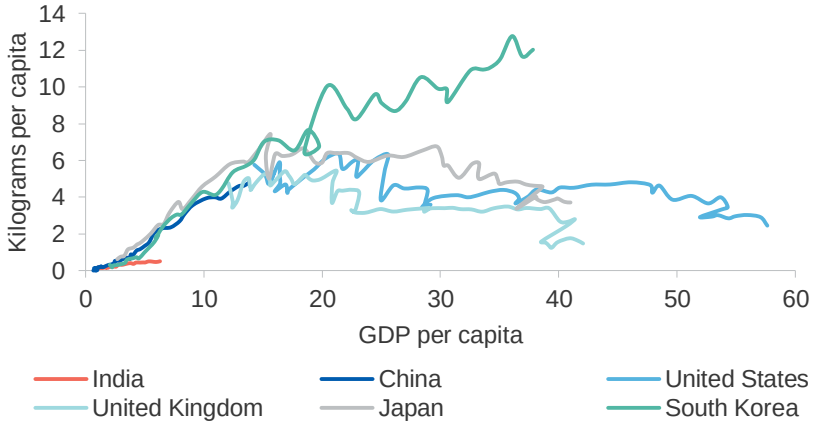
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.14: Nickel consumption intensity 1950 to 2017: high intensity path countries and India



Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Figure 15.15: Zinc consumption intensity 1950 to 2017: high intensity path countries and India



Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

Overview of India's commodity consumption

As a highly populous and rapidly developing middle-income country, India's consumption of metals is likely to increase considerably over the outlook period to 2035. However, relatively low investment in manufacturing and construction compared to China is likely to see India's development path lie somewhere between the lower metals intensity path of Latin American countries and the high intensity path of China. Saying precisely where between the low and high intensities seems too speculative for the purposes of this analysis.

Table 15.1 shows that should India industrialise in a similar way to China and other East Asian countries, it has the potential to be larger consumer of minerals in 20 years time than China is now — primarily due to its larger population. However, should India move more directly towards a services-based economy, its consumption by 2035 may be less than a third of China's current resource usage.

Even the 'low intensity' scenario will create a substantial commodity demand profile, given strong population growth, and thus potentially important export opportunities for the Australian mining industry.

India's National Steel Policy 2017 projects total national supply and demand of steel to be 255 million tonnes by 2030–31. This is close to the low intensity growth scenario presented in Table 15.1. However, this still represents a doubling of India's iron ore needs. Metallurgical coal needs are also likely to increase by a third under this scenario, although technological improvements in India's steel-making process are likely to lower the relative use of metallurgical coal in steel production.

Technological change is another key sensitivity to the outlook. There is significant potential for new technologies such as mobile, satellite and fibre optics to replace traditional copper wire in communications networks. On the other hand, copper may play a greater role in electric cars relative to conventional cars.

Table 15.1: India's metals consumption projections and steel input requirements, thousand tonnes

		Low intensity scenario c		High intensity scenario b	
Commodity	2015	2035	Annual per cent growth a	2035	Annual per cent growth a
Copper	491	2,844	9.2	13,536	18.0
Aluminium	1,476	3,307	4.1	33,334	16.9
Nickel	37	27	-1.6	1,044	18.2
Zinc	612	1,495	4.6	8,648	14.2
Steel	89,353	222,512	4.7	1,031,181	13.0
Iron ore e	147,804	378,270	4.8	1,753,008	13.2
Metallurgical coal e	100,600	133,507	1.4	618,709	9.5

*Notes: **a** Compound average annual percentage growth over 20 years; **b** High intensity scenario is based on China's growth path; **c** Low intensity scenario is based on the average of Brazil, Argentina and Mexico's growth paths; e Projections for iron ore and metallurgical coal requirements per tonne of steel are derived from India's National Steel Plan*
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database; World Steel Association (2017); United Nations (2017) World Population Prospects; India National Steel Policy 2017

Prospects by commodity

1. Iron ore

India's iron ore production depends largely on government policy

India has the fifth largest global reserves of iron ore, with most deposits located in the States of Orissa, Karnataka, Chhattisgarh, Goa and Jharkhand. India has historically been a large producer of iron ore, with production peaking at 224 million tonnes in 2009. The introduction of a 30 per cent iron ore export tax and mining bans in several States resulted in a sharp decline in production and exports from 2010 to 2012.

Domestic iron ore production has since rebounded modestly, reaching over 160 million tonnes in 2016. This reflects more supportive government policies, including measures to enhance growth in the sector, such as streamlined approval processes, and the easing of mining bans and export taxes.

India's domestic production unlikely to be sufficient to meet demand

However, there are ongoing barriers to the development of mines, including challenges in accessing land and capital and insufficient infrastructure to transport ore from the mines to steel mills. Ongoing uncertainty in government policy may also dampen incentives to develop new mines. With deposits concentrated in a few States, their respective Governments hold inordinate power over production and exports.

On current projections, India's domestic iron ore production is unlikely to be sufficient to meet demand. India's consumption of iron ore from its rapidly growing steel industry — even in the low intensity scenario — is projected to outpace domestic production.

India's iron ore import growth is sensitive to highly uncertain factors

However, the scale of this import growth is sensitive to some highly uncertain factors. Primarily, there is potential for India's iron ore output to grow at a faster rate than current projections if government policy becomes more supportive, which could result in no import growth.

Figure 15.16 shows that 'high' and 'low' intensity consumptions scenarios create a very large range for India's potential import demand growth. India will likely to follow a low-intensity scenario, but this still implies growth in import demand of 19 per cent a year — albeit from a low base. This would result in 159 million tonnes of imports by 2035.

For the purposes of this exercise, exports are assumed to be zero, though this is unlikely to be the case in practice. India's iron ore exports reached 101 million tonnes in 2008, before the introduction of export taxes led to a collapse in exports. Any future growth in exports is likely to result in offsetting growth in imports, to fill the resulting domestic deficit.

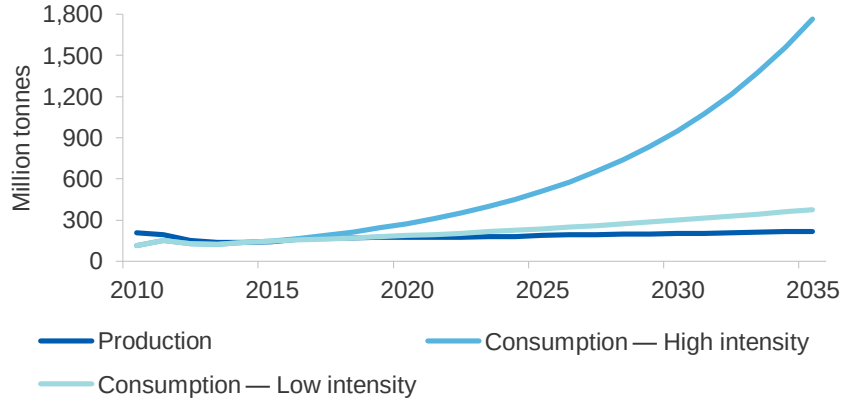
There are opportunities for growth in Australia's iron ore exports to India

The projected gap between projected production and consumption presents opportunities for Australian producers to export iron ore to India. There are two additional factors supporting the displacement of domestically produced iron ore with imports.

First, India's rail and port infrastructure, both current and planned, is more conducive to supplying the steel mills on the east coast with imports, rather than transporting iron ore from domestic mines.

