Australian Government
Department of Industry, Innovation and Science

Office of the Chief Economist

Resources and Energy Quarterly

March 2017

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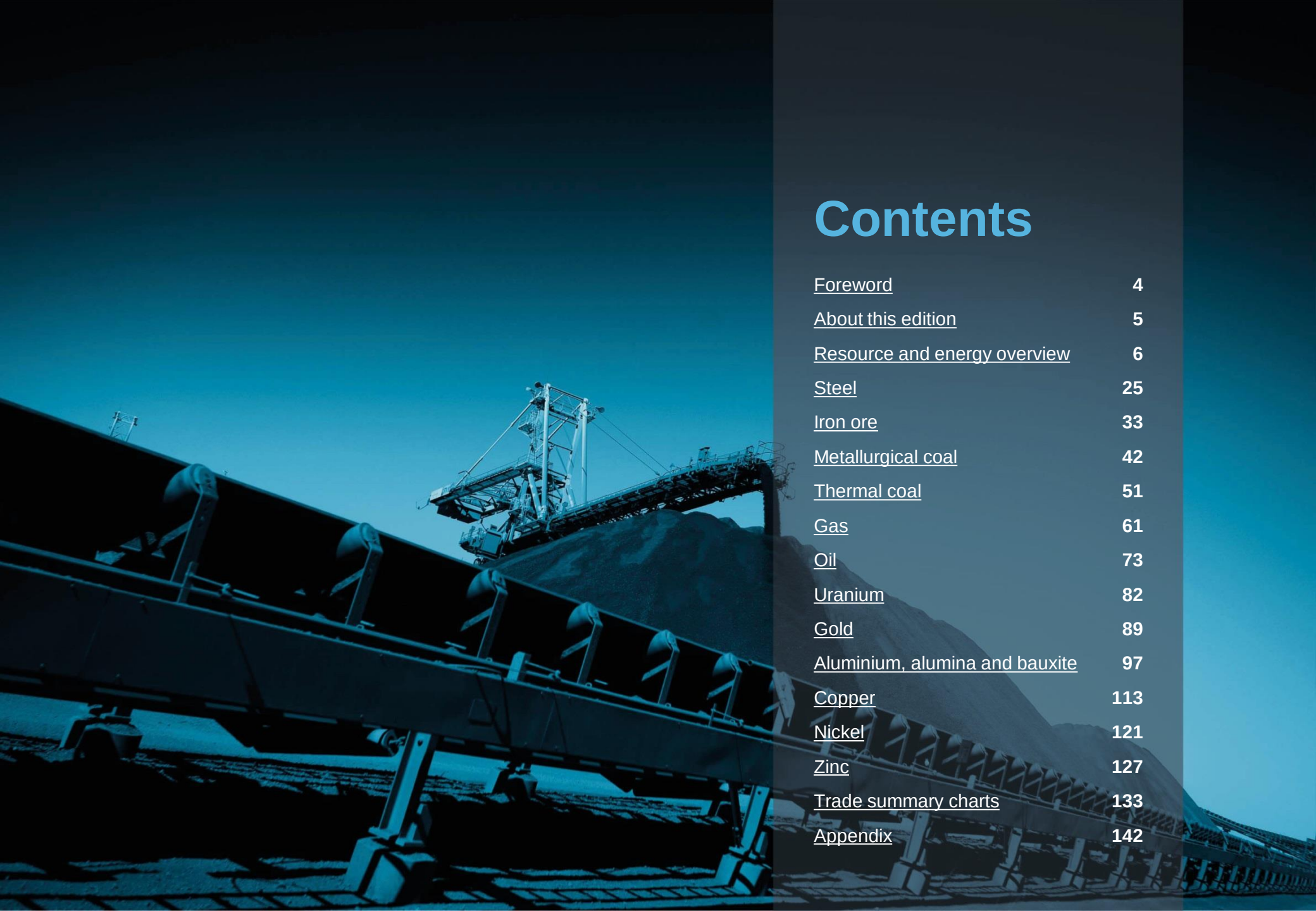


Contents

Foreword

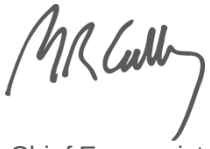
Australia's resources and energy export earnings are forecast to reach an all-time high of $215 billion in 2016–17 and 2017–18. In real terms, this represents 32 per cent growth on 2015–16. Higher prices for iron ore and metallurgical coal, as well as increased LNG export volumes, are likely to be the most significant contributors to growth in export earnings.

Strong steel production in China, as well as temporary supply disruptions, have supported higher iron ore and metallurgical coal prices so far in 2016–17. However, the price gains are not expected to last. Production of steel in China is expected to decline over the next five years, as construction activity slows, particularly in the residential sector.

Even as prices decline beyond 2016–17, the value of Australia's resources and energy exports are projected to remain relatively steady. This will be due to the continuation of the production phase of the mining boom — which is not expected to peak until late 2019.

Over the next two years, export volumes will continue to grow for iron ore, the base metals, and in coal, but the most important source of growth will be LNG. Australia's LNG export volumes, which grew by nearly 50 per cent in 2015–16, are forecast to double in the next three years, as new production capacity comes fully online.

Global demand for resource and energy commodities are expected to continue to grow in the next five years — but at a markedly slower rate than in the previous five years. With reserves of high-energy coal and high-grade iron ore, demand for Australia's resources will remain strong, as China moves away from using (and producing) low-energy coal and low-grade iron ore to limit air pollution in some of its large cities.



Chief Economist
Department of Industry, Innovation and Science

About this edition

Each March quarter edition of the *Resources and Energy Quarterly* contains the Office of the Chief Economist's five year outlook for production and exports of Australia's major resource and energy commodities. This edition extends the outlook to 2021–22, one year further into the future than the March 2016 edition.

The outlook period for the previous edition of the *Resources and Energy Quarterly* — the December quarter edition — was only to 2017–18.

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.

Unless otherwise stated, all Australian dollar figures in this report are in 2016–17 dollar terms. All US dollar figures are in 2017 dollar terms.

As the *Resources and Energy Quarterly* goes to press, the impact of Cyclone Debbie in Queensland is still unclear. Huge rainfall has occurred over the coal producing regions of Queensland. The mines that have suspended production account for approximately 15 per cent of global seaborne exports of metallurgical coal. The overall impact could be larger, as port and rail infrastructure have halted operations too: the Dalrymple Bay, Abbot Point and Hay Point coal terminals have been closed, with damage reports yet to come through.

Table 1.1: Resources and Energy Quarterly publication schedule

Publication	Expected release date	Outlook period	Special focus
March quarter 2017	7 April 2017	Australian data: 2021–22 International data: 2022	Medium term outlook
June quarter 2017	7 July 2017	Australian data: 2018–19 International data: 2019	TBA
September quarter 2017	6 October 2017	Australian data: 2018–19 International data: 2019	TBA
December quarter 2017	22 December 2017	Australian data: 2019–20 International data: 2020	Resources and Energy Major Projects

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

Resources and energy overview

Revisions to the outlook

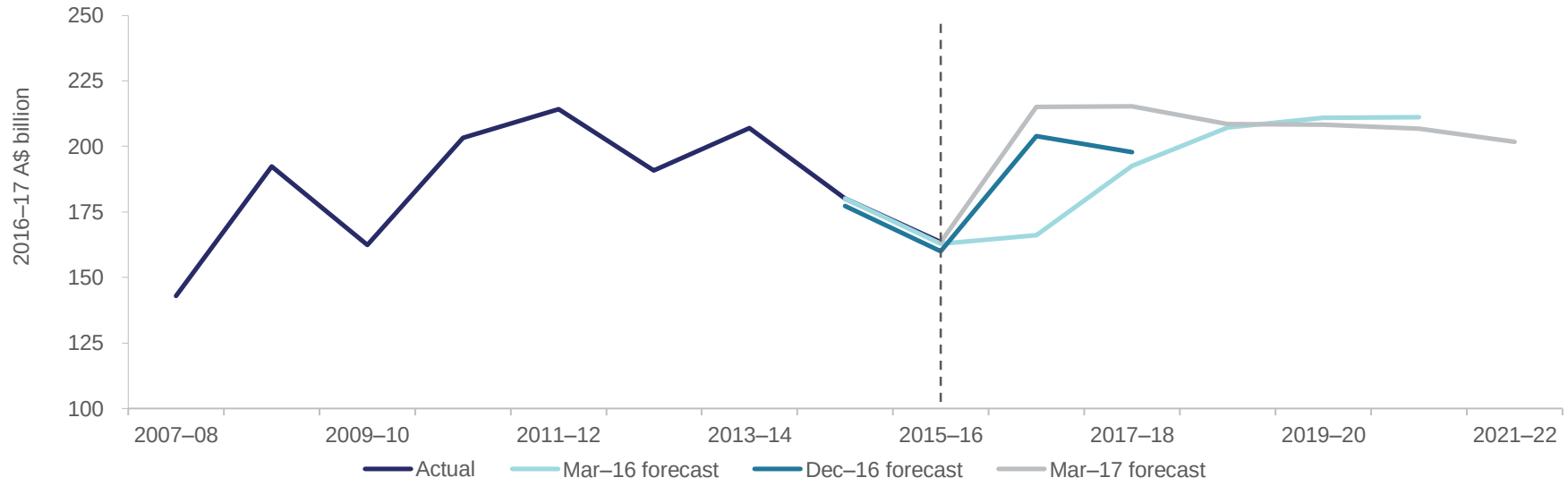
The value of Australia's resources and energy export earnings in 2016–17 has been revised up by $12 billion since the December *Resources and Energy Quarterly* to $215 billion. The upward revision largely reflects the unexpected increase in the price of iron ore, and the unexpected strength in thermal coal prices in the March quarter 2017. Export earnings in 2017–18 have been revised up by $17 billion, because of upward revisions to iron ore, metallurgical coal and thermal coal prices.

As a result of the revisions, 2016–17 and 2017–18 are expected to represent the highest level of resources and energy exports (in real terms) both on record and over the outlook period.

The outlook for 2018–19 — which was last examined in the March 2016 *Resources and Energy Quarterly* — has also been revised upwards, largely reflecting persistently higher prices for iron ore and coal. However, from 2018–19 to 2020–21, the outlook remains broadly the same as what was forecast a year ago.

This reflects an unaltered view on the direction of prices and volumes over the medium term. That is, the view remains that prices for Australia's major resource and energy commodities will decline a little further (not withstanding the unexpected and temporary price surge in the last six months) and that growth in export volumes — brought about by the mining investment boom — will slow in the next few years.

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)

Global market summary

Recent price gains are forecast to be unwound over the next 12 months

An unforeseen spike in the iron ore price saw the weighted average price of Australia's resources and energy commodities reach their highest level in three years in the March quarter 2017.

The price spike is attributed to a combination of unexpectedly robust demand from China's steel mills, temporary supply disruptions and slower-than-anticipated growth in global iron ore supply. As supply grows and steel production moderates, the price of Australia's largest exports — iron ore and metallurgical coal — are forecast to decline.

Putting slight downward pressure on commodity prices (measured in Australian dollars) in the March quarter 2017 was an estimated 1.1 per cent increase in the value of the Australian dollar. As demonstrated in Figure 1.3, the depreciation of the Australian dollar since 2011 has dampened the impact of the decline in commodity prices on Australia's export earnings.

Demand growth to remain Asia centric

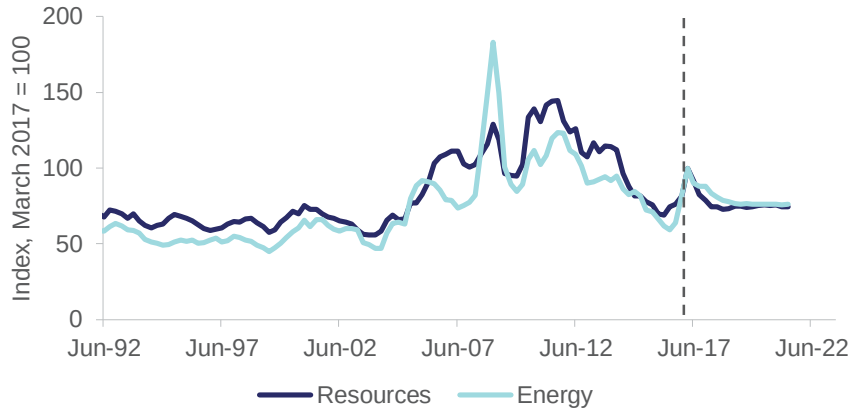
Urban populations and industrialisation drive the demand for resource and energy commodities, particularly as populations grow and materials are needed to develop and expand cities.

In recent years, China has experienced rapid growth in urbanisation and industrialisation. The speed of this transition, along with the sheer size of China's population, fuelled unprecedented growth in mineral resource demand. Between 1995 and 2015, the urban population of China rose by over 400 million — or 22 million persons per year.

In absolute terms, urbanisation in China will remain significant in the next five years, but the rate of growth is set to slow noticeably. Between 2015 and 2020, the urban population is projected to grow by 19 million per year, and in the five years following, by 15 million per year.

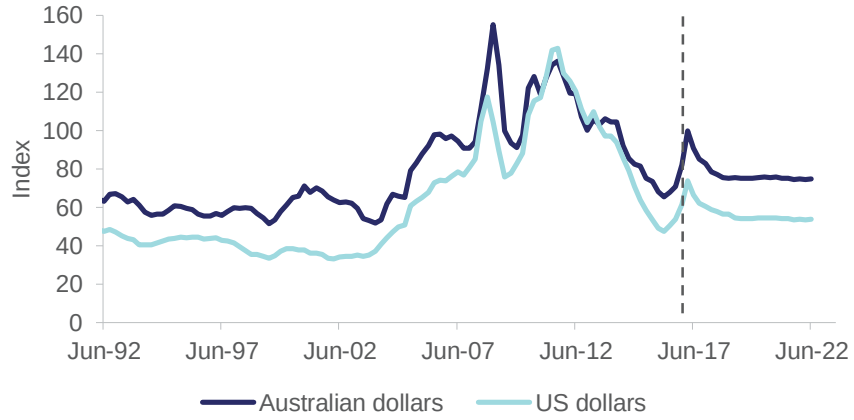
Other parts of Asia are also urbanising rapidly. In India, over the next five years, urban populations are projected to grow by 11 million persons a year, while in South East Asia, urban populations are projected to grow by 7 million persons a year. Urban populations in 'Other Asia' (i.e. excluding China, India and South East Asia) are projected to grow by 11 million persons a year.

Figure 1.2: Commodity prices, real Australian dollars



Notes: Prices are a Fisher Price Index, based on Australia's export values and volumes
Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Figure 1.3: Resource and energy commodities price index, real terms



Notes: Australian dollar real commodity prices indexed to March 2017 = 100. 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)

Africa is also urbanising rapidly, with the annual number of newly-urbanised persons expected to overtake China in the next few years. However, to date Africa's urbanisation has not been associated with the same rates of industrialisation as experienced in China and other developing countries. In particular, manufacturing industries remain relatively small, and infrastructure investment has not kept pace with growing populations. Still, Africa has the potential to play a major role in resource and energy commodity consumption over the longer term.

Global economic development, energy policies, and disruptions to free trade are the key sensitivities to the outlook

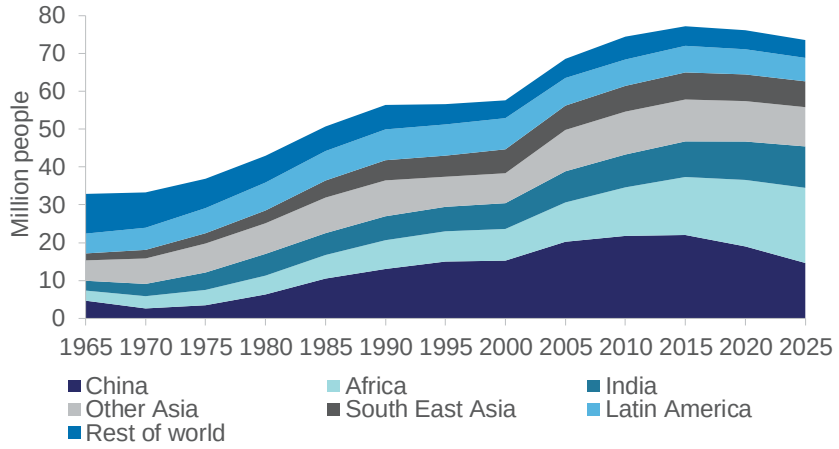
The outlook for global demand for resource and energy commodities is closely tied to the outlook for economic growth and, in particular, industrial production. If global economic growth differs from the projections adopted (see Chapter 2), this will alter the demand for, and prices of, Australia's resource and energy exports.

Energy and climate policy are also key sensitivities to the outlook. For example, action directed at reducing emissions beyond policies and targets that have already been announced would, likely affect the demand side outlook for Australia's energy commodities.

With reserves of high-energy coal and high-grade iron ore, Australia is likely to be relatively well insulated from the push by countries such as China and India to limit input usage (to energy generation and steel making) in order to reduce air pollution. Air pollution is becoming chronic in some of the major cities of Asia, and efforts to make production more energy efficient will double up on those countries' obligations and/or commitments to cut greenhouse gas emissions.

Finally, the rise of trade protectionism has the potential to negatively affect Australia's resources and energy exports — even if protectionist policies are not directly targeted at Australia. This is because Australia's mineral commodities form part of a global value chain, which means they do not necessarily get consumed by Australia's direct trading partners. Any disruptions to free trade — particularly involving the world's largest economies — could negatively affect the outlook for Australia's resources and energy exports.

Figure 1.4: World urban population, annual growth



Source: United Nations (2014) World Urbanisation Prospects: The 2014 Revision

Figure 1.5: Global demand volume growth, average annual rate

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

Global resource commodities (non-energy) overview

Demand growth for most resource commodities to slow

Over the five years to 2022, growth in global demand for the types of non-energy resource commodities that Australia produces — mainly iron ore, gold, aluminium, copper, nickel and zinc — are projected to be slower than in the previous five years. This will dampen the potential for further price rises, and potentially affect the viability of some of Australia's higher cost mining and refining operations.

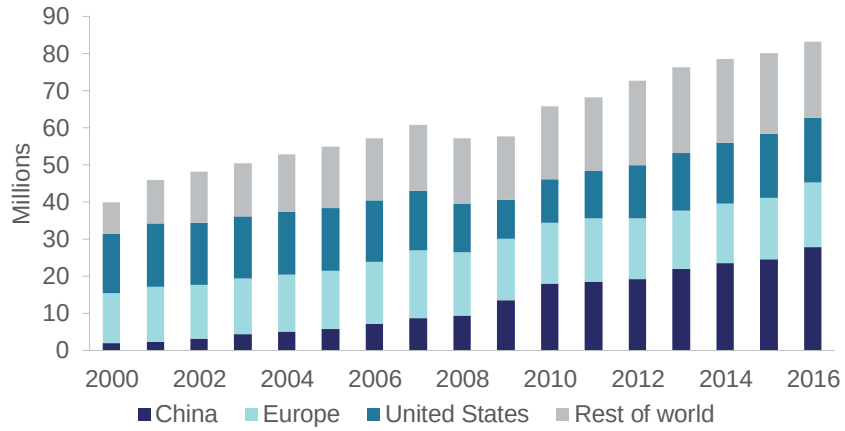
The slowing in commodity demand growth — shown in Figure 1.5 — will be most noticeable in metallurgical coal and iron ore, both used in steel making. This is because steel is an early development–cycle commodity — primarily used in the construction of buildings and infrastructure. As China develops and transitions to a more consumption-driven growth path, its 'steel intensity' will plateau.

Nickel, zinc, aluminium and copper are also used in construction, and the demand for these commodities is also projected to slow or remain slow over the next five years. However, because of their relatively greater use in consumer products, such as automobiles and durable household appliances, demand for these commodities is expected to grow more rapidly than iron ore and metallurgical coal.

Consumer products, including vehicles and household durable products (such as washing machines, dryers and refrigerators), use a range of raw materials that Australia produces. On a global basis, it is estimated that 13 per cent of steel and 25 per cent of aluminium are consumed by the automotive sector. Stainless steel (which contains nickel), as well as copper and zinc-based alloys, is also used in motor vehicles.

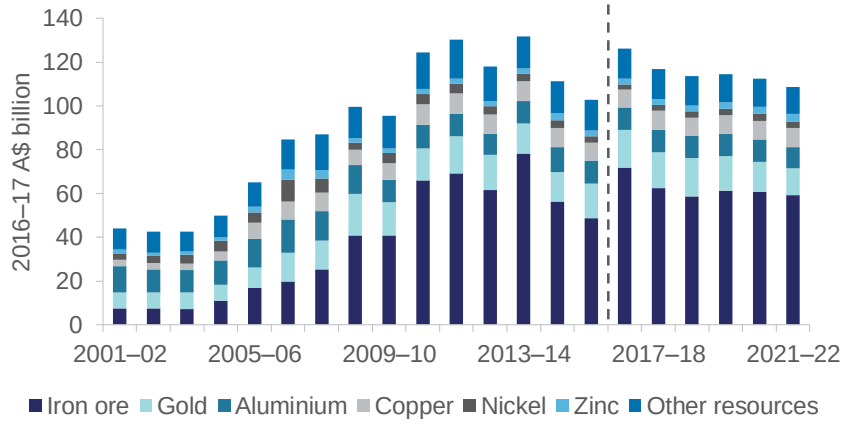
Since 2000, vehicle sales in China have increased by over 1300 per cent. In 2016, 28 million vehicles were sold in China — over one third of global sales. And there is potential for further growth: in 2016, 20 vehicles were sold per thousand persons in China's population, compared with 37 and 39 in South Korea and Japan, respectively. However, issues with traffic congestion and air pollution may act as a constraint on China's per capita vehicle consumption, particularly in the large cities.

Figure 1.6: Global vehicle sales, annual



Source: Bloomberg Intelligence (2017)

Figure 1.7: Australia's resource commodity exports (non-energy)



Notes: 'Aluminium' includes aluminium, alumina and bauxite
Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Global energy commodities overview

Global consumption of energy commodities expected to grow slowly

Growth in global consumption of energy commodities — particularly thermal coal, gas, and oil — is generally expected to remain slow over the next five years, although this outlook is sensitive to policies on climate change and technological developments.

According to the International Energy Agency's (IEA's) New Policy Scenario, global energy consumption is projected to slow from an average annual rate of 1.9 per cent a year between 1990 and 2014 to 1.1 per cent between 2014 and 2020 and 1.0 per between 2020 and 2025. In addition to slowing energy demand overall, the global energy mix is projected to change.

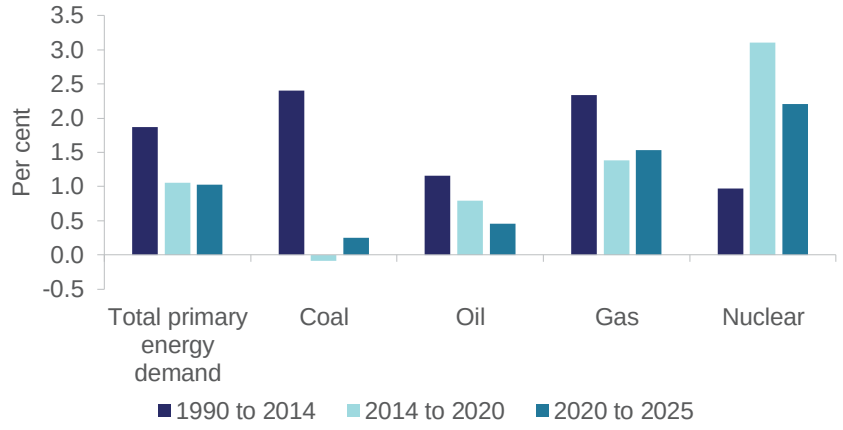
In November 2016, the Paris Agreement on climate change came into force. Under the Paris agreement, 190 countries have pledged targets to limit carbon emissions. Even so, transformative changes are already underway, as economies move to increase their energy efficiency and transition towards using a larger proportion of renewable sources of energy.

Nonetheless, fossil fuels are projected to remain the bedrock of global energy consumption in the next five years (and beyond). In particular, rapid growth in international trade in LNG is expected to support the increased role of gas in the global energy mix.

Coal will remain an important source of global energy, although prospects for further growth are limited. Coal consumption is projected to increase in lower income countries — because of its role as a low cost source of energy — but this is expected to be offset by efforts to reduce coal usage in higher-income countries.

Demand for uranium is projected to increase by a robust 3.4 per cent over the outlook period, as Japan reintroduces nuclear power to its energy mix following the Fukushima disaster.

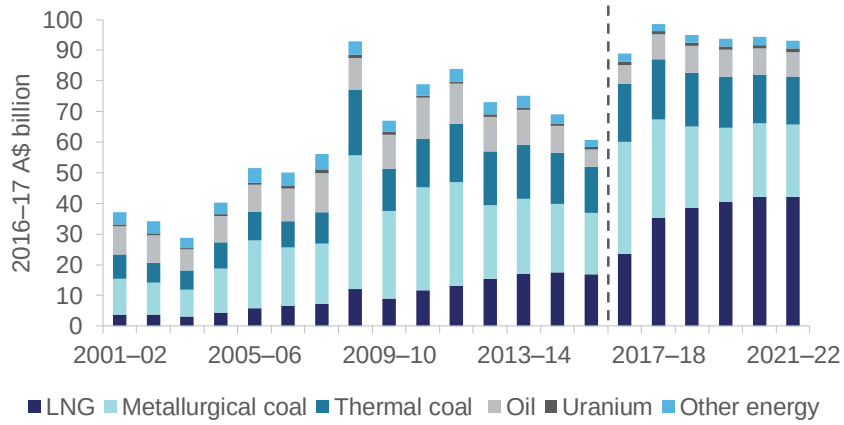
Figure 1.8: Global energy demand under the New Policy Scenario , annual growth



Notes: The New Policy Scenario is the IEA's central scenario, and is based on an assessment of national and international climate policy intentions

Source: International Energy Agency (2016) World Energy Outlook

Figure 1.9: Australia's energy commodity exports



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

Box 1.1: Phases of Australia's mining boom

Australia's mining boom is often described in terms of three phases: the price phase, the investment (or 'construction') phase and the production phase. The price and production phases can be seen in their contributions to the value of Australia's resources and energy exports (see Figure 1.10), while the investment phase can be seen in the surge in the value of capital expenditure in the mining sector (see Figures 1.16 and 1.17).

Prior to 2004, Australia had not seen a sustained period of commodities price growth for many decades. Higher commodity prices drove massive growth in Australia's resources and energy export earnings between late 2004 and late 2011 — with the notable exception of the global financial crisis in 2009. This period can be identified as the 'price' phase of the mining boom.

Prices peaked in the December quarter 2008, and then again — at a slightly lower level — in the September quarter 2011. The investment phase saw record spending on new mines and capacity, with the bulk of the investment ending in 2015.

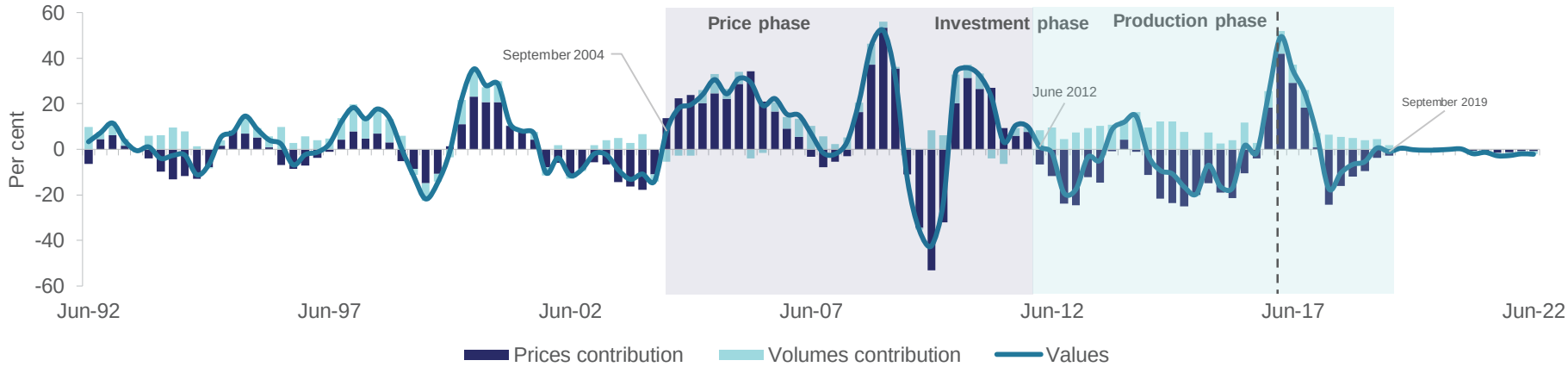
As capacity expanded, production volumes surged. This period can be identified as the 'production' phase of the mining boom.

With the exception of the recent spike in prices, export values are projected to decline over the production phase of the boom. This is because rapidly declining prices — particularly in the early part of the production phase — will outweigh the impact of relatively slower increases in volumes.

The forecasts and projections in this report suggest that the production phase of the mining boom will peak around late 2019, with limited prospects for significant production growth after this time. At this point, there are few major mining developments remaining in the investment pipeline.

After 2019, Australia will continue to benefit from the mining boom. Resources and energy export values are projected to remain close to their historical highs over the remainder of five year outlook period, and well above their pre-boom levels.

Figure 1.10: Australia's resources and energy export values, real quarterly year-on-year growth



Notes: Prices are a Fisher Price Index, based on export values and volumes.
Source: ABS (2017) International Trade in Goods and Services, 5368.0; Department of Industry, Innovation and Science (2017)

Australia overview

Australian resources and energy export values are forecast to peak in 2016–17 and 2017–18

The (real) value of Australia's resources and energy exports are forecast to reach new highs in 2016–17 and 2017–18, before gradually declining over the remainder of the five year outlook period.

In 2016–17, the value of Australia's resources and energy exports are forecast to grow by 32 per cent to reach a record $215 billion, primarily because of higher iron ore and coal prices and growth in LNG export volumes.

In 2017–18, export values are forecast to remain stable at $215 billion (2016–17 dollars). Growth in LNG export volumes are forecast to be offset by declines in iron ore and coal prices

Beyond 2017–18 , the value of Australia's resources and energy exports will decline slightly. Export volumes — primarily of LNG — are projected to continue to increase until 2018–19 , but this is projected to be offset by declining iron ore and coal prices. Growing low-cost supply and subdued global demand growth are expected to weigh on iron ore prices, while coal prices will come under pressure as China implements fewer cuts to capacity.

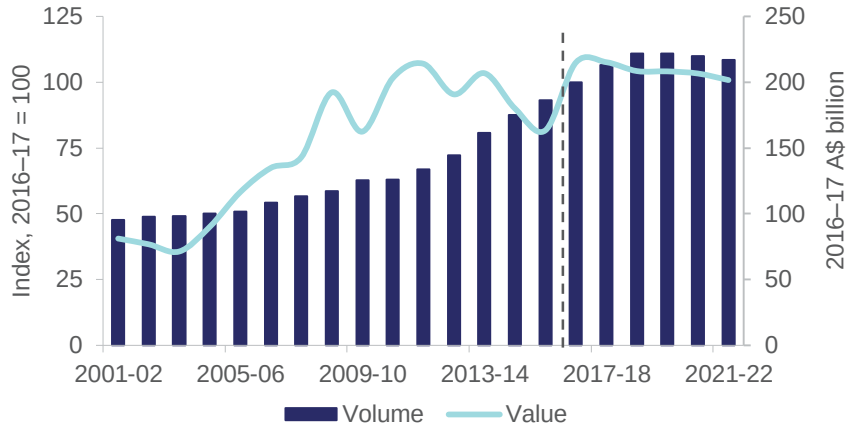
With the limited number of mining projects currently in the investment pipeline, it is unlikely that in the five-year outlook period the value of resource and energy exports will increase substantially beyond 2018–19.

LNG to displace metallurgical coal as Australia's second largest export

LNG is forecast to displace metallurgical coal to become Australia's second largest commodity export in 2017–18. Following large investment in new production capacity, Australia's LNG exports volumes are projected to grow by 106 per cent between 2015–16 and 2018–19.

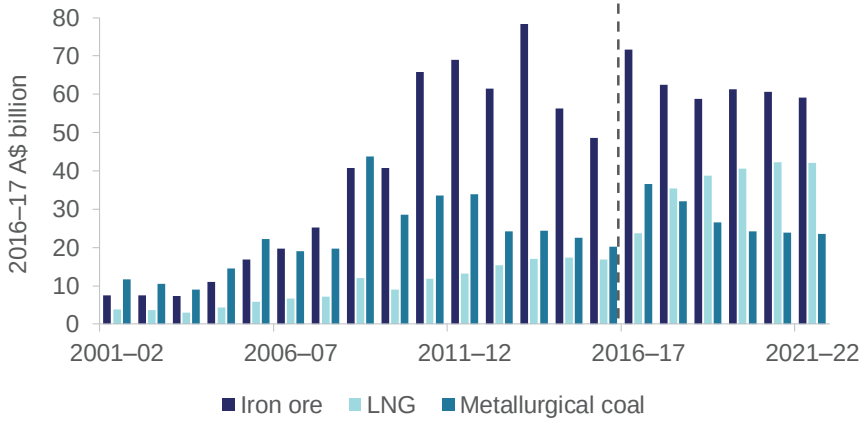
Nevertheless, there are risks to the outlook, as Australian LNG faces stiff competition from growing LNG supplies in the United States and Russia, and from pipeline and indigenous gas production elsewhere.

Figure 1.11: Australia's resources and energy exports



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

Figure 1.12: Australia's three largest commodity exports



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

Australia's resources and energy export volumes are projected to grow

In a period of modest growth in world demand for commodities, demand for Australia's resource and energy commodities will remain relatively strong over the next five years. As shown in Figures 1.13 and 1.14, Australia is projected to continue to increase its global market share — as measured by share of global resource production — in iron ore and gas for several years to come.

This will be underwritten by Australia's position as a highly competitive supplier of high grade iron ore and coal resources. In the case of LNG, there are still gains in production volumes to be realised following the mining investment boom (which raised Australia's production capacity).

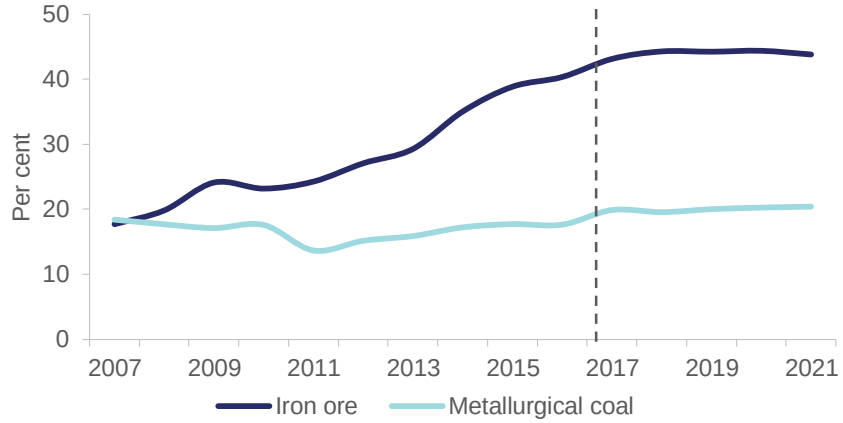
The production phase on the mining boom will peak in 2019

The production phase of the mining boom is projected to peak around late-2019. By then, supply both from Australia and its competitors will have finally caught up with the expansion in global demand brought on by the rise of China. The prospect for further strong growth in production volumes beyond 2019 (to the end of the five year outlook period) is limited, as there is relatively little new investment in the pipeline.

Hancock Prospecting's Roy Hill mine — the last major iron ore project to add to large volumes over the next five years — should reach nameplate capacity in 2017. As a result, slower growth in Australia's iron ore export volumes is projected in the coming years. Coal production will also slow — to 1.3 per cent per annum. Even LNG production, which is forecast to grow rapidly in the next two years, is projected to top out in 2020–21.

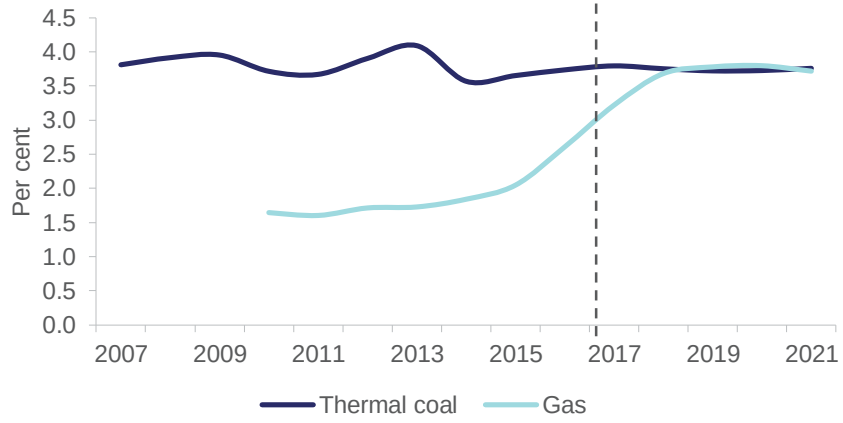
However, Australia will reap the rewards of the mining boom well beyond the peak of the production phase. Because of the large investment to boost production capacity in the past decade, recent extensive cost-cutting and the high quality of our resources, export earnings from mining are projected to remain well above pre-boom levels.

Figure 1.13: Australia's share of global commodity production



Source: World Steel Association (2017); International Energy Agency (2016); Department of Industry, Innovation and Science (2017)

Figure 1.14: Australia's share of global commodity production



Source: International Energy Agency (2016); Department of Industry, Innovation and Science (2017)

Mining's contribution to economic growth to remain strong in the short term, but is projected to fade over the medium term

Australia's real Gross Domestic Product (GDP) grew by 1.1 per cent in the December quarter 2016, following a decline in the September quarter. The mining industry accounted for nearly a quarter of Australia's total GDP growth in the December quarter.

Growth in Australia's mining industry value added was driven by increasing resources and energy export volumes. In the December quarter 2016, resources and energy export volumes grew by an estimated 7.4 per cent year-on-year.