Second, India's steel industry will be transitioning to a larger share of basic oxygen furnaces, which requires higher quality iron ore. While India's iron ore reserves are relatively high grade, their hematite ores tend to contain higher levels of silica and alumina. Consequently, it is unlikely that India will be able to meet its requirements with domestic reserves alone. This will result in the need to import iron ore from countries like Australia, which has a lower impurities content.

Figure 15.16: India's iron ore consumption and production: high and low consumption intensity scenarios



Source: AME Group (2017); Department of Industry, Innovation and Science (2017)

2. Aluminium

Output to rise strongly in the short term, but remain flat in the long term

India currently produces around 2.3 million tonnes of aluminium per year, or 4 per cent of global aluminium production. The country's production is forecast to increase at an average annual rate of 13 per cent over the next three years, to nearly 2.8 million tonnes in 2019, supported by the Jharsuguda and Korba expansion projects. However, production is subsequently projected to stabilise until 2035, with no scheduled additions or expansion to capacity. Thanks to high electricity costs, Indian aluminium smelters are expected to be high cost producers, which will hinder future investment in production capacity.

Consumption to rise at a moderate rate in the short to long term

Aluminium consumption in India is forecast to grow over time, as higher income stimulates demand for cars and durable goods. However, the growth trend depends significantly on the degree to which the Indian economy industrialises: a pivot towards heavy industry would support a high metals intensity path similar to China, while a continuation of its service-based development will support consumption on a lower intensity path similar to Latin American countries.

A high intensity scenario is projected to drive growth in aluminium consumption at an average annual growth rate of around 18 per cent. With this accelerated growth rate, the country is expected to be self-sufficient in aluminium — supply and demand in balance — only until 2020, with imports needed in increasing quantities after that. The market balance (the difference between production and consumption) is expected to be in deficit by 30 million tonnes by 2035.

Under the 'low intensity' scenario, India's aluminium consumption is projected to grow at an average annual growth rate of 5 per cent, meaning local output will be sufficient to cover domestic use until 2031.

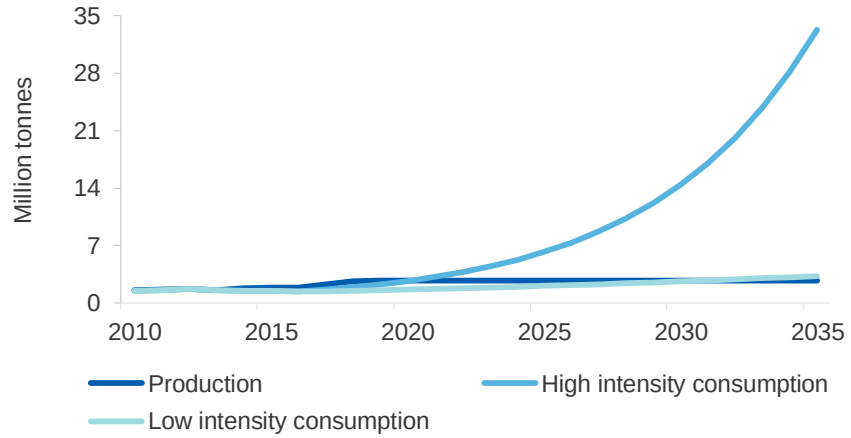
Australia's aluminium exports to India are small in quantity

India is a very small aluminium export market for Australian aluminium. In 2016–17, India accounted for just 2.2 per cent of total Australian aluminium export volumes (29 thousand tonnes, from 1.4 million tonnes). Australian aluminium smelters are currently confronting issues with energy and supply, and it is estimated that Australian aluminium producers will be high-cost producers as a result of growing energy costs. Moreover, with no new smelter to be built in Australia over the next decade, it is unlikely that production and export capacity can grow to accommodate the expected increase in demand from India.

India has become a significant exporter of alumina (notably to China), and could retain more of its production at home as domestic aluminium demand rises. At present, Indian bauxite costs are significantly lower than Australia's, suggesting limited prospects for a surge in bauxite exports to India as alumina/aluminium demand grows.

Risks to these projections include the availability and supply of secondary aluminium in India. This is expected to pick up noticeably as scrap availability increases and environmental considerations become more important. The energy requirement for recycling secondary aluminium is estimated to be 5 to 10 per cent lower than what is required for primary aluminium production, leading to cheaper prices and a more environmentally friendly product. It is likely that aluminium producers will invest and build more recycling facilities than smelting plants in the future, increasing the likelihood that primary aluminium production will flatten out in India after 2020.

Figure 15.17: India's aluminium production and consumption: high and low consumption intensity scenarios



Source: International Aluminium Institute (2017); Department of Industry, Innovation and Science (2017)

3. Copper

Consumption set to rise

India is currently the world's 10th largest consumer of copper. Over the next two decades, copper consumption is projected to rise in India as the economy grows and investment in infrastructure (especially energy infrastructure) picks up.

Heavy investment in renewable energy by India would accelerate copper consumption. Rises in average incomes will also lead to increased consumption of white goods and vehicles, also supporting higher use of copper. High levels of air pollution in major cities is currently pushing China to renewables and electric vehicles, which are heavily copper intensive.

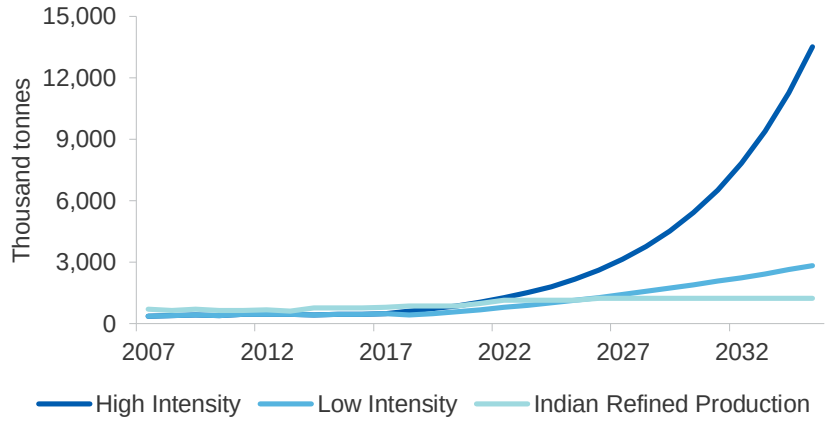
India has historically consumed far less copper than China. In 1995, India consumed 13 per cent of China's total copper consumption; in 2016, this figure was just 4 per cent. The high intensity copper consumption projection for India (of 13,536,000 tonnes) is modeled on China's growth in copper consumption intensity during 2005 and 2015. However, at this stage, a low metals intensity services model is more likely.

Production projected to rise to 2026, then plateau

India has several copper refineries and is the world's seventh largest producer of refined copper. In 2016, India produced 790,000 tonnes of refined copper. Refined copper production is projected to increase by around 4.6 per cent annually over the next 10 years, reaching 1,242,000 tonnes by 2026. India's large refinery capacity means there is less opportunity for Australia to supply refined copper in the short-term. But even under the low intensity scenario, India is projected to become a major importer of refined copper products from 2026 onwards.

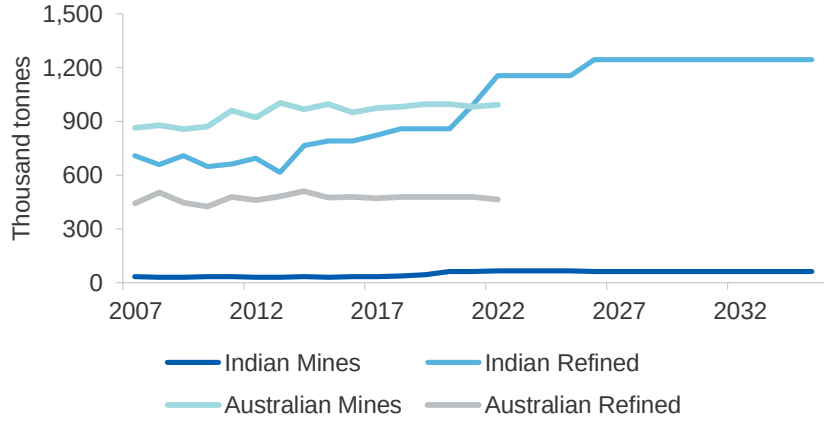
Lack of domestic supply obliges India to import most of its copper ores and concentrates. So there are likely to be major opportunities for Australian copper ore and concentrate producers over the coming two decades. In 2015–16, India was Australia's third largest export destination for copper ores and concentrates, accounting for 13 per cent of copper ore exports.

Figure 15.18: India's refined copper production and consumption: high and low consumption intensity scenarios



Source: WBMS (2017) World Metal Statistics; Department of Industry, Innovation and Science (2017)

Figure 15.19: Mine and refined copper production



Source: AME (2017); Department of Industry, Innovation and Science (2017)

Energy use in India

The following section references the IEA's New Policy Scenario (NPS), published in the IEA's 2016 World Energy Outlook. The NPS broadly serves as the IEA baseline scenario. It takes account of broad policy commitments and plans that have been announced by India and other countries, including national pledges to reduce greenhouse-gas emissions and plans to phase out fossil-energy subsidies, even if the measures to implement these commitments have yet to be identified or announced.

This section also refers to India's two draft energy-related plans currently in circulation:

- The National Electricity Draft Plan — released December 2016
- Draft National Energy Policy — released June 2017

4. Thermal coal

Thermal coal is expected to remain the dominant energy source in India

The IEA's 2016 World Energy Outlook report projects that India's coal-fired power capacity will increase to 300 gigawatts (GW) in 2025 and to 451 GW in 2040 — 10 GW more than stated in India's Draft National Energy Policy.

New Policy Scenario projections in the IEA 2016 World Energy Outlook show India's coal demand will increase noticeably from 2014 to 2035, despite commitments to increasing the use of non-fossil fuels. Rising access to electricity and growing per capita power usage will outpace the nation's ability to generate power through non-coal fuel sources.

Table 15.2: IEA's coal demand projections for India

	2014	2020	2025	2030	2035
Demand (Million tonnes of oil equivalent)	378	480	574	690	814

Source: IEA World Energy Outlook, 2017

The Indian Government's Draft National Energy Policy states that it expects coal-fired power generation capacity to increase from 197 GW in 2017 to 330–441 GW by 2040.

The share of coal in primary energy supply will also remain dominant, at 48–54 per cent by 2040. Coal-fired power generation capacity in 2040 is expected to require coal consumption of 1.1–1.4 billion tonnes.

India's Draft National Energy Policy projects near self-sufficiency in 2040

India's Draft National Energy Policy projects that India will be in a position to be mostly self-sufficient in thermal coal until 2037; being able to achieve peak annual production of 1.2–1.3 billion tonnes by 2037, before decreasing slightly thereafter. This date could be pushed out further, if the Government is able to promote production efficiencies and technological innovations to support the increased exploitation of reserves. Unlike the National Electricity Draft Plan, the Draft National Energy Policy neglects to address the role of imports for High Efficiency, Low Emissions (HELE) coal-fired power plants. As a result, the feasibility of the projection is potentially questionable.

The import outlook remains highly uncertain

India's thermal coal imports declined in both 2015 and 2016, following eleven consecutive years of import growth. This decline reflected the Modi Government's push for greater self-reliance in energy supply using domestic sources. The Government's aim was to improve domestic coal production by reforming both the coal sector and the power sector. The Indian power sector is plagued by power theft; power prices are held artificially low, severely inhibiting the profitability of generators and hence the use of coal.

Coal India has consistently failed to meet its production target, though the 2016–17 Indian fiscal year (April to March) recorded the best the result in years, with the state-owned enterprise achieving 93 per cent of its target (of 554 million tonnes).

India's thermal coal imports are projected to start growing from 2019, as a result of India's likely need for high quality coal to fuel their HELE power plants.

India currently has 29 operating HELE coal-fired power plants, with a further 29 under construction and 106 planned. To realise the full benefits and efficiencies of HELE power plants (including reduced air pollution), high-energy coal is required. India's indigenous coal supply consists of mainly low quality (low energy, high ash) coal.

India's Draft National electricity plan projects a rapid move to renewable power. Nevertheless, it forecasts that by 2021–22, India will require anywhere between 727 to 797 million tonnes of coal, varying depending on the quantity of renewable energy (which is expected to be between 125–175 GW). By 2026–27, the plan projects installed capacity of renewable energy of 275 GW, and a coal requirement of 901 million tonnes for power generation needs. The same plan projects 50 million tonnes in coal imports under every renewable energy scenario in 2021–22 and 2026–27.To put this in context, India's thermal coal imports have grown at an average annual rate of 32 per cent between 2004 and 2014, before declining to 152 million tonnes in 2016.

Australia could be a significant exporter of thermal coal to India, but many variables are in play

India's projections for cuts in imports to 50 million tonnes are likely to face headwinds, given India's thermal coal import history, the relatively low quality of its domestic coal reserves, and the increase in the number of HELE power plants in operation over the next 10 years.

Should India succeed in cutting imports to 50 million tonnes — and making those imports high quality coal — Australia should be very well placed to meet the majority of this demand. Investment in the large Carmichael mine in Australia's Galilee Basin by India's Adani power conglomerate may also play a role.

Australia will not be the only exporter vying for more market share in India. South Africa, which also holds high energy coal reserves, exported 35 million tonnes of thermal coal to India (24 per cent) in fiscal 2016–17, and may play a larger role out to 2026–27. India is also a large importer of Indonesian thermal coal. In fiscal 2016–17, Indonesia supplied 65 per cent of India's total thermal coal (or 97 million tonnes).

However, Indonesian coal by itself (with no blending with high energy content coal) is generally not of sufficient quality to provide the best option for HELE plants. Indonesia could also move to raise the Domestic Market Obligation requirement, under which an increasing amount of domestic production would be forcibly retained for domestic usage.

The coastal location of many of India's coal fired power plants improves the competitiveness of imports across the board, but given the number of variables at play, the ultimate magnitude of growth in imports is difficult to predict.

5. Metallurgical coal

India will need high quality metallurgical coal for its infrastructure needs

India's metallurgical coal demand is projected to increase significantly between 2017 and 2035, driven by infrastructure needs, economic growth, and a prospering steel sector. The majority of metallurgical coal demand is expected to be met through imports, since India possesses few high quality metallurgical coal reserves. India currently produces roughly 20 per cent of its metallurgical coal needs and imports the remaining 80 per cent (roughly 80 million tonnes in 2016). The majority (80 per cent) of these imports come from Australia.