Mining has been an important part of Australia's GDP growth in the last five years, directly accounting for 17 per cent of Australia's GDP growth. However, as demonstrated in Figure 1.15, as the production phase of the mining boom reaches its peak in 2019, mining's contribution to real GDP growth is also projected to moderate.

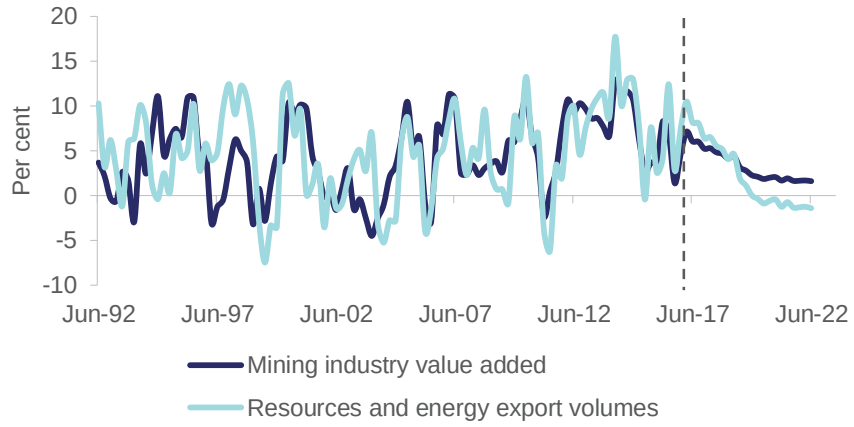
Mining capital expenditure to soften further in the short term, but should bottom out in the next few years

The investment phase of the mining boom has largely concluded. Private new capital expenditure in the mining sector declined by 9.3 per cent in the December quarter 2016, to be down 37 per cent year-on-year — its lowest level in seven years. There was an increase in investment in equipment, plant and machinery in the December quarter, but this was more than offset by declining investment in buildings and structures.

Despite the improvement in commodity prices in recent months, prices remain well below the levels that spurred the investment phase of the mining boom. Additionally, mining companies appear to be exercising more caution, given that the price gains in 2016 and early 2017 are expected to be at least partly unwound over the next 18–24 months. This caution is reflected in business' expectations for mining capital investment, which suggest further declines into 2017–18.

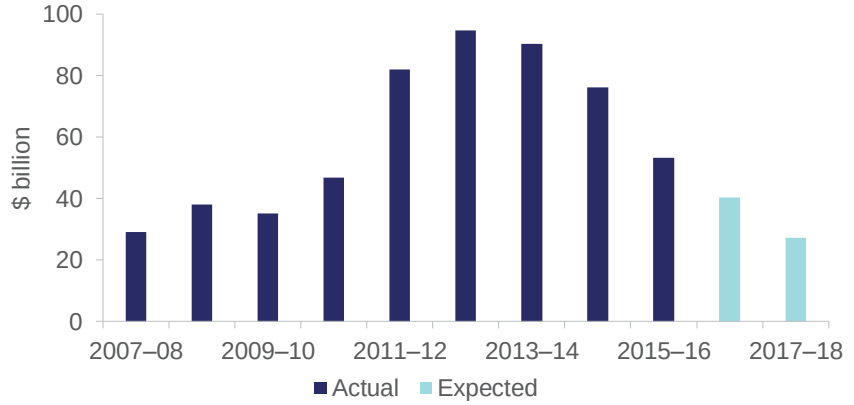
However, global demand for Australia's resources and energy exports is projected to continue to grow (albeit more modestly) over the next five years, and existing mining and energy assets will eventually need replacement. As a result, mining investment may pick up after 2017–18.

Figure 1.15: Mining industry value added, quarterly year-on-year growth



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 1.16: Private investment in mining, current prices



Notes: Expected capex on mining is based on responses to an ABS survey of businesses.
Source: ABS (2017) Private New Capital Expenditure and Expected Expenditure, 5625.0

Exploration

Exploration expenditure declined by 2.5 per cent in the December quarter 2016, to be 15 per cent lower year-on-year. The decline in exploration expenditure continues to be driven by petroleum exploration, with minerals exploration relatively stable over the last two years.

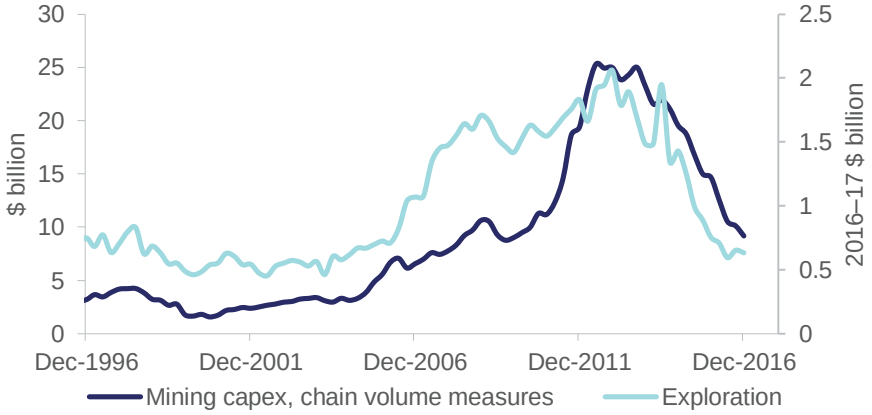
Exploration expenditure across the mineral commodities was mixed, with increases in exploration in gold, nickel, cobalt, copper and silver, lead and zinc. Coal, uranium and iron ore exploration declined.

The generally subdued medium term outlook for commodity prices makes substantive increases in exploration expenditure over the outlook period unlikely.

Employment edges up in 2017 for a third consecutive quarter

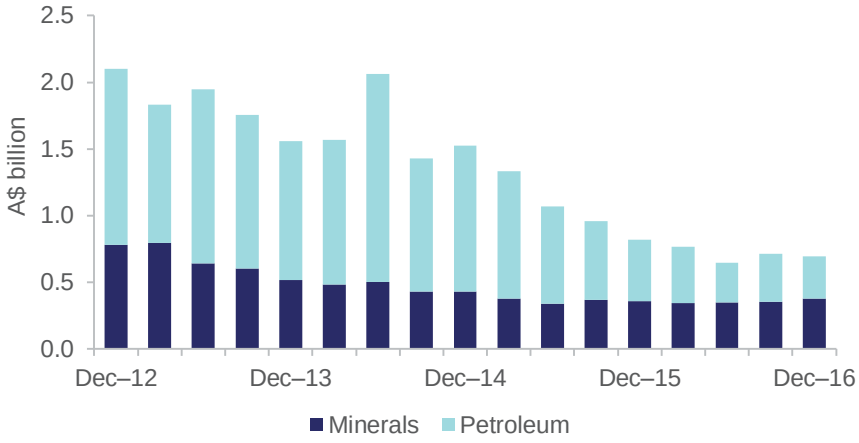
The mining sector employed 241,000 persons in February 2017, up by 3.5 per cent quarter-on-quarter and 6.6 per cent year-on-year. Employment in the sector is not expected to rebound substantially over the medium term, with the production phase of the boom expected to be less labour-intensive than the construction phase.

Figure 1.17: Mining investment and exploration expenditure, quarterly



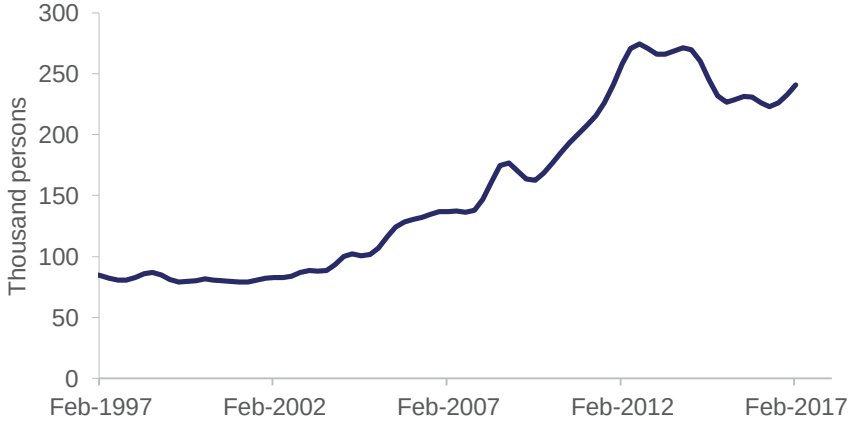
Source: ABS (2017) Actual and Expected Private Mineral Exploration, 8412.0; ABS (2017) Private New Capital Expenditure and Expected Expenditure, 5625.0

Figure 1.18: Australia's exploration expenditure, quarterly



Source: ABS (2017) Actual and Expected Private Mineral Exploration, 8412.0

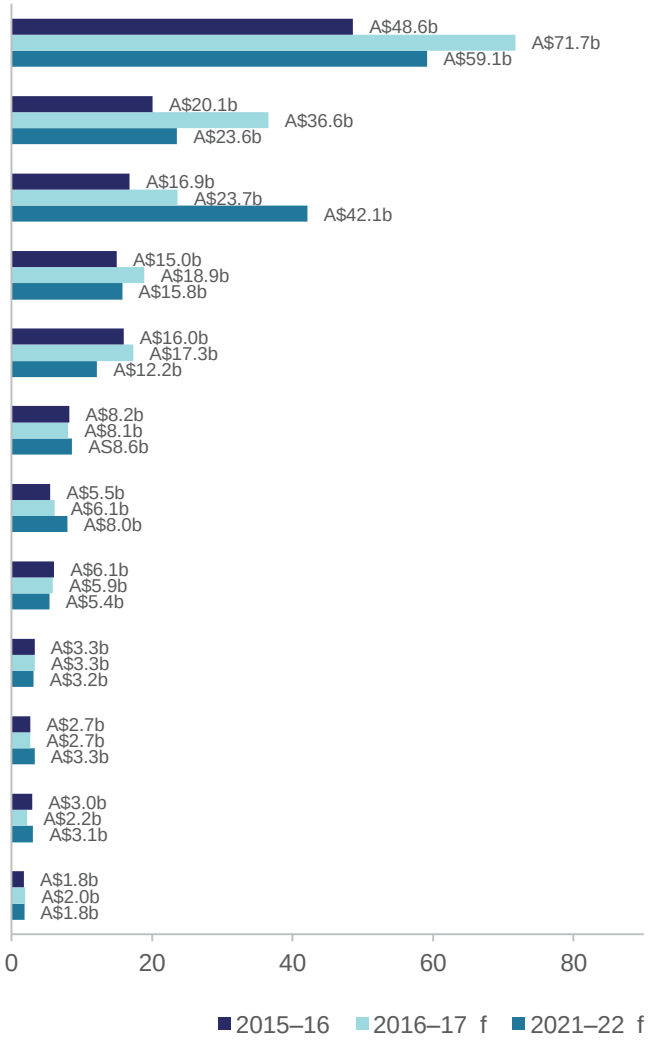
Figure 1.19: Australia's mining sector employment



Notes: Trend data

Source: ABS (2017) Labour Force Australia, 6291.0.55.003

Figure 1.20: Australia's major resources and energy commodity exports, 2016–17 dollars



	2016–17 f (Per cent) volume	2016–17 f EUV	2016–17 f value	2021–22 z volume	2021–22 z EUV	2021–22 z value
Iron ore	▲ 8	▲ 36	▲ 48	▲ 1	▼ -5	▼ -4
Metallurgical coal	▲ 2	▲ 78	▲ 82	▲ 1	▼ -10	▼ -8
LNG	▲ 44	▼ -3	▲ 40	▲ 8	▲ 4	▲ 12
Thermal coal	→ 0	▲ 26	▲ 26	▲ 1	▼ -4	▼ -4
Gold	▲ 7	▲ 2	▲ 9	▼ -5	▼ -2	▼ -7
Copper	▼ -12	▲ 11	▼ -2	→ 0	▲ 2	▲ 1
Crude oil	▲ 1	▲ 10	▲ 11	▲ 2	▲ 3	▲ 5
Alumina	▲ 1	▼ -4	▼ -3	→ 0	▼ -2	▼ -2
Aluminium	▼ -2	▲ 4	▲ 2	▲ 1	▼ -2	▼ -1
Zinc	▼ -12	▲ 14	▲ 1	▼ -6	▲ 10	▲ 4
Nickel	▼ -25	▲ 1	▼ -25	▲ 2	▲ 5	▲ 7
Lead	▼ -17	▲ 31	▲ 9	▲ 2	▼ -3	▼ -1

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

*Notes: **f** Forecast (one year growth); **z** Projection (five year average annual growth); EUV is export Unit Value; values are in 2016–17 dollars*

Table 1.2: Outlook for Australia's resources and energy commodities

	unit	2015–16	2016–17 f	2017–18 f	2018–19 z	2019–20 z	2020–21 z	2021–22 z
Value of exports								
Resources and energy	A$m	160,754	215,104	219,964	218,151	223,330	227,128	227,225
– real b	A$m	163,477	215,104	215,333	208,582	208,369	206,736	201,736
Energy	A$m	59,810	88,924	100,749	99,297	100,561	103,633	104,826
– real b	A$m	60,823	88,924	98,628	94,941	93,825	94,328	93,067
Resources	A$m	100,945	126,180	119,215	118,855	122,769	123,495	122,399
– real b	A$m	102,654	126,180	116,705	113,641	114,544	112,407	108,669

*Note: **b** In 2016–17 financial year Australian dollars; **f** Forecast; **z** Projection*
Source: ABS (2017) International Trade, cat.no 5465.0; Department of Industry, Innovation and Science

Table 1.3: Australia's resources and energy commodity exports, by selected commodities

	Volume				Value (2016–17 $)			
	unit	2016–17	2021–22 z	CAGR	unit	2016–17	2021–22 z	CAGR
Alumina	kt	17,899	18,335	0.5	A$m	5,920	5,427	–1.7
Aluminium	kt	1,411	1,448	0.5	A$m	3,347	3,155	–1.2
Copper	kt	964	992	0.6	A$m	8,064	8,602	1.3
Gold	t	327	255	–4.8	A$m	17,329	12,207	–6.8
Iron ore	Mt	850	915	1.5	A$m	71,699	59,135	–3.8
Nickel	kt	187	201	1.5	A$m	2,237	3,104	6.8
Zinc	kt	1,329	992	–5.7	A$m	2,691	3,293	4.1
LNG	Mt	53	77	7.7	A$m	23,654	42,128	12.2
Metallurgical coal	Mt	192	204	1.2	A$m	36,574	23,555	–8.4
Thermal coal	Mt	202	209	0.7	A$m	18,921	15,767	–3.6
Oil	kbd	241	266	1.9	A$m	6,130	7,996	5.5
Uranium	t	7,141	9,800	6.5	A$m	907	1,112	4.2

*Notes: **z** Projection. CAGR is compound annual growth rate, in percentage terms from 2016–17 to 2021–22*
Source: ABS (2017) International Trade, cat.no 5465.0; Department of Industry, Innovation and Science

Macroeconomic outlook

World outlook

From a resource and energy commodity–producing perspective, the ongoing improvement in the world growth outlook since our last report has been very encouraging. In trend terms, growth in global industrial production has continued to accelerate in recent months. The pick-up in global activity is reflected in trade and manufacturing activity around the world, with several nation's Purchasing Managers' Indices reporting their highest level in a number of years. World trade volumes have risen in recent months, up 3.4 per cent in the twelve months to January 2017.

Forward indicators point to a further gradual pick up in global growth in the short term, with slightly stronger growth prospects for 2017, namely GDP growth of 3.4 per cent, increasing to 3.6 per cent in 2018. The standout contributors are the US, China and India.

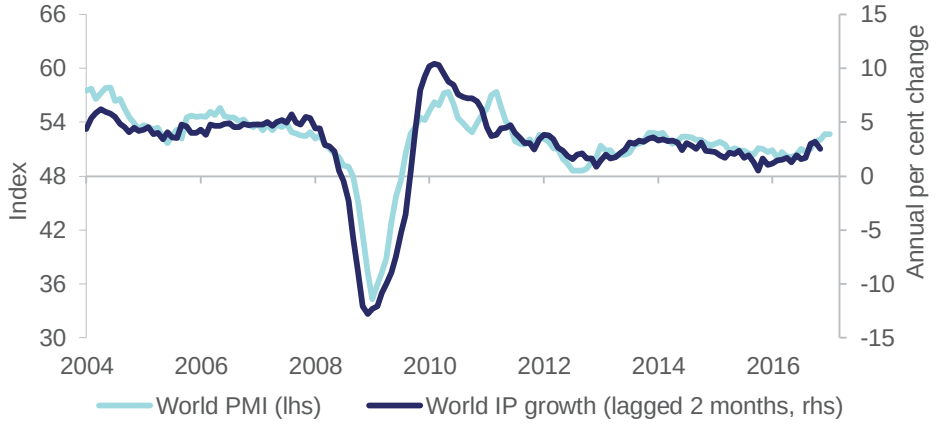
However, some advanced economies are still expected to experience relatively weak growth, as their policy levers reach the limit of their capacity. The desire to return government budgets to surplus is conflicting with attempts to bring about economic recovery. Moreover, debt and deficits may become more challenging to repay/reverse if global bond yields start to rise. Already, the US Federal Reserve has raised the Federal Funds Rate by 25 basis points in March 2017, with firm signals that further increases can be expected this year and next. US income and corporate tax cuts and increased infrastructure spending have the potential to push the economy against capacity constraints, raising inflation and interest rates further.

Other policies emerging from the new US Administration have the potential to have far-reaching implications for world growth. Globalisation — and its impacts on trade and production — is likely to be an ongoing focus for markets and policy makers. Governments in the major economies are likely to be increasingly sensitive to political sentiment favouring protectionism over the further dismantling of trade barriers.

China

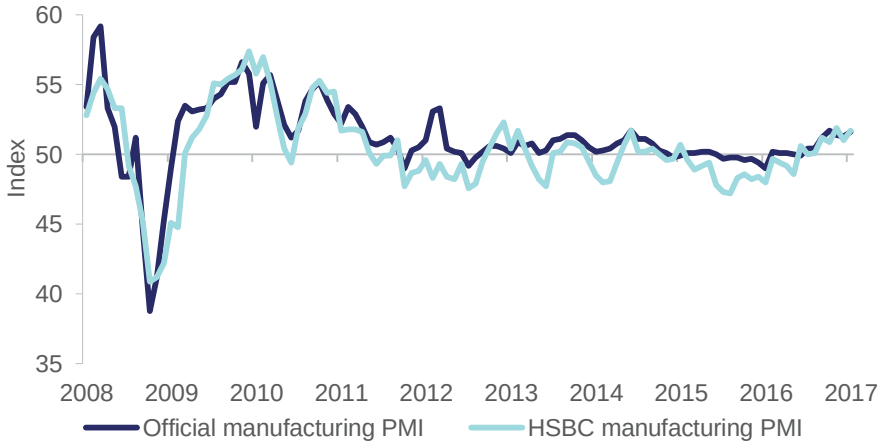
Both of China's Purchasing Manager's Indices (PMI) for manufacturing have shown strength in recent months, driven by improvements in new export orders and imports. Industrial production grew by 6.3 per cent in January-February compared to the corresponding period last year.

Figure 2.1: World Industrial Production vs World Purchasing Manager Index



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

Figure 2.2: China manufacturing PMIs (official and unofficial HSBC)



Source: National Bureau of Statistics, China (2017) Manufacturing PMI; Markit-HSBC (2017) China manufacturing PMI

Private sector investment has also increased, filling the gap created by lower investment by state-owned enterprises.

Growth in Chinese house prices has started to slow, following the implementation of policies to reduce speculative investment in late 2016. House prices in the major cities (tier 1) showed no growth in January 2017 compared to the previous month. House price growth should continue to moderate in 2017 and 2018, contributing to slower growth in residential construction. Bringing down housing inventory and reforming the property industry to limit speculative housing investment, remains a key goal for China. Over the longer term, price growth should continue to moderate, but construction is likely to stay strong, as new developments are undertaken to meet the under supply in the major cities.

Chinese GDP growth is expected to ease modestly, from 6.7 per cent in 2016 to 6.5 per cent in 2017, and to 6.0 per cent in 2018. During the National People's Congress, China's Government announced the 2017 growth target would be 'around 6.5 per cent'. This is softer than the previous target of between 6.5 and 7 per cent for 2016, suggesting that China is comfortable with slower but more stable growth in 2017. Plans to invest heavily in railway construction (800 billion yuan), and highway and waterway projects (1.8 trillion yuan) were also announced. This increased infrastructure spending could lead to increased demand for steel and, as a result, Australian iron ore.

Over the longer term, China is set to continue the transition away from manufacturing investment and export-oriented growth, towards consumption-led growth. In the 13th Five Year Plan for 2016-2020, several targets were set, focusing on structural and market-oriented reforms. These include raising the service sector's contribution to GDP to 56 per cent, expanding infrastructure investment by 15 trillion yuan, and financial market reform to enable higher private sector investment.

As the transition continues, China's GDP growth is projected to slow to an average of 5.9 per cent in the years from 2019 to 2022. Risks to the outlook include the leadership change expected at the 19th National Congress — to be held in late 2017 — which may see a renewed focus on strong economic growth at the expense of structural reform.

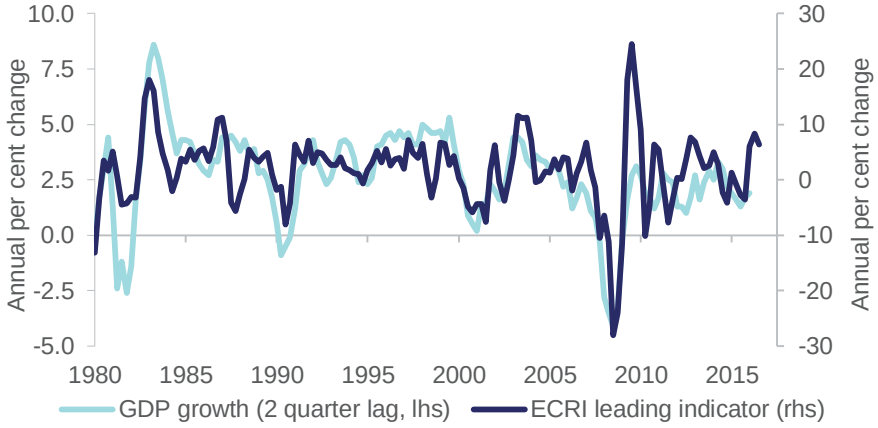
United States

US GDP growth slowed to 2.1 per cent (seasonally-adjusted annualised rate) in the December quarter of 2016, but the economy is showing signs of continued recovery. Consumer spending has been a driver of growth. Recent positive results for the manufacturing Institute of Supply Managers (ISM) survey, consumer confidence and jobless claims, suggest firmer growth prospects in 2017.

After strong gains in late 2016, US construction spending has started 2017 in decline; increases in private construction investment have been insufficient to offset a fall in public construction spending. State and Local government spending on construction has been declining for the last three months, while Federal Government spending dropped sharply in January, to break three consecutive months of growth.

After 1.6 per cent growth for all of 2016 — its worst performance since 2011 — US GDP growth is forecast to pick up to 2.3 per cent in 2017 and 2.5 per cent in 2018. However, growth is projected to slow to an average of 1.7.

Figure 2.3: US GDP growth vs Economic Cycle Research Institute leading indicator, quarterly



Source: Bureau of Economic Analysis (2017) US Gross Domestic Product; Economic Cycle Research Institute (2017) US Weekly Leading Index

per cent from 2019 to 2022, as tighter monetary conditions (due to rising interest rates and a stronger US dollar) induce a slowdown.

There are concerns about the inflationary effects of increased infrastructure spending, given that prices, wages and bond yields are already rising. After the US Federal Reserve raised the Federal Funds Rate at its March 2017 meeting, Fed officials indicated that a further two more rate rises were likely this year and three more in 2018. Interest rate rises will likely see the US dollar appreciate, putting pressure on US businesses competing with offshore producers.

Europe

GDP in the EU grew by 1.8 per cent in the year to the December quarter 2016. Industrial production growth in the EU is rising and the Eurozone Composite PMI suggests stronger activity in the Eurozone in the short term. The index reached 56.7 index points in March, the highest level since April 2011. This strengthening has been helped by ongoing loose monetary policy and a weaker Euro, which is driving strong demand for European exports.

Stronger growth across the region has been driven by private consumption, sustained by improvements in wages and employment growth. Improvements in the global economy have also improved growth prospects, particularly for European exports. Positive growth has led to a steady reduction in government debt-to-GDP ratios, helped by low interest rates and lower interest spending. However, business investment is still weak, and investment as a share of GDP remains below pre-GFC levels.

Several Western European countries are to hold elections this year. The uncertainty could impact on consumer and business confidence and spending in the short term. The practical implications of the UK's exit from the EU are still to play out, with general expectations of more complex economic relations. However, the potential impacts on Australia appear modest at this stage.

The European Central Bank is unlikely to start winding back any accommodative monetary policy measures in 2017. Inflation is still short of the 2 per cent target. Quantitative easing measures are to remain in place until December 2017. Beyond this, easing is still possible if the recovery is jeopardised by political upheaval or rising trade tensions.

Figure 2.4: Eurozone Composite Purchasing Managers' Index vs Eurozone GDP quarterly growth

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

However, markets have remained stable following previous shocks, such as the Brexit decision, suggesting the upcoming elections may cause minimal economic disruption.

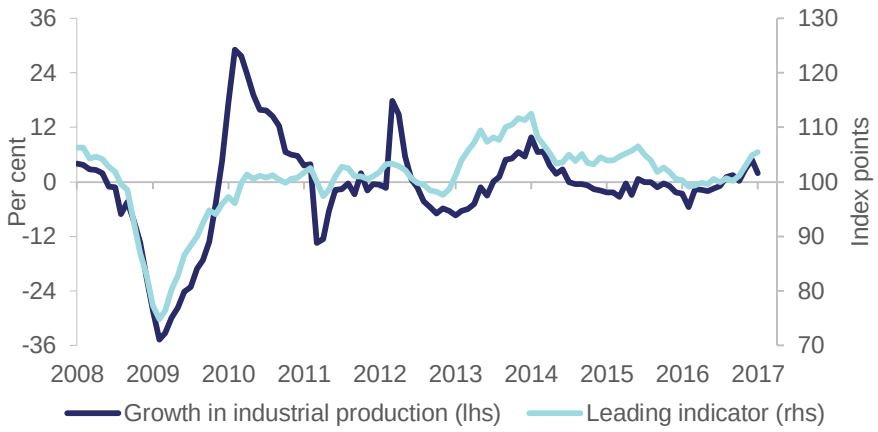
Growth estimates have been revised up slightly, to 1.7 per cent in 2017 and 1.8 per cent in 2018. These estimates are broadly in line with the growth seen in the EU in recent years. From 2019 to 2022, growth is expected to remain steady, at 1.7–1.8 per cent.

Japan

Japanese industrial production in January fell 0.4 per cent from December, falling for the first time in six months. The key driver of the fall was a drop in the production of cars, engines and other transport equipment.

Japanese GDP growth is forecast to be 0.8 per cent in 2017 and 0.5 per cent in 2018. Inflationary pressures in the United States may prove beneficial for Japanese exporters if the US dollar strengthens against the Yen.

Figure 2.5: Japan Industrial production index vs leading index



Source: Ministry of Economy, Trade and Industry, Japan (2017) Indices of Industrial Production; Economic and Social Research Institute, Japan (2017) New Composite Index of Business Cycle Indicators Leading Index

Over the longer term, growth is Japanese growth in projected to rise to 1.0 per cent in 2020, before stabilising at 0.6 per cent to 2022.

Despite the apparent recovery of the Japanese economy, the Bank of Japan remains cautious, choosing not to change any policy settings at their March 2017 meeting. Inflation remains short of the central bank's 2 per cent target, reducing the chance of any increase in the interest rate in the short term. However, consumer prices increased for the first time in over a year in January suggesting that the central bank will soon need to start withdrawing the current loose monetary policy settings.

India

Indian GDP growth has been revised down in the short term, to 7.2 per cent in 2017 and 7.7 per cent in 2018. This downward revision is largely due to the recent withdrawal of high-value banknotes, which has caused significant disruption to several cash-based sectors. Further out, growth is projected to remain strong, averaging 8.0 per cent from 2019 to 2022.

South Korea

Industrial production in South Korea spiked by 3.3 per cent in the month of January, the fastest monthly growth in over seven years. The jump is attributed to an increase in output from key electronics sector, suggesting that global demand is picking up (as exports increased substantially). While this indicates an improvement in economic activity, South Korea is looking to diversify its export markets, to reduce reliance on their major partners (the US and China). The government is concerned over growing protectionist sentiment in the US, and rising political tensions with China.

Despite positive results for the beginning of 2017, consumption continues to drag down growth prospects. GDP growth for South Korea has been revised down to 2.6 per cent in 2017 and 2.8 per cent in 2018, and is projected to stabilise at 3.0 per cent from 2019 to 2022.

Table 2.1: Key world macroeconomic assumptions

Per cent	2016	2017 a	2018 a	2019 a	2020 a	2021 a	2022 a
Economic growth b							
Advanced economies	1.6	1.9	2.0	1.8	1.7	1.7	1.7
United States	1.6	2.3	2.5	1.9	1.7	1.6	1.6
Japan	0.9	0.8	0.5	0.7	1.0	0.6	0.6
European Union 28	1.9	1.7	1.8	1.8	1.8	1.7	1.7
Germany	1.7	1.5	1.5	1.3	1.3	1.2	1.2
France	1.3	1.3	1.6	1.7	1.8	1.8	1.8
United Kingdom	2.0	1.5	1.4	1.8	1.9	1.9	1.9
South Korea	2.7	3.0	3.1	3.0	3.0	3.0	3.0
New Zealand	2.8	2.7	2.6	2.5	2.5	2.6	2.6
Emerging economies	4.1	4.5	4.8	5.0	5.1	5.1	5.1
Emerging Asia	6.3	6.4	6.3	6.4	6.4	6.4	6.4
South East Asia d	4.8	4.9	5.2	5.4	5.5	5.5	5.5
China e	6.7	6.5	6.0	6.0	5.9	5.8	5.8
Chinese Taipei	1.0	1.7	1.9	2.2	2.5	2.7	2.7
India	6.6	7.2	7.7	7.8	8.0	8.1	8.1
Latin America	-0.7	1.2	2.1	2.6	2.7	2.7	2.7
Middle East	3.2	3.2	3.4	3.6	3.7	3.6	3.6
World	3.1	3.4	3.6	3.7	3.7	3.8	3.8
Inflation rate b							
United States	1.4	2.2	2.2	2.0	2.3	2.4	2.4

Notes: ***a*** *Assumption;* ***b*** *Change from previous period;* ***d*** *Indonesia, Malaysia, the Philippines, Thailand and Vietnam;* ***e*** *Excludes Hong Kong*
Source: IMF (2017) World Economic Outlook; Department of Industry, Innovation and Science


Steel

Market summary

Over the next five years, global steel production is projected to grow at an annual average rate of 1.2 per cent, a modest rebound from 2015 and 2016, to reach 1.73 billion tonnes in 2022. Declining production in China, which produces half the world's steel, is projected to be offset by a rapid expansion in India's steel output, and to a lesser extent, higher production growth in Japan, South Korea, the United States and the EU. Steel consumption growth is expected to be supported by Emerging economies; current levels of per-capita steel consumption are well below their advanced counterparts, suggesting substantial potential for growth.

China

China's steel sector began 2017 buoyed by high prices

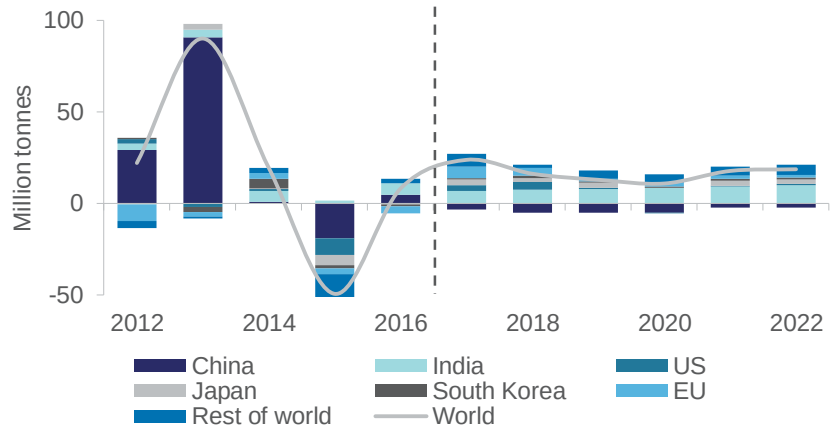
China's steel production increased by 4.5 per cent year-on-year in the December quarter 2016, to total 808 million tonnes in 2016 — a 0.6 per cent increase on 2015. Steel output increased despite the Chinese authorities accelerating capacity cuts to well over the 45 million tonne target.

The 2016 output rise came because approximately two-thirds of the mandated closures were to already-idled plants. Additionally, capacity utilisation at the remaining (generally larger and more efficient) steel mills has increased, in response to higher steel prices and margins.

The additional output has been absorbed by domestic demand, which increased by 15 per cent year-on-year in the three months to February. Steel demand has been supported by strong growth in infrastructure, real estate and manufacturing investment, with infrastructure fixed asset investment (FAI) up 13 per cent, real estate FAI up 8.3 per cent, and manufacturing FAI up 6.8 per cent year-on-year in the December quarter.

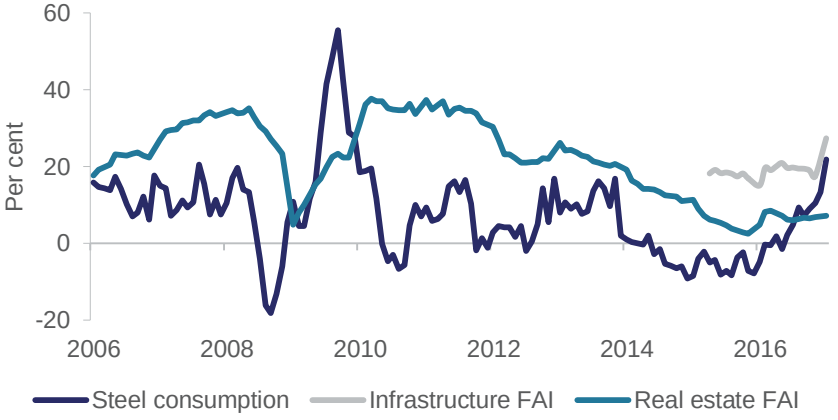
Demand is expected to remain robust in the short term, supported by stimulatory policies and increased infrastructure investment to sustain economic growth (ahead of the politically important National Communist Party Congress in November). The OECD leading indicator for China was up 7.5 per cent year-on-year in December 2016, pointing to accelerating growth in China's industrial production. Steel production is closely linked with industrial production in China.

Figure 3.1: World steel production, annual YoY change



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

Figure 3.2: China monthly steel consumption and cumulative fixed asset investment, YoY growth



Notes: Infrastructure FAI series begins in 2015

Source: Bloomberg (2017) National Bureau of Statistics China

China's steel output is projected to decline to 785 million tonnes by 2022

Steel production is forecast to decline by 0.4 per cent to 805 million tonnes in 2017, driven by a capacity cut targeted at 50 million tonnes for the year, in addition to closures of all illegitimate induction furnaces. The capacity cuts are expected to have more tangible impacts on steel production than in 2016. However, capacity cuts and closures of induction furnaces are expected to be partially offset by increased production at remaining mills, where higher margins should incentivise increased production.

Over the next five years, steel production is projected to decline at an average annual rate of 0.5 per cent, to reach 785 million tonnes in 2022. This would put steel output 4.6 per cent lower than its peak in 2014. The Government's 'Iron and Steel Industry Adjustment and Upgrade Plan (2016–2020)' — released in November 2016 — highlights the need to reconcile an expected decline in steel consumption with rising production capacity (that has ballooned to over 1.1 billion tonnes).

The plan reflects a shift in focus from quantity to quality, and aims for a net reduction in capacity of 100 to 150 million tonnes, an increase in the capacity utilisation to 80 per cent and increased industry consolidation. The aim is for the top ten producers in China to produce 60 per cent of production by 2020. Increasingly stringent environmental regulations will also drive reductions in output and capacity in major steel producing cities, particularly in the winter months of November to February.

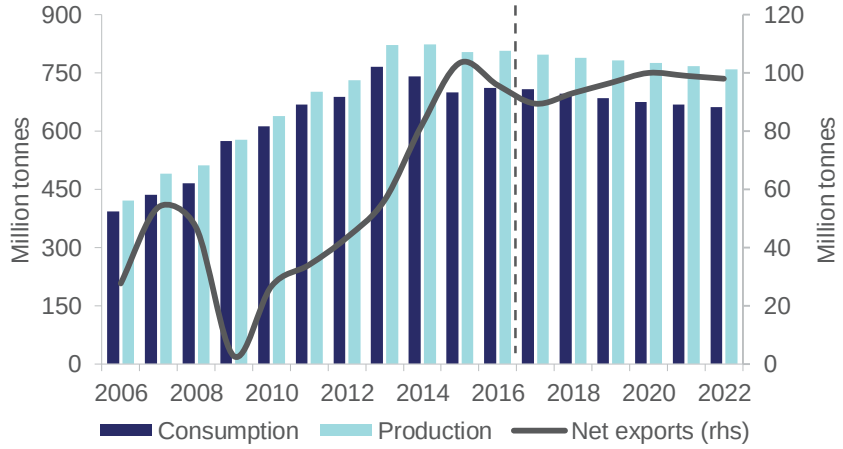
China's steel exports have declined from their peak in 2015, and at 5.8 million tonnes in February, were at the lowest monthly volume since 2013. Declining exports have been driven by growing domestic consumption and ballooning global capacity. Nevertheless, export growth over the next five years is expected to be supported by growing demand from emerging economies in Asia.

China's steel consumption is forecast to decline at an average annual rate of 1.2 per cent over the outlook period, to 662 million tonnes in 2022. This implies a steel intensity of 470 kilograms per capita in 2022, lower than both Japan and South Korea (Figure 3.5). Unlike these countries, China's steel-using industries are not expected to be supported by the same levels of aggressive export growth, and will be constrained by increasing global trade tensions.

China's moderating demand for steel is also expected to be underpinned by slowing housing construction activity. Government policies to cool the property market have already resulted in slowing growth of house prices. This will only be partially offset by plans for substantial government investment in infrastructure ($7.9 trillion to 2020) and increased consumer spending (that will support growth in the automobile, machinery and appliances sectors).

The pace and extent of the slowdown in both real estate and other fixed asset investment, and the consequent trajectory of China's steel demand, is sensitive to how the Central government will balance competing priorities. On one hand, there is a need to ensure stable growth and use stimulatory government spending to smooth the country's structural transition. On the other hand, there is a need to progress reforms to address industrial overcapacity, reduce public and private debt, and manage financial risk from property bubbles and speculative investment.

Figure 3.3: China's annual steel production, consumption and net exports



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

India

India to become the world's second largest steel producer by 2018

India's steel production increased by 11 per cent year-on-year in the December quarter, and by 7.4 per cent in 2016 as a whole, to 96 million tonnes. The domestic steel industry has been supported by a range of policies that have resulted in a substantial decline in steel imports. In the December quarter, the value of steel and iron imports decreased by 19 per cent year-on-year.

Over the next two years, India's steel production is forecast to grow at an average annual rate of 7.3 per cent to at 110 million tonnes in 2018. India will then become the world's second largest steel producer, but still far lower than China. Production is projected to reach 146 million tonnes in 2022, contributing to the 300 million tonne capacity target in 2031.

Although comparisons are often drawn with China, the development of the steel industry in India will be constrained by more challenging financial, political and economic conditions. Risks to the forecast include challenges in accessing finance, land and raw materials, and competition from lower-cost imports (if import duties are removed).

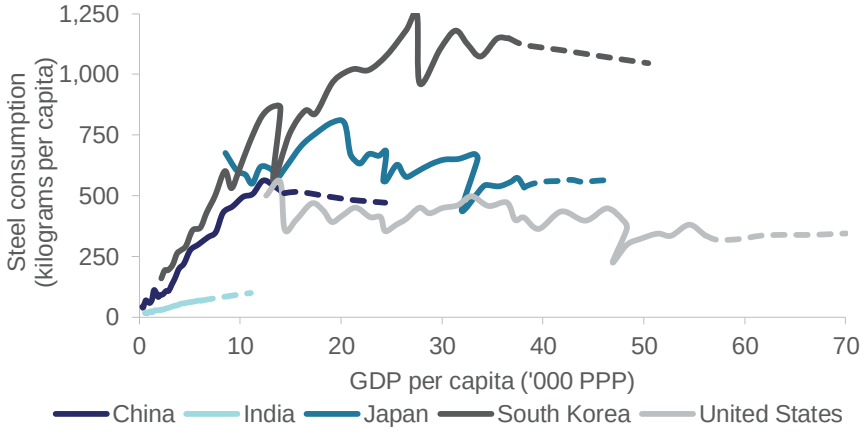
Capacity expansion plans are being driven by expectations of growing consumption — forecast to increase at an average rate of 6.7 per cent to 140 million tonnes in 2022. There is scope for substantial growth in India's steel consumption; in 2016, the estimated steel intensity of India was 73 kilograms per capita, compared to 516 kilograms per capita in China.

Steel consumption growth is expected to be driven by substantial infrastructure investment, growth in residential construction, and the growth of the shipbuilding, defence, automobile and manufacturing sectors — driven by the 'Make in India' campaign. India's projected steel demand implies a steel intensity of 99 kilograms per capita in 2022.

Figure 3.4: India's monthly steel production and imports, YoY growth

Source: Bloomberg (2017) World Steel Association; Bloomberg (2017) Reserve Bank of India

Figure 3.5: Steel consumption intensity, 1980 to 2022



Notes: Dashed lines are forecasts

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

Box 3.1: Scrap steel and EAF route not expected to have a substantial impact on raw materials demand to 2022

Every tonne of recycled steel used in steel-making replaces over 1,400 kilograms of iron ore and 740 kilograms of metallurgical coal. Scrap steel usage depends both on the type of process used to make steel, in addition to the availability of scrap steel. This has potential implications for import demand for Australia's two biggest exports — iron ore and metallurgical coal.

There are two main steel production processes used today:

1. The blast furnace and basic oxygen furnace (BF–BOF) route, using 1.4 tonnes of iron ore and 0.8 tonnes of coal and 0.012 tonnes of recycled steel, for every tonne of crude steel. BOFs can be fuelled with up to 30 per cent scrap.

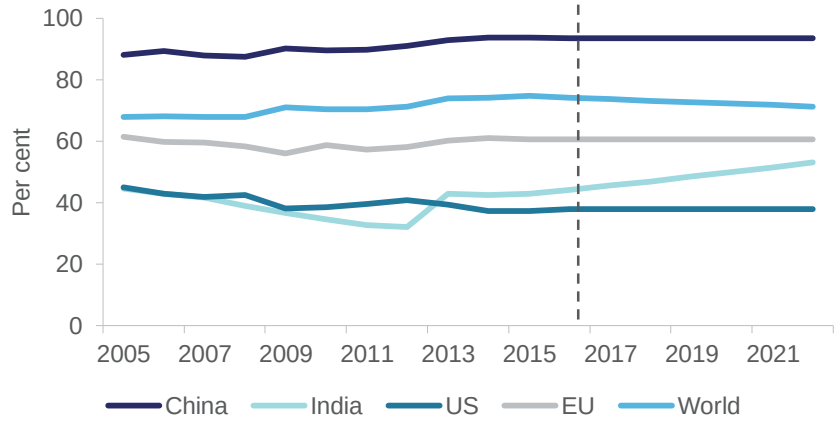
2. The electric arc furnace (EAF) route, using 0.88 tonnes of recycled steel, 0.016 tonnes of coal and varying amounts of direct reduced iron and recycled steel, for every tonne of crude steel. EAFs can be fuelled with up to 100 per cent scrap steel.

The efficiency, feedstock flexibility, lower capital costs and environmental advantages of EAFs, can make them a more attractive option in some contexts. However, the BF–BOF route currently accounts for 75 per cent of world steel production, and it is expected to continue to dominate world steel production to 2022.

In China, BF–BOF's share of steel production was 94 per cent in 2015. The government's plan for the iron and steel industry indicates that in the longer term (beyond 10 to 15 years), there is potential for large scale investments in EAF plants. In the meantime, however, the relatively slow growth of scrap output (with an average lifecycle of steel at 40 years for construction), high cost of electricity and constraints in adding new capacity, will limit the pace of growth in EAFs.

In India, BF–BOF's share of steel production was 43 per cent in 2015, but this share is expected to increase substantially over the next 5 years to 2022. The vast majority of major steel projects currently underway are BF-BOF plants. There are also plans to increase the domestic availability of coking coal and iron ore, making the BF-BOF route the more cost-effective option.

Figure 3.6: Share of total steel production from BF–BOF



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

Figure 3.7: China's monthly steel scrap imports

Source: Bloomberg (2017) China Customs General Administration

United States

US steel sector boosted by Trump administration policies

US steel production declined by 0.3 per cent in 2016 to 79 million tonnes. However, the decline masked a recovery in production late in the year — output rose by 3.8 per cent in the year to the December quarter, supported by the impact of high anti-dumping duties on a range of steel products.

The share prices of US steel producers have also been bolstered by the election of the Trump administration. Substantial uncertainty still surrounds the implementation of pledges made during the US election campaign. There has been optimism that President Trump's policies and infrastructure spending proposals will support domestic steel prices and sales. Since the US election, a number of steel mills have announced restarts and expansions. Production is forecast to grow by 3.8 per cent and 5.2 per cent in 2017 and 2018, respectively, reaching 86 million tonnes in 2018. Production growth is projected to moderate through the remainder of the outlook period to reach 88 million tonnes in 2022.

Rest of Asia

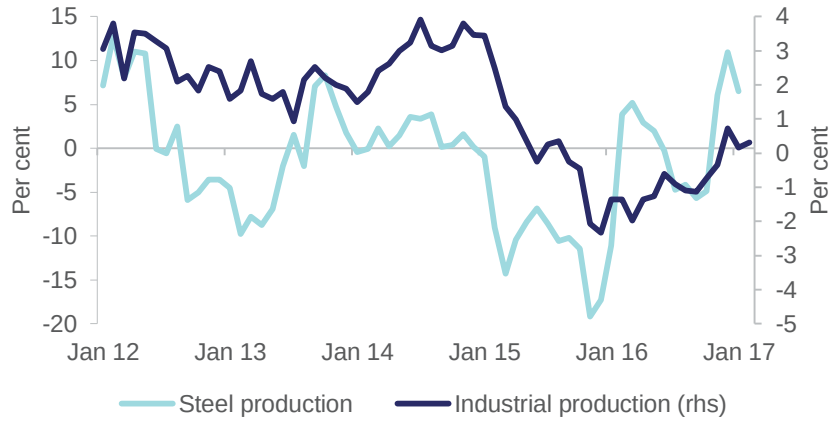
Emerging economies in Asia to increasingly drive steel consumption

Steel consumption from the rest of Asia (excludes China, India, Japan, South Korea and Taiwan) grew by 9.3 per cent to 102 million tonnes in 2015, making this bloc of countries the world's fourth largest consumer of steel after China, the EU and the US.

Consumption is projected to grow at an average rate of 5.7 per cent over the outlook period, to reach 150 million tonnes in 2022, driven by strong economic growth in the ASEAN countries. Consumption growth will be supported by the construction sector, which accounts for around 74 per cent of steel use in these countries, and to a lesser extent, the automobile sector, which accounts for 11 per cent.

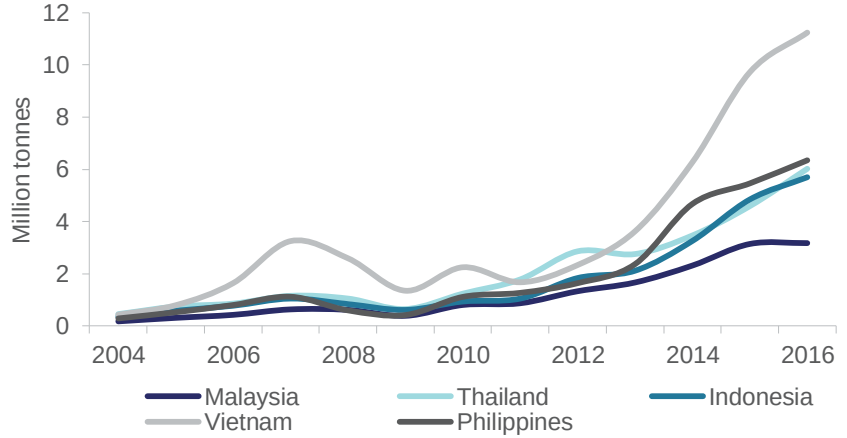
The steel industry in ASEAN countries is generally underdeveloped and fragmented, producing 26 million tonnes in 2016 of primarily low-end steel products. While steel production is projected to grow over the medium term, this is from a relatively low base, reflecting a high potential for steel export growth to these countries — and opportunities for Australian exporters of steel-making commodities.

Figure 3.8: US steel production and industrial production, YoY growth



Source: Bloomberg (2017) World Steel Association; Bloomberg (2017) US Federal Reserve

Figure 3.9: ASEAN steel imports from China



Source: Bloomberg (2017) China Customs General Administration

Rest of world

Japan's steel exports supported by demand for high-value steel products

Japan's steel production remained broadly stable in 2016, at 105 million tonnes. In February 2017, Japan's industrial production index and rose by 9.7, pointing to growth in the steel sector in the first half of 2017. Steel production is forecast to grow by 3.0 per cent in 2017, and then grow at an average rate of 1.7 per cent over the remainder of the outlook period to 2022, to reach 118 million tonnes. Despite moderating consumption, exports from Japan — the world's second largest steel exporter — are expected to be supported by demand for its high-value steel products, used in vehicles and home appliances. In particular, demand is expected to grow from Asia, which accounts for 76 per cent of Japan's steel exports.

South Korea's steel production to return to growth

South Korea's steel production declined by 1.6 per cent in both the December quarter and for 2016 as a whole, taking output down to 69 million tonnes for the year. However, South Korea's industrial production index reached its highest recorded level in December, pointing to a modest rebound in the steel sector. Steel production is forecast to grow at an average of 1.3 per cent through the outlook period, to reach 74 million tonnes in 2022, supported by a range of government policies to restructure and revitalise the sector.

European Union steel production to grow to 170 million tonnes in 2022

Steel production in the EU decreased by 2.3 per cent in 2016 to 162 million tonnes, but increased by 5.7 per cent year-on-year in the December quarter, and by 2.4 per cent in the year to January 2017. The rebound in production has come on the back of high tariffs on steel products from China and stronger demand indicators, with industrial production up 2.4 per cent year-on-year December 2016.

Steel production in the EU is forecast to grow at an average of rate of 1.7 per cent to 180 million tonnes in 2022, supported by a rebound in production activity in steel-using sectors, and ongoing anti-dumping duties on steel products.

Following 'Brexit', there is higher potential for the EU to pursue protectionist policies — the UK has historically been stringently opposed to trade restrictions.

Australia

Australia's steel production is estimated to have increased by 6.5 per cent in the December quarter, and by 5.7 per cent in the year, to 5.2 million tonnes. Steel producers in Australia have benefited from a rise in domestic and global steel prices, which offset higher raw material costs during the second half of 2016.

In the medium term, Australia's steel production is projected to remain steady, at 5.2 million tonnes. BlueScope's Port Kembla steelworks will provide some stability, after high steel prices and aggressive cost-cutting activities returned it to profitability. There is some uncertainty regarding the future of Arrium — with negotiations for the sale of its operations currently underway.

Figure 3.10: World industrial production and steel output, annual growth

Source: Bloomberg (2017) World Steel Association; Thomson Reuters (2017) Oxford Economics

Table 3.1: World steel consumption (million tonnes)

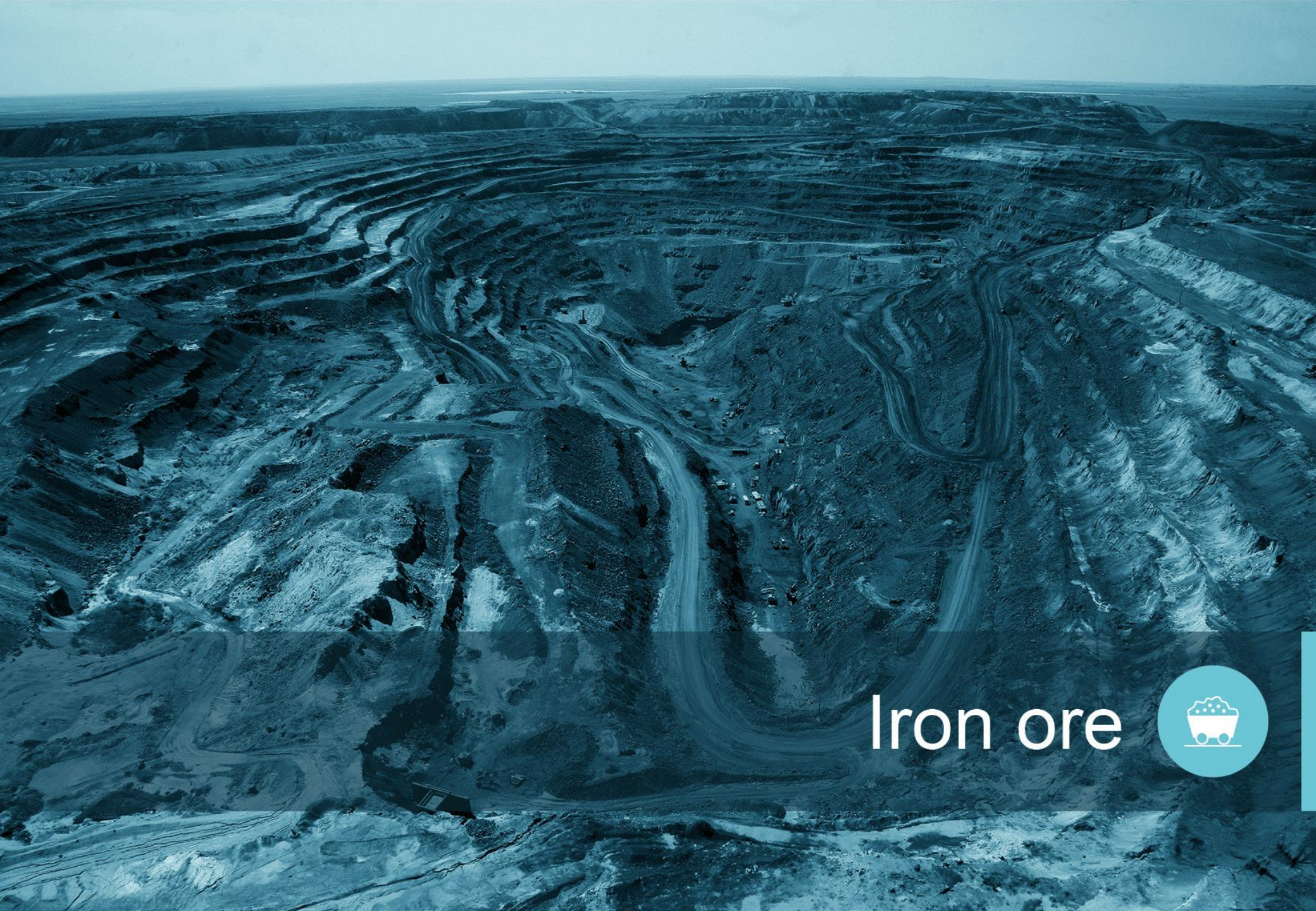
	2016 s	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Crude steel consumption							
European Union 28	171	172	174	177	180	183	186
United States	103	107	112	114	115	116	119
Brazil	19	18	17	17	17	17	17
Russia	43	41	40	40	40	40	40
China	711	707	696	686	675	668	662
Japan	69	71	71	71	69	70	70
South Korea	57	57	56	56	55	55	55
India	95	102	108	116	123	132	140
World steel consumption	1,631	1,646	1,660	1,673	1,685	1,704	1,724

*Notes: **f** Forecast; **z** Projection*
Source: World Steel Association (2017); Department of Industry, Innovation and Science (2017)

Table 3.2: World steel production (million tonnes)

	2016 s	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Crude steel production							
European Union 28	162	169	173	174	176	178	180
United States	79	82	86	87	86	87	88
Brazil	30	31	32	34	35	37	38
Russia	71	71	71	71	71	72	72
China	808	805	800	795	790	788	785
Japan	105	108	110	113	113	115	118
South Korea	69	69	70	71	72	73	74
India	96	103	110	118	127	136	146
World steel production	1,629	1,652	1,669	1,681	1,692	1,710	1,729

*Notes: **f** Forecast; **z** Projection*
Source: World Steel Association (2017); Department of Industry, Innovation and Science (2017)



Iron ore

Market summary

Australia's iron ore export earnings are forecast to increase by 50 per cent in 2016–17, to reach a three-year high of A$72 billion (2016–17 dollars). This represents a substantial upwards revision from the December edition forecast (up $9.4 billion), due to the unexpectedly large and prolonged rally in the iron ore price.

Growing supply, primarily from Australia and Brazil, is expected to steadily outpace demand growth over the rest of 2017 . As a result, the price is projected decline to average US$55 a tonne (FOB Australian dollars) in the December 2017 quarter and US$51 a tonne in 2018.

Export earnings in 2017–18 are forecast to decrease to $62 billion (2016–17 dollars). This still represents an upwards revision (of A$6.7 billion) from the December quarter forecast, reflecting slightly higher price forecasts. The stronger price is expected to derive from ongoing improvement to the world economic outlook and the global steel sector.

Export values in 2018–19 and beyond are forecast to average $60 billion (2016–17 dollars) a year, with prices projected to be weighed down by growing low-cost supply. Nevertheless, with low-cost and high-quality iron ore, Australia is still expected to increase its share of seaborne iron ore trade over the next five years.

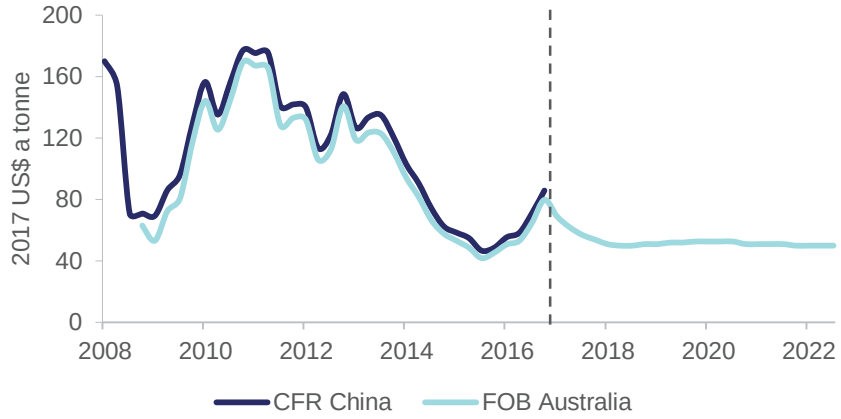
Prices

Iron ore price supported by strong steel sector in the short term

A sharp rally took the iron ore price to a 30-month high of US$89 a tonne in mid-February 2017, defying expectations for the price to moderate. The iron ore price averaged US$79 a tonne (FOB Australia) in the March quarter 2017, up 23 per cent from the December quarter and 75 per cent year-on-year.

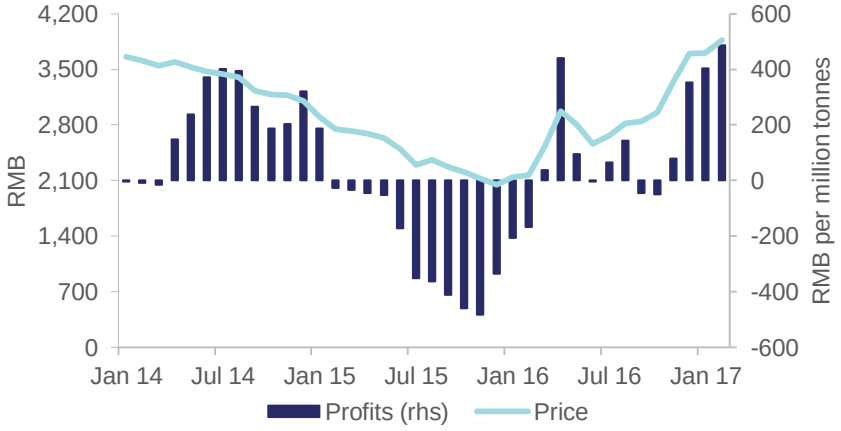
With robust demand from China's steel sector — in particular, for higher grade ore — iron ore prices are expected to continue to be supported in the short term. There has been increased optimism in China's steel sector — with higher margins expected in the short term — following announcements of plans for new infrastructure investment and further cuts in old, inefficient capacity.

Figure 4.1: Quarterly iron ore prices



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

Figure 4.2: China monthly steel profits and price



Source: Bloomberg (2017) Bloomberg Steel Profit Index, Bloomberg (2017) CUSTEEL Steel Price Index

Temporary supply disruptions at the Pilbara have also supported higher prices. The Pilbara's wettest season on record saw iron ore shipments from Port Hedland decline by 3 per cent year-on-year — almost a million tonnes — in February.

Price to moderate, reflecting rising supply and modest demand growth

The iron ore price is forecast to decline over the forecast period, reflecting a gradual easing of recent market tightness.

China's iron ore port stocks have steadily risen in the December and March quarters, to reach 130 million tonnes — the highest level on record. However, anecdotes suggest that a large share of this is comprised of low-grade iron ore, while demand for higher grade ore remains strong. This is reflected in the widening price spread between low and high grade iron ore prices. Nevertheless, the supply of high grade iron ore should increase and persistently high rising stocks will eventually place downward pressure on the price.

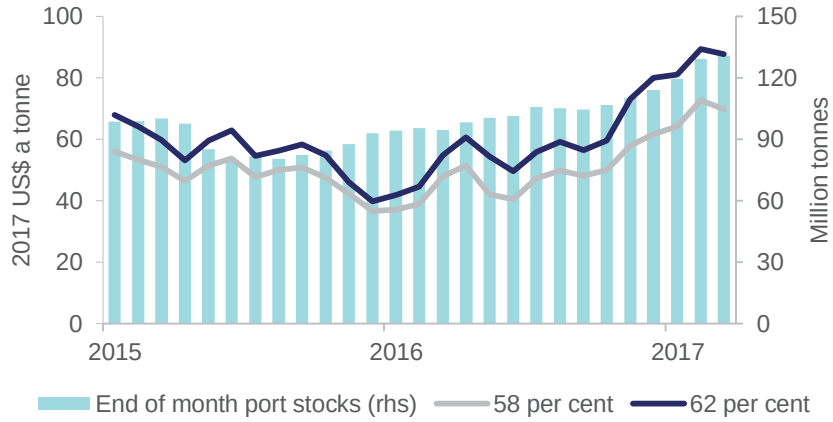
With current price levels unlikely to be sustained beyond the short term, the price is forecast to decline to average US$65 a tonne in 2017. The price is then projected to further decline to average US$51 a tonne (2017 dollars) over the remainder of the outlook period, weighed down by the combined impact of ongoing growth in low-cost supply and soft demand.

World trade

World trade in iron ore is forecast to grow by 4.2 per cent and 2.6 per cent in 2017 and 2018, respectively, before moderating to grow at an average annual rate of 0.7 per cent, to reach 1.61 billion tonnes in 2022.

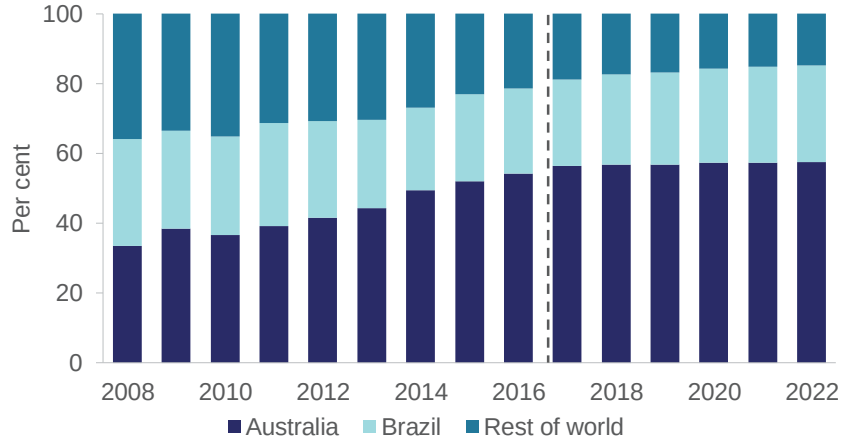
Export growth is projected to come almost entirely from low-cost producers in Brazil and Australia. China will remain the largest importer in absolute terms — accounting for 66 per cent of seaborne trade in 2022 — but growth in imports is projected to come from India and, to a lesser extent, Japan, South Korea and the United States.

Figure 4.3: Monthly iron ore prices (CFR China) and port stocks



Source: Bloomberg (2017) Steelhome; Bloomberg (2017) CUSTEEL

Figure 4.4: Share of world iron ore exports



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

China's iron ore imports projected to flatten

China's iron ore imports increased by 7.5 per cent in 2016, to reach a record 1.04 billion tonnes, supported by a resurgence of the steel sector and a sharp decline in China's domestic iron ore production. China's quality-adjusted iron ore production decreased by 22 per cent in 2016, to 159 million tonnes, due to the closure of small, high-cost mines.

While China's steel production — and consequently iron ore consumption — is forecast to decline, this is expected to be offset by the ongoing displacement of domestic iron ore with high-grade iron ore imports. China's domestic iron ore production (adjusted for quality) is projected to fall to 100 million tonnes in 2022, with the closure of high-cost mines partially offset by opportunities for growth in higher-grade pellet production.

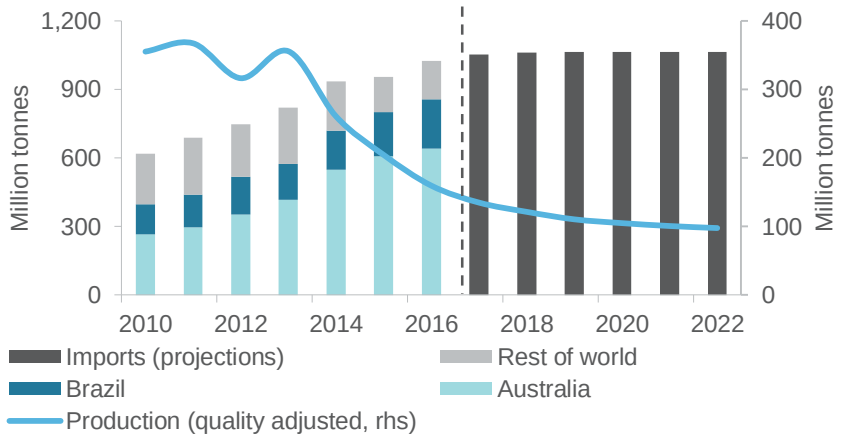
China has large iron ore reserves, estimated at 7.2 billion tonnes. However the average iron content is 34 per cent, lower than the global average of 51 per cent. Lower-grade ores are more costly to process, and also less desirable for use in China's steel mills, which are facing increasingly stringent environmental regulations.

The outlook for seaborne iron ore exports is sensitive to assumptions regarding China's domestic iron ore production, which is in turn dependent on government policy and underlying economic and financial drivers.

The recent spike in iron ore prices could incentivise domestic iron ore mines to restart production, particularly if miners believe that the price will remain high for an extended period. Conversely, increasingly stringent environmental regulations could further limit domestic production of iron ore. A faster/slower pace of closures can substantially increase/reduce global seaborne trade, and consequently has implications for the iron ore price and Australia's exports.

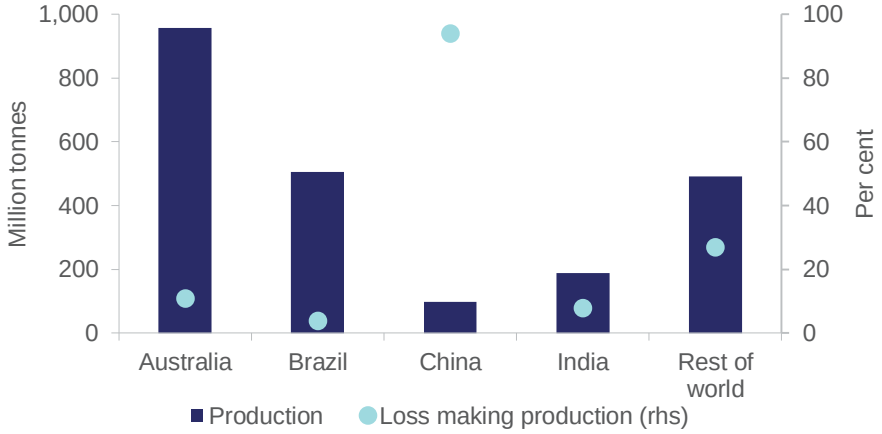
Despite reaching a record high in 2016, China is not projected to be a substantial source of import demand growth in the outlook period, with imports projected to remain steady at 1.1 billion tonnes until 2022.

Figure 4.5: China's iron ore imports and domestic production



Source: Bloomberg (2017) Antaike Information Development; Bloomberg (2017) China Customs General Administration; Department of Industry, Innovation and Science

Figure 4.6: Projected iron ore production and cash losses in 2022



Notes: China's production is adjusted for quality

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

India projected to become a net importer of iron ore

Mining bans in some Indian States saw a sharp decline in production and exports from 2010 to 2013. In the last couple of years, Indian iron ore production and export growth have been driven by more supportive government policies, including streamlined approval processes and the easing of mining bans and export taxes.

Imports have risen despite a significant rebound in domestic iron ore production — estimated to have increased by 12 per cent in 2016 to reach a six-year high of 160 million tonnes.

The outlook for India's iron ore production and imports is dependent on several highly uncertain factors. While India has enough iron ore reserves to be self-sufficient, there are ongoing constraints to the development of mines, including land access, rail infrastructure, political and social issues.

A cap on domestic iron ore prices — to ensure low-cost materials for the steel industry — has been proposed. If implemented, this would serve as a large disincentive for the development of new projects. Slowing exploration activity and the upcoming expiry of mining leases also pose a risk to domestic production.

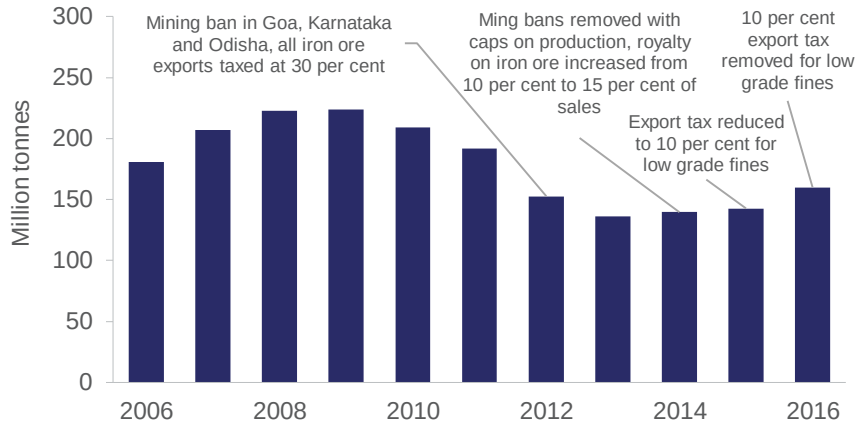
Conversely, if the Indian government introduces further policies to promote self-sufficiency in iron ore, this would reduce their import requirements.

India's iron ore production is projected to grow at an annual average of 2.8 per cent, to reach 188 million tonnes in 2022.

India's consumption of iron ore is projected to outpace domestic production in 2019, resulting in India becoming an increasingly important source of global iron ore imports.

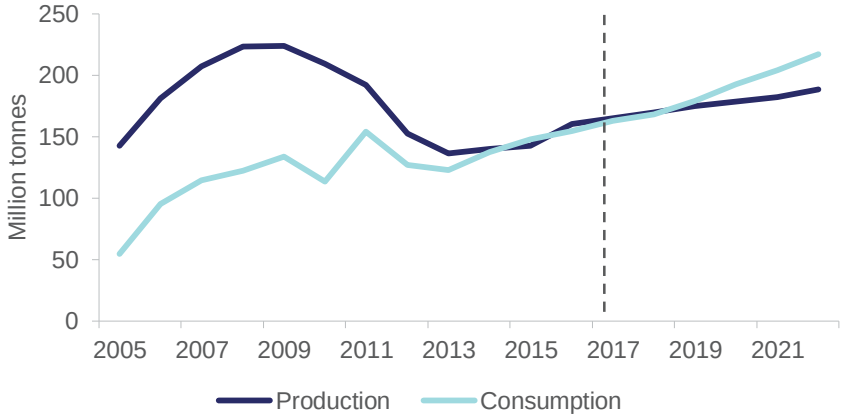
India's iron ore imports are projected to grow almost seven-fold over the next five years, to reach 38 million tonnes by 2022, underpinned by India's rapidly growing domestic steel industry.

Figure 4.7: India's iron ore production and policy changes



Source: Bloomberg (2017) World Steel Association; India Ministry of Mines (2017)

Figure 4.8: India's projected iron ore deficit



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

Exports from Australia and Brazil to dominate seaborne trade

Australia and Brazil's iron ore exports are projected to displace high-cost, low-grade producers, and increase their share of global iron ore exports, from a combined 78 per cent in 2015 to 84 per cent in 2022. Growing supply and declining costs from these two countries are expected to displace high-cost producers in countries such as China and Iran. A growing preference for higher grade ore from China's steel mills will also support export growth from Brazil and Australia.

Brazil's iron ore exports are forecast to increase by 5.4 per cent and 6.8 per cent in 2017 and 2018, respectively, and average 1.8 per cent growth for the remainder of the outlook period, to reach 441 million tonnes — or 27 per cent of seaborne trade.

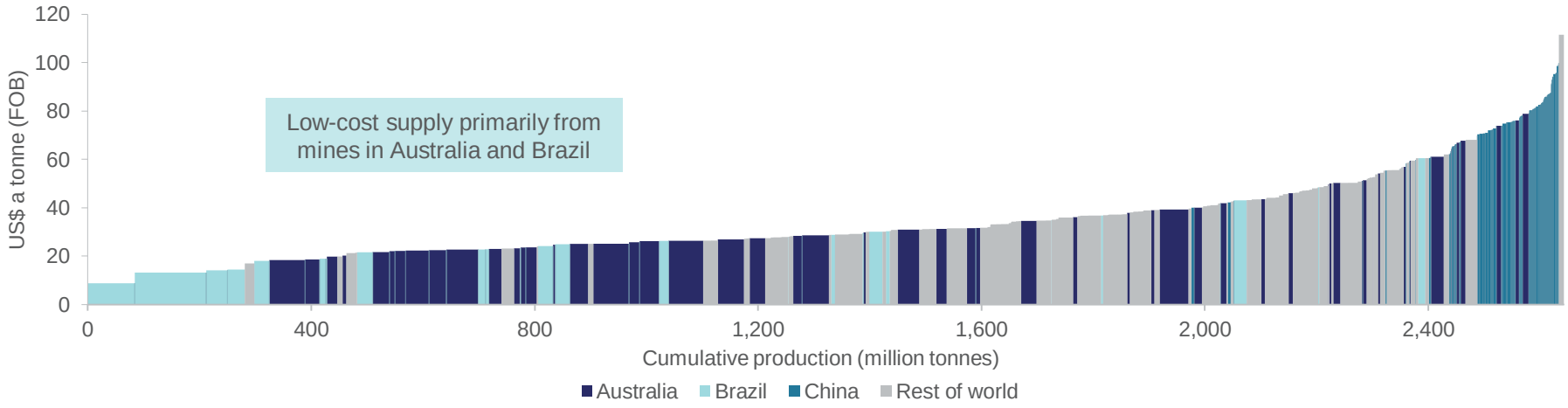
Underpinning much of this growth is the ramp up of Vale's S11D project at the Carajás complex, which shipped its first ore in January 2017. S11D will add annual production capacity of 90 million tonnes by 2020, and reduce Vale's C1 cash costs to below US$10 a tonne. Anglo American's 26.5 million tonne Minas-Rio mine will also likely ramp up to full capacity by 2020.