Opportunities exist for Australian exports

Under a high-intensity scenario, India is projected to go from consuming 104 million tonnes of metallurgical coal in 2016 to 619 million tonnes in 2035. Under the low intensity scenario, demand is projected to rise to 134 million tonnes. Under the low intensity scenario, it is projected that at least 70 to 80 per cent of India's demand will be met by imports in 2035, and that Australia could continue to maintain the largest share of India's imports at around 80 per cent (roughly 86 million tonnes). India is looking to diversify its sourcing of metallurgical coal, to ensure supply reliability — impacted in recent months by Cyclone Debbie in Australia.

The high intensity scenario does not take into account substitutes for metallurgical coal in the steel making process — the Indian Government is reported to be undertaking research and development to reduce the use of metallurgical coal in steel production in the longer term. Ignoring this, under a high intensity scenario, Australia would need to export roughly 396 million tonnes to maintain its current market-share level of 64 per cent of India's total metallurgical imports. This would require current Australian production levels to double.

According to AME, Australia's exports of metallurgical coal are projected to grow at an average annual rate of 2.3 per cent between 2022 and 2030, suggesting Australia's metallurgical coal export capacity could increase to 275 million tonnes in 2030. Assuming an average annual growth rate of 2.3 per cent between 2030 and 2035, Australia could be exporting up to 309 million tonnes by 2035. Provided Australia exported metallurgical coal solely to India, this 309 million tonnes of metallurgical coal exports would represent only 50 per cent of India's metallurgical coal imports under a 'high intensity' scenario.

6. Uranium

Nuclear power generation is expected to expand strongly over time

India has significant plans underway to diversity its energy grid, with large investments expected in nuclear power. This investment is driven partly by the need for secure baseload power generation and partly by a push for cleaner energy to meet climate change commitments and reduce air pollution, which presently results in more than 1 million premature deaths in India each year.

India has 6,780MWe of nuclear output at present, spread across more than 20 nuclear power plants. There are well-advanced plans underway to build a further 10 large pressurised heavy water reactors, which woulod add a further 7,000 MWe of generation.

But long-term plans go far beyond this, with the Government's latest Draft National Energy Policy proposing to expand nuclear generation almost ten-fold, to more than 60,000 MWe by 2030. While it is not yet clear that the entire target will be met, there is a certainty of a very significant expansion in India's nuclear generation capacity over the next 20 years.

Further out still, India is seeking to develop thorium power. India holds abundant domestic reserves of thorium, and sees nuclear power as a means to develop the expertise and tools to unlock thorium's potential as an energy source. This would help India to achieve greater energy independence over the longer term.

India looks for partners that can package uranium exports with reactor research and technology that can be used to develop its domestic nuclear generation program.

India is likely to become a key uranium market over the next 20 years

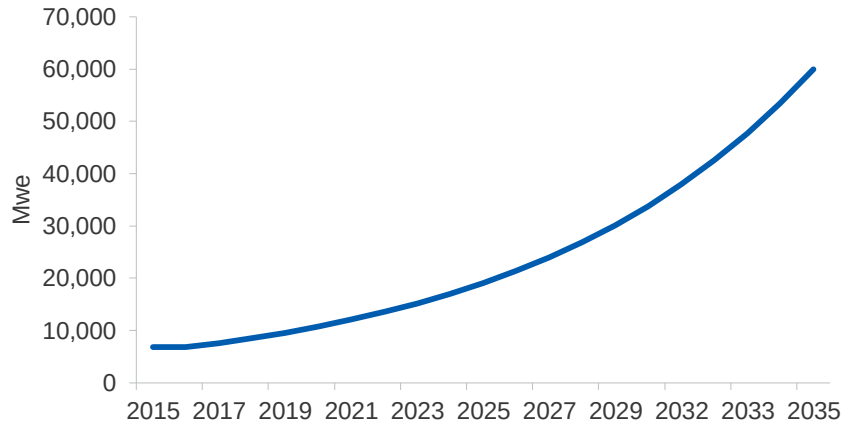
Although long-term energy independence is a high priority for the Indian Government, its need for nuclear power over the next 20 years is likely to be met mainly through imports. This opens significant opportunities for Australia, which has uranium reserves that are more abundant, more concentrated, and closer to the surface than uranium deposits in India.

Australia has recently signed a cooperation agreement with India which provides a framework for supplying uranium. Price negotiations are already underway with Australian companies, who are expected to supply India with around 1,500 tonnes of uranium over the next five years. There is potential for larger agreements over time, as Indian demand grows.

Long-term prospects for uranium exports to India are difficult to predict. New uranium mines in Western Australia have been banned by the West Australian Government, which will constrain supply growth to a degree. At the same time, falling solar prices may lead to some encroachment by solar power into the potential future market for nuclear energy. The Indian Government is also undertaking a large-scale review into its existing reactors to ensure environmental safeguards are sufficient.

The long-term growth trajectory for uranium exports to India is thus very strong, but with significant risks and potential for downsides to emerge.

Figure 15.20: Indian nuclear capacity projections



Source: Indian Draft National Energy Policy (June 2017)

7. Gas

Gas consumption in India is expected to triple

Gas currently accounts for a relatively small share of India's overall energy mix (5 per cent in 2014). Most of India's natural gas consumption is accounted for by industry, with power generation the next largest consuming sector. India is regarded as a price sensitive user of gas. In recent years, a large proportion of India's gas-fired power plants have stood idle, as a result of gas being unable to effectively compete with other fuels. Indian gas demand has also been constrained by poor infrastructure, with India's gas pipeline network reaching only a small number of Indian States.

Under the IEA's New Policies Scenario, India's natural gas consumption is expected to increase rapidly, from 50 billion cubic metres in 2014 to 159 billion cubic metres by 2035. The increase will be partly driven by the Indian Government's desire to diversify the country's energy sources and to reduce air pollution and carbon emissions. Strong economic growth is also likely to support this increased gas consumption, with gas consumed in power generation expected to be the main driver of growth. The availability of relatively low cost LNG — at least over the medium term — should also support increased gas consumption.

India could meet future gas demand from a number of sources, including domestic gas production, pipeline gas imports, and imports of LNG.

India's domestic production is unlikely to meet demand

India has considerable reserves of natural gas and India's domestic production is expected to increase over the outlook period. Under the IEA's New Policies Scenario, Indian gas production rises from 33 billion cubic metres in 2014 to 75 billion cubic metres in 2035. The Indian Government's Draft National Energy Policy states that India has the potential to produce 95 billion cubic metres of gas on a business-as-usual basis, and up to 124 billion cubic metres under the 'ambitious' scenario.

However, India faces a number of challenges when it comes to the development of its natural gas reserves. Much of India's gas reserves are unconventional ones, including coal seam gas and shale gas, so the extent to which India can increase its domestic gas production will depend on the quality of these reserves and how the costs of these technologies change over time relative to the cost of imported gas.