The 31 million tonne Samarco mine, which ceased operations in November 2015 (following a catastrophic tailings dam burst), is also likely to restart during the five year outlook period. While the owners have indicated that mining will likely resume at the end of 2017, this is dependent on Samarco's ability to service debt and refinance, in addition to environmental restrictions.

The competitiveness of Brazil's iron ore exports will also be supported by the ongoing use of Valemax bulk carriers. With capacity of 400,000 deadweight tonnes, more than twice the capacity of the Capesize carriers used by most of Australia's producers, this will go some way in competing with Australia's location advantage in exporting to Asian destinations.

Australia's iron ore exports are forecast to increase by 8.3 per cent and 3.0 per cent in 2017 and 2018, respectively, before growing at a slower pace to reach 917 million tonnes in 2022 (57 per cent of seaborne trade). The vast majority of Australia's iron ore mines are low-cost and high-quality, with 90 per cent of mines expected to remain viable at prices below US$50 a tonne in 2022. However, an extended period of lower prices would place pressure on smaller, high-cost producers.

Figure 4.9: Projected iron ore cash costs by mine in the year 2022



Notes: Cash costs do not include ocean freight, depreciation and amortisation, corporate administration, sale, royalties, interest and financing costs.
Source: AME Group (2017); Department of Industry, Innovation and Science (2017)

Australia

Strong growth in Australia's iron ore earnings, driven by price rally

Australia's iron ore export earnings increased by 43 per cent year-on-year to $16 billion in the December quarter, driven by higher prices and, to a lesser extent, growth in export volumes. Export volumes increased by 8.5 per cent to 215 million tonnes in the December quarter. There was further growth in exports at the start of 2017, with iron ore shipments from Port Hedland up 19 per cent year-on-year in January, before decreasing by 2.8 per cent year-on-year in February, due to weather-related supply disruptions at the Pilbara.

Australia's iron ore export earnings are forecast to increase by 49 per cent in 2016–17, to reach a 3-year high of $72 billion (2016–17 dollars), supported by the extended rally in the iron ore price. Export volumes are forecast to grow by 8.2 per cent to 850 million tonnes, supported by output growth from ongoing productivity improvements and capacity expansions.

Australia's iron ore exports volumes are projected to remain high, supported by steady production

As a result of the forecast decline in prices, export earnings are projected to moderate over the outlook period, to average $60 billion (2016–17 dollars) annually from 2017–18 to 2021–22; the impact of lower prices are expected to be partially offset by modest growth in export volumes.

While the era of large and rapid new mine developments observed during the mining boom is largely over, Australia's export growth will be supported by ongoing productivity improvements, expansions and the continued development of high-quality deposits.

The Roy Hill mine is expected to reach nameplate capacity of 55 million tonnes per annum in early 2017, providing some short term support to export growth. Annual system capacity at BHP Billiton's Western Australia Iron Ore mines is expected to ramp up to 290 million tonnes by 2018–19, supported by productivity improvements and additional capacity at the Jimblebar mining hub. After encountering technical difficulties, Rio Tinto's AutoHaul program is expected to be deployed in a few years, delivering increased system capacity and lower costs.

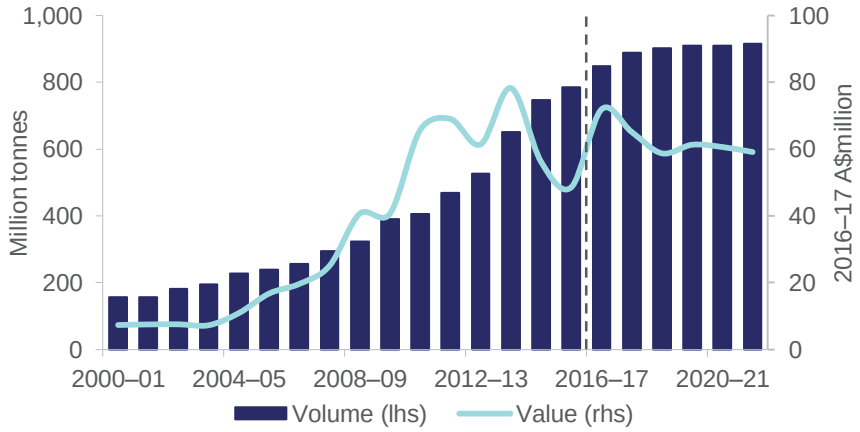
Towards the end of the outlook period, production growth will also be supported by the expansion of the 10 million tonnes Silvergrass mine, and the likely commissioning of the 70 million tonnes Koodaideri and 10 million tonne Turee Syncline projects — both currently undergoing feasibility studies.

Other Australian mines that are expected to begin operations over the next five years, include Mt Gibson Iron's 6 million tonne (over the life of the mine) Iron Hill project in 2017, Atlas Iron's 4 million tonne per annum Corunna Downs project in 2018, Brockman's 18 million tonne Marillana mine in 2018, and the 50 million tonne Balla Balla mine in 2021–22.

Iron ore exploration activity remain at historical lows

Iron ore exploration expenditure declined by 9.0 per cent to $288 million in 2016, the lowest in a decade. Despite the rally in the iron ore price, most companies do not expect high prices to be sustained, and have continued to focus on cutting costs and maintaining existing assets.

Figure 4.10: Australia's iron ore export volumes and values



Source: ABS (2017) International Trade, Australia, cat. no. 5465.0; Department of Industry, Innovation and Science (2017)

Table 4.1: World iron ore imports

	2016	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Iron ore imports (Mt)							
European Union 28	140	140	141	140	138	136	135
Japan	131	133	135	138	139	142	145
China	1,035	1,055	1,061	1,064	1,063	1,063	1,063
South Korea	75	71	72	73	74	75	76
India	3	6	7	13	22	30	38

*Notes: **f** Forecast; **z** Projection*
Source: World Steel Association (2017); Department of Industry, Innovation and Science (2017)

Table 4.2: World iron ore exports

	2016	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Iron ore exports (Mt)							
Australia	809	876	902	906	914	911	917
Brazil	364	384	410	421	428	436	441
India	9	8	7	7	4	3	3
Ukraine	38	42	42	41	41	41	41
World trade	1,492	1,556	1,596	1,605	1,603	1,601	1,609

*Notes: **f** Forecast; **z** Projection*
Source: World Steel Association (2017); Department of Industry, Innovation and Science (2017)

Table 4.3: Iron ore outlook

	unit	2016	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
World								
Prices b								
Iron ore c								
– nominal	US$/t	52.7	65.2	51.6	53.9	56.5	55.8	55.9
– real d	US$/t	53.9	65.2	50.5	51.5	52.7	51.0	50.0
	unit	**2015–16**	**2016–17 f**	**2017–18 f**	**2018–19 z**	**2019–20 z**	**2020–21 z**	**2021–22 z**
Australia								
Production								
Iron and steel gs	Mt	5.05	5.35	5.26	5.26	5.25	5.25	5.25
Iron ore	Mt	836.1	888.1	927.1	942.3	950.9	951.5	953.9
Exports								
Iron and steel gs	Mt	0.77	0.93	0.98	0.98	0.98	0.98	0.98
– nominal value	A$m	598	728	740	739	739	738	738
– real value h	A$m	608	728	725	707	689	672	655
Iron ore	Mt	785.8	849.8	889.9	903.4	910.2	910.6	915.1
– nominal value	A$m	47,799	71,699	63,843	61,455	65,739	66,624	66,607
– real value h	A$m	48,608	71,699	62,499	58,759	61,335	60,642	59,135

Notes: ***b*** *Fob Australian basis;* ***c*** *Spot price, 62 per cent iron content basis;* ***d*** *In 2017 US dollars;* ***g*** *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;* ***h*** *In 2016–17Australian dollars;* ***f*** *Forecast;* ***s*** *Estimate;* ***z*** *Projection*

Source: ABS (2017) cat. no. 5368.0; World Steel Association (2017); AME Group (2017); Company Reports

Metallurgical coal

Market Summary

Prices have declined sharply from the late 2016 highs of over US$310 a tonne. Buyers have run down stocks — in the hope of price declines — China has eased its restrictive supply side policies, and supply has increased from major producing countries such as Australia. Prices are forecast to moderate further over 2017, but are likely to remain higher than the cycle lows of 2015. Higher metallurgical coal prices and export volumes are forecast to add $16 billion to export values in 2016–17 (to total $37 billion), but price declines will see the value of exports drop by 12 per cent year-on-year in 2017–18, to $32 billion (2016–17 dollars). Export values are forecast to decline to $24 billion in 2021–22, as benchmark contract metallurgical coal prices ease back further — to around US$108 (2016–17 dollars) a tonne.

The value of Australia's metallurgical coal exports have been revised down in 2016–17, and revised up in 2017–18. The revisions are due to the volatility seen in coal markets from late 2016, and changing expectations around the timing and pace of price rises and declines. Export values for 2016–17 have been revised down by $3 billion, while values in 2017–18 have been revised up by $6 billion. Export values beyond 2017–18 have been revised up by around $4 billion (2016–17 dollars) in 2020–21, due to higher than expected prices.

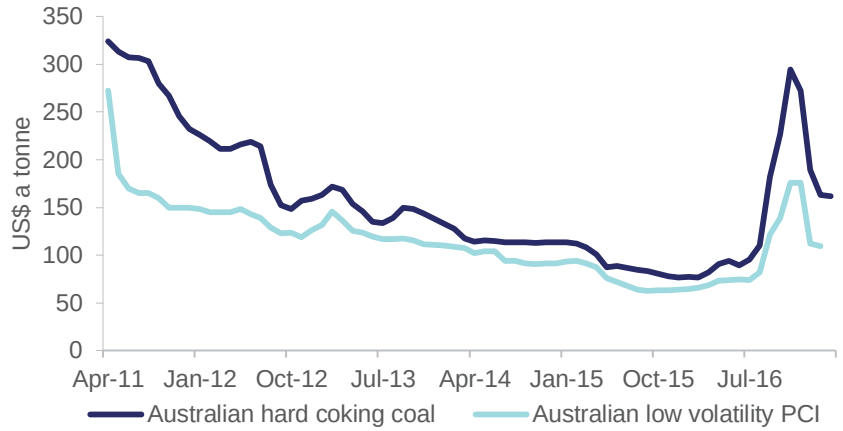
Prices

Benchmark prices projected to moderate over the medium term

The Australian hard prime coking coal spot price has slumped since the last Resources and Energy Quarterly. The price averaged US$267 a tonne in the December quarter, peaking in mid-November at US$311 a tonne on the back of increased demand from China's steel sector, and Government–mandated production cuts in the coal sector. On average, for the March quarter, spot prices have declined an estimated 35 per cent from the previous quarter, to around US$172 a tonne. The decline in price can be attributed to increased supply availability, especially in China. In late 2016, China eased the '276 days of annual capacity' production rule, which was introduced across the coal mining sector in early 2016.

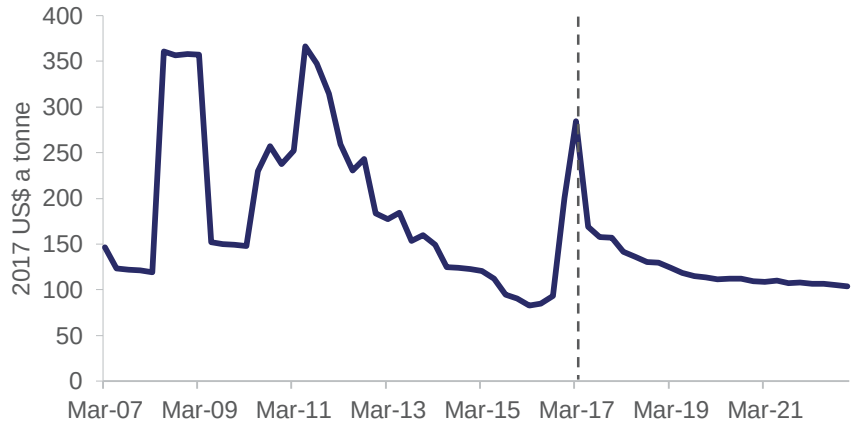
Benchmark contract prices for the March quarter were settled between Australian metallurgical coal producers and Japanese steel producers at US$285 a tonne. This marked the highest negotiated quarterly contract price in five years.

Figure 5.1: Surge in spot prices to more than five year highs



Source: IHS Inc. (2017) Prices: Coal and Petcoke

Figure 5.2: Benchmark contract price for Australian metallurgical coal — on a quarterly basis



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

A the time of writing, the impact of Cyclone Debbie in Queensland on the metallurgical coal market is still unclear. Huge rainfall has occurred in the northern Bowen Basin. The mines that have suspended production account for around 15 per cent of global seaborne exports of metallurgical coal. The overall impact could be larger, as port and rail operations have halted activity too. Since the 2010–11 cyclone — which impacted a third of Queensland output — miners have spent significant sums of money becoming more storm-ready. However, it is still likely to take a week to dewater the pits, and miners may delay Q2 metallurgical coal contract price negotiations until greater clarity emerges over potential production downgrades.

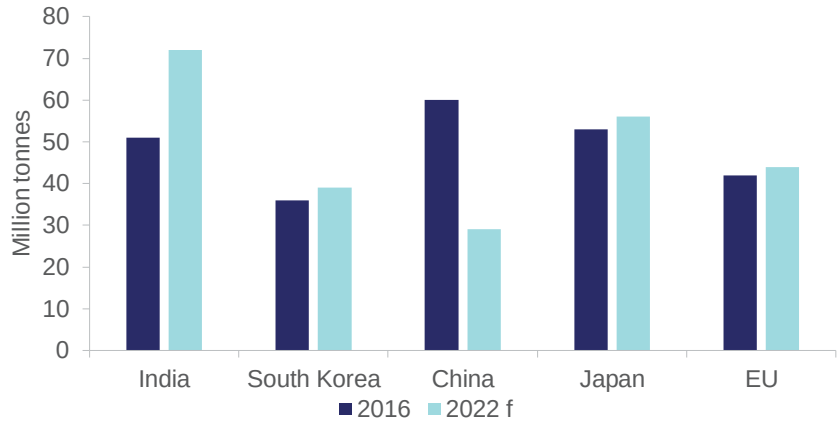
Assuming very limited impact from Cyclone Debbie, in 2017, benchmark contract prices are forecast to increase by 66 per cent to average US$194 a tonne, due to the tighter market. Spot prices are forecast to decline through 2017, with Australian prime hard coking coal forecast to average around US$157 a tonne over the year.

Medium term outlook shows a deterioration

An expected increase in import demand from India over the medium term is unlikely to outweigh declining metallurgical coal import demand from China. Chinese metallurgical coal output should improve from 2016 levels, after being inordinately affected by the 276 day annual capacity restrictions — thus spot and benchmark prices are forecast to gradually decline over the outlook period, but hold at levels above the recent cycle lows (set in March quarter 2016). Australian hard metallurgical coal spot prices are projected to drop at an average annual rate of 5.9 per cent from 2016 to 2022, to US$102 a tonne (in 2017 dollars).

Benchmark contract prices are projected to decline at an average annual rate of 15 per cent between 2017 and 2020, to US$121 a tonne in nominal terms, and hold steady thereafter. In 2022, benchmark contract prices are projected to be US$108 a tonne (in 2017 dollars). It is expected that stronger Indian and ASEAN demand will eventually make up for weaker Chinese demand. The biggest risks to the price forecast are the pace at which India's metallurgical coal demand picks up, and the magnitude and length of China's capacity/production cuts.

Figure 5.3: Major metallurgical coal importers — 2016 and 2022



Notes: ***f*** *Forecast*

Source: IEA (2016) Coal information 2016; Department of Industry, Innovation and Science (2016)

World demand and trade

World metallurgical coal demand is forecast to remain steady over the projection period, at 1.03 billion tonnes. Metallurgical coal imports are forecast to increase at an average annual rate of 0.2 per cent over the projection period, to 318 million tonnes, as import demand from India and ASEAN (directly and indirectly) increases, and as demand and production drops in China (the world's largest producer and consumer).

China's metallurgical coal imports grew significantly in 2016, but over the medium term, imports are projected to decline

China's metallurgical coal imports rose by 24 per cent year-on-year in 2016, after consecutive declines in 2014 and 2015.

This increase in imports was driven by China's supply–side policy of restricting 2016 production to 276 days of annual mine capacity — a policy which had a disproportionate impact on metallurgical coal production. China's supply constraints were further exacerbated by weather disruptions in the Shanxi province in late 2016. At the same time, higher steel demand (driven by a rebound in the Chinese real estate market) generated metallurgical coal shortages.

In 2017, China's metallurgical coal imports are forecast to decline by 10 per cent to 54 million tonnes. The decline in imports is expected to be underpinned by China's easing of its '276 day annual capacity' rule, as it aims for a less heavy-handed approach, to limit domestic loss-making production, targeting a metallurgical coal price of US$95 to US$105 a tonne, and as steel demand moderates.

It is likely that the Chinese Government will adopt a similar policy to that of thermal coal, allowing some mines to operate at 330 days' annual capacity and others at 276 days. While China is still committed to reducing its coal sector to a more sustainable size (consisting of generally profitable, safe and legal mines), it is likely to be cautious in reducing capacity too rapidly.

In February 2017, China announced that it would immediately ban all imports of coal from North Korea for the year. This could create potential shortfalls (around 20 million tonnes), however, it is expected that these shortfalls will be recovered either through higher Chinese domestic output or imports from other metallurgical coal producers, such as Australia.

Over the projection period, China's metallurgical coal imports are projected to decline at an average annual rate of 11 per cent to 29 million tonnes by 2022. China's expected steady production, and projected declining steel production — as it moves away from major industrial production and large scale construction projects — is expected to drive down import demand. Declines in imports are likely to be limited by China's expected significant role in supplying the ASEAN region's rising demand for steel.

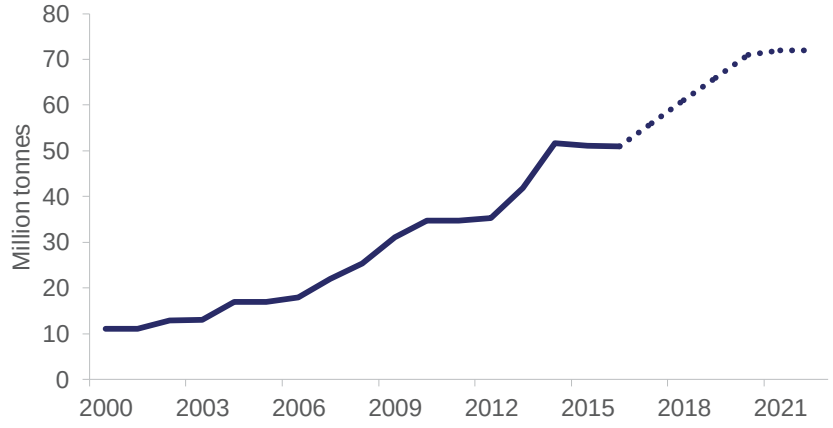
India's imports are forecast to rise in the short term and medium term

India is currently the largest importer of Australia's metallurgical coal. India's metallurgical coal imports in 2016 stayed similar to 2015 levels, at 51 million tonnes. Despite most of its metallurgical coal being bought on the spot market, Indian demand does not seem to have been hit too hard by the spike in metallurgical coal prices towards the end of 2016. In 2017, India's metallurgical coal imports are forecast to grow by 9.5 per cent to 56 million tonnes, as spot prices decline and India's steel demand increases.

Figure 5.4: China's metallurgical coal imports — annual basis

Source: IHS Inc. (2017) Coal imports by country and type

Figure 5.5: India's metallurgical coal imports — annual basis



Source: IHS Inc. (2017) Coal imports by country and type

Over the medium term, India's metallurgical coal imports are projected to increase at an average annual rate of 5.9 per cent, reaching 72 million tonnes by 2022. While this is significant growth, it is still not anywhere near the same scale as past metallurgical coal import growth in China — 45 per cent average annual growth between 2008 and 2013.

The difference in the rate of growth between countries is largely due to the vastly different, political and economic landscapes. However, growth in Indian imports over the medium term is expected to be underpinned by the lack of metallurgical coal reserves within the country.

As India's economy grows, its infrastructure needs are expected to increase. Infrastructure is expected to be a key component in India's economic growth, with Prime Minister Modi announcing in February that his Government plans to spend US$59 billion to upgrade, build and modernise its roads, railways and airports. Indian demand for metallurgical coal over the medium term is further supported by significant investment in blast furnace technology, as opposed to the electric arc furnace process.

ASEAN region expected to drive metallurgical coal import demand

Growth in the Association of Southeast Asian Nations (ASEAN) is projected to help drive steel demand over the medium term. Therefore, metallurgical coal imports are projected to rise in countries such as Japan and South Korea — major steel exporters to ASEAN members — who have no indigenous metallurgical coal or an underdeveloped steel sector.

ASEAN is made up of a number of Emerging economies, including Indonesia, Philippines, Cambodia, Laos, Myanmar and Vietnam. ASEAN's metallurgical coal imports are forecast to increase in the short–term — as these countries' economic growth increases, it is expected that their industrial production and infrastructure needs will also increase.

Steel demand is expected to grow across the ASEAN region, fueled by growth from its industrial sectors (manufacturing etc.) As per capita income and general affluence grows across the region, infrastructure investment and construction is expected to flourish, through increased housing construction, urbanisation, better roads and railways, and large scale building construction in the form of hospitals, shopping malls etc. Over the medium term (from 2016 to 2022), ASEAN's metallurgical coal demand is thus projected to increase at an average annual rate of about 20 per cent, to around 9 million tonnes.

Japan's metallurgical coal imports are forecast to remain steady

Japan is currently the world's second largest importer of Australia's metallurgical coal. Higher metallurgical coal prices in late 2016 did not prevent higher exports by Japanese steel producers, with metallurgical coal imports estimated to have increased by 5.7 per cent in 2016. This increase in imports followed declines in 2014 and 2015 — suggesting re-stocking of metallurgical coal by steel makers. In 2017, Japan's metallurgical coal imports are forecast to rise by 1.9 per cent to 54 million tonnes, driven by forecast higher steel production.

Japan's metallurgical coal imports are projected to increase moderately — at an average annual rate of 0.9 per cent — to reach 56 million tonnes by 2022. Imports are expected to be supported by a projected increase in Japanese steel production, driven by higher Asian demand for Japanese premium steel — used in vehicles and home appliances.

World production and exports

Global metallurgical coal production is forecast to remain steady over the medium term, at 1.03 billion tonnes in 2022. A decline in Chinese production is expected to be offset by increased production from other large metallurgical coal producers, such as Australia and Russia.

Canada's exports projected to rise

Higher metallurgical coal prices and increased global import demand drove Canada's exports up slightly in 2016 — by 0.6 per cent to 28 million tonnes. This follows declines in exports between 2013 and 2015.

In 2017, Canada's metallurgical coal exports are forecast to increase slightly, to 28.3 million tonnes. Large producers such as Teck (North America's second largest metallurgical coal exporter) have put themselves in a position to easily respond to increased import demand — having increased production efficiencies when the coal sector was facing low prices. Over the medium term, Canada's exports are projected to increase at an average annual rate of 1.7 per cent, to 31 million tonnes in 2022. Exports are expected to be underpinned by relatively higher metallurgical coal prices compared to 2015 and early 2016, and higher production, through the expected restart of a number of mines, including Kanuma Coals' Bruel, Terry Complex and Willow Creek mines.

The United States' metallurgical coal exports are not expected to grow

Despite higher prices, the United States' metallurgical coal exports continued to decline in 2016, down 11 per cent to around 37 million tonnes. The United States' metallurgical coal production and exports are projected to remain subdued over the outlook period — exports have been declining since 2013. However, if President Trump's plans to reinvigorate the coal sector and increase infrastructure spending takes off, it could spur increased metallurgical coal production. It is unlikely that significantly more US metallurgical coal production would enter the seaborne market though, given the US's low global competitiveness.

Russia's exports are projected to rise over the medium term

Russia's metallurgical coal exports increased by 19 per cent in 2016, to 22 million tonnes. Exports are forecast to increase by a further 7.0 per cent in 2017, encouraged by higher metallurgical coal prices and a lower Ruble. Over the medium term (out to 2022), Russia's metallurgical coal exports are forecast to increase at an average annual rate of 2.5 per cent. Growth in exports are likely to be driven by lower domestic production costs and strong metallurgical coal prices.

Mongolia a strong contender to experience increased exports to China

In 2016, Mongolia's metallurgical coal exports to China almost doubled to 23.5 million tonnes, supported by China's strong import demand over the year and Mongolia's close proximity to China. In 2017, Mongolia is set to become an even more significant exporter of metallurgical coal to China — possibly filling the void left by North Korea. Over the medium term, Mongolia's export prospects are uncertain, as China's imports are projected to decline, and Mongolia's ability to increase output is highly dependent on potential political impediments regarding mine development.

Table 5.1: World metallurgical coal trade

	2016s	2017 f	2018 f	2019 z	2020z	2021 z	2022 z
Metallurgical coal imports							
European Union 28	42	43	43	43	44	44	44
Japan	53	54	54	54	55	55	56
China	60	54	46	39	35	32	29
South Korea	36	37	37	37	38	38	39
India	51	56	61	66	71	72	72
Metallurgical coal exports							
Australia	186	183	186	192	195	198	200
Canada	28	28	29	29	29	30	31
United States	37	35	33	31	30	30	30
Russia	22	23	24	25	25	25	25
World trade	315	309	306	309	312	315	318

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

Source: IEA (2017) Coal Information 2016; Department of Industry, Innovation and Science (2017)

Australia's production and exports

Australia's exports projected to increase over the medium term

Australia's metallurgical coal production is forecast to increase by 3.4 per cent to 196 million tonnes in 2016–17. Challenging operational conditions across some mines in the December quarter (and possibly the March quarter) are expected to be outweighed by increases in production at other mines over the year — buoyed by higher metallurgical coal prices and generally improved mine productivity.

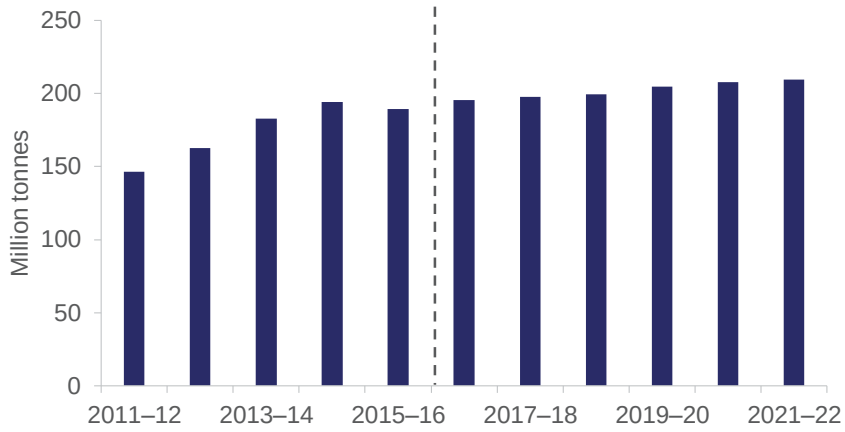
In 2017–18, metallurgical coal production is forecast to remain similar to 2016–17 levels, at 198 million tonnes, as metallurgical coal prices remain above lows experienced over 2015 and early 2016. Over the medium term, production is forecast to increase at an average annual rate of 1.4 per cent, to 210 million tonnes by 2021–2022. A number of mines are expected to come online towards the end of the outlook period, which will outweigh the impact of lower production at other mines (due to reserve exhaustion).

Mines expected to cease operation over the outlook period include the Carborough Downs mine (annual capacity of 3.2 million tonnes) and the Tahmoor mine, (with an annual capacity of 2 million tonnes). Mines expected to restart operations over the outlook period include Collinsville (a decision encouraged by higher metallurgical coal prices) with an expected annual capacity of 5 million tonnes, and Eagle Downs (annual capacity of 4.5 million tonnes). The new Byerwen mine is also expected to begin operating, with an expected capacity of 10 million tonnes. Most of these mines are located in Queensland, where most of Australia's metallurgical coal is produced.

Australia's export earnings moderating over the medium term

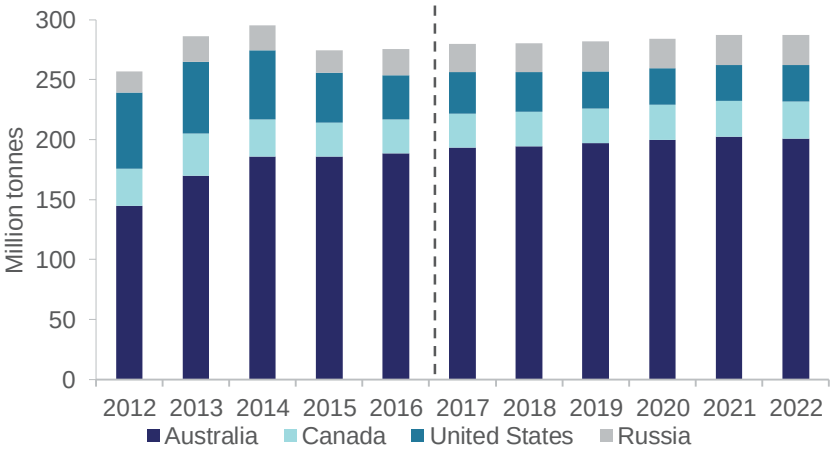
Australia's metallurgical coal export volumes in 2016–17 are forecast to increase by 1.9 per cent to 192 million tonnes, underpinned by increased import demand from China. Export values are forecast to increase $16 billion to $37 billion, supported by higher volumes and five–year record high prices. In 2017–18, metallurgical coal export volumes are forecast to increase by a further 1.0 per cent, to 194 million tonnes, supported by rising steel production. Export values are forecast to decline by 12 per cent to $32 billion (in 2016–17 dollars) in 2017–18, as prices come off late 2016 and early-2017 highs.

Figure 5.6: Australia's metallurgical coal output — fiscal year basis



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

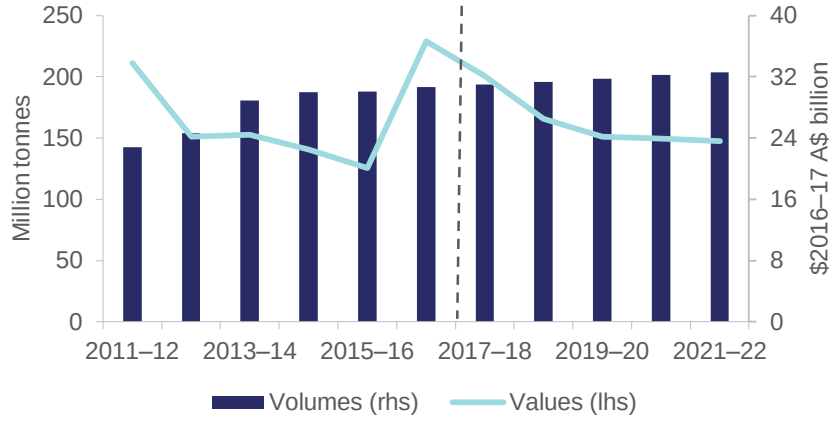
Figure 5.7: Major metallurgical coal exporters — fiscal year basis



Source: IEA (2017) Coal information 2016; Department of Industry, Innovation and Science (2017)

Over the medium term, export volumes are projected to increase at an average annual rate of 1.2 per cent, to 204 million tonnes by 2021–2022. Declining import demand from China is expected to be slightly more than offset by increases in demand from the ASEAN region, India and other countries that supply the ASEAN region with steel. Export values are projected to decline at an average annual rate of 8.4 per cent over the medium term, to $24 billion (2016–17 dollars) by 2021–2022, as contract and spot prices gradually decline.

Figure 5.8: Australia's metallurgical coal exports — fiscal year basis



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

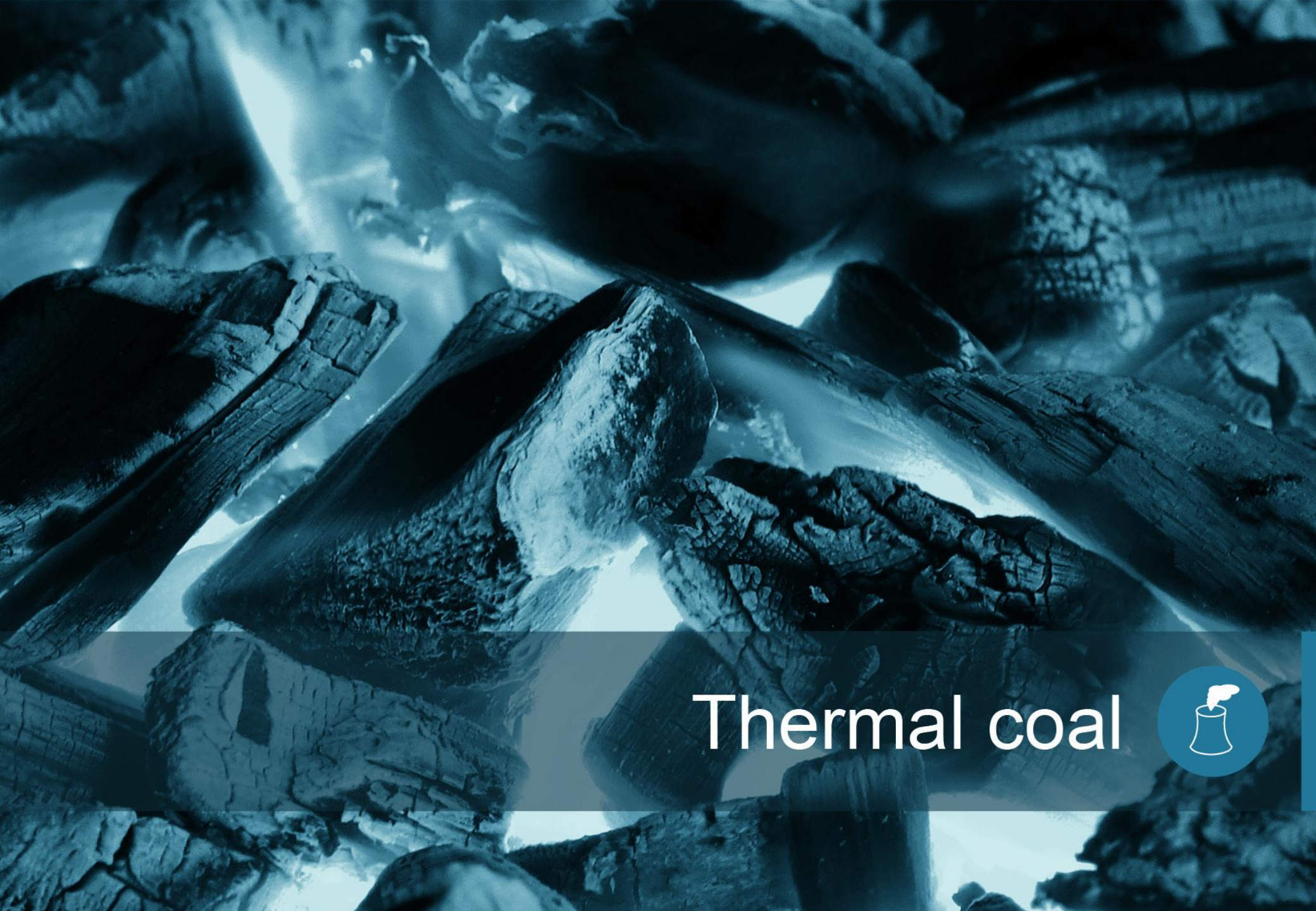
Table 5.2: Australia's metallurgical coal outlook

	Units	2016s	2017 f	2018 f	2019z	2020 z	2021 z	2022 z
World								
Contract prices b c								
- nominal	US$/t	114.4	193.8	138.8	124.5	120.8	120.8	120.3
- real d	US$/t	116.9	193.8	135.8	118.9	112.7	110.3	107.5
Spot prices g								
- nominal	US$/t	143.5	156.8	133.7	117.4	114.6	114.5	114.0
- real d	US$/t	146.7	156.8	130.8	112.1	106.9	104.6	101.9
Production	Mt	1,033	1,021	1,015	1,010	1,018	1,023	1,028
Consumption	Mt	1,037	1,024	1,016	1,011	1,018	1,024	1,030
	Units	**2015–16**	**2016–17 s**	**2017–18 f**	**2018–19z**	**2019–20 z**	**2020–21 z**	**2021–22 z**
Australia								
Production	Mt	189.3	195.7	197.6	199.6	204.7	207.8	209.8
Export volume	Mt	188.0	191.7	193.7	195.6	198.5	201.5	203.5
- nominal value	A$m	19,790	36,574	32,814	27,738	25,987	26,297	26,531
- real value e	A$m	20,125	36,574	32,123	26,521	24,246	23,936	23,555

*Notes: **b** Fob Australian basis; **c** Contract price assessment for high-quality hard coking coal; **d** In 2017 calendar year US dollars; **e** In 2016–17 financial year Australian dollars; **f** Forecast; **g** Hard coking coal fob Australia east coast ports; **s** Estimate; **z** Projection*

Source: ABS (2017) International Trade, cat.no 5465.0; Company Reports; Bloomberg (2017) Steel Business Briefing; Department of Industry, Innovation and Science (2017)

Thermal coal



Market summary

The outlook for growth in Australia's thermal coal exports is positive over the medium term. Significant gains in export values are expected in the short term, buoyed by higher thermal coal prices in the latter half of 2016 and early 2017. Recent price increases were driven by supply-side reform in the coal sector in China. However, the current and expected continued easing of Beijing's reform policies are expected to drive thermal coal prices down over the medium term. Moderate increases in thermal coal export volumes are expected to offset the impact of the decline in prices over the medium term, resulting in strong export earnings. Australia's thermal coal export volumes are forecast to increase at an average annual rate of 0.7 per cent, to 209 million tonnes by 2021–22, driven by increased demand from India and ASEAN. Export values are forecast to increase to $15.8 billion (2016–17 dollars), by 2021–22.

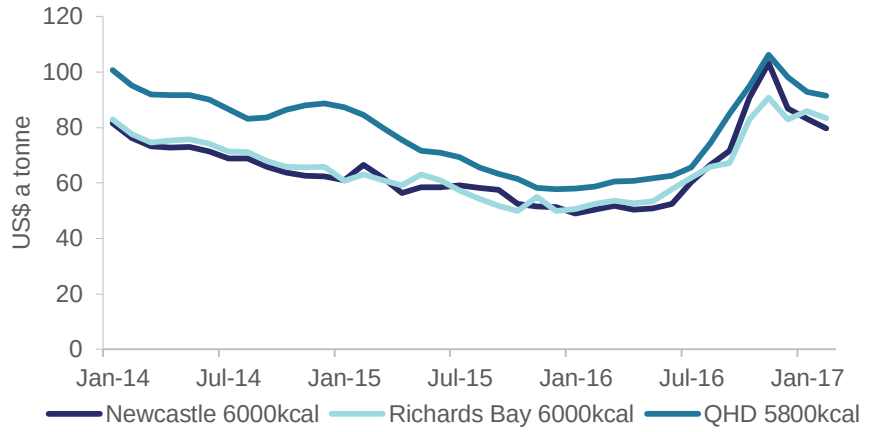
The value of Australia's thermal coal export values remains largely unchanged in 2016–17. An upward revision of $1.5 billion has been made in 2017-18, due to a higher than previously expected Japanese Fiscal Year thermal contract price. Export values beyond 2017–18 are projected to be higher than previously expected — an upward revision of $2 billion (2016–17 dollars), in 2020–21, due to higher than expected prices.

Prices

Late 2016 prices gains expected to be partly reversed in medium term

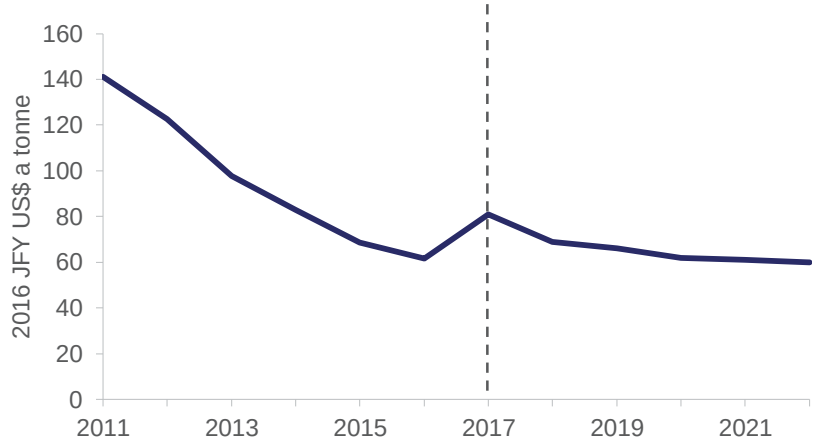
Newcastle thermal coal FOB spot prices averaged US$93 a tonne in the December quarter, the highest average quarterly price since September quarter of 2012. Developments in China were a key driver of higher thermal coal prices in 2016 and early 2017 — a combination of government policies mandating a reduction in the number of days coal mines could produce, weather-related supply disruptions, and a spike in demand over a hot Chinese summer. These factors resulted in supply shortfalls in China and upward pressure on global prices. While China's imports generally only account for around 5 per cent of its total thermal coal demand, its import activities have a significant impact on seaborne prices — China's thermal coal imports account for around 15 per cent of total seaborne trade.

Figure 6.1: Thermal coal spot prices — on a quarterly basis



Source: IHS Inc. (2017) MCR prices-steam coal, metallurgical coal and petcoke

Figure 6.2: Contract prices — Japanese fiscal year basis (Apr to Mar)



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

March quarter 2017 Newcastle FOB benchmark spot prices are estimated to have declined by 16 per cent from December quarter 2016 highs, to average around US$80 a tonne. This decline in price can be attributed to increased supply availability that came about with the easing of Beijing's 276 day annual capacity operational rule — to allow mines to operate for the full 330 days a year until the end of their heating supply season.

The move by Beijing was aimed at ensuring supply availability over China's winter and keeping thermal coal prices within the Government target of around US$70 to US$85 a tonne.

The end of the Chinese winter peak demand season, combined with expected reduced Indian import demand in the short-term, makes for heightened uncertainty on price direction; policy moves by the Chinese Government will also have a crucial influence. In 2016, the Chinese Government's '276 days of annual capacity production' policy was effective in reducing domestic coal production capacity (by 290 million tonnes) and improving the profitability of China's miners. The Government aims to cut an additional 150 million tonnes of permanent capacity in 2017 — slightly more than half of what was reduced in 2016, with the aim of reducing 500 million tonnes of permanent capacity by 2020. Because of this downgraded capacity reduction target, it is likely that the Chinese Government will implement a softer supply–side policy than seen in 2016. Such a policy is therefore unlikely to have as pronounced an effect on price in 2017 as policies implemented in 2016.

The JFY 2017 (April 2017 to March 2018) benchmark price, is forecast to increase by 33 percent, year–on–year, to US$81 (JFY 2016 dollars) a tonne. The increase will reflect the spot price recovery relative to the first half of the previous year, driven by China's supply side policies. Newcastle FOB spot prices are forecast to average US$77 a tonne over 2017, an increase of 17 per cent from 2016. The year-on-year increase is largely reflective of the lower prices seen in the first half of 2016, which dragged down the annual 2016 average price.

The JFY 2022 contract price is projected to decline at an average annual rate of 1.7 per cent from 2016, to US$60 (JFY 2016 dollars) a tonne, as China's capacity cuts cease and its demand declines due to increased diversification of its electricity generation mix. Newcastle FOB spot prices are projected to decline at an annual average rate of 2.2 per cent, to US$59 (2016–17 dollars) a tonne by 2022.

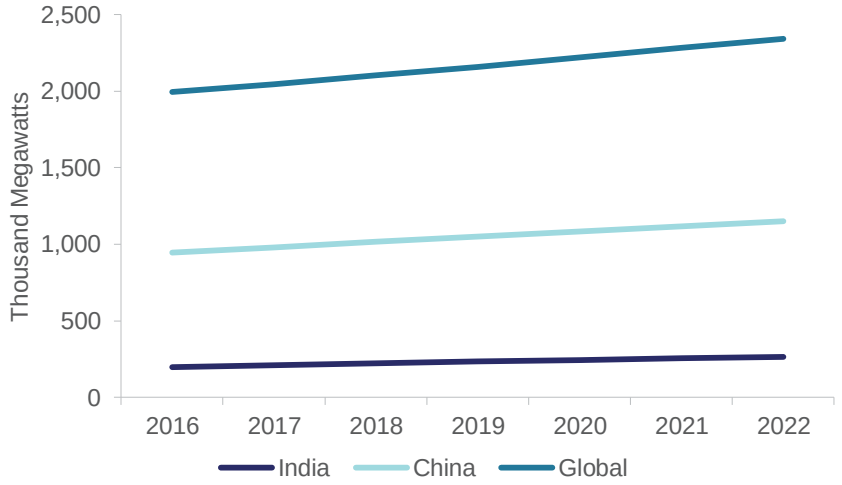
Declines in prices to 2020 are expected to be driven by decreased demand from China. Price drops are expected to moderate thereafter, as India's and ASEAN's thermal coal demand growth slightly outweighs China's declining usage.

World demand and trade

Global thermal coal and lignite demand is projected to increase at an average annual rate of around 1.0 per cent over the forecast period, to reach 7.1 billion tonnes in 2022. Increased demand is expected to be driven by growth in coal use in the power generation mix in emerging economies.

World thermal coal trade is estimated to have declined by around 1.0 per cent in 2016, to 1.04 billion tonnes. Lower import demand in India — due to an increased focus on self-sufficiency — more than offset increased demand from China, lowering trade volumes further. Global import demand in 2017 is forecast to decline by 2.0 per cent, to 1.02 billion tonnes, due to lower imports from China and India. By 2022, global trade is projected to rise marginally from 2016 levels to 1.06 billion tonnes. Towards the end of the outlook period, growth in imports from India and ASEAN is expected to slightly outweigh a decline in imports from China.

Figure 6.3: Projected global electrification capacity — annual basis



Source: Global Power Data (2017)

World imports

China's capacity cuts more effective than expected

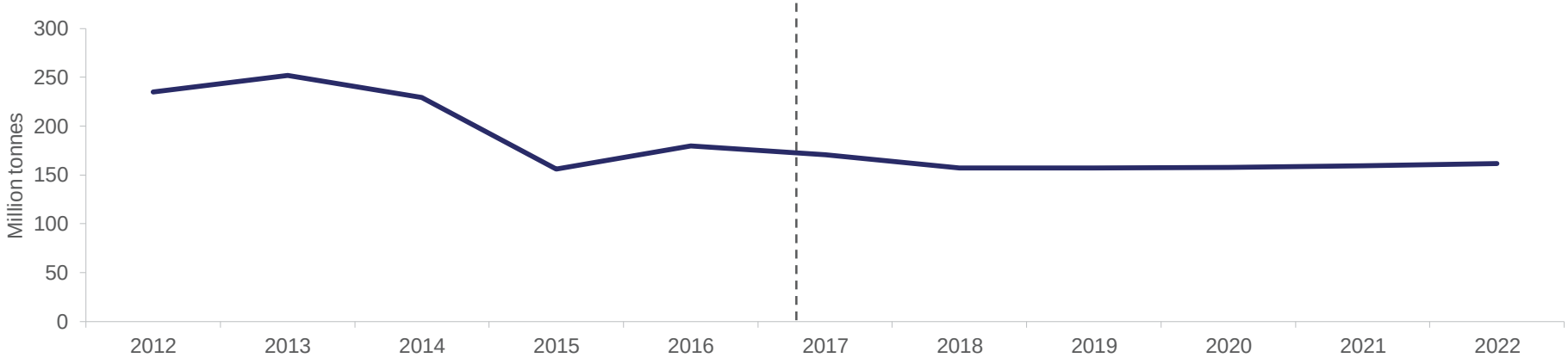
China's thermal coal imports are estimated to have increased by 15 per cent in 2016, to 180 million tonnes. A large increase in import demand in the second half of the year more than outweighed reductions in import demand in the first half, resulting in a nett increase. The main driver for this increase was reduced domestic supply availability, after domestic production and capacity cutbacks.

China's thermal coal import demand is forecast to decline by 5.0 per cent to 171 million tonnes in 2017. This decline is expected to be driven by the Chinese Government's move to a less restrictive supply side policy relative to the past year. Mines are likely to be allowed to produce at 330 days of capacity, but switch back to 276 days at the end of the high demand period. A capacity reduction policy supports the following factors; the Chinese Government's continued focus on ensuring security of supply, a target domestic thermal coal price (RMB500 to RMB570 a tonne), as well as the downsizing of its coal industry to one of higher sustainability, safety and profitability.

China's thermal coal import demand is projected to decline at an average annual rate of 1.7 per cent from 2016, to 162 million tonnes by 2022. Most of the decline is expected to occur over 2017 to 2020, before moderating over 2021 and 2022. The main drivers for the decline are expected to be China's focus on reducing air pollution from coal-fired power generation and the diversification of power supply. Coal is projected to lose share in the power mix to gas and renewables — from 64 per cent in 2015 to 58 per cent in 2020. An increase in China's import demand from 2021 to 2022 is likely to be driven by the larger share of coal-fired power plants expected to be in operation that employ 'super critical' or higher technologies. These power plants require higher grades of coal to operate at maximum efficiency.

China has varying grades of coal quality, and is not as well placed as Australia or South Africa to service the high calorific coal content market. Furthermore, China is expected to significantly expand its coal conversion capacities — i.e. coal to gas, coal to liquid and coal to olefin, towards the end of the outlook period, as it capitalises on its investment in energy-related technological advancements, and on global developments in energy-based technologies.

Figure 6.4: China's thermal coal imports — on an annual basis



Source: IHS Inc. (2017) Coal imports by country and type

Box 6.1: Coal in India

In 2016, India's thermal coal imports declined by 6.2 per cent, the second consecutive yearly decline after imports declined for the first time in twelve years in 2015. (The declines came despite a sharp drop in the thermal coal price in the five years to the March quarter 2016.) Driving the decline in imports was increased production by India's largest coal producer, state-owned Coal India, with an estimated 24 per cent year–on–year increase in 2016. Coal India's production was 92 per cent of the calendar year 2016 target set by the Government.

The decline in imports in 2015 and 2016 came as the new, reform–driven Indian Government pushed to increase thermal coal self–sufficiency. The self–sufficiency push had two prongs – to raise domestic coal production, and to increase the efficiency of coal use. Extremely high levels of air pollution in some major Indian cities has also put pressure on National and State Governments to use higher energy and low ash coal. However, most Indian power plants cannot use this type of coal, because their boilers cannot withstand the higher heat generated. Indian coal reserves are predominately low–energy/high–ash. The Indian Minister for Energy has stated that India will reduce coal imports to zero over the next few years, but many consider these plans to be overly ambitious.

Coal India has been given an ambitious plan to increase production. Output was to increase to 1 billion tonnes by 2020, from 550 million tonnes in 2015–16. However, given the even more ambitious plans for increased (coal–fired and other) power generation, it is highly likely that imports will be required to meet power needs. The majority of India's thermal coal imports are currently sourced from Indonesia and South Africa.

The composition of India's imports changed significantly in 2016. South Africa took market share from Indonesia, possibly in a push by Indian utilities to raise the calorific content of their imports. (For some of India's coastal-based power utilities, it is cheaper to import coal than risk infrastructure constraints and pay higher transport costs to move coal from distant domestic coal mines — a reflection of the fractured rail infrastructure in India. This underpins the case for continued significant import demand from India.)

The cost of coal produced in India is typically well below the market price of imported coal, and India is very price sensitive to power supply and raw material inputs. The pricing of domestic coal reflects deliberate Government policy, with electricity pricing in India being a sensitive political issue. Electricity distribution utilities (mostly Government-owned) continue to make losses because of price caps, electricity theft and the free electricity they are sometimes 'encouraged' to provide the agricultural sector by the Government. The poor financial health of the distribution sector is leading many coal–fired power generators to operate at relatively low power load factors (PLF). The amount of imported coal India requires over the longer term is difficult to forecast, especially given the uncertain progress of reform in the Indian power sector. Countries that possess high calorific content coal (like Australia and South Africa) may benefit, given the rising utilisation of super critical coal-fired power plants in India. According to Global Power Data, India's total coal-fired generation capacity is projected to increase at an average annual rate of 5.1 per cent between 2016 and 2022.

As of the beginning of 2017, new coal power plants under development in India must use super-critical technology or better. This technology requires a higher grade of coal (with higher calorific value and lower ash content) than the coal used in sub-critical power plants. While Australia is a leading source of this higher quality coal, and India does not have sufficient reserves of high quality coal to run the new plants, the Indian Government plans to blend or enhance the quality of indigenous coal to meet 'super-critical' requirements. The increased utilisation of super critical coal-fired power plants also means increased efficiency in electricity generation — requiring less coal to produce the same or more electricity. However, the absolute increase in coal-fired generation capacity still presents a strong case for increased imports by 2020 and beyond, as new capacity begins to come on line. India also plans to increase the share of renewables in its electricity mix, particularly solar power, with the Government offering subsidies for solar power installation. However, much work and investment needs to be made within the power sector to effectively connect renewables to the power grid. Given the uncertainties surrounding the progress of Indian power sector reform and the reliable diversification of power supply, there is significant upside risk to the forecasts of India's import demand.

India is committed to thermal coal self–sufficiency

Imports are forecast to decline by 3 per cent year-on-year in 2017, to 161 million tonnes. India's thermal coal imports are projected to grow at an average annual rate of 1.1 per cent between 2016, and 2022, to 175 million tonnes. Most of the growth is expected to occur towards the end of the outlook period. The main driver for this growth is expected to be the increased need for higher calorific coal — unavailable domestically in India, but a fuel requirement for the greater share of advanced coal-fired power plants expected to be in operation in India by 2022.

Japan's imports to remain steady as coal gains share in power mix

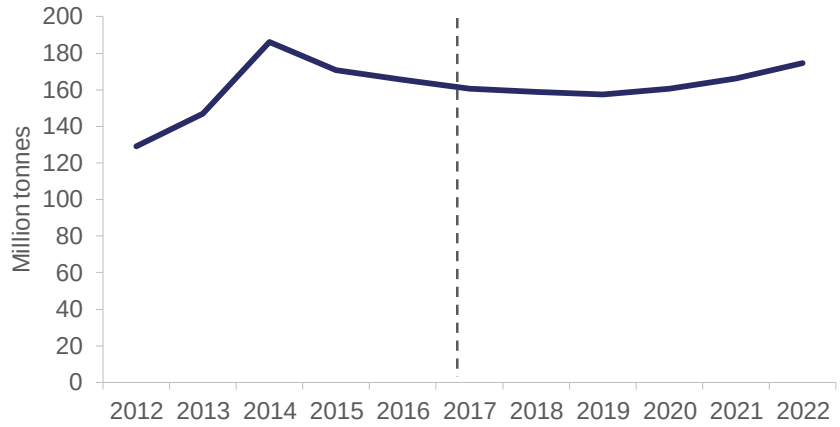
Japan is currently the largest importer of Australian thermal coal. Japan's thermal coal imports are projected to increase at an average annual rate of 1.1 percent over the next five years, to reach 147 million tonnes in 2022. This growth in import demand is expected to be underpinned by increased coal-fired power generation capacity. Between 2016 and 2022, Global Power Data projects that Japan will install an additional 3,046 megawatts of coal-fired power capacity.

Installed gas-fired power generation (a substitute for coal) is projected to increase at an annual average rate of 1.5 per cent over the same period. However, the growth of installed gas-fired power between 2016 and 2022 is much lower than the average annual growth rate between 2011 and 2016 (4.4 per cent). The investment in (cheaper) coal power — encouraged by cheaper thermal coal prices up until mid-2016 reflects — Japan's price-sensitive power sector and their plans to diversify their energy mix.

South Korea's imports remain stable and are forecast to rise

South Korea is currently the world's second largest importer of Australia's thermal coal. By 2022, South Korea's thermal coal imports are projected to reach 111 million tonnes, an annual average increase of 2.2 per cent from 2016. Much like growth in imports in 2017, this average annual increase is likely to be underpinned by increased installed coal-fired power generation capacity and the South Korean Government's push for a diversified electricity generation mix, ensuring security of energy supply.

Figure 6.5: India's thermal coal imports— on an annual basis



Source: IHS Inc. (2017) Coal imports by country and type

This additional coal-fired power capacity will be 'super critical' technology or better, and thus generate electricity more efficiently— requiring less coal to generate the same or higher amounts of electricity compared to older coal-fired power plant technologies. Therefore, the growth in coal imports is likely to be lower than in previous periods when there was growth in installed coal-fired power capacity — as the old coal-fired power plants were older technologies. Between 2016 and 2022, installed coal-fired power generation capacity is projected to grow at an average annual rate of 5.0 per cent. By 2022, it is expected that South Korea's installed coal-fired power capacity will be almost the same as installed gas-fired power capacity, at around 41,721 megawatts — with both coal and gas making up the majority of the electricity generation mix.

ASEAN demand to fuel thermal coal growth

Driven by increasing urbanisation, growing affluence, consumerism, and infrastructure needs, growing energy demand from ASEAN should result in increased thermal coal imports over the outlook period. Countries within ASEAN include Thailand, Vietnam, Indonesia, Singapore, Philippines, Malaysia, Myanmar, Cambodia, Laos, and Brunei.

World production and thermal coal exports

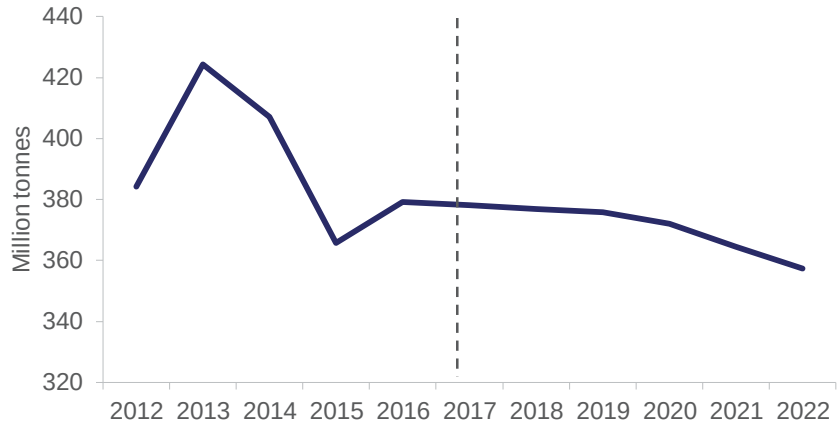
World thermal coal and lignite production over the medium term is projected to increase at an average annual rate of 1.2 per cent, to 7.1 billion tonnes by 2022. Growth in production from Australia, South Africa and Russia, are expected to outweigh production declines in China and possibly Indonesia.

Indonesia's exports lift on the back of higher thermal coal prices

In response to higher thermal coal prices — Indonesia's thermal coal exports increased by 3.7 per cent in 2016, with much of the growth in the second half of the year. This increase in exports follows consecutive declines in Indonesia's thermal coal exports between 2013 and 2015. Unprofitable miners, struggling with lower thermal coal prices pre mid-2016, were able to lift output and exports to benefit from the thermal coal price surge.

Between 2016 and 2022, Indonesia's thermal coal exports are forecast to decline at an average rate of 1.0 per cent, to 357 million tonnes — similar to its 2011 export levels. Exports are projected to remain steady over the first half of the outlook period, as Indonesia's key Asian customers (India and South Korea) still use lower calorific content coal for blending or fuelling coal-fired power plants that are using older technology. In the second half of the outlook period, this is expected to change, as consumers such as India increase their share of advanced coal-fired power plants — requiring coal of a higher calorific value and lower ash content. Furthermore, the projected thermal coal price decline over the outlook period (more pronounced for lower calorific value coal) is likely to affect the profitability of some of Indonesia's marginal producers, reducing the country's output and exports.

Figure 6.6: Indonesia's thermal coal export volumes— annual basis



Source: IHS Inc. (2017) Coal imports by country and type

On top of this, the Indonesian Government's mandated domestic coal obligation policy may pose a downside risk for the country's thermal coal exports. The policy enforces a domestic reservation policy — a requirement that domestic coal mines fulfil most of the country's coal–fired power generation needs. Global Power Data projects that between 2016 and 2022, 14,058 megawatts of coal-fired power generation will come on line, however to date, progress has been slower than anticipated.

Russia's exports projected to grow over the outlook period

Russia's thermal coal exports increased by 11 per cent in 2016, driven by an increase in demand from China.

In 2017, Russia's thermal coal exports are forecast to increase by 1.4 per cent to 150 million tonnes, underpinned by the low Ruble and higher US dollar thermal coal prices. A decline in China's import demand is expected to be outweighed by increased demand from other customers, including other countries in Asia.

Russia's thermal coal exports are projected to increase at an average annual rate of 1.8 per cent from 2016, to 165 million tonnes in 2022. Growth in exports is expected to be driven by Russia's devalued currency, its globally competitive coal production costs, and its geographic advantage to service both the European and Asian coal markets. While Europe's imports of thermal coal are projected to decline over the outlook period, import levels are expected to still be substantial, at around the 170 million tonnes by 2022.

South Africa's exports fell in 2016 but are projected to recover

In 2017, South Africa's thermal coal exports are forecast to remain similar to 2016 levels, underpinned by strong production — on the back of higher thermal coal prices — and steady demand from key consumers. South Africa's thermal coal exports are projected to rise steadily over the outlook period — at an average annual rate of 0.9 per cent, to 78 million tonnes by 2022. The strongest growth in exports is expected to come towards the end of the outlook period, driven by increased import demand from India — as it imports higher calorific coal — to fuel its growing share of advanced technology, coal-fired power plants.

A potential downside risk to South Africa's thermal coal exports is infrastructure constraints, related to power supply and transport (railways).

Australia's exploration, production and trade

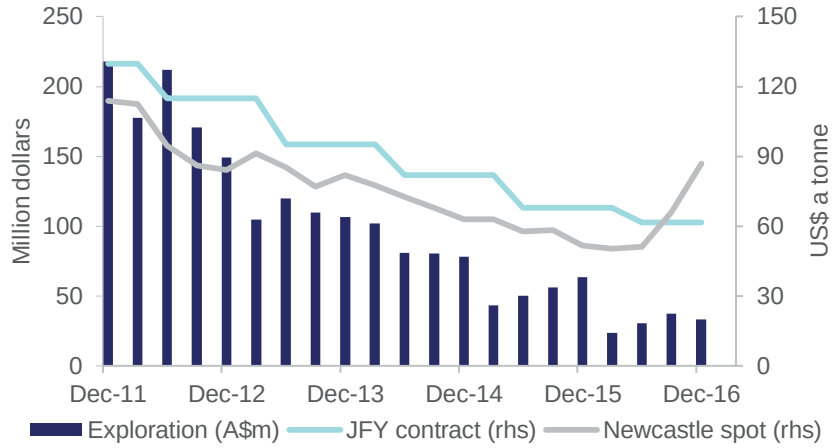
Coal exploration declined year-on-year

Australia's exploration expenditure almost halved year-on-year in 2016, to $124 million. However, given the sharp rise in thermal coal prices in recent quarters and the less pessimistic medium term outlook for thermal coal, exploration expenditure may soon recover.

Australia's production to rise, underpinned by higher thermal coal prices

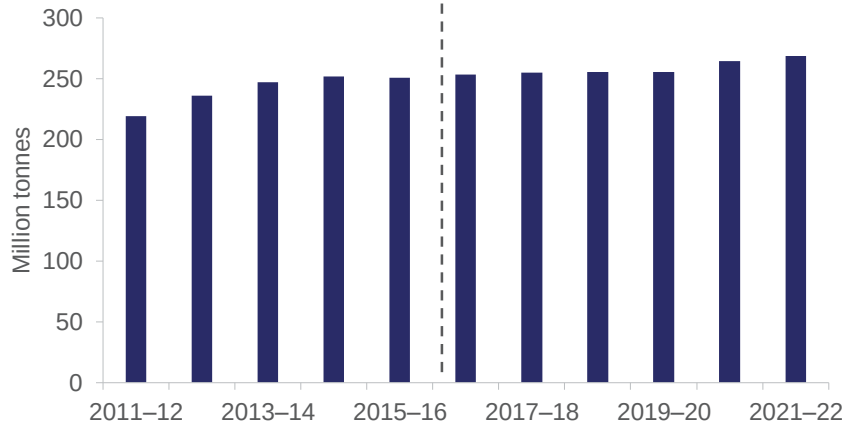
Production across most mines increased over 2016, encouraged by higher prices, especially in the second half of 2016. In the December quarter, increases in production were registered across many mines, including Maules Creek and Wilpinjong.

Figure 6.7: Australia's coal exploration expenditure, quarterly



Source: ABS (2017) Mineral and Petroleum Expenditure, 8412.0; IHS Inc. (2017); Department of Industry, Innovation and Science (2017)

Figure 6.8: Australia's thermal coal production, annual



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

In 2016–17, production is forecast to increase by 1.1 per cent to 253 million tonnes, supported by higher average thermal coal contract and spot prices. The planned shutdown of the Drayton mine in New South Wales (annual capacity of 1.25 million tonnes) will be outweighed by increased production from other mines, and by the expected start-up of the Byerwen mine in Queensland in 2017 (eventual full annual capacity of around 2-3 million tonnes).

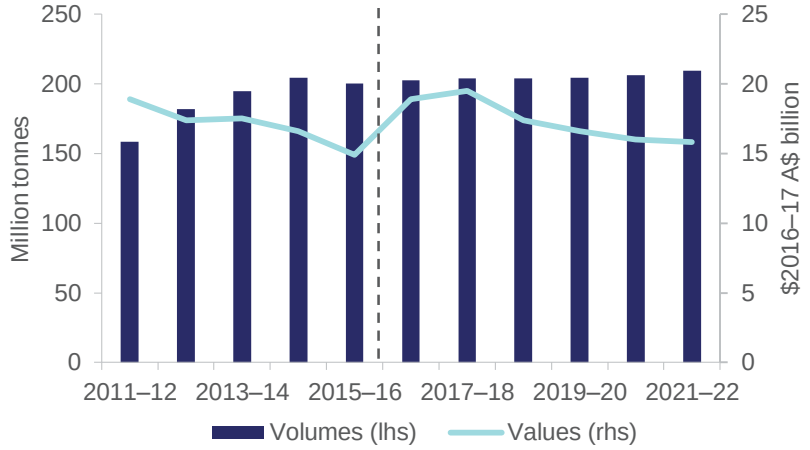
In 2017–18, production is forecast to increase by a further 0.7 per cent to 255 million tonnes, driven by higher average thermal coal prices. Ramp ups in production are expected at a number of large mines, including at the Hunter Valley Operations, Narrabri and Moolarben.

By 2021–22, coal production is projected to increase at an average annual rate of 1.2 per cent to 268 million tonnes. Growth in production is expected to be underpinned by steady domestic consumption and import demand growth, especially from the ASEAN region. Mines expected to come online by 2021–22 include the Grosvenor West and Monto mines, both in Queensland. There is some debate as to whether or not Adani's Carmichael mine in the Galilee Basin will go ahead or not. In October 2016, the Queensland Government granted the Adani project "critical infrastructure" status. According to the Queensland State Development Minister, this status entails less red–tape for the project, and permits the Coordinator General to sign off on approvals quickly. The Queensland Government still has to approve a water licence and minor applications for power and road access before construction can start. Adani is hoping to start work on the mine sometime in 2017. If the project were to go ahead it is expected to begin production in late 2022 — outside the Resources and Energy Quarterly's projection period.

Australia's export earnings to increase in 2016–17 and 2017–18, but then decline over the remaining outlook period

Export volumes in 2016–17 are forecast to increase by 0.4 per cent year-on-year, to 202 million tonnes. Higher export volumes are expected to be supported by higher production, driven by China's strong demand (notably in the first half of the year). Export earnings are forecast to increase by 28 per cent year-on-year to $18.9 billion, driven by increased spot thermal coal prices.

Figure 6.9: Australia's thermal coal export volumes and values — on a fiscal year basis



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

In 2017–18, export volumes are forecast to increase slightly from 2016–17 levels (up by 0.7 per cent) to 204 million tonnes. Export values are also forecast to increase by 3.1 per cent in 2017–18, to $19.5 billion (2016–17 dollars), as thermal coal contract prices and average annual spot prices increase from 2016–17 levels.

Export volumes are projected to grow at an average annual rate of 0.7 per cent to 209 million tonnes by 2021–22. Growth in volumes are expected to be underpinned by demand from the ASEAN region and India (towards the end of the outlook period), outweighing a decline in demand from China. Export values are projected to decline at an average annual rate of 1.3 per cent to $15.8 billion (2016–17 dollars) by 2021–22. This is expected to reflect forecast gradual declines in thermal coal prices, as they come off a relatively high base in 2016–2017.

Table 6.1: Thermal coal outlook

	unit	2016s	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
World								
Contract prices b								
– nominal	US$/t	62	82	72	70	68	68	68
– real c	US$/t	62	81	69	66	62	61	60
Spot prices d								
– nominal	US$/t	65	77	71	69	68	67	66
– real e	US$/t	66	77	70	66	63	61	59
Production g	Mt	6,711	6,765	6,796	6,859	6,976	7,092	7,094
Consumption g	Mt	6,711	6,769	6,800	6,864	6,980	7,096	7,098
Coal trade	Mt	1,036	1,016	1,002	1,004	1,017	1,038	1,062
Imports								
Asia	Mt	727	722	729	747	761	781	804
China	Mt	180	171	157	157	158	159	162
India	Mt	166	161	159	157	161	166	175
Japan	Mt	138	141	143	145	146	147	147
South Korea	Mt	98	101	103	105	107	109	111
Exports								
Colombia	Mt	89	90	95	97	102	110	117
Indonesia	Mt	379	378	377	376	372	365	357
Russia	Mt	148	150	152	156	159	162	165
South Africa	Mt	74	75	76	77	77	78	78
United States	Mt	17	17	16	16	16	15	14

	unit	2015–16	2016–17 s	2017–18 f	2018–19 z	2019–20z	2020–21 z	2021–22 z
Australia								
Production	Mt	250.8	253.1	254.8	255.1	255.3	264.5	268.4
Export volume	Mt	201.3	202.2	203.8	204.0	204.3	206.3	209.4
– nominal value	A$m	14,751	18,921	19,937	18,208	17,822	17,594	17,759
– real value h	A$m	15,001	18,921	19,517	17,409	16,628	16,015	15,767

*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 calendar year US dollars; **g** Includes lignite. h In 2016–17Australian dollars; **s** Estimate; **f** Forecast; **z** Projection*

Source: ABS (2017) International Trade, cat.no 5465.0; IHS Inc (2017); IEA (2017) Coal Information 2017; Coal Services Pty Ltd; Queensland Department of Natural Resources and Mines (2017); Department of Industry, Innovation and Science (2017); Company Reports


Gas

Market summary

The value of Australia's LNG exports is projected to increase from $17 billion in 2015–16 to $42 billion in 2021–22, supported by higher prices and export volumes. LNG contract prices — under which most Australian LNG is sold — are forecast to increase in line with oil prices. The addition of 21 million tonnes of export capacity by mid-2018 will underpin strong growth in export volumes and bring total export capacity to 87 million tonnes. LNG is forecast to overtake metallurgical coal as Australia's second largest resource and energy export in 2017–18.

The outlook for Australian LNG exports is not without risks. Production is ramping up just as competition in global LNG markets is set to intensify, and the capacity utilisation of Australian LNG projects is expected to decline. The extent of the decline remains uncertain, however, and will depend on the price competitiveness of Australian producers and their contractual arrangements with buyers.

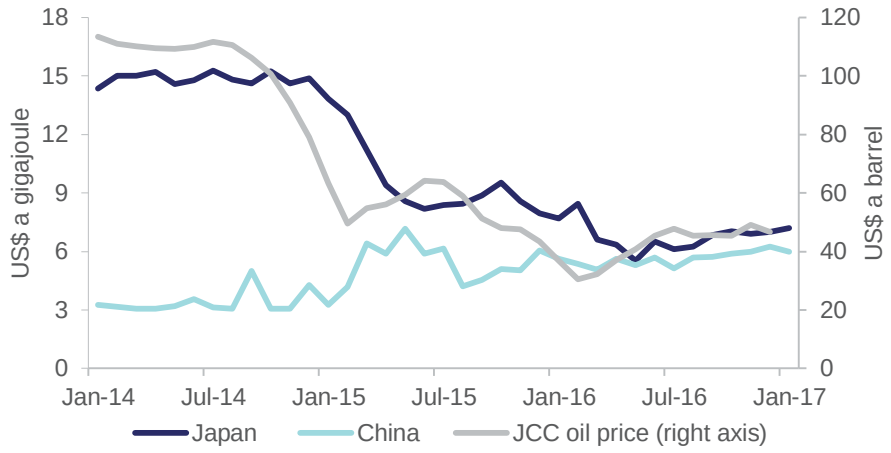
Prices

Australian LNG prices forecast to rise, driven by rising contract prices

Prices for Australian LNG delivered into North East Asia declined in 2016. Most Australian LNG is sold into Asia on contracts linked to the price of Japanese Customs-cleared Crude (JCC) oil by a time lag of three to four months. The average price for Australian LNG delivered into Japan — Australia's largest market and the world's largest importer — reached as low as US$5.50 a gigajoule in the middle of 2016, before recovering to around US$7.20 in January 2017.

Australian LNG prices are projected to recover over the medium term, driven by rising contract prices. The price of Brent crude — which the JCC price follows closely with about a one month lag — is expected to average US$64 a barrel in 2022 (in 2017 dollar terms), up from around US$45 a barrel in 2016. The average price of China's LNG imports from Australia is expected to increasingly follow movements in the JCC price, as trade based on oil-linked contracts swamps the level of trade based on older, fixed-price contracts.

Figure 7.1: Price of Australian LNG delivered to key markets



Source: Argus Media (2017)

Figure 7.2: Monthly LNG spot prices in North East Asia

Notes: spot price index covers Japan, China, South Korea and Taiwan, is for delivery in 4–6 weeks, and is composed of 50 per cent volume weighted deal data and 50 per cent average bids and offers.

Source: Argus Media (2017)

Spot prices are expected to remain subdued

LNG spot prices have been volatile in recent months. Spot prices in North East Asia rallied in late 2016 and into early 2017, averaging almost US$9 a gigajoule in January, as a cold start to winter in Asia fuelled demand, and production outages constrained supply. By March, they had fallen back to around US$6 a gigajoule — well down on the 2014 peak but above the lows of around US$4 observed in early 2016.

Unlike contract prices, spot prices are expected to remain subdued over the next few years, although the potential for volatility will remain. Spot prices are forecast to bottom out at around US$4 a gigajoule in 2019, as additions to global liquefaction capacity outstrip projected growth in LNG demand. Prices will then recover gradually in the second half of the outlook period.

The potential entry of China, Japan and South Korea into global spot markets as sellers would add to downward pressure on spot prices. The world's three biggest LNG buyers have large purchasing commitments, and may seek to resell LNG on spot markets to manage their contractual positions. Against this backdrop, Japan's Fair Trade Commission is undertaking an investigation into whether destination clauses in existing contracts — which restrict buyers from reselling cargoes to third parties — are uncompetitive.