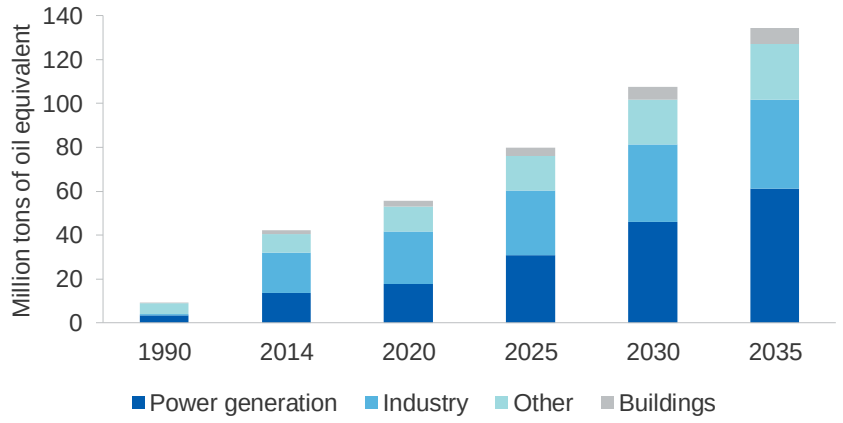
Another complicating factor is the limited precompetitive geoscience information on sedimentary basins, which makes exploration more difficult and imposes a higher risk on companies. India's Draft National Energy Policy makes several recommendations aimed at addressing these issues.

In addition, regulatory and social licence issues are expected to pose challenges for onshore unconventional gas development. Regulation of the price of domestically produced gas is currently inhibiting investment in the sector.

India is set to increase its gas imports

Given Indian gas demand is expected to outstrip domestic production (even under an ambitious domestic production scenario), India seems likely to require increased gas imports. India imported 24 billion cubic metres of LNG in 2016 (18 million tonnes), making it the fourth largest LNG importer in the world. There are currently no international gas pipelines into India.

Figure 15.21: Indian gas consumption by sector



Source: World Energy Outlook (2016)

The extent of India's LNG requirements will depend, in part, on progress on the Turkmenistan-Afghanistan-Pakistan-India (TAPI) and the Iran-Pakistan-India (IPI) pipelines. Both pipelines have been long delayed, and continue to face economic and geopolitical hurdles — such as financing arrangements and pipeline security. It is difficult to say with certainty whether or not these hurdles will be overcome.

If international pipeline projects do not materialise, India will require 84 billion cubic metres of LNG imports (62 million tonnes) in 2035 under the IEA's New Policies Scenario. This would represent an average annual increase of 6.8 per cent per year on 2016 levels.

India's price sensitivity may also affect LNG demand in the event that LNG prices rise relative to other energy commodities .

Australia's LNG exports to India will be subject to a range of influences

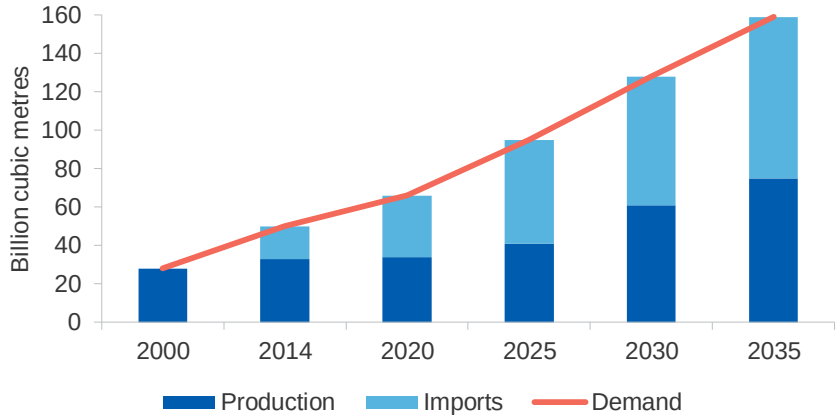
India imports the majority of its LNG from Qatar, mostly under long-term contracts. Australia supplies relatively little LNG to India, with only one contract having been signed with Indian buyers during Australia's recent wave of LNG projects. India's state-owned Petronet has a 20 year contract with ExxonMobil for supply from the Gorgon LNG project offshore Western Australia.

The proportion of Australian LNG in India's future imports will depend in large part on the cost competitiveness of Australian producers. LNG projects on the west coast tend to have the lowest cash costs. These projects are also relatively close to India, reducing shipping costs. Given India buyers have often favoured spot market purchases over long-term contracts, there may be opportunities for Australian projects to sell spot cargoes into India if they can capitalise on their inherent cost advantage.

However, the capital costs of Australian LNG projects are high by global standards. When it comes to signing longer-term contracts where the cost of capital must be recovered, Australian projects could be at a competitive disadvantage. There are also an increasing number of competing supply options, with competition in global LNG markets expected to intensify over the next few years and excess capacity expected to persist until the early to mid-2020s. India has potential supply options in the Middle East and East Africa, and possibly the United States.

Australia's exports to India could also be affected by the level of foreign investment by Indian companies in future Australian LNG projects. Historically, Indian companies have not invested in Australian gas export projects. In contrast, Indian companies have significant interests in LNG projects in East Africa, the US and Russia, supporting future supply agreements.

Figure 15.22: Indian gas demand, production and imports under the IEA's New Policies Scenario



Source: World Energy Outlook (2016)

Conclusion

Commodity producers have good reasons to pay attention to India, and not merely because India is set to become the world's most populous nation. There are sound reasons to believe that India's growth path may be potentially game-changing.

Where previous trailblazers like China built their growth on centrally planned, export-intensive, high-manufacturing models, India is likely to be fundamentally different. Entire phases of resource-intensive technological change may skipped. India will almost certainly not become highly manufacturing-intensive, in part due to global shifts away from labour-intensive manufacturing methods, and in part due to infrastructure issues and highly regulated labour laws. India is instead likely to progress straight into a services-intensive economic model, which will require significantly less commodity inputs.

Technological change will also encourage large leaps for consumers: India may, for example skip over much of the computer age involving lengthy cable lines and large devices, shifting straight to an economy dominated by wireless devices and mobile phones.

As a result, commodities will be used differently in India: copper is likely to play a much smaller role in wiring and telecommunications, but a larger role in emerging technology such as mobile phones and electric vehicles. Zinc will be less used in cars, due to the push for lighter weight vehicles to limit air pollution; but it will be highly sought after in public transport, as India seeks to repair, expand and improve more than 65,000 kilometres of rail lines. Changes in the form of use will have significant implications for commodity producers and supply chains.

It is certain that base metal use will step up in India, as infrastructure is upgraded. However, the precise pace of this infrastructure rollout is difficult to assess, due to the complexities of infrastructure rollouts in a vast and complex nation such as India. As a result, high- and low-intensity scenarios for iron ore and metallurgical coal remain hugely divergent. The greatest rewards will flow to commodity firms that embody flexibility and capacity to respond quickly to changes in policy.

Probably the best prospects for Australian resource commodity producers is in steel-making inputs. The degree of success of India's goal to be self sufficient makes the demand for iron ore imports a little uncertain. However, India's lack of metallurgical coal resources probably provides the best upside of any Australian resource commodities.

The prospects for producers of energy commodities are good. India is already underway with large scale expansions in capacity for HELE coal and nuclear power, and Australia has significant natural advantages as a provider of both. There are also likely to be opportunities for gas producers, although Australia's entry in this field is likely to require more disruption of India's well-established gas import chains.

Yet even providers of energy commodities will face some uncertainties. India has announced strong commitments to further deploy solar and other renewable energy, and the scale of technological change and price falls among these technologies creates a possibility of huge and unpredictable disruption to traditional energy models.