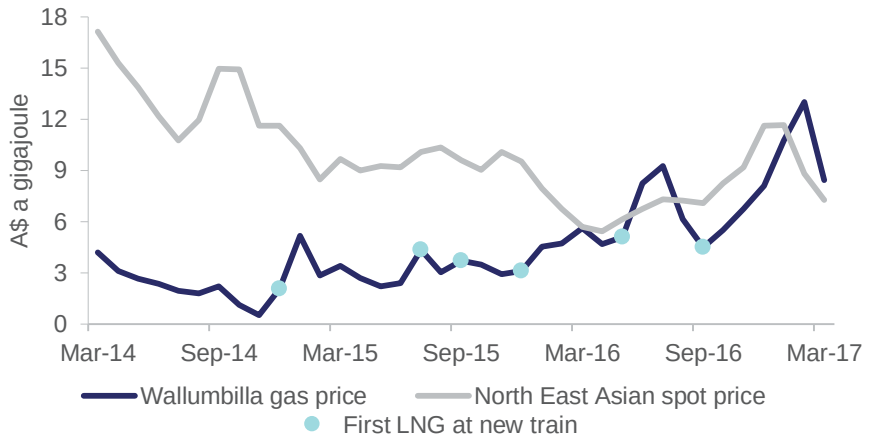
Australian east coast gas prices are expected to remain volatile

Around 45 per cent of east coast gas production was used in LNG production in 2015–16, either as a feedstock or in processing. With the commencement of operations at APLNG train 2 in late 2016 and the ramp up of production at GLNG, this share is expected to climb.

Given the scale of gas use in LNG production, small changes in gas demand from LNG projects are likely to have a significant impact on domestic spot prices. Prices are likely to be especially sensitive to LNG demand in winter, when the market is seasonally tight.

Figure 7.3 plots spot prices at Wallumbilla against the start up of LNG trains on the east coast. Spot prices fell at Wallumbilla (as they did across the eastern seaboard) during 2014, likely due to the presence of ramp gas (CSG being developed for the purposes of supporting LNG production).

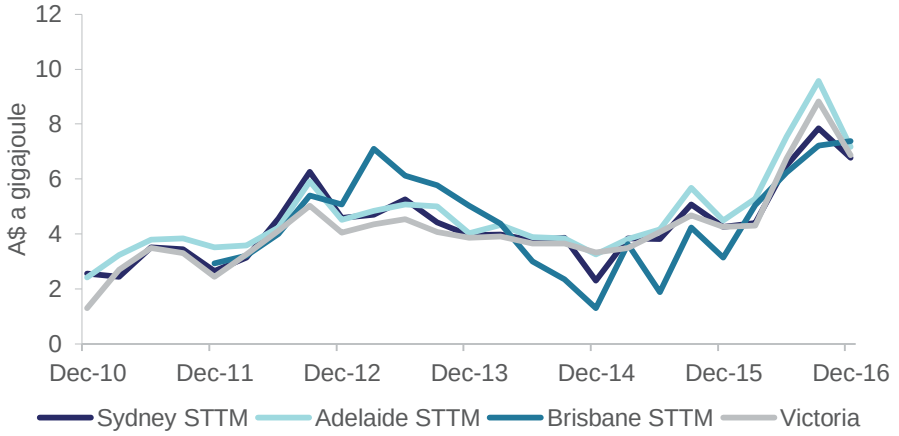
Figure 7.3: Monthly Wallumbilla gas price and Asian LNG spot price



Notes: The chart plots the month that LNG production began at each train at Gladstone. See Figure 7.2 for notes on the North East Asian spot price index.

Source: Australian Energy Market Operator (2017); Argus Media (2017)

Figure 7.4: East coast gas prices



Notes: Only a small proportion of Australian gas is sold on spot markets, with the majority being sold under confidential bilateral contracts.

Source: Bloomberg (2017) STTM prices, Victoria wholesale price.

Prices spiked at Wallumbilla after train 1 at QCLNG began production in December 2014, and continued to increase while trains started-up at QCLNG, GLNG and APLNG.

In the winter of 2016, the monthly spot price at the Wallumbilla trading hub reached $9 a gigajoule. Factors included LNG demand pressures, combined with higher seasonal demand, an increased need for gas-powered generation following coal-fired plant closures, below-average wind generation and interconnector outages.

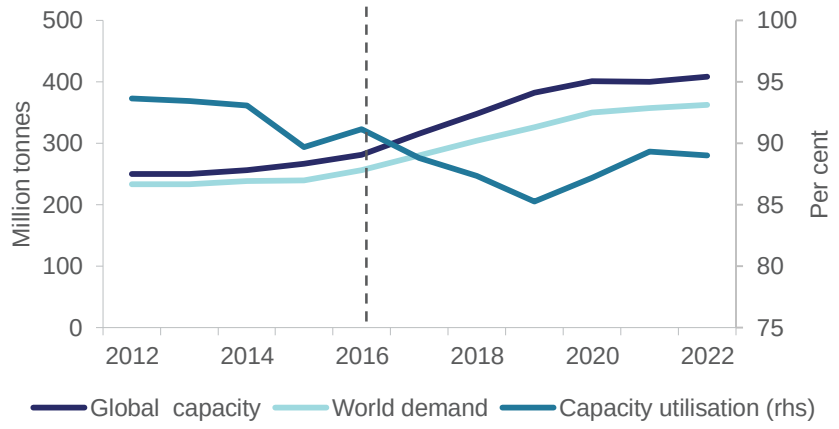
With all six trains on the east coast now operational, a key determinant of domestic spot prices is expected to be the price of LNG on the Asian spot market. When international spot prices are sufficiently high, LNG operations have strong incentives to purchase third party gas and sell it to overseas customers, resulting in pressure for domestic prices and LNG netbacks to converge. Alternatively, low international spot prices, or unexpectedly low demand, may see LNG operators redirect gas to the domestic market, putting downward pressure on domestic prices. In short, the relationship between international spot prices and the short-run marginal costs of LNG production is likely to exert a major influence on domestic gas prices in the east coast gas market.

World trade

Global gas consumption is projected to increase at an average annual rate of 1.7 per cent between 2016 and 2022. LNG production is expected to account for 37 per cent of the growth in global gas consumption, and LNG trade projected to increase by 5.9 per cent per year to 357 million tonnes in 2022. Demand growth will be driven by Emerging Asia and Europe. Supply growth will be supported by a major expansion of LNG export infrastructure, primarily in Australia and the US.

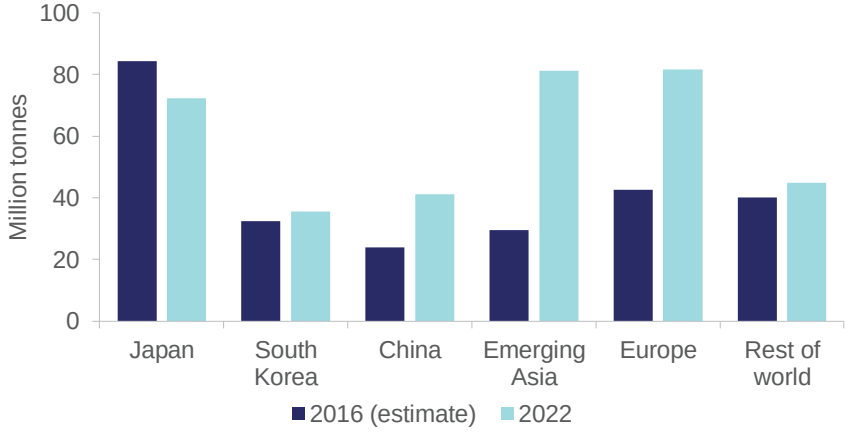
Despite projections of strong growth in LNG demand, increases in global production capacity over the next few years are expected to outpace growth in global imports. Overcapacity in global LNG markets is expected to peak in 2019. Increasing supply-side competition has potential implications for Australian exporters.

Figure 7.5: 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)

Figure 7.6: LNG import forecasts



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 are projected to fall by 2.5 per cent a year to 72 million tonnes in 2022. Overall energy demand in Japan is expected to remain subdued, due to a declining population, improving energy efficiency and a sluggish economic growth outlook. At the same time, LNG is expected to face increasing competition in the power generation sector, which accounts for around two-thirds of Japan's gas consumption.

Japan will expand both coal-fired power and renewable capacity over the next five years. In addition, a forecast decline in thermal coal prices is expected to support the competiveness of coal vis-à-vis gas, especially in the absence of an emissions trading scheme.

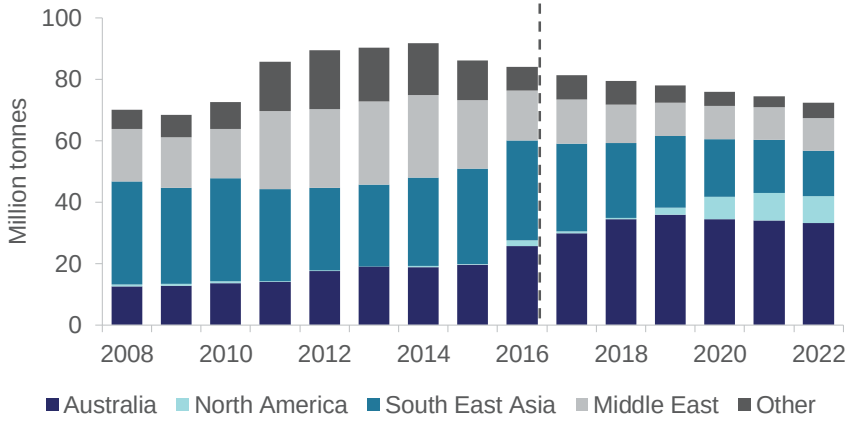
Added to this, around 17 of Japan's 45 gigawatts of nuclear capacity is expected to be operational by 2020. At the time of writing, three of Japan's fleet of 42 nuclear reactors, with a combined capacity of 2.7 gigawatts, had recommenced operations. Four more reactors, with capacity totalling 4.7 gigawatts, had received approval from Japan's Nuclear Regulation Authority to restart. A further two reactors (with combined capacity 1.7 gigawatts), which restarted in early 2016 but shut down shortly afterwards following a court injunction, were awaiting the outcome of a court decision. There are currently 13 other reactors under review by the Nuclear Regulation Authority.

The timing and scale of nuclear restarts thus remains a key uncertainty affecting the outlook. Nuclear energy continues to face public opposition in Japan in the wake of the 2011 Fukushima disaster, with all three of Japan's operational nuclear reactors having had to overcome legal challenges to their restart.

Prospects for growth in South Korea's imports remained limited

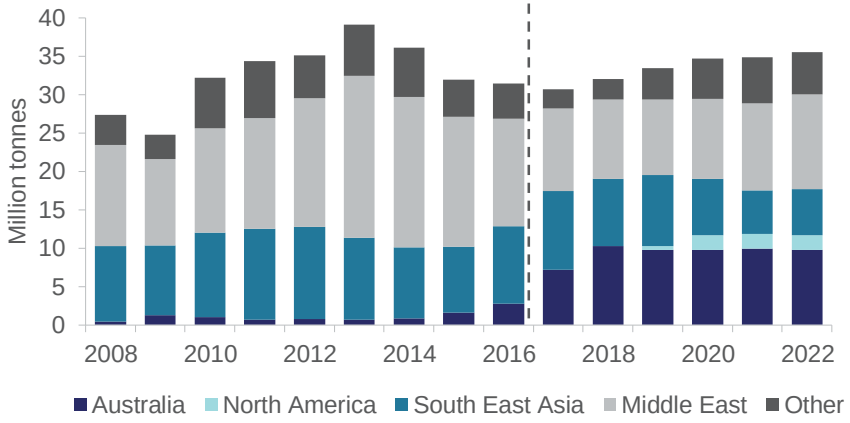
South Korea's LNG imports are projected to increase by 1.6 per cent a year to 36 million tonnes in 2022. Competition from other energy sources is expected to constrain demand for LNG, with South Korea planning to expand both nuclear and coal-fired power generation capacity.

Figure 7.7: Japan's LNG imports



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

Figure 7.8: South Korea's LNG imports



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

China will make the single largest contribution to growth in LNG demand

The scale of projected increases in Chinese gas consumption is enormous. Between 2016 and 2022, China is expected to account for a third of the total projected increase in global gas demand, with consumption forecast to rise by 65 per cent to 330 billion cubic metres. Policy targets will drive growth in gas demand, with the Chinese government aiming to increase the share of gas in the energy mix from 5 per cent in 2014 to 10 per cent by 2020.

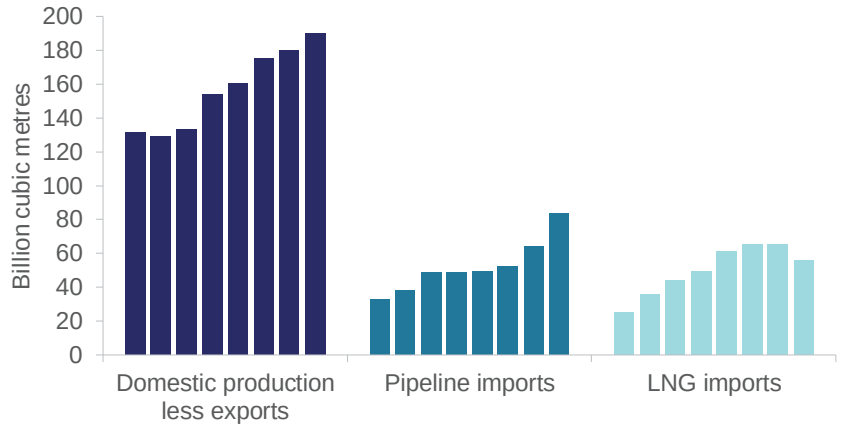
LNG is expected to play an important role in servicing rising gas demand, with China having agreed to contracts that will see its imports increase over the next few years. China's LNG imports are forecast to increase by 19 per cent a year to 48 million tonnes by 2020, before declining to 41 million tonnes (or 56 billion cubic metres) in 2022.

A key factor affecting China's LNG demand will be the extent of competition from indigenous production and gas imported through pipelines. China's pipeline imports are expected to remain relatively stable over the first half of the outlook period. The Chinese government appears to have deferred the start-up of Line D, the fourth and final pipeline in the China-Central Asia gas pipeline network. The pipeline was expected to have capacity of 30 billion cubic metres a year — equivalent to around half of China's total gas imports in 2015.

From the early 2020s, LNG will likely face stiffer competition from pipeline imports. China is expected to begin importing gas from Russia via the Power of Siberia pipeline around this time, starting at 5 billion cubic metres in the first year and reaching 38 billion cubic metres in the sixth year.

China's domestic production is expected to grow steadily over the outlook period, by around 60 billion cubic metres. Both conventional and unconventional gas production will support growth. China is aiming to increase production from its shale gas resources — amongst the largest in the world — from 4.5 billion cubic metres in 2015 to 30 billion cubic metres in 2020.

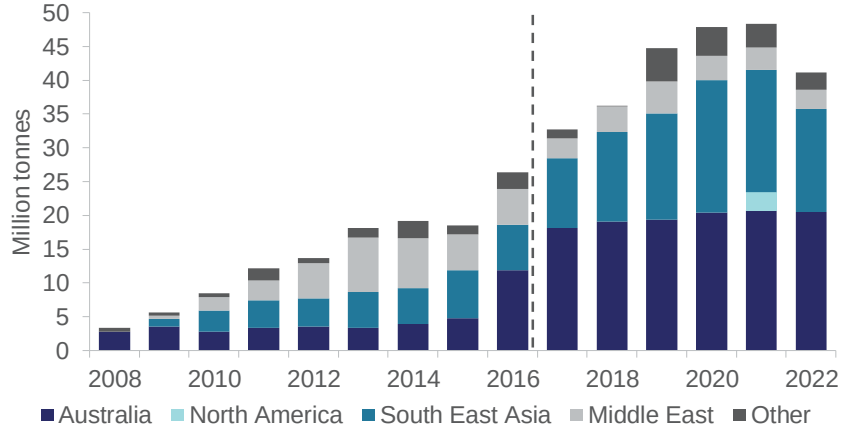
Figure 7.9: China's LNG consumption by source, 2015 to 2022



Notes: stock changes are excluded.

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

Figure 7.10: China's LNG imports



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

Imports by a large number of Asian nations will also drive growth

Other Emerging Asian economies will also make a large contribution to growth in global LNG trade, with their imports expected to quadruple from 20 million tonnes in 2015 to 81 million tonnes in 2022.

Growth will be underpinned by low spot prices and the availability of floating storage and regasification unit (FSRU) technology, which allow small volumes of LNG to be received economically. Since 2015, the number of FSRUs in operation has increased from 13 to 21, and there are currently six more under construction.

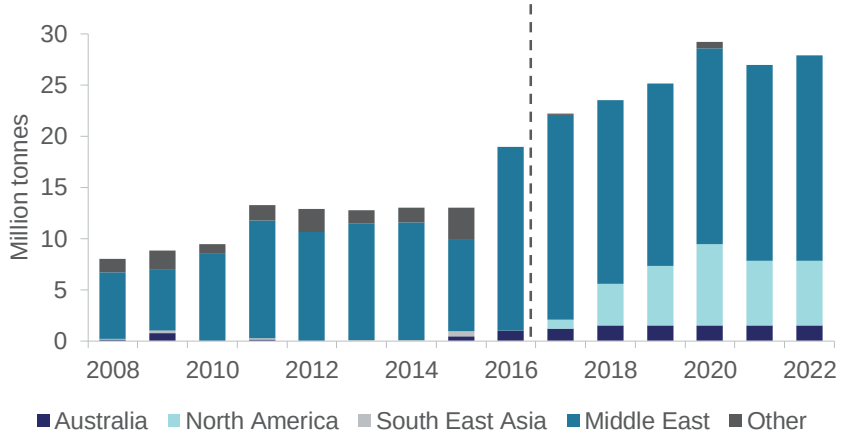
India is expected to be one of the key drivers of LNG demand in Emerging Asia. The government is aiming to increase the share of gas in the energy mix from 6.5 per cent at present to 15 per cent, although a timeframe for achieving these targets has not been specified. The extent of India's LNG requirements will depend, in part, on progress on the Turkmenistan-Afghanistan-Pakistan-India (TAPI) and Iran-Pakistan-India (IPI) pipelines. India's domestic production is not expected to keep pace with the projected increase in demand.

Europe's LNG imports are set to increase

Despite a relatively subdued demand outlook for gas consumption, European LNG imports are projected to increase by 11 per cent a year to 82 million tonnes in 2022. Falling indigenous production (particularly in the Netherlands) and a desire to diversify away from Russian pipeline supply are expected to support growth in LNG imports.

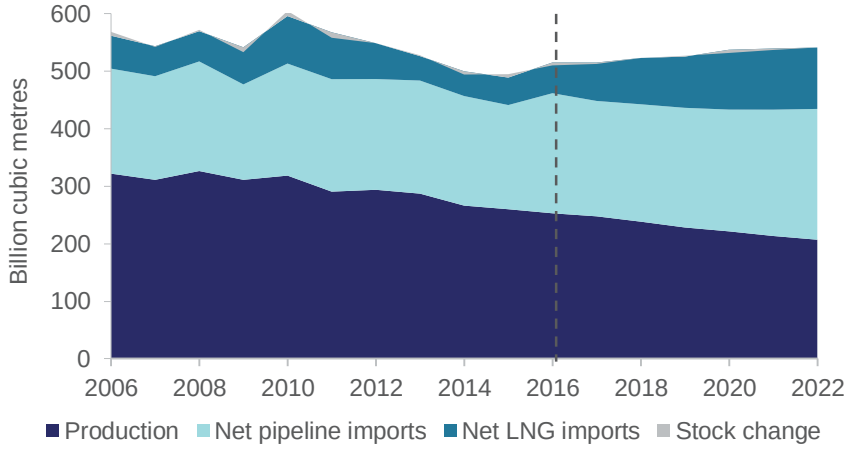
While Europe is not a large market for Australian LNG, the outlook for European gas demand is still important for Australian producers. If LNG demand in Europe does not grow as strongly as projected, Qatari and US LNG may be displaced, potentially bringing increased competition to the Asia-Pacific.

Figure 7.11: India's LNG import volumes



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

Figure 7.12: Europe's gas consumption



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

World supply

Global liquefaction capacity is expected to rise

The global LNG market is going through a period of transformation, with a major expansion in liquefaction capacity currently underway. Global liquefaction capacity is projected to increase from around 280 million tonnes in 2016 to 408 million tonnes in 2022.

The majority of new capacity will be added between 2017 and 2019, with more capacity additions in 2020, before growth slows towards the end of the outlook period. With capacity additions outpacing projected demand, global capacity utilisation is projected to fall.

The United States will make the largest contribution to new capacity

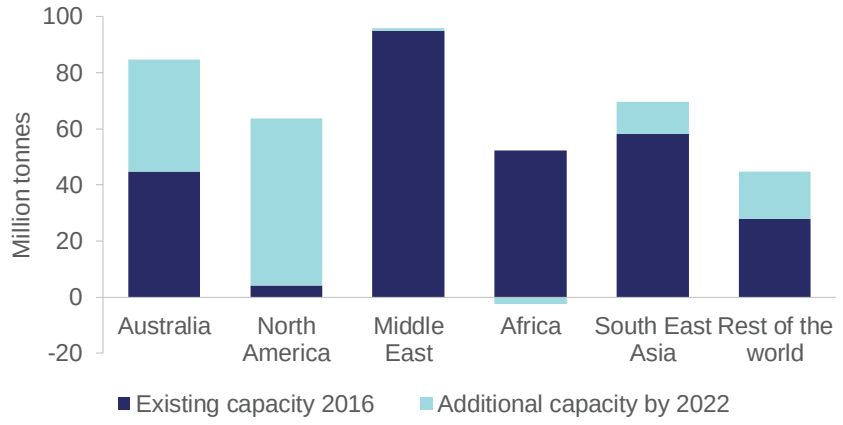
Around half of all new capacity will come from the United States. By 2022, all five LNG projects currently under construction in the United States are expected to be completed. Large capacity additions are also expected in Russia — driven by the completion of the 16.5 million tonne Yamal LNG project — and Australia.

The cost competitiveness of US exporters will largely be determined by the cost of domestic gas, for which the reference price is Henry Hub. Henry Hub prices averaged US$3.0 per million British thermal units over the first quarter of 2017 (A$3.80 a gigajoule) and expectations are for the Henry Hub price to remain low, edging up to around US$4.0 per million British thermal units by the early 2020s. US exports are projected to rise to around 53 million tonnes in 2022.

Qatar's exports are projected to remain largely unchanged

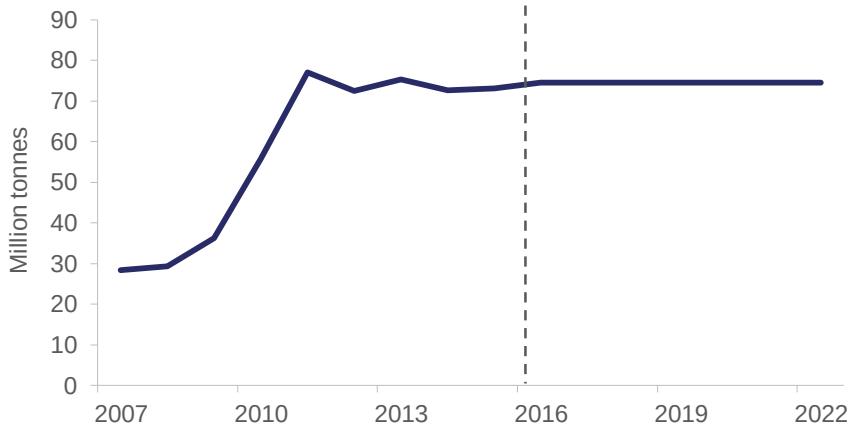
Qatar is the world's largest LNG exporter. In 2015, Qatar exported 73 million tonnes of LNG, but its exports have been as high as 77 million tonnes in 2011. Qatar's LNG projects are the lowest cost in the world, and Qatar's exports are projected to remain broadly unchanged over the outlook period at 74 million tonnes.

Figure 7.13: 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)

Figure 7.14: Qatar's LNG exports



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

Australia

Australia's LNG earnings to rise, supported by higher prices and volumes

The value of Australia's LNG exports is projected to increase from $17 billion in 2015–16 to $42 billion in 2021–22 — an average annual increase of 16 per cent. Rising export values will be underpinned by higher prices and export volumes. The average price of Australian LNG is forecast to increase as oil prices recover, with most Australian LNG sold under contracts linked to the JCC oil price by a 3-4 month lag. While rising contract prices should drive up the average price of Australian LNG, persistent low spot prices are expected to weigh on the value of uncontracted production.

Australia's LNG export volumes are expected to grow rapidly

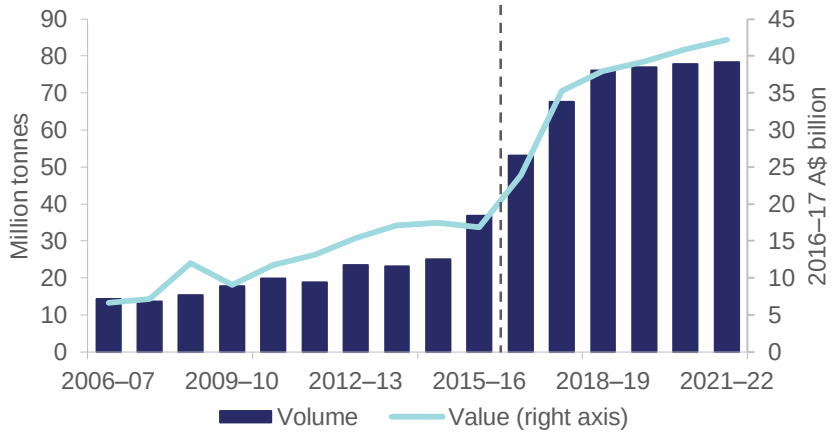
Australia's LNG export volumes are forecast to increase from 37 million tonnes in 2015–16 to 77 million tonnes in 2021–22. Higher export volumes will be underpinned by the recent completion of trains at APLNG and Gorgon, as well as the completion of the three remaining LNG projects under construction — Wheastone, Icthys and Prelude. The three projects will add around 21 million tonnes to Australia's LNG export capacity, bringing total capacity to around 87 million tonnes.

All three projects are scheduled to commence operations by mid-2018. However, some uncertainty surrounds the timing of Shell's Prelude project in the Browse Basin, where start up could be complicated by the cyclone season, which runs from November to April.

Additional export capacity is also expected to be added later in the outlook period, with a small expansion at Woodside's Pluto project. Woodside have outlined two options for the expansion. The first — debottlenecking — would add just under one million tonnes of capacity. The second — an off-the-shelf train that would plug-in to the existing infrastructure — would add 1 to 1.5 million tonnes. A decision is scheduled for the September quarter 2017.

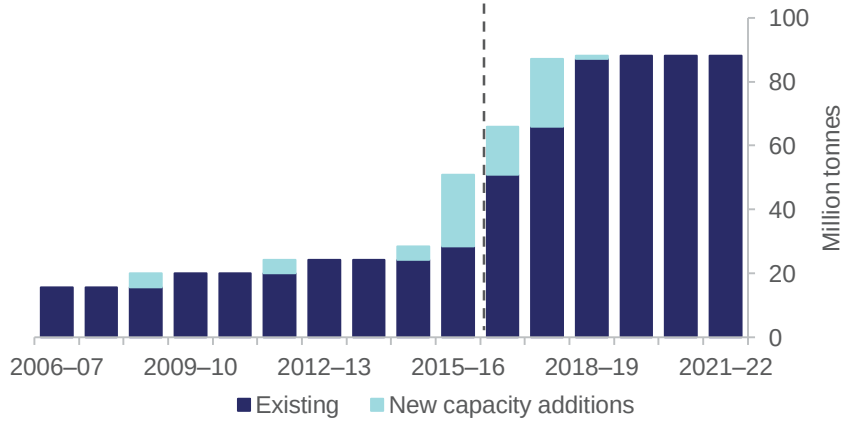
Increased exports to Japan, South Korea and China are expected to drive the rise in Australia's export volumes in 2016–17 and 2017–18. While prospects for growth in the imports of Japan and South Korea are limited, Australian producers are expected to capture an increasing share of both country's imports as long-term contracts start up.

Figure 7.15: Australia's LNG exports



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

Figure 7.16: Australia's LNG export capacity



Notes: nameplate capacity.

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

Deeper into the outlook period, Australia's exports to these destinations are expected to level off. In China, LNG will increasingly compete with pipeline gas, while nuclear restarts in Japan and competition from other fuels in South Korea will weigh on LNG imports. Small falls in exports to these destinations will be offset by growth in exports to smaller importers, as Australian producers seek out new markets.

Australia is not immune from supply-side competition

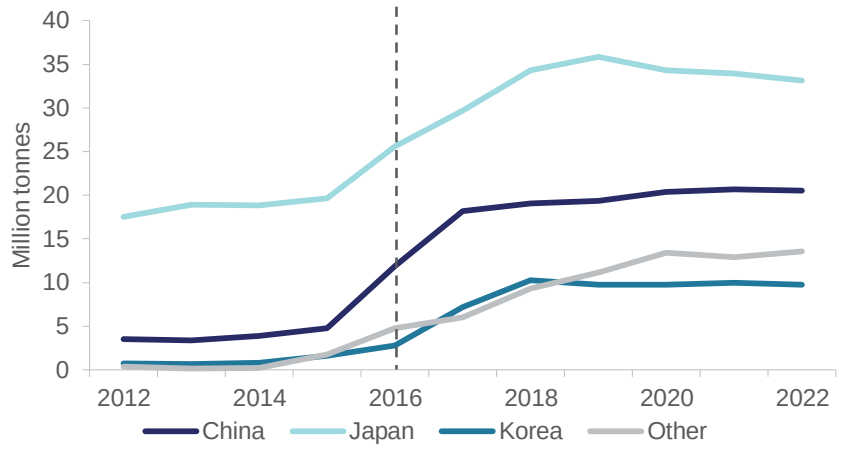
While LNG exports are projected to rise, the capacity utilisation of Australian LNG export projects is expected to decline. The extent to which capacity utilisation declines will depend, in part, on the nature of the contractual arrangements that Australian exporters have in place with buyers.

LNG contracts often include clauses which allow buyers to reduce purchases to minimum 'take-or-pay' levels. The flexibility with which buyers can reduce purchases on Australian contracts is likely to be important if oil-linked contract prices and spot prices diverge, encouraging buyers to reduce imports on contracts to minimum levels and to boost purchases on the spot market. The flexibility in Australian contracts is also likely to be important at times when buyers are over contracted and need to reduce LNG purchases. Take-or-pay levels are thought to be around 85 per cent of contracted volumes, but can vary from contract to contract.

The price competitiveness of Australian producers is another factor affecting the outlook for exports. Proximity to Asia will be an advantage, although the Panama Canal expansion in 2016 has lowered shipping costs from the US, and Qatar will remain the lowest cost producer in the world.

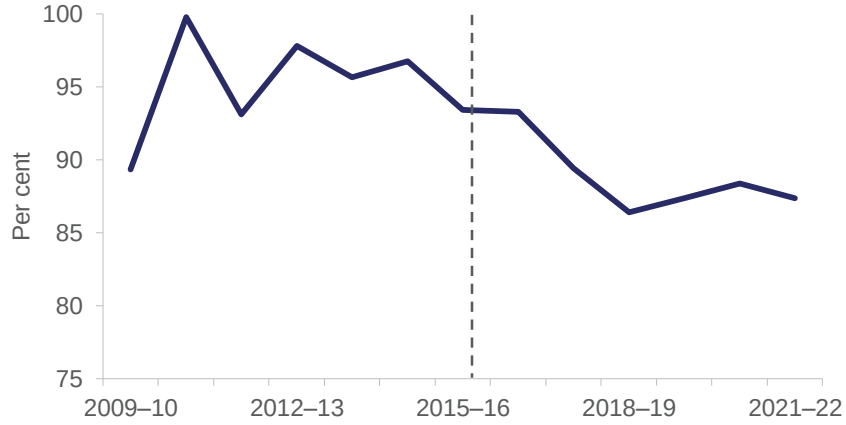
A large cost for LNG plants is feed gas. The three LNG export terminals on the east coast — which are largely fed by CSG from Queensland's Surat and Bowen basins — tend to have relatively high costs for feed gas. Unlike LNG ventures using gas from conventional reservoirs, LNG operators on the east coast will need to drill hundreds of new wells each year to maintain CSG production, with costs of over a million dollars per well.

Figure 7.17: Australia's LNG exports by destination



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

Figure 7.18: Australia's LNG export capacity utilisation



Notes: Utilisation shown as a share of nameplate capacity. Office of the Chief Economist estimates are used when LNG trains are ramping up to full capacity.

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

On current projections, Australia will overtake Qatar as the world's largest LNG exporter in 2019, when Australian LNG exports reach 76 million tonnes. However, given the narrow difference between the projected exports of the two countries and the downside risks to the outlook for Australian LNG, Australia overtaking Qatar at this time is not a certainty.

Two of Australia's LNG plants will need to source new gas

Australian LNG projects also face other challenges. Gas is contracted to the Darwin LNG project from the Bayu-Undan field until around 2022. However, after this time the Darwin LNG plant will require new gas supply to be able to continue operations. Similarly, the existing gas supply into the North West Shelf begins to taper off from 2020 onwards.

Gas fields that could backfill both operations have been identified. ConocoPhillips is progressing two options for backfill of Darwin LNG — Greater Poseidon and Barossa-Caldita. Woodside has identified the Browse gas fields as a backfill option for North West Shelf. Final investment decisions will need to be taken over the next few years, in the midst of a difficult price environment.

Gas production is projected to rise

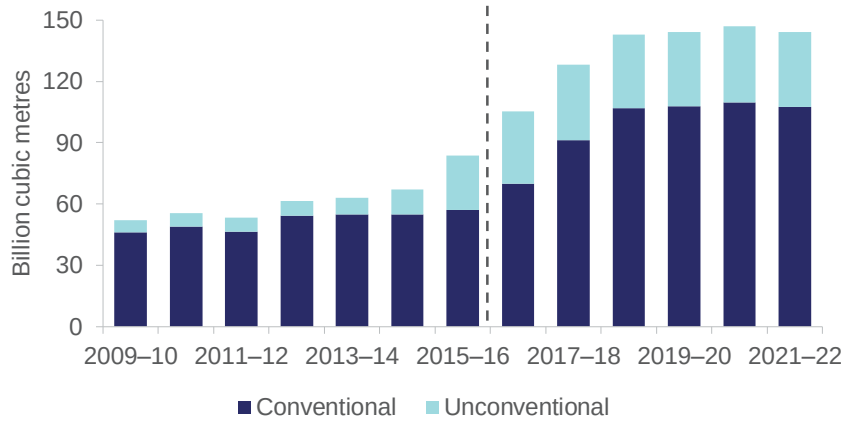
Australian gas production is projected to increase over the period to 2018–19, rising to 143 billion cubic metres from 84 billion cubic metres in 2015–16. Conventional gas production on the West Coast and CSG production on the East Coast — both associated with LNG projects — is expected to be the major driver of growth.

In the Western Australian market — Australia's largest gas producing area — production is expected to rise, as LNG production at the Gorgon project ramps up and the Wheatstone and Prelude projects come online. Both Gorgon and Wheatstone also have large plants that will produce gas for the domestic market, replacing domestic supply from North West Shelf contracts that expire around 2020.

In the Eastern market, increased CSG production to support exports from recently-completed LNG projects will contribute to growing gas production. Rising production in the small Northern market will be driven by the completion of the Icthys project.

Growth in gas production is projected to level off from 2019–20, with production remaining at around 145 billion cubic metres. Currently, there are only a small number of gas projects in the pipeline, and the outlook for some of these is clouded by community opposition or uncertainties surrounding their commercial viability.

Figure 7.19: Australia's gas production



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

Table 7.1: LNG outlook

	unit	2015–16	2016–17 f	2017–18 f	2018–19 z	2019–20 z	2020–21 z	2021–22 z
Australia								
Natural gas production b	Bcm	83.6	105.5	128.1	142.8	144.3	147.1	144.3
– Eastern market	Bcm	40.7	49.9	51.2	50.6	51.1	51.8	51.1
– Western market	Bcm	42.2	54.8	71.8	79.8	80.7	82.6	80.7
– Northern market c	Bcm	0.7	0.7	5.1	12.4	12.5	12.6	12.5
LNG export volume	Mt d	36.9	53.1	67.6	76.1	77.0	77.9	77.0
– nominal value	A$m	16,576	23,654	36,118	40,448	43,487	46,346	47,451
– real value e	A$m	16,856	23,654	35,358	38,673	40,574	42,185	42,128
LNG export unit value g								
– nominal value	US$/MMBtu	6.6	6.6	7.9	7.8	8.1	8.6	8.9
– real value e	US$/MMBtu	6.7	6.6	7.7	7.5	7.6	7.8	7.9
– nominal value	A$/GJ	8.5	8.4	10.1	10.1	10.7	11.3	11.7
– real value e	A$/GJ	8.7	8.4	9.9	9.6	10.0	10.3	10.4

*Notes: **b** Production includes both sales gas and gas used in the production process (i.e. plant use) as well as ethane; **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 2016–17 financial year Australian dollars; **g** 1 MMBtu is equivalent to 1.055 GJ; **f** Forecast; **z** Projection.*

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


Oil

Market summary

The value of Australia's crude oil and condensate exports is forecast to increase to $6.1 billion in 2016–17, supported by higher oil prices. As condensate output from new offshore LNG projects ramps-up, export values are projected to reach $8.8 billion in 2018–19 (2016–17 dollar terms). Export earnings have been revised down compared to the previous projections, inline with slightly lower price forecasts.

Further into the outlook period, slowing growth in export volumes is expected to offset a small increase in prices. Export values are projected to decline to $8.0 billion in 2021–22.

Global production dynamics are undergoing a period of significant change. OPEC has agreed to limit 2017 production, and a more positive price outlook has encouraged US production to increase. With global consumption increasing at a greater rate than production, oil prices are expected to strengthen.

Prices

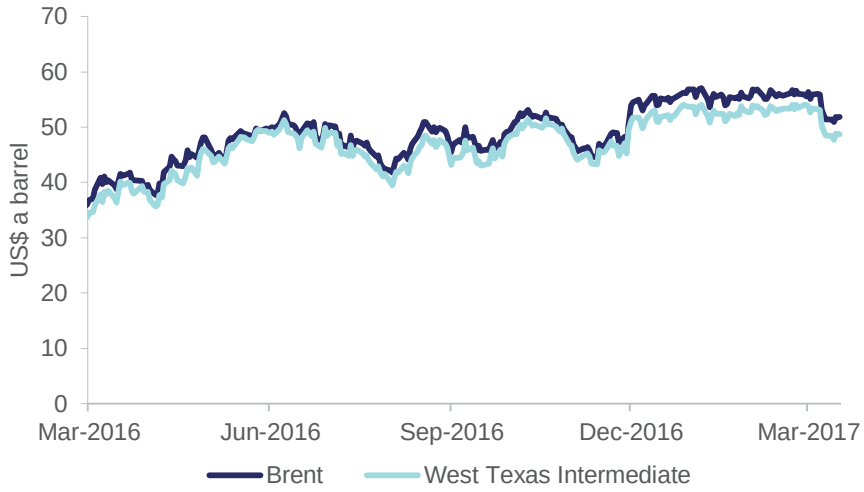
OPEC supply reductions support price growth

After a significant price recovery towards the end of 2016, prices have continued to strengthen in 2017, although at a slower pace. In the first quarter of 2017, Brent crude averaged US$54 a barrel, 8 per cent higher than the December quarter average price. West-Texas Intermediate (WTI) crude was 5 per cent higher for the same period, averaging US$52 a barrel.

Crude oil prices are expected to increase over the remainder of 2017, as global supply is constrained under the OPEC agreement — which seeks to reduce 2017 output by 1.8 million barrels per day. Provided the OPEC agreement is adhered to, and is extended beyond the initial six month period, average prices are forecast to be US$12 a barrel higher in 2017 than in 2016. Prices are forecast to average US$56 a barrel for Brent crude and US$55 a barrel for WTI, slightly lower than the previous forecast.

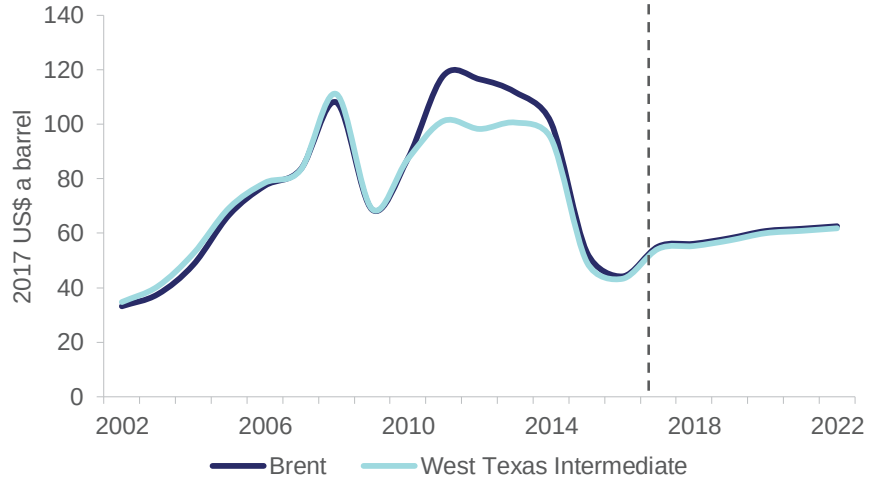
Increases in non-OPEC production growth, including surging US production and stock drawdowns, are expected to have a dampening effect on potential price increases. The historically high stock levels accrued in 2015 and 2016 were a driving factor behind the OPEC agreement to cut output , and a stock reduction is expected in 2017.

Figure 8.1: Recent quarterly 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)

Stock level movement has varied so far in 2017, as shipments related to high 2016 production are still being delivered to markets to satisfy contractual arrangements. After OECD crude oil stocks rose in January, initial indicators showed modest stock depletion in February. Higher production and lower refinery activity led to US oil stocks increasing to record high level levels during this period.

US oil production is forecast to increase significantly in 2017, up by 0.4 million barrels a day to almost 13 million barrels a day. Higher US production is expected to stem some of the upward price pressure resulting from the OPEC agreement.

With restrained global production gradually bringing output closer to the level of global consumption, a more balanced oil market is expected in the second half of 2017. Prices are forecast to rise at a slower rate over the long term, as the OPEC agreement expires and OPEC production returns to the market. Depending on the rate at which OPEC transitions away from production restrictions, there could be considerable downward pressure on prices in 2018.

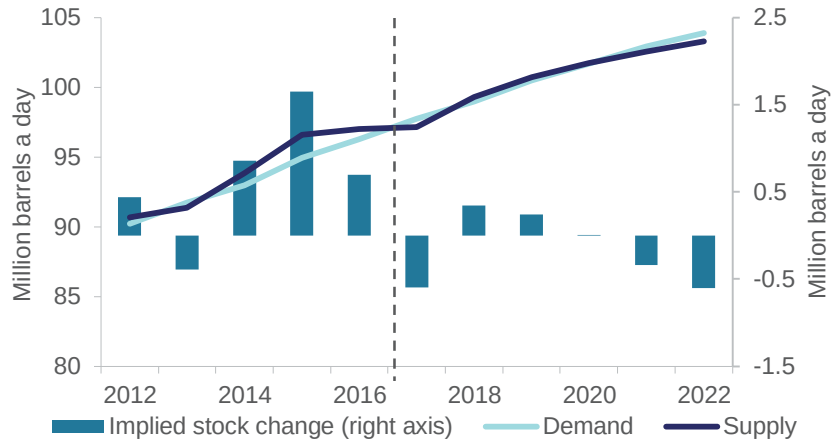
Towards the end of the outlook period, production growth is expected to flatten, due to a number of factors, including field depletion, higher capital costs, a decreased rate of exploration and lower new project investment. In an environment of growing consumption, 2022 prices are projected to average US$64 a barrel for Brent and US$63 a barrel for WTI (2017 dollar terms).

World oil consumption

World oil consumption grew an estimated 1.7 per cent in 2016 to average 96.6 million barrels a day. This increase was driven by high consumption growth in China and India, up by 3.1 per cent and 7.3 per cent, respectively. Consumption in Europe was higher than expected. Low oil prices and an improving economic environment have continued to support oil consumption in the US.

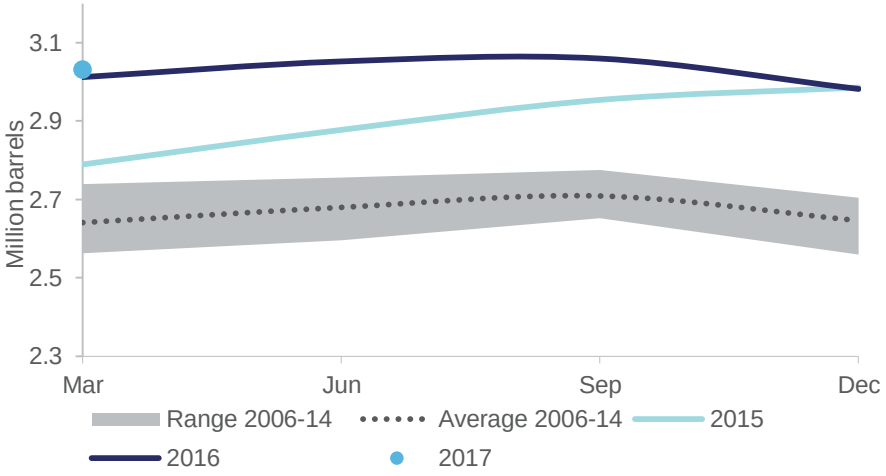
Estimated global consumption so far in 2017 has exceeded corresponding levels in 2016, although consumption in India has been (temporarily) negatively affected by currency reform. Over the year, world consumption is forecast to expand by 1.4 million barrels a day, primarily due to higher non-OECD consumption, although China's consumption growth is expected to be lower than in previous years.

Figure 8.3: Oil supply, consumption and stocks



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

Figure 8.4: Quarterly measures of OECD Industry petroleum stocks



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

Aside from growing US consumption, OECD oil consumption is expected to be broadly unchanged in 2017. In Europe, more stringent fuel efficiency standards and increased fuel substitution, are expected to offset the impact of stronger economic activity and higher levels of vehicle sales.

Beyond 2017, world oil consumption is projected to grow at a marginally lower rate, increasing at an average rate of 1.2 per cent a year. In 2022, oil consumption is projected to be 103.9 million barrels a day, around 6 million barrels a day higher than 2017.

Expanding vehicle fleets in non-OECD nations support demand growth

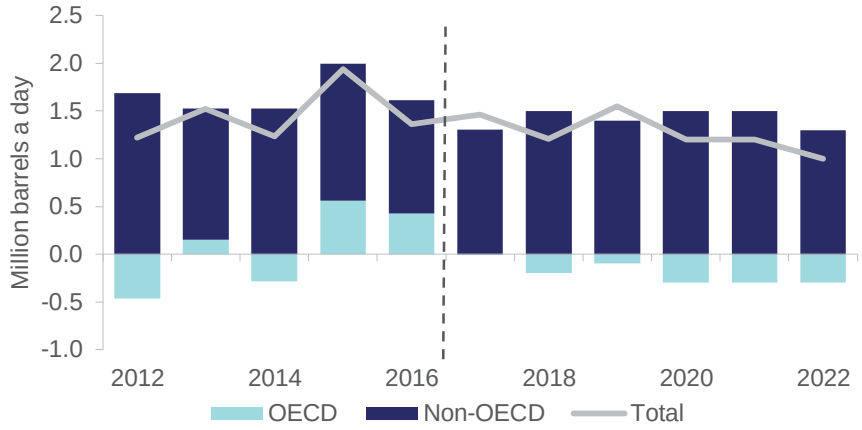
Within total world consumption, non-OECD consumption is projected to grow at an average annual rate of 2.7 per cent over the outlook period, while OECD consumption is expected to decrease slightly.

Road transport in non-OECD countries — primarily China and India — is expected to account for the largest growth in forecast oil consumption. China's vehicle fleet expanded considerably in 2016, aided in part by a tax reduction for specific vehicle purchases, and by a 15 per cent increase in passenger car sales. In addition, ownership of SUV's in China showed a second year of double-digit growth. As China's oil consumption patterns change — influenced by Government policy targeting energy consumption, fuel-switching and improving vehicle energy efficiency — consumption growth is forecast to slow, averaging 2.3 per cent per year over the outlook period.

India is expected to be a key driver of world consumption growth, where oil consumption is projected to increase at an average rate of 5.6 per cent a year to 2022. While vehicle ownership in India and China is expected to increase significantly, neither country is expected to reach the levels of market saturation or vehicle usage of developed countries.

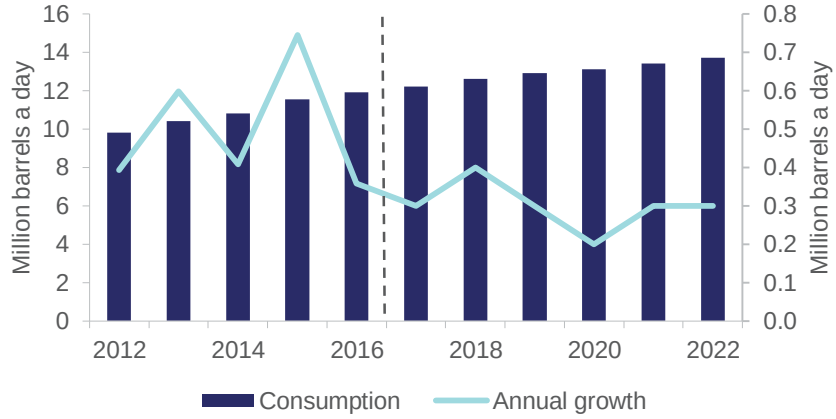
The overall rate of consumption growth will depend on the changing patterns of oil consumption, which is in turn influenced by economic growth, government policy, oil prices and the suitability of alternatives.

Figure 8.5: Change in world oil consumption



Source: International Energy Agency Monthly Oil Data Service (2017)

Figure 8.6: China's oil consumption



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

World oil production

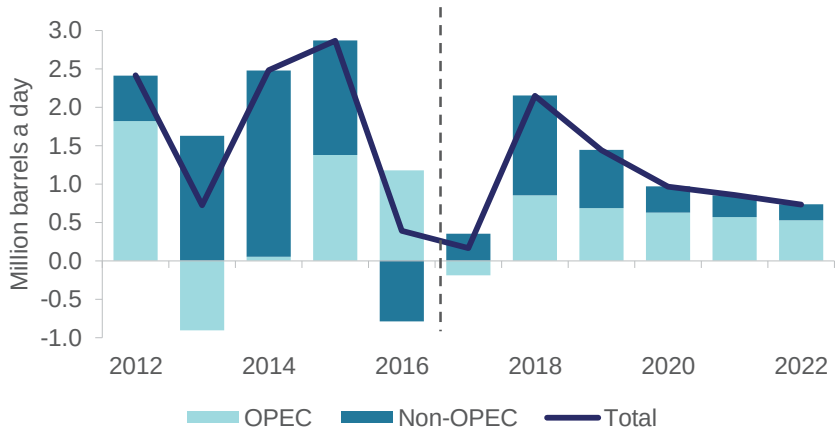
In 2016, global oil production grew to 97 million barrels a day, 0.2 per cent higher than the previous year. OPEC crude and natural gas liquids production increased considerably for the second year in a row, up 3.1 per cent over the year to 39.3 million barrels a day. Lower production from China's maturing oil fields, and decreasing US production due to financial pressures, resulted in non-OPEC production dropping 1.3 per cent in 2016.

Production dynamics are expected to change considerably in 2017, as lower OPEC production is displaced by higher production from non-OPEC countries, particularly unconventional US production. These factors are expected to result in a virtually unchanged level of production in 2017. Preliminary results suggest OPEC producers have lowered production in the first two months of year, in some cases reducing output by more than the committed level.

OPEC production is forecast to increase considerably in 2018 and 2019, as production limits are eased. Capacity expansions are planned or currently underway in a number of member countries; total OPEC capacity is expected to increase at an annual average rate of 0.8 per cent over the outlook period. Higher output is expected from low-cost Middle-East producers, as production capacity in Iraq, Iran and the UAE is projected to expand at an average rate of 2 per cent a year to 2020. Geopolitical risks increase the uncertainty around output for a number of OPEC members, including any production recovery in Nigeria and Libya.

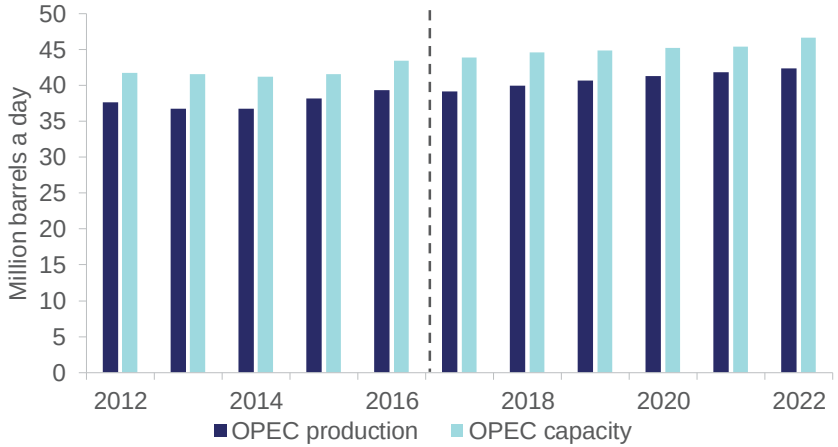
Towards the end of the outlook period, production growth is projected to flatten, reaching around 103.3 million barrels a day in 2022. This slower production growth is expected to occur as the rate of new projects and expansions drops — an outcome of field decline and lower capital expenditure in previous years.

Figure 8.7: Change in world oil supply



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

Figure 8.8: OPEC capacity and production



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

OPEC agreement and uncertain market outcomes

Initial results for the first two months of 2017 show OPEC production to be 320 thousand barrels a day lower than the same period in 2016. Lower production indicates that member countries are abiding to the agreed 1.8 million barrels a day reduction, which is the first time production has been lowered in two years. Production rates are expected to decline further, as countries — particularly Russia — phase in agreed restrictions over the first two quarters of 2017. A number of member countries have indicated support to extend the agreement beyond June 2017, however this is yet to be officially agreed.

An extension to the OPEC agreement will be influenced by how the market reacts: whether high stock levels are depleted and whether relatively high prices are maintained. Budgetary pressures, as well as increased supply from non-OPEC producers, may make it increasingly difficult for OPEC members to agree to restrict supply. Production from OPEC producers not part of the agreement — including Iran, Nigeria and Libya — is also uncertain. Despite infrastructure damage, Libya has reopened some ports, and intends to return to normal production levels by the end of 2017.

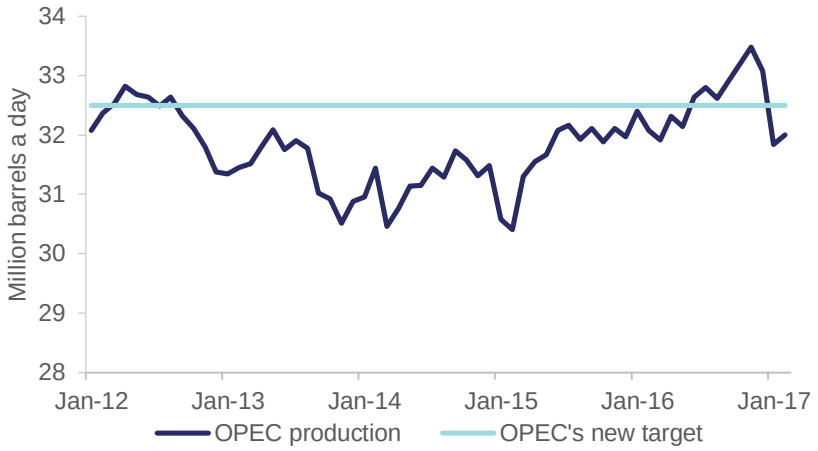
Non-OPEC supply growth driven by US unconventional production

In 2017, higher production is expected from Brazil, Canada and the US, as stronger oil prices entice production back to the market and long-term projects come online.

After a prolonged period of slow or negative production growth, US oil production increased in the December quarter of 2016. This could be the start of a new boom era in US production, driven by unconventional output. The rig count has increased in the first quarter of 2017, reaching 756 at the start of March, 55 per cent higher than the equivalent month in 2016. At these levels, the rig count is still significantly lower than in 2014.

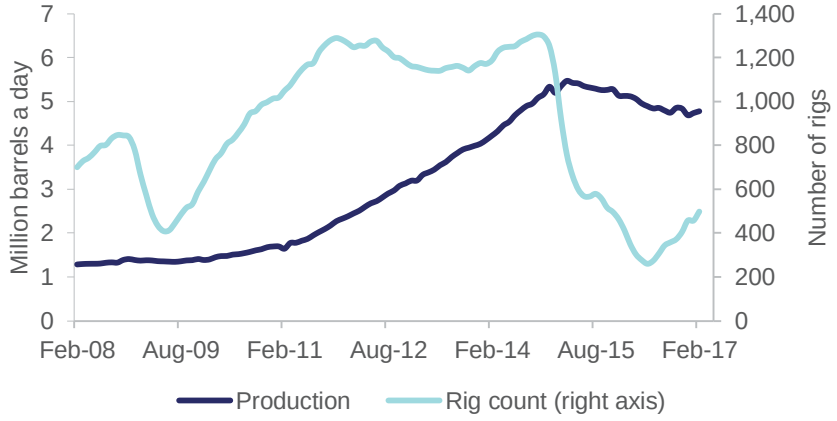
It is expected that the US will reach new peaks in production over the outlook period, as operating efficiencies rise and an accommodative policy environment is established by the Trump Administration. Output growth is forecast to be more than 3 per cent a year over the next three years, with the majority of this growth coming from the Permian Basin.

Figure 8.9: OPEC target and production, on an annual basis



Source: International Energy Agency Monthly Oil Data service (2017)

Figure 8.10: US shale oil monthly production and rig count



Source: US Energy Information Administration (EIA), Drilling Productivity Report (2017)

Australia's production and trade

In the December quarter, Australia's crude oil and condensate production was 287 thousand barrels a day, down 5.3 per cent year-on-year. Lower rates of crude oil production are expected to continue, as resource depletion weighs on production. Australia's petroleum exploration expenditure decreased in the December quarter, down 30 per cent year-on-year to $335 million. Low exploration expenditure is expected to contribute to stagnant production growth going forward.

As a result of lower production, Australia's December quarter exports decreased by 8.3 per cent year-on-year, to 248 thousand barrels a day.

Decreasing crude oil output outweighed by higher condensate output

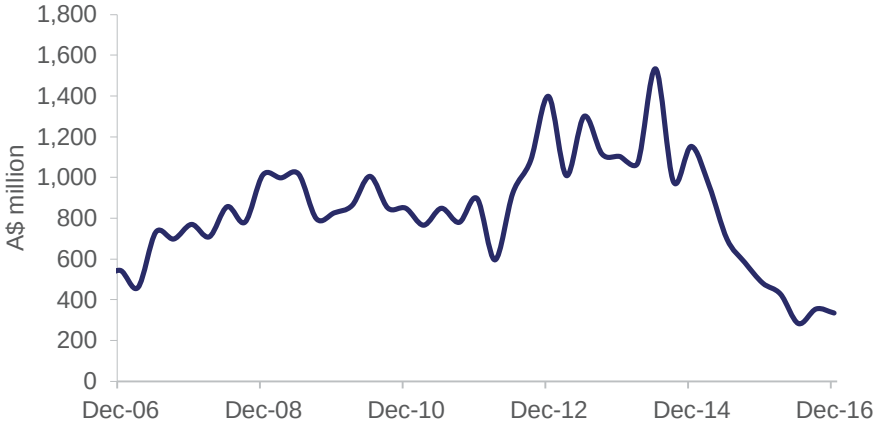
Production of crude oil and condensate is expected to decrease slightly in 2016–17, due to continued field decline and lower December quarter production. Further out, crude oil production is expected to steadily decrease, however, this will be outweighed by higher condensate output related to new LNG projects. Provided the new Gorgon, Prelude and Ichthys projects come online within current timeframes, production is forecast to peak at 410 thousand barrels a day in 2019–20, with some decrease expected towards the end of the outlook period. The current market outlook is not conducive to increased exploration investment in or an expansion in domestic production.

Higher prices and export volumes support export earnings growth

Australia's export volumes are expected to reflect production changes: in 2018–19, exports are forecast to reach 320 thousand barrels a day, as condensate production ramps up. Towards the end of the outlook period, exports are projected to decrease, reaching 266 thousand barrels per day by 2021–2022.

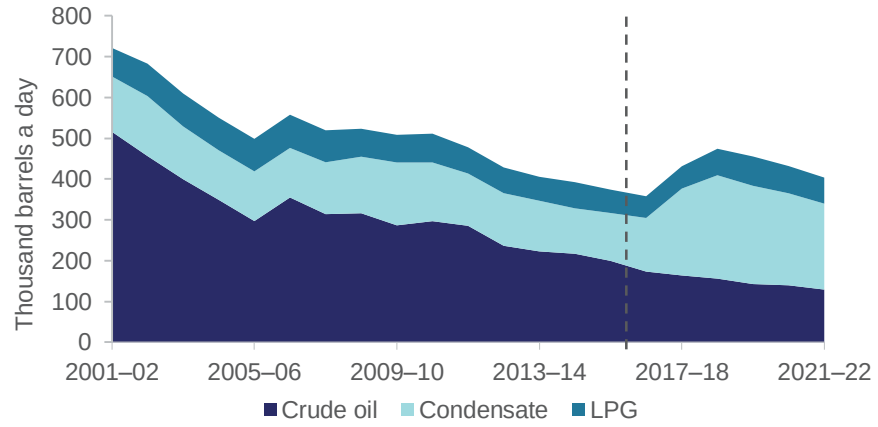
Positive price expectations have resulted in higher export earnings forecast over the first two years of the outlook period. Export earnings are forecast to increase to $8.2 billion 2017–18 and $8.8 billion in 2018–19(2016–17 dollar terms). Developments in the global market — particularly around higher global production — could limit price increases and potential export earnings. Lower export volumes are expected to reduce export earnings towards the end of the outlook period. The value of Australian exports is projected to decline to $8.0 billion in 2021–22 (2016–17 dollar terms).

Figure 8.11: Australia's petroleum exploration expenditure, quarterly



Source: ABS (2017) Mineral and Petroleum Exploration Expenditure, 8412.0

Figure 8.12: Australia's petroleum production



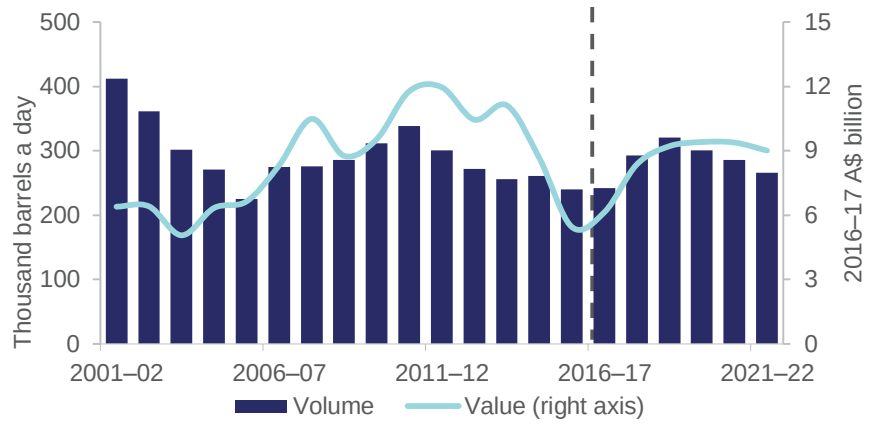
Source: Australian Petroleum Statistics (2017); Department of Industry, Innovation and Science (2017)

Refinery activity forecast to decline, resulting in higher imports

Australia's refinery output declined modestly in the December quarter 2016, to 442 thousand barrels a day, a trend that is expected to continue over the outlook period. In 2017, expansion works are expected to be undertaken at the Altona refinery, which will increase capacity by 10 thousand barrels a day.

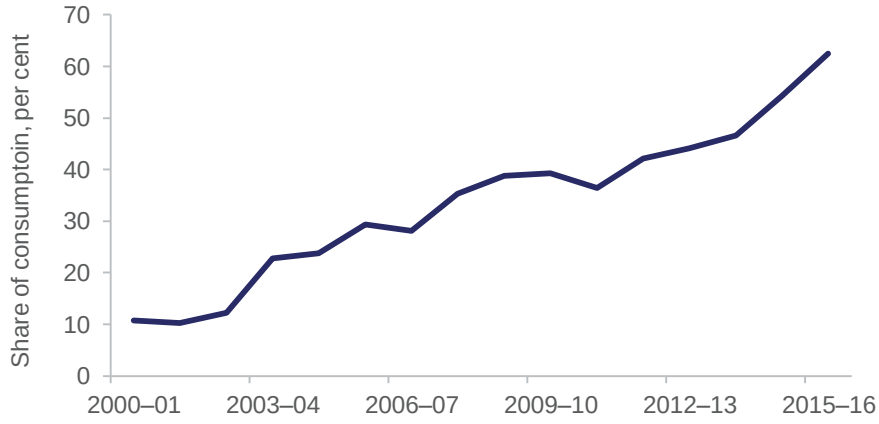
Global refinery capacity is expected to grow over the outlook period, increasing by 7 million barrels a day by 2022— primarily driven by expansions in the Middle East and China. A number of countries in the Asian region are expected to become increasingly reliant on imports of crude oil and refined products over the outlook period. This is particularly true for Australia, as a rationalisation of refining capacity has led to higher imports of refined products. As Australia's projected consumption of refined products grows over the outlook period, the share of imported refined products is forecast to reach around 70 per cent of consumption in 2021–22, up from 63 per cent in 2016–17. Refined product imports are projected to increase at an average rate of 3.2 per cent a year over the outlook period, reaching 704 thousand barrels a day in 2021–22.

Figure 8.13: Australia's exports of crude oil and condensate



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

Figure 8.14: Imported share of refined product consumption



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

Table 8.1: Oil outlook

World	unit	2016	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Production a	mb/d	97.0	97.1	99.3	100.7	101.7	102.6	103.3
Consumption a	mb/d	96.3	97.7	99.0	100.5	101.7	102.9	103.9
WTI crude oil price								
Nominal	US$/bbl	43.3	55.5	57.8	61.4	65.7	68.1	70.7
Real b	US$/bbl	44.2	55.5	56.5	58.6	61.3	62.2	63.2
Brent crude oil price								
Nominal	US/$bbl	44.2	56.3	58.6	62.3	66.6	69.0	71.5
Real b	US$/bbl	45.1	56.3	57.4	59.5	62.1	63.0	63.9
Australia	**unit**	**2015–16**	**2016–17 f**	**2017–18 f**	**2018–19 z**	**2019–20 z**	**2020–21 z**	**2021–22 z**
Crude and condensate								
Production a	kb/d	317	305	377	410	384	365	340
Export volume a	kb/d	239	241	293	320	301	285	266
Nominal value	A$m	5,444	6,130	8,363	9,210	9,404	9,381	9,006
Real value g	A$m	5,537	6,130	8,187	8,806	8,774	8,538	7,996
Imports a	kb/d	342	343	323	316	315	315	320
LPG								
Production ac	kb/d	53	55	65	72	67	64	59
Export volume a	kb/d	34	39	44	49	45	43	40
Nominal value	A$m	547	645	922	1 032	1 040	1 045	1 002
Real value g	A$m	557	645	902	987	970	952	889
Refined products								
Refinery production a	kb/d	437	436	419	415	411	406	406
Exports ad	kb/d	10	24	9	9	9	9	9
Imports a	kb/d	593	604	622	648	667	688	704
Consumption ae	kb/d	950	957	965	982	1,000	1,019	1,038

Notes: ***a*** *Number of days in a year is assumed to be exactly 365;* ***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;* ***z*** *Projection. A barrel of oil equals 158.987 litres*

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


Uranium

Market summary

Uranium production remains subject to uncertain market conditions and historically low prices. The near-term outlook for Australia's exports remains largely unchanged, with Australia expected to export 7,141 tonnes in 2016-17. However, Australian exports are expected to pick up over time, with an increase of 25 per cent to around 9,800 tonnes of U3O8 expected by 2021-22. Reactors are opening progressively in China and India, and re-opening in Japan, and growth in uranium demand is accelerating. Higher demand will exert gradual upward pressure on contract prices, leading to a forecast increase in Australia's export earnings to around $1.25 billion (in 2015-16 dollars) by 2021-22.

Prices

New capacity to support price growth from current historical lows

Uranium prices were low and volatile during 2016, averaging just under $26 a pound over the year — more than $10 a pound lower than the average for 2015. After opening the year at $34.70 a pound, prices subsequently declined over successive months, reaching $18 a pound in November. Late in the year, prices rallied following an announcement by Kazatomprom — a major supplier — that Kazakh production would be cut by around 5 million pounds in 2017. The price is currently $US23 per pound as at the end of February 2017.

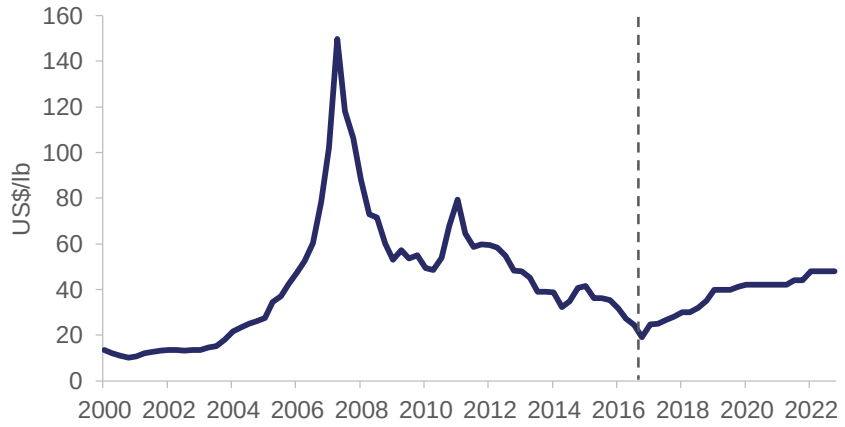
Uranium inventories have not declined as rapidly as expected, and an increasing rush of sellers has placed downward pressure on spot prices. Uranium producers continue to face difficult market conditions amidst the ongoing departure of generalist funds, large asset sales, and uncertainty over the future growth of the nuclear power industry.

It is likely that the long, gradual decline in prices is now bottoming out, with extraction having fallen sharply and new nuclear generation capacity coming online at accelerating rates in China and India. Spot prices are expected to average around $26 a pound through 2017, before lifting to $32 a pound in 2018. From 2019, prices are expected to increase more gradually, stabilising at around $48 a pound by 2022.

Figure 9.1: Uranium prices, monthly

Source: Cameco Corporation (2016)

Figure 9.2: Uranium spot price, quarterly average



Source: Cameco Corporation (2016); UxConsulting (2016)

This assessment is contingent on a progressive re-opening of reactors in Japan, and new power plants in China and India being completed according to schedule. If there are delays to the commissioning of reactors, consumption growth is likely to be slower than anticipated, and price increases may take effect more slowly.

Large uranium producers typically sell most of their output through long term contracts rather than on the spot market. In contrast to the spot price, the Ux Consulting long term indicator contract price edged down from $46 a pound in 2015 to $39 a pound in 2016. The long-term price is expected to average $37 a pound in 2017. 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.

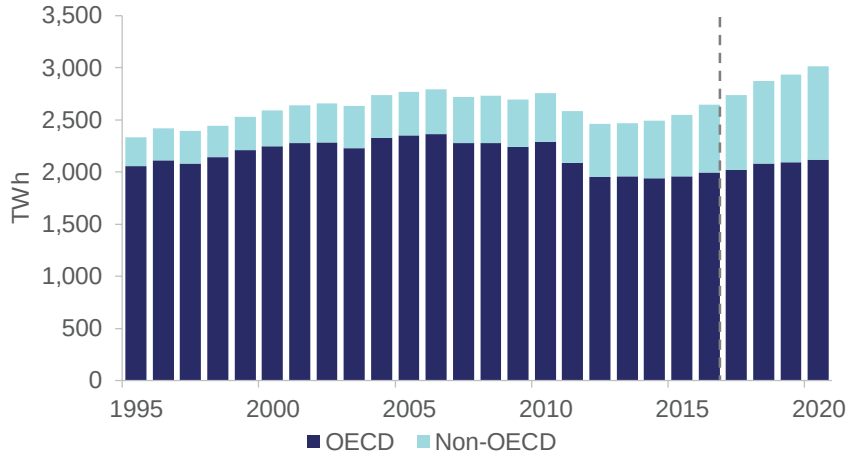
Consumption

China, India and Russia to drive consumption growth

In 2016, world uranium consumption increased by 1.1 per cent to 83,400 tonnes. Growth in uranium consumption is being driven by the development of new nuclear power generation capacity. Commissioning a new reactor requires more uranium for its initial core than existing 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.

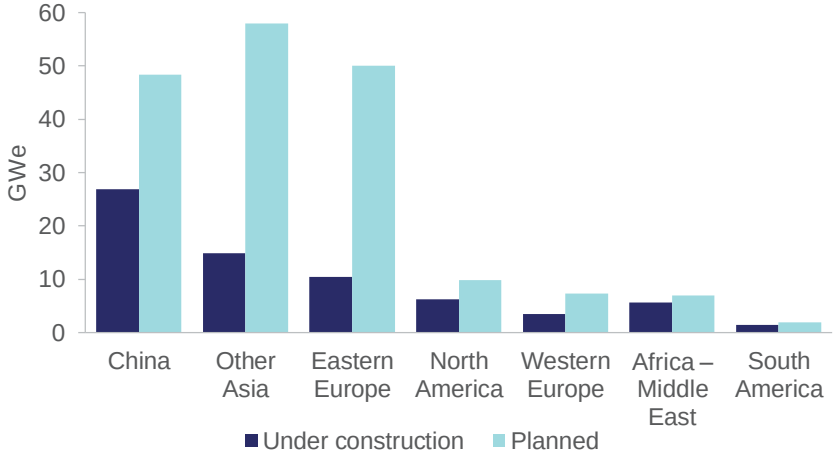
China, India and Russia continue to dominate new nuclear capacity, as state policies seek non-polluting, low-emission baseload energy. In 2017, China has 20 nuclear reactors under construction and more than 40 planned; India has five reactors under construction and more than 20 reactors planned; and Russia has seven reactors under construction and 25 planned. This growth will be partly offset by the closure of older reactors in Germany, Hungary, Japan, South Korea, Russia, Sweden, Switzerland, the United Kingdom and the United States, as those reactors reach the end of their economic life.

Figure 9.3: World nuclear power generation



Source: International Energy Agency (IEA); World Nuclear Association (2016)

Figure 9.4: New nuclear capacity



Source: World Nuclear Association (2016)

World uranium consumption in 2017 is forecast to increase by 6 per cent to 84,000 tonnes, supported by the initial start-up of new reactors in China, as well as moderate output increases at existing reactors in advanced economies.

Progress in bringing reactors back online in Japan remains slow. Despite the resumption of nuclear power generation, Japan's output is projected to remain well below pre-Fukushima (March 2011) levels for the foreseeable future. The United States, with 99 reactors already in operation, is expected to remain the largest producer of nuclear power out to 2022. Although energy policy in the United States is currently unclear — and reactor construction is slower than that in China — the development of four reactors (with a combined capacity of around 4,500 megawatts) on top of its large existing capacity will ensure the US remains easily the largest market for uranium.

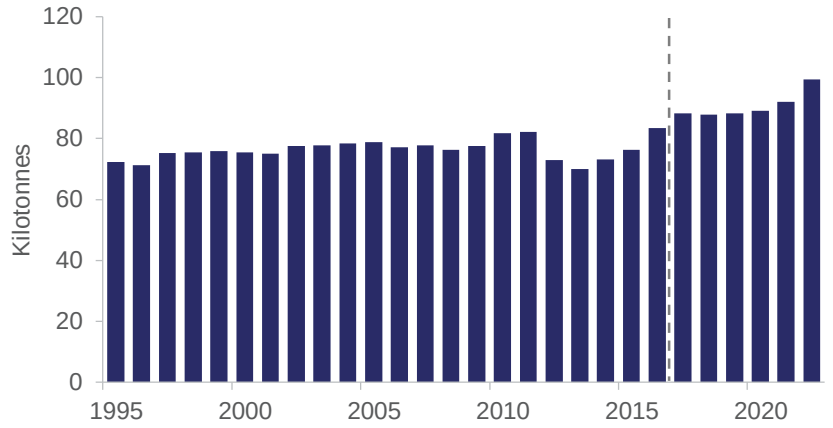
World uranium consumption is projected to grow at an average annual rate of 2.7 per cent from 2017 to 2022, reaching 97,000 tonnes in 2022. A wave of new reactors is expected to come online towards the end of the outlook period.