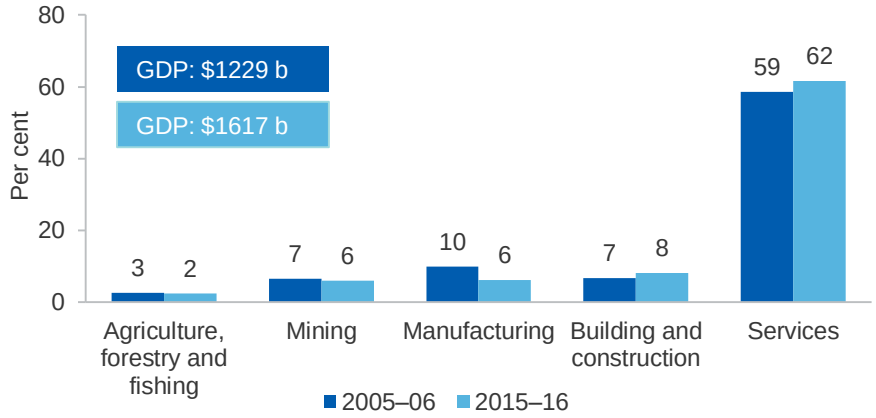
Much also depends on political factors. As a vibrant democracy with a well-established rule of law, India faces challenges to infrastructure rollout that were not evident in China. Previous reform and infrastructure efforts in India have often stalled as a result.

Yet, there is reason to be optimistic this time. The Government has not merely committed more than $US150 billion to rail and other infrastructure upgrades; it has also adopted new and innovative measures to attract funding from alternative sources, such as 'masala' bonds aimed at foreign investors. This will provide a more robust overall funding model, with greater longevity and predictability. The Government has also achieved some significant reforms already, including the introduction of a national GST, which replaces a slew of inefficient local taxes and better enables goods trading between States.

Technological change will matter in shaping India's commodity needs, as will the Government's ability to withstand pressure and forge ahead on its reform proposals and its long-planned rollout of energy, transport an housing infrastructure. Success in India will not merely change life for its people, but also change the game for commodity producers over the longer term. India's achievements will present the world with a new development model, and blaze a trail for other developing nations to follow. Commodity producers who can harness the opportunities presented by India will have many more opportunities in the future.

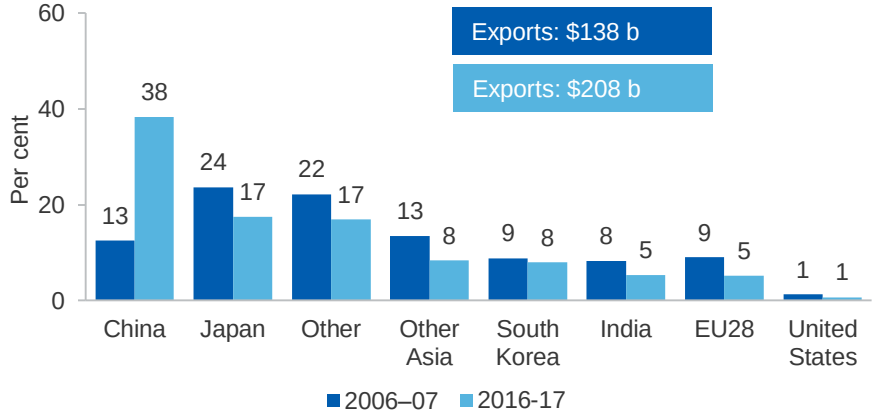
Trade summary charts and tables

Figure 16:1: Contribution to GDP



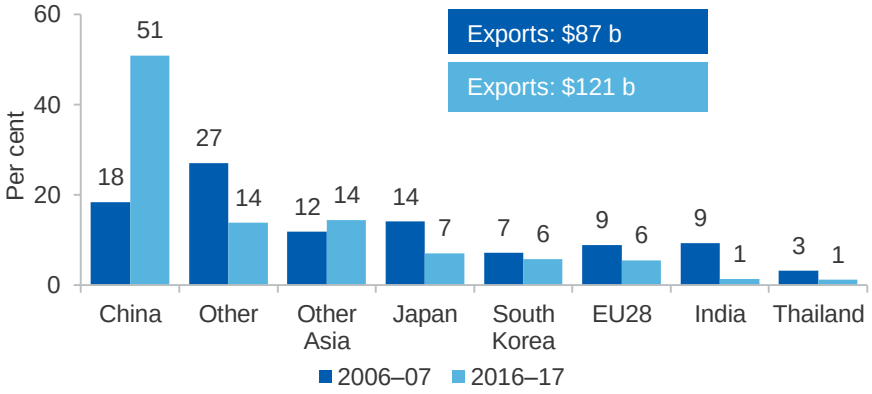
Source: ABS (2017) Australian National Accounts, National Income, Expenditure & Production, 5204.0

Figure 16.2: Principal markets for Australia's resources and energy exports, 2017–18 dollars



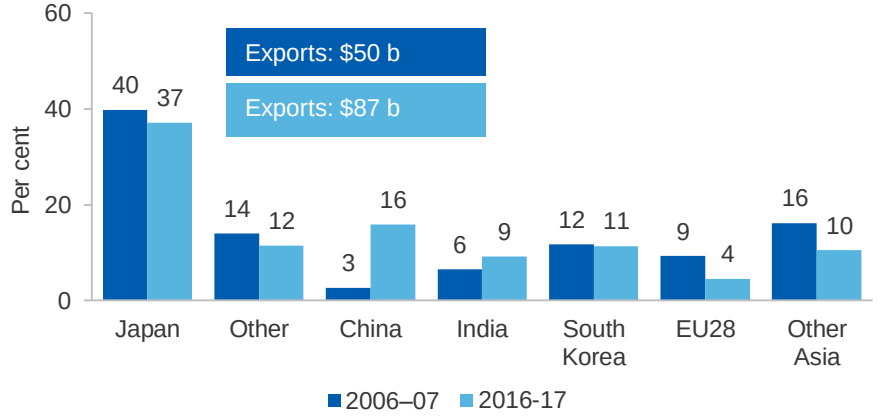
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 16.3: Principal markets for Australia's resources exports, 2017–18 dollars



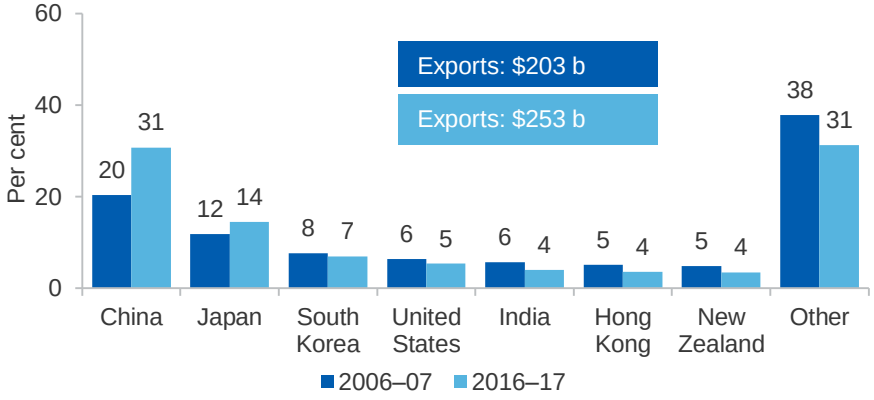
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 16.4: Principal markets for Australia's energy exports, 2017–18 dollars



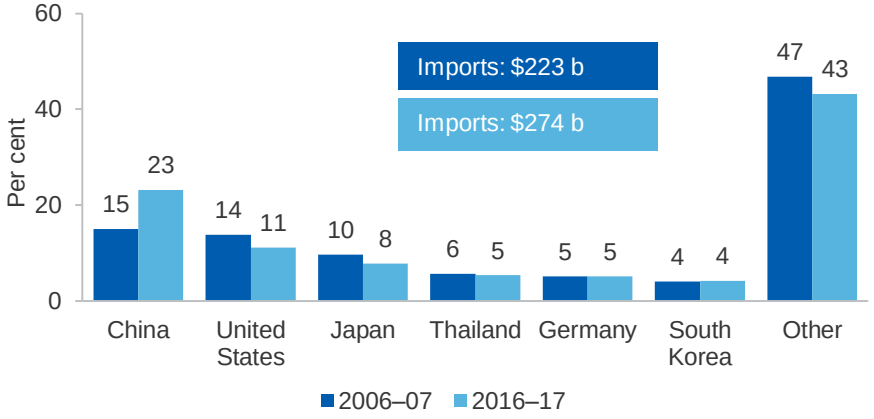
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 16.5: Principal markets for Australia's total exports, 2017–18 dollars



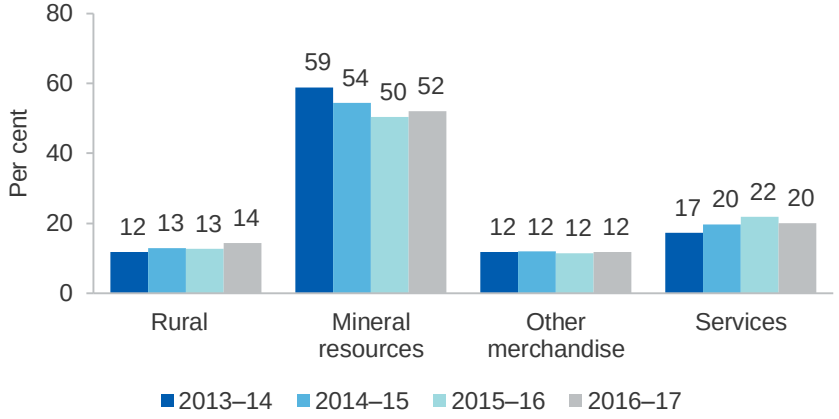
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 16.6: Principal markets for Australia's total imports, 2017–18 dollars



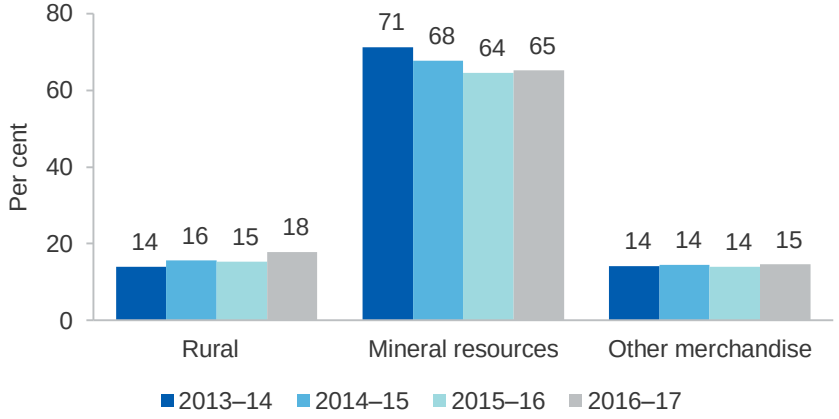
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 16.7: Proportion of goods and services exports by sector



Source: ABS (2017) Balance of Payments and International Investment Position, 5302.0

Figure 16.8: Proportion of merchandise exports by sector



Source: ABS (2016) Balance of Payments and International Investment Position, 5302.0

Table 16.1: Principal markets for Australia's thermal coal exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
Japan	$m	8,707	8,443	7,608	7,208	8,557
South Korea	$m	3,045	3,036	2,860	2,657	2,664
China	$m	3,259	3,802	2,933	1,825	3,644
Taiwan	$m	1,874	1,818	1,894	1,660	2,348
Malaysia	$m	305	379	626	517	660
Thailand	$m	267	317	292	331	302
Total	**$m**	**19,376**	**17,837**	**17,902**	**16,930**	**15,330**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.2: Principal markets for Australia's metallurgical coal exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
India	$m	5,164	5,295	5,375	4,859	8,604
Japan	$m	6,705	6,054	4,944	4,594	7,190
China	$m	5,184	6,446	5,116	4,083	7,897
South Korea	$m	2,735	2,705	2,551	2,199	3,834
Taiwan	$m	1,300	1,282	1,222	1,024	1,886
Netherlands	$m	1,094	1,105	892	964	1,913
Total	**$m**	**34,560**	**24,693**	**24,919**	**22,981**	**20,566**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.3: Principal markets for Australia's crude oil and refinery feedstocks exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
Singapore	$m	2,498	2,174	1,949	663	1,061
Indonesia	$m	338	340	36	373	954
China	$m	2,218	5	29	743	735
Thailand	$m	918	1,798	1,351	731	585
South Korea	$m	1,742	700	1	473	467
Malaysia	$m	900	323	4	152	444
Total	**$m**	**11,760**	**12,234**	**9,276**	**5,736**	**5,704**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.4: Principal markets for Australia's LNG exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
Japan	$m	14,392	16,571	15,341	11,096	11,755
China	$m	672	702	1,401	3,097	5,927
South Korea	$m	708	483	1,019	1,768	2,655
India	$m	0	0	0	531	639
Chinese Taipei	$m	293	191	43	168	310
Malaysia	$m	0	0	119	198	171
Total	**$m**	**16,065**	**17,946**	**18,105**	**17,463**	**23,208**

Notes: ABS data for LNG exports by destination in 2016–17 and total LNG exports. Australia's LNG exports by destination before 2016–17 are estimates based on International Trade Centre data.
Source: ABS (2017) International Trade in Goods and Services, 5368.0; International Trade Centre (2017) International Trade Statistics 2001–2017

Table 16.5: Principal markets for Australia's iron ore exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
China	$m	47,211	62,771	45,118	40,852	53,765
Japan	$m	9,699	10,637	7,176	4,933	5,587
South Korea	$m	5,547	6,711	4,337	3,216	4,081
Taiwan	$m	1,685	1,882	1,390	1,076	1,493
Indonesia	$m	63	45	30	57	45
India	$m	53	45	117	7	5
Total	**$m**	**64,251**	**82,190**	**58,423**	**50,359**	**65,326**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.6: Principal markets for Australia's aluminium exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
South Korea	$m	763	750	823	1,175	769
Japan	$m	1,130	1,226	1,561	734	966
Taiwan	$m	513	488	524	314	210
Thailand	$m	410	334	307	283	317
China	$m	168	256	54	98	53
Indonesia	$m	280	215	147	99	159
Total	**$m**	**3,688**	**3,829**	**4,097**	**3,415**	**3,282**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.7: Principal markets for Australia's copper exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
China	$m	3,418	4,335	3,907	3,779	2,797
Japan	$m	1,818	1,788	2,132	1,504	1,404
Malaysia	$m	762	673	564	650	893
India	$m	1,249	1,040	861	540	700
South Korea	$m	493	643	391	517	479
Philippines	$m	158	314	269	232	404
Total	**$m**	**9,055**	**9,583**	**9,075**	**8,545**	**7,840**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.8: Principal markets for Australia's gold exports, 2017–18 dollars

	Unit	2012–13	2013–14	2014–15	2015–16	2016–17
China	$m	4,798	6,588	8,663	7,326	9,108
United Kingdom	$m	2,945	704	625	4,150	4,066
Hong Kong	$m	124	166	203	2,660	9,988
Singapore	$m	1,064	2,502	3,337	1,260	314
Thailand	$m	1,431	489	961	267	553
Switzerland	$m	322	379	16	91	234
Total	**$m**	**16,949**	**14,320**	**13,982**	**16,527**	**18,719**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 16.9: Spot prices, nominal quarterly average

	Unit	Jun–17	Sep–17 s	Dec–17 f	Mar–18 f	Jun–18 f	Sep–18 f	Dec–18 f	Mar–19 f	Jun–19 f
Alumina fob Australia	US$/t	296	323	339	332	325	319	312	309	306
Aluminium LME cash	US$/t	1,909	2,100	2,121	2,142	2,014	1,893	1,779	1,779	1,770
Copper LME cash	US$/t	5,665	6,383	6,331	5,869	5,585	5,543	5,521	5,625	5,814
Gold LBMA PM	US$/t	1,258	1,306	1,258	1,233	1,248	1,240	1,206	1,200	1,181
Iron ore fob Australia a	US$/t	57	65	55	52	49	49	48	49	49
Nickel LME cash	US$/t	9,234	9,437	9,742	10,009	10,160	10,379	10,465	10,916	11,038
Zinc LME cash	US$/t	2,597	2,920	2,900	2,880	2,850	2,800	2,750	2,700	2,600
LNG fob b	US$/MMBtu	6.9	7.3	7.0	7.4	7.8	7.5	7.3	7.3	7.5
Metallurgical coal c	US$/t	191	190	170	156	140	135	132	120	120
Thermal coal fob Newcastle 6000 kc	US$/t	79	94	84	75	70	70	70	70	70
Crude oil (WTI)	US$/bbl	48	48	52	56	52	50	52	54	55
Crude oil (Brent)	US$/bbl	50	51	55	58	55	53	54	56	57
Crude oil (Japan Customs Cleared)	US$/bbl	53	51	55	58	55	53	54	56	57
Uranium d	US$/t	21	20	23	24	24	25	27	28	28

Notes: fob free-on-board; kc calorific content; ***a*** *At 62 per cent iron content estimated netback from Western Australia to Qingdao China;* ***b*** *Australia's export unit values;* ***c*** *Premium hard coking coal fob East Coast Australia;* ***d*** *Average of weekly restricted spot price published by The Ux Consulting Company;* ***f*** *Forecast;* ***s*** *Estimate.*

Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; LME; London Bullion Market Association; The Ux Consulting Company; US Department of Energy; Metal Bulletin; Japan Ministry of Economy, Trade and Industry; Department of Industry, Innovation and Science (2017).

Table 16.10: Australia's export values, nominal quarterly

	Unit	Jun–17	Sep–17 s	Dec–17 f	Mar–18 f	Jun–18 f	Sep–18 f	Dec–18 f	Mar–19 f	Jun–19 f
Iron ore	$m	15,132	17,656	15,180	13,347	13,479	13,844	13,543	13,067	13,731
Gold	$m	4,554	4,269	4,186	4,299	4,391	4,300	4,175	4,241	4,163
Copper	$m	2,048	2,087	2,094	2,032	1,972	2,105	1,991	2,052	2,140
Alumina	$m	1,830	1,877	2,009	1,929	2,007	1,894	1,915	1,858	1,928
Aluminium	$m	829	946	1,023	949	913	850	845	788	792
Zinc	$m	780	587	676	722	671	630	725	789	683
Bauxite	$m	285	279	285	285	285	285	290	327	327
Nickel	$m	76	80	85	101	100	101	102	103	104
Other resources	$m	4,572	4,021	4,187	3,733	4,055	3,980	4,214	3,815	4,103
Total resources	**$m**	**30,106**	**31,802**	**29,725**	**27,397**	**27,873**	**27,989**	**27,800**	**27,040**	**27,971**
Metallurgical coal	$m	8,249	9,389	9,097	8,347	7,723	7,301	7,037	6,344	6,150
Thermal coal	$m	4,941	5,553	5,013	4,381	4,234	4,237	4,118	4,212	4,125
LNG	$m	6,480	7,403	7,456	7,427	7,968	8,664	8,837	9,107	8,789
Crude oil	$m	1,295	1,367	1,544	1,688	1,579	1,583	1,737	1,896	2,041
Uranium	$m	187	163	219	237	237	257	260	244	244
Other energy	$m	673	680	792	783	754	737	797	793	859
Total energy	**$m**	**21,825**	**24,555**	**24,121**	**22,862**	**22,497**	**22,778**	**22,785**	**22,595**	**22,208**
Total resources and energy	**$m**	**51,931**	**56,358**	**53,845**	**50,259**	**50,370**	**50,767**	**50,585**	**49,635**	**50,179**

Notes: ***b*** *In 2017–18 Australian dollars;* ***f*** *Forecast;* ***s*** *Estimate*

Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Department of Industry, Innovation and Science (2017)

Appendix

Methodology and key assumptions

Commodity classifications

In this report, exports for each commodity are defined by a selected set of 8-digit Australian Harmonised Export Commodity Classification (AHECC) codes. Where possible, the choice of AHECC codes is based on alignment with international trade data, to ensure that direct comparisons can be made. For example, groupings for various commodities are aligned classifications used by the International Energy Agency, World Steel Association, International Nickel Study Group, International Lead and Zinc Study Group, International Copper Study Group and World Bureau of Metal Statistics.

In this report, benchmark prices and Australian production and exports are forecast for 21 commodities, as shown in Table 17.1 below. In estimating a total for Australia's resources and energy exports, the remaining commodities, defined as 'other resources' and 'other energy', are forecast as a group.

Value and price

In this report, all value and price data (unless otherwise specified) is in nominal Australian or US dollars.

If the real value or price is specified (mostly in the tables), the conversion from nominal to real dollars is based on the Australian and US consumer price indices.

Prices in future years are based on the median of economic forecasters at the time that this report was prepared. The source for this is Bloomberg's survey of economic forecasters.

Exchange rates

In this report, the exchange rate forecasts for the Australian/US dollar is based on the median of economic forecasters at the time that this report was prepared. The source for this is Bloomberg's survey of economic forecasters.

Table 17.1 Resource and energy commodities groupings and definitions

	Resources (non-energy)	Energy
Definition	Resource commodities are non-energy minerals and semi-manufactured products produced from non-energy minerals	Energy commodities are minerals and petroleum products that are typically used for power generation
Australian Harmonised Export Commodity Classification (AHECC) chapters	25 (part); 26 (part); 28 (part); 31 (part); 71 (part); 73 (part); 74; 75; 76; 78; 79; 80; 81	27 (part)
Commodities for which data is published, forecasts are made and are analysed in detail in this report	Alumina; aluminium; bauxite, copper; gold; iron ore; crude steel; nickel; zinc	Crude oil and petroleum products; LNG; metallurgical coal; thermal coal; uranium
Commodities for which data is published and forecasts are made	Lead; silver; tin; salt; diamonds; other resources	Other energy

Notes: The AHECC chapter is the first two digits of the trade code. Groupings are made at the 8-digit level.
Source: Department of Industry, Innovation and Science (2017)