Production

Mine production to increase steadily over the medium term

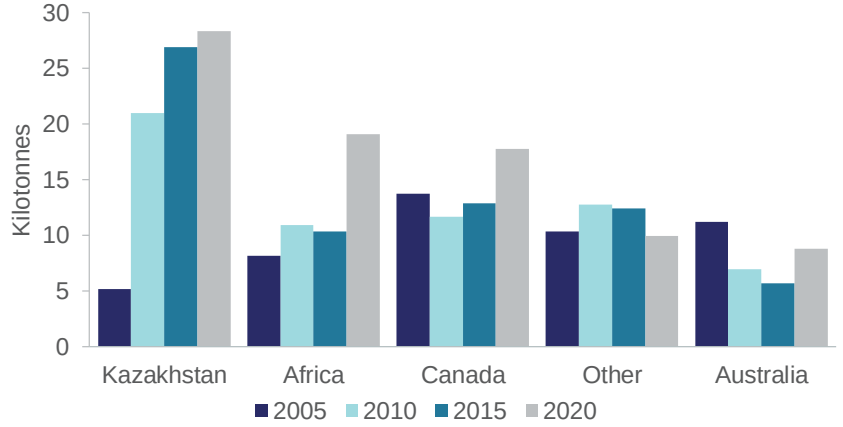
In 2016, world uranium production increased by 1.4 per cent to 72,600 tonnes, largely owing to higher production from Canada and Russia. In 2017, world production is forecast to increase by a further 1.9 per cent to 74,000 tonnes. Increased production is expected at Rio Tinto's Rössing mine and CGN/Swakop Uranium's Husab mine in Namibia, Peninsula Energy's Lance mine in the US and Cameco's Cigar Lake mine in Canada. Partly offsetting this, Kazakh production is expected to decline, following the late 2016 announcement of reduced output by Kazatomprom — the largest producer in the country.

Figure 9.5: World uranium consumption (U_3O_8)



Source: International Energy Agency (IEA); World Nuclear Association (2016)

Figure 9.6: World uranium production (U_3O_8)



Source: Nuclear Energy Agency; UxConsulting (2016); World Nuclear Assoc (2016)

World uranium supply is increasingly being driven by uranium inventories held by nuclear utilities and secondary market supplies. 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. Consequently, it is expected that uranium producers will focus on cutting costs, rather than increasing production over the medium term. High-cost mines are likely to scale back or cease production, and new projects will remain on hold until future price increases improve the commercial viability of those projects.

World uranium production is projected to increase at an average rate of 4.4 per cent a year to 2022 to 94,200 tonnes. This will be underpinned by continued increases in production at CGN/Swakop Uranium's Husab mine in Namibia, Peninsula Energy's Lance mine in the United States and Cameco's Cigar Lake mine in Canada.

Australia's exploration, production and exports

Australia's uranium exploration expenditure has been declining

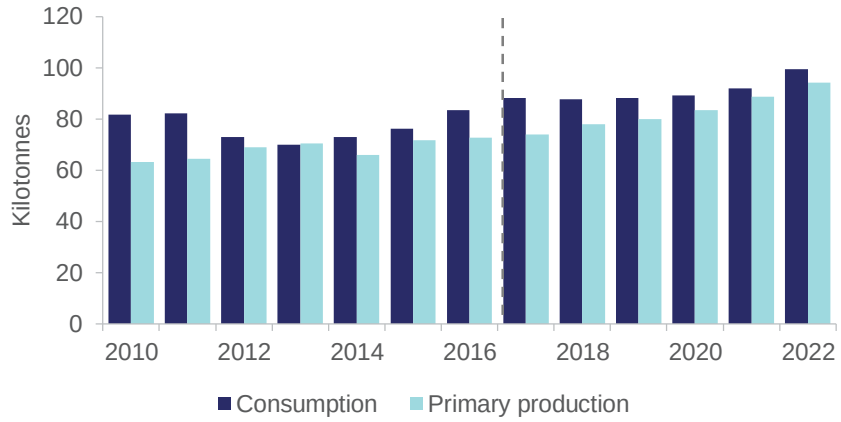
Australia's uranium exploration expenditure decreased by 47 per cent in 2016, to $23.4 million. This decrease was primarily because of a $15 million decline in exploration expenditure in Western Australia.

Exploration has fallen progressively due to historically low prices, and now stands at just over one-tenth of the 2010 peak, when exploration spending reached $190 million.

Australia's production to increase despite the wind-up of Ranger

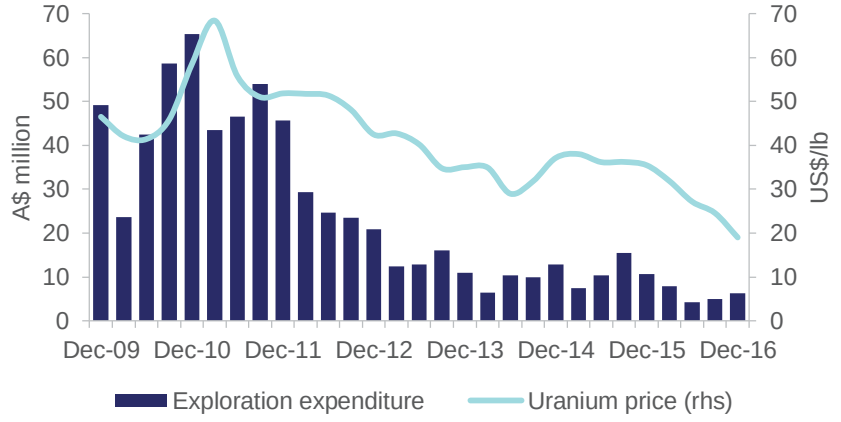
Australia's uranium production is forecast to decrease by 6.8 per cent in 2016–17, to 7,141 tonnes, as production gradually shifts back down to 'normal' levels at the Olympic Dam and the ERA Ranger facilities. These facilities recorded spikes in production in 2015-16, after operational disruptions in 2014–15. Expected strong production at the BHP Olympic Dam mine and a ramp-up of production in Quasar Resources' Four Mile Mine, are expected to support a rebound in production to 7,850 tonnes in 2017–18.

Figure 9.7: Uranium supply–demand balance (U_3O_8)



Source: International Atomic Energy Agency (IAEA); UxConsulting; World Nuclear Association (2016)

Figure 9.8: Australia's Uranium exploration vs Uranium price



Source: Australian Bureau of Statistics (2016); Cameco Corporation (2016)

Australian producers may face tougher conditions in the medium term, as long-term supply contracts expire. It is likely that a greater share of global demand will be met from the spot market in 2017, due to the historical low in prices. The price is currently below the cost of production for most miners.

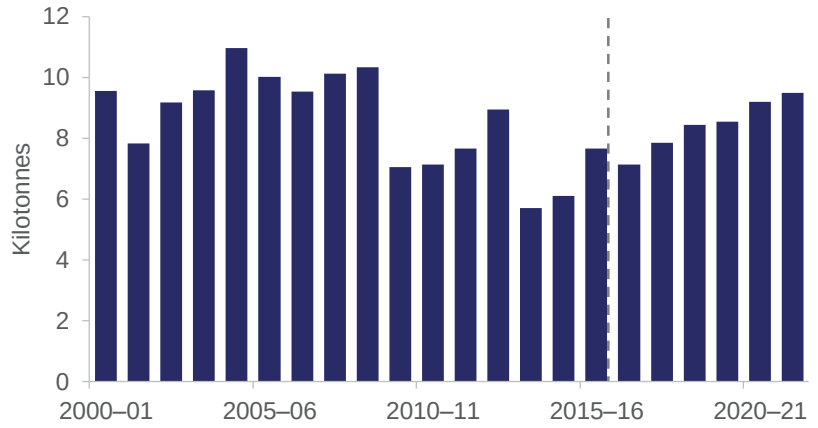
Nuclear power growth in China to drive Australia's uranium exports

Australia exported 7,837 tonnes of U308 in 2015–16 — an increase of almost 50 per cent on the volume exported in 2014–15. However, export values were disappointing, at $A959 million, reflecting the impact of ongoing weak prices. Exports are expected to ease in 2016–17, to 7,141 tonnes. Export earnings are also forecast to decline in the short term, falling to $907 million in 2016–17 as poor prices add to the impact of lower volumes. In out years, export earnings are expected to recover steadily.

Although the outlook for exports remains tight in the short term, there is still strong potential for future growth in key regions, including North America, Western Europe, and Asia. In particular, future export growth is likely to be supported by increasing demand in China, where consumption is expected to rise strongly in coming years, as a string of new reactors commence operation.

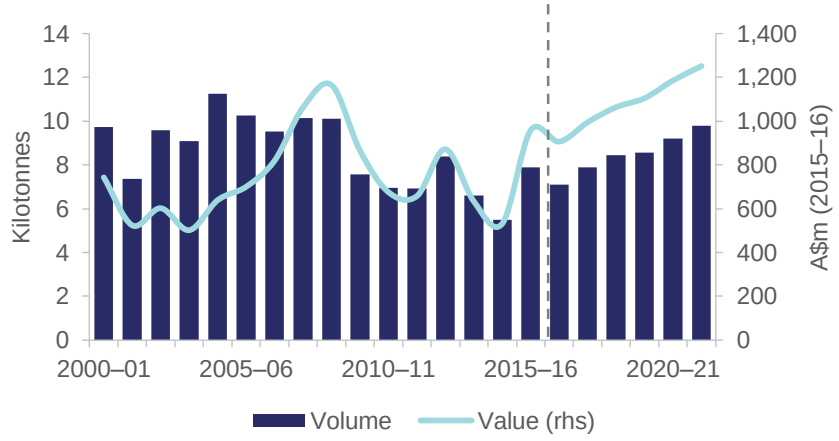
Although exports to Japan are expected to remain subdued, there is a possibility that the pace of re-openings may increase, which would improve Australia's export performance relative to current expectations.

Figure 9.9: Australia's uranium production volumes



Source: Company reports (2016)

Figure 9.10: Australia's uranium export volumes



Source: Australian Safeguards and Non–Proliferation Office (ASNO); Department of Industry, Innovation and Science (2016)

Table 9.1: Uranium outlook

World	unit	2016	2017f	2018f	2019z	2020z	2021z	2022z
Production	kt	72.6	74.0	77.9	80.1	83.4	88.7	94.2
Africa b	kt	9.5	11.4	13.1	14.9	16.7	17.8	18.9
Canada	kt	15.9	16.2	16.7	16.7	16.7	18.6	18.6
Kazakhstan	kt	28.1	26.7	27.4	27.4	28.8	30.7	34.4
Russia	kt	3.6	4.0	4.2	4.3	4.4	4.4	4.7
Consumption	kt	79.4	84.0	85.9	89.4	94.2	96.7	97.0
China	kt	13.8	17.1	17.5	18.7	20.8	22.9	23.0
European Union 27	kt	22.2	22.4	24.3	22.2	22.6	21.8	22.0
Japan	kt	0.5	1.2	1.7	2.0	2.3	2.9	3.0
Russia	kt	6.1	6.6	6.9	7.0	6.9	6.9	7.0
United States	kt	23.0	22.5	22.1	22.5	23.0	23.0	23.0
Spot price								
– nominal	US$/lb	25.6	26.1	31.8	40.3	42.0	43.0	48.0
– real c	US$/lb	25.6	25.6	30.4	37.7	38.3	38.4	42.0
Australia	**unit**	**2015–16**	**2016–17 f**	**2017–18 f**	**2018–19 z**	**2019–20 z**	**2020–21 z**	**2021–22 z**
Production	t	7,665	7,141	7,850	8,450	8,550	9,200	9,800
Export volume	t	7,837	7,141	7,850	8,450	8,550	9,200	9,800
– nominal value	A$m	959	907	995	1,064	1,105	1,186	1,252
– real value d	A$m	976	907	974	1,018	1,031	1,080	1,112
Average nominal price	A$/kg	122.4	127.0	126.8	126.0	129.2	128.9	127.8
– real d	A$/kg	128.6	127.0	124.1	120.4	120.6	117.3	113.4

Notes: ***b*** *Includes Niger, Namibia, South Africa, Malawi and Zambia;* ***c*** *In 2017 calendar year US dollars;* ***d*** *In 2016-17 financial year Australian dollars;* ***f*** *Forecast;* ***z*** *Projection.*
Source: ABS (2017); Company Reports (2017);Department of Industry, Innovation and Science (2017); UxConsulting (2017)

Gold

Market summary

Australian producers benefited from a historically high Australian dollar gold price in 2016. Australian dollar gold prices are expected to rise moderately over the outlook period. Export volumes are projected to peak in 2018–19, and then decline, as a number of mines close. Since the December 2016 REQ, forecasts gold export values have been revised lower by 24 million to $17.3 billion in 2016–17 — due to exchange rate effects. Prices have been revised higher over the outlook (previously projected to decline) due to stronger inflation and political concerns. However, export values are still projected to decline to $13.5 billion (in 2016–17 dollar terms) by 2021–22, due to lower volumes and flat prices.

Prices

Gold prices rose in 2016

On an annual basis, the US dollar gold price increased for the first time in 2016, ending a three year downtrend. The LBMA gold price increased by 8 per cent to average US$1,248 per troy ounce in 2016. Investment demand rose rapidly in the first half of 2016, on the back of political uncertainty stemming from England's referendum on EU membership. However, investment demand declined in the second half, in anticipation of an increase in US interest rates (later realised). The gold price fell back modestly as a result. Gold fabrication demand (for use in jewellery and technology), was subdued throughout the year.

Prices weighed down by rising interest rates in the short term

Gold prices have recovered in early 2017, rising to over $US1,257 per troy ounce in February — however remain 8 per cent below the peak of 2016. The rising price of gold in 2017 appears mostly driven by investor uncertainty, historically low real interest rates and rising inflation — after many years of historically low inflation. However, the current upturn in US economic growth and rising US dollar is expected to dampen investor interest in gold throughout 2017.

The US Federal Reserve increased interest rates in March, and is expected to gradually raise the Fed Funds rate over 2017 to 2019, to reach 3 per cent. Rising US interest rates improve the returns on US dollar-denominated financial assets, which increases the opportunity cost of holding gold, a non-interest bearing asset.

Figure 10.1: Quarterly price forecast

Source: LBMA (2017) Gold Price; Department of Industry, Innovation and Science (2017)

Figure 10.2: Recent movement in gold prices

Source: LBMA (2017) Gold Price PM

However, higher interest rates in the US will be partly offset by rising inflation, which is expected to reach 2 per cent in 2018 and remain at that level over the outlook period. Real interest rates in many advanced economies, including the US, EU and Japan are expected to remain historically low over the outlook period — making gold more attractive to own.

Inflation in the EU (Harmonized Index of Consumer Prices) reached 2 per cent in the last quarter of 2016 — the target set by the ECB. Inflation has been rising due to higher commodity prices, a cyclical upturn in economic activity and historically high money supply growth. In the US, inflation has also been boosted by rising labour costs, due to an improving labour market.

Over the outlook period, the US is expected to increase fiscal spending and lower taxes. Both will add to historically high US debt and possibly lead to higher inflation. Historically, gold has been viewed as an inflation hedge, so will potentially be in demand if investors' retain this association.

Investor demand for gold as a safe haven asset is expected to grow over the outlook period. The combination of high debt and high inflation, with less certainty of achieving high economic growth, is expected to attract safe haven investor demand for gold. Moreover, many investors will remain cautious about the US stock market, which has risen annually since 2009 and is currently setting new record highs. In historical terms, the length of the current uptrend in US equity markets is one of the largest.

Subdued prices over the medium term

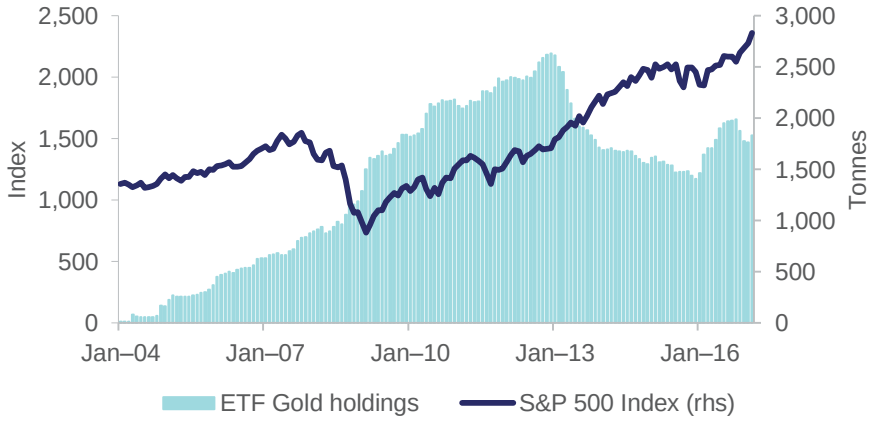
Over the medium term, gold prices are projected to decline at an average annual rate of 1.4 per cent to around $US1,120 (2017 dollars) in 2022. Investor demand is unlikely to gather momentum while interest rates are rising and major economies continue to grow — even if growth remains relatively weak.

While gold prices are projected to decline slightly over the medium term, a range of factors could trigger temporary rallies in prices. These include price corrections in bond or equity markets, poor economic data emanating from the United States or China, and concerns over rising populism and nationalism.

Figure 10.3: EU and US inflation

Source: Bloomberg (2017) ECB Euro Area Harmonized CPI All items ex Tobacco YoY and US CPI Urban Consumers YoY

Figure 10.4: Gold ETF holdings and the S&P 500 Index



Source: Bloomberg (2017) Known ETF gold holdings;S&P500 index

Consumption

Consumption subdued in 2016

Global gold consumption declined by 5 per cent in 2016. Within total consumption, fabrication demand fell, driven by slowing economic growth in China and subdued jewellery consumption in India. Investment demand rose strongly in the first half of 2016, but declined in the last quarter. Investment demand was driven by strong demand for bullion-backed Exchange Traded Funds (ETFs).

Investment demand was fuelled by concerns around the UK's controversial decision to leave the EU, and the ramifications of this decision for UK/European trade and investment going forward. Similarly, anticipation of the US election in November weighed on investor sentiment. The surprise result saw gold rise on the day of the election, however, the prospect of higher fiscal spending then saw gold prices retreat. The decline in the last few months of 2016 was driven by anticipation of rising US interest rates. Total ETF holdings gained by over 500 tonnes in the first half of 2016, but fell by 160 tonnes in the last quarter.

In early 2017, ETF holdings have risen a further 115 tonnes, with demand driven by ongoing political uncertainty, rising inflation and low real interest rates. Investor demand represents around a third of total gold consumption, and is the most important driver of price fluctuations.

Subdued investment demand over the medium term, while fabricated consumption grows

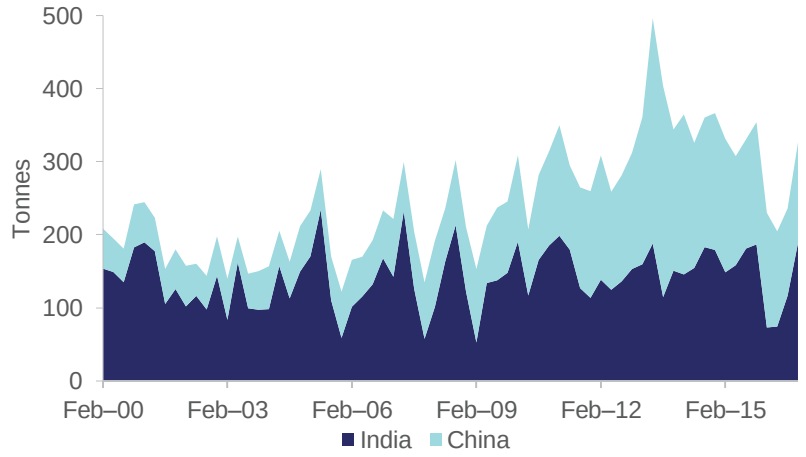
Gold consumption is projected to rise moderately over the medium term, driven by higher fabrication demand which is expected to offset flat investor demand. While investors will be attracted to gold as a safe haven asset and, for diversification purposes, investment demand will be constrained by expectations of higher US interest rates and improving global economic conditions.

Fabrication demand is projected to increase early in the outlook period. Rising household incomes in Emerging economies, and a rebound in discretionary purchases (delayed over 2016), are expected to support jewellery consumption — the major component of fabricated demand.

The consumer gold market in India performed poorly throughout 2016, falling over 30 per cent year–on–year, however, appears to be recovering in early 2017. India's gold market was stifled by the Government's decision to demonetise over US$220bn of high value currency notes, which are typically used by Indian consumers to buy gold. China and India — the world's two largest consumers — will drive much of the expected consumption growth over the outlook period. Gold is viewed as an important store of value in these countries, and is entwined with cultural and religious practices.

Fabricated consumption is projected to rise by 2.5 per cent annually over the outlook period. The continuing transition of China towards a consumption-based economy with higher per capita income, is expected to increase demand for gold in jewellery and in other industrial uses. Non-jewellery fabrication demand — which accounts for 12 per cent of total fabricated demand — declined by 7 per cent in 2016. Demand was driven lower by higher prices during the year, many fabricators substituted gold for copper, the price of which remained relatively low.

Figure 10.5: Gold jewellery consumption India and China



Source: Thompson Reuters (2017) quarterly jewellery consumption

Production

Global production rises despite a fall in mine output in 2016

In 2016, total gold supply — which consists of both mine output and recycled supply — increased by 2.8 per cent to 4,525 tonnes. In contrast, growth in mine supply declined for the first time in eight years, led by falls in production in both Asia and America. The decline in Asia was largely due to a 15 tonne loss when several Chinese mines were suspended from producing in the third quarter of 2016, for safety and environmental reasons. Gold production in the United States and Mexico also declined over 2016, largely due to lower ore grades. Production at Penasquito in Mexcio declined by 4 tonnes in 2016, when ore grades fell from 1.08 grams a tonne to around 0.69.

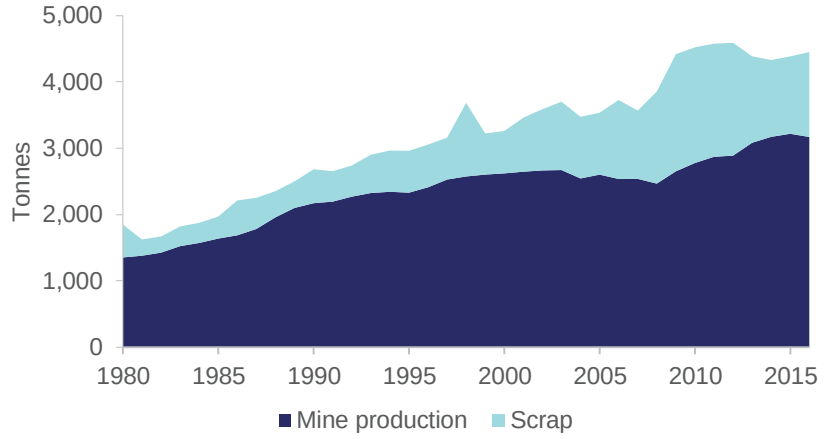
Supply from gold recycling — which makes up around a quarter of total supply — increased by 9.7 per cent in 2016, in response to higher prices. Recycled gold consists of gold sold for cash by consumers or gold from other supply chain participants, such as jewellery manufacturers.

Mine production set to plateau over the medium term

World gold supply is projected to stabilise over the next five years, underpinned by higher scrap supply. Mine supply is expected to peak in 2019, at 3,330 tonnes, and decline over the rest of the outlook period. Several recent start-ups are expected to expand production over the outlook period, partly offsetting the impact of declining ore grades and mine closures (due to reserve depletion). A notable example is the Merian mine in Suriname — which commenced production in October last year — which is expected to produce up to 16 tonnes of gold annually for the next 11 years. The Fekola gold mine in Mali, operated by B2Gold, is expected to commence production in the last quarter of 2017, and produce 11 tonnes annually over the next seven years.

Mine production will be complemented by slightly higher recycled supply over the outlook. Recycled supply is projected to increase by 0.2 per cent annually, dampened by lacklustre gold prices (in real terms) over the outlook period. Subdued prices lower the incentive to cash in gold holdings or attempt to reclaim gold from electronic goods, although the latter is a relatively minor source of recycled supply.

Figure 10.6: Total world gold supply



Source: Thompson Reuters (2017)

Figure 10.7: World mine supply and real gold price

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

Australia's exploration, production and exports

Exploration continues to increase

Australia's gold exploration expenditure increased for a second consecutive year in 2016, rising by 30 per cent to over $600 million. Expenditure on gold projects accounted for 43 per cent of Australia's total minerals exploration expenditure in 2016. Exploration expenditure was supported by a rise in the Australian dollar price of gold, and is expected to rise over the outlook period.

Production continued to rise in 2016

Australia's gold production reached 288 tonnes in 2016 — its highest level in 13 years. Production was supported by higher Australian dollar gold prices, which improved operating margins. The Australian dollar price of gold averaged $1,713 per ounce — 12 per cent higher than the previous peak set in 2011 (during the commodity price boom). The favourable Australian dollar price was due to higher USD prices and a weaker AUD/USD exchange rate. In 2011, on average the Australian dollar bought 1.03 US dollars, compared to just 0.74 US dollars in 2016.

Gold production increased by 3.2 per cent in 2016, led by Australia's three largest mines which all increased output on 2015 levels. Australia's largest mine — Boddington in Western Australia, operated by Newmont — produced 24.9 tonnes of gold in 2016. The Super pit joint venture in Kalgoorlie produced 23.8 tonnes and Newcrest's Cadia Valley Mine in New South Wales produced 23.5 tonnes.

Production projected to decline over the outlook

Australia's gold production is projected to peak in 2018–19, reaching 318 tonnes, before declining to 270 tonnes in 2021–22. The short term rise is due to a combination of new projects and mine expansions, while over the medium term, production will be impacted by several mine closures.

Figure 10.8: US dollar versus Australian dollar gold price

Source: LBMA (2017) Gold Price PM; Bloomberg (2017) Australian Dollar Spot Price

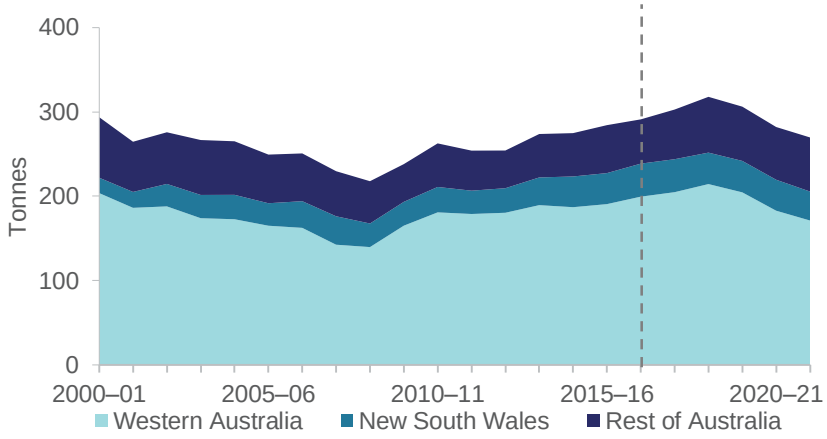
Production in the Northern Territory will be boosted by the Tanami project — with Newmont's announcement that they will spend US$100-120 million expanding the project to maintain annual gold production at 13.7 tonnes over the next five years. In addition, Mount Todd, a large scale mine, is expected to commence production in 2018, with output of 18 tonnes in the first year of operation. Coolgardie, operated by Focus Minerals, is expected to commence production in 2018, and produce 3.7 tonnes each year over the outlook period. Charters Towers, operated by Citigold, is expected to commence production in 2019, and ramp up to produce over 7.8 tonnes in 2022.Towards the end of the outlook period, the closure of a number of mines is expected to reduce Australian production.

Gold exports projected to peak in 2018–19

Australia's gold exports increased by 28 per cent in 2016–17 to 327 tonnes, worth $17.3 billion. The increase was driven by higher refined production of overseas ore, while refined production of Australian gold remained near 2015 levels — at 217 tonnes. Imports of gold ore and concentrates were higher than expected in 2016, due to higher prices during the year.

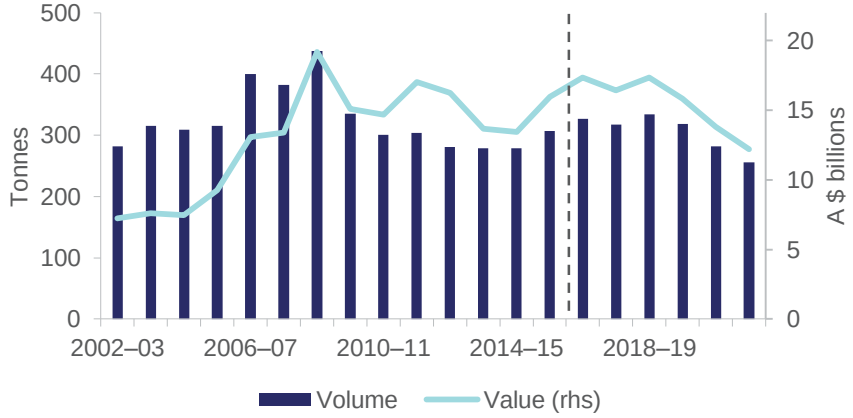
Australia's gold exports are projected to peak in 2018–19, due to the peak in mine production. Gold exports are forecast to reach 334 tonnes in 2018–19, worth over $18 billion (in 2017 dollars). Declining mine production will weigh on exports volumes in 2020–21 and 2021–22, however will be partly offset by imported ore to be refined in Australia.

Figure 10.9: Australian gold production



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

Figure 10.10: Australia's gold exports



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

Table 10.1: Gold outlook

World	unit	2016	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Fabrication								
Consumption b	t	2,110	2,077	2,119	2,127	2,199	2,237	2,273
Total demand	t	3,871	3,940	4,107	4,131	4,224	4,296	4,317
Mine production	t	3,169	3,195	3,236	3,330	3,304	3,254	3,205
Price c								
– nominal	US$/oz	1,248	1,201	1,241	1,226	1,214	1,238	1,253
– real d	US$/oz	1,276	1,201	1,214	1,170	1,133	1,130	1,120

Australia		2015–16	2016–17 f	2017–18 f	2018–19 z	2019–20 z	2020–21 r	2021–22 r
Mine Production	t	284	291	303	318	306	282	270
Export volume	t	306	327	318	334	321	296	283
– nominal value	A$m	15,687	17,329	16,778	18,129	17,134	15,951	15,252
– real value e	A$m	15,952	17,329	16,425	17,334	15,986	14,519	13,541
Price								
– nominal	A$/oz	1,602	1,677	1,642	1,690	1,657	1,676	1,675
– real e	A$/oz	1,629	1,677	1,607	1,616	1,546	1,525	1,488

*Notes: **b** Includes jewellery consumption and industrial applications; **c** London Bullion Market Association PM price; **d** In 2017 calendar year US dollars; **e** In 2016–17 financial year Australian dollars; **f** Forecast; **r** Final gold production and export figures correctly reported in this table differ to the amounts reported elsewhere in the publication, due to a late revision; **z** Projection.*

Source: Sources: 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, bauxite

Aluminium

Market summary

The outlook for Australia's aluminium exports in 2016–17 has deteriorated since our last report. Production losses due to the power outage at the Portland smelter in December 2016 and a production cut at Rio Tinto's Boyne Island plant, are driving the deterioration. However, over the medium term, production should recover, supported by estimated increase in world aluminium consumption and prices. As a result, aluminium exports are projected to fall 2.2 per cent in 2016–17 to 1.41 million tonnes, before returning to the normal export capacity of 1.44 million tonnes a year from 2017–18 and onwards. Export earnings are projected to increase at an average annual rate of 1 per cent in the short term, but to fall by about 1.5 per cent annually from 2018–19 and onwards to nearly $3.16 billion (2016–17 dollars) by 2021–22. This has been revised down from the five-year outlook in March 2016, because of capacity constraints and increased competition from low-cost producers offshore.

Prices

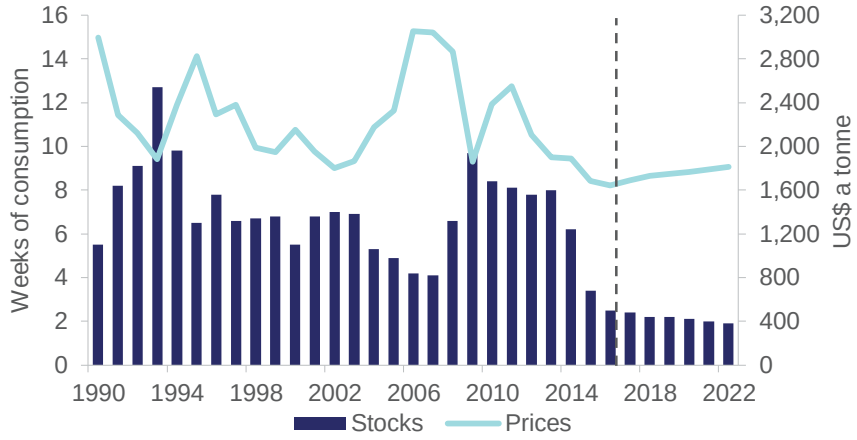
Aluminium prices were under pressure in early 2016

In 2016, the average London Metals Exchange (LME) spot aluminium price decreased by 3 per cent to average US$1,640 a tonne in real terms. Prices remained under pressure in the first half of 2016 following a build-up of stocks and excess capacity in China in 2015. LME stocks declined by 24 per cent in 2016, to 2.2 million tonnes.

Aluminium prices to rise in the short term

Aluminium prices are estimated to increase at an annual rate of about 3 per cent in 2017 and 2018, to average US$1,690 and US$1,731 a tonne in real terms, respectively, as aluminium demand outpaces aluminium supply. Global aluminium production is estimated to decrease by 2 per cent annually over the short term, as the Chinese central, provincial and local governments intensify their efforts to tackle smog and air pollution in major cities. Chinese aluminium smelters have been ordered to cut production by 30 per cent over the 2017–18 winter period. Production cuts in China will have a material impact on global aluminium production. World aluminium production is likely to decrease by about 2 per cent annually over the forecast period.

Figure 11.1: Annual aluminium prices and stocks



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

On the demand side, global aluminium consumption is estimated to grow by 3 per cent annually over 2017 and 2018, driven by stronger vehicle sales. Furthermore, the proposed increase in infrastructure spending by the US President Trump is likely to support higher demand and prices for aluminium.

Usage growth and Chinese output cut to support prices in medium term

Over the medium term, aluminium prices are projected to increase at an annual rate of 1 per cent, to reach US$1,813 a tonne in real terms by 2022. The expected closure of high-cost production capacity in China, the US and possibly Australia, will slow the growth in world aluminium output relative to consumption. In China, the 'air pollution control' policy that requires aluminium smelters to cut production by 30 per cent during the winter period, will likely be extended beyond 2017–18. A further rise in aluminium demand from the global automotive industry is forecast. Moreover, increased government spending on infrastructure in the US will provide some support to aluminium demand.

Consumption

Growth in aluminium consumption continues until 2022

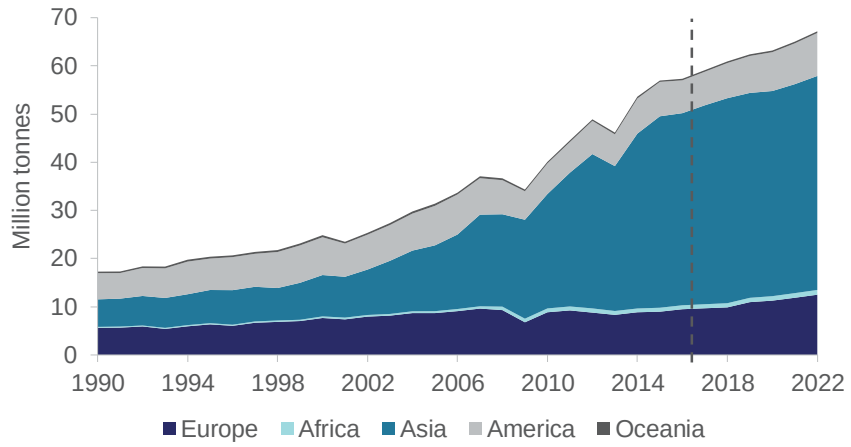
In 2016, world aluminium consumption grew by 0.7 per cent to nearly 58 million tonnes, mainly driven by modest consumption growth in China. Consumption in China – the world's largest aluminium consumer, accounting for more than 54 per cent of the world consumption – increased by 0.7 per cent to over 31 million tonnes, following an extended period of firm growth since 2000. The real estate, construction and automotive sectors are among the largest aluminium consumers in China. Vehicle sales in China grew strongly in 2016, with over 28 million vehicles sold. The Chinese government's decision to cut the tax on small cars by 50 per cent from October 2015 to the end of 2016, resulted in a 14 per cent rise in car sales from the previous year.

Over the short to medium term, world aluminium consumption is forecast to grow at an annual rate of 3 per cent in 2017 and 2018, to 59 and 61 million tonnes, respectively. Consumption growth should then moderate to 2.5 per cent annually, to reach 67 million tonnes by 2022.

The automobile sector is projected to be the key driver of growth in aluminium usage, supported by both increased vehicle sales and higher aluminium intensity of new motor vehicles. Global vehicle sales are projected to increase at an annual rate of 5 per cent over the next 5 years, driven by strong growth in China. China accounts for over one third of global vehicle sales, and is now the world's largest automotive market, both in terms of demand and supply. Since 2000, vehicle sales in China have risen by over 1,300 per cent. By 2020, over 200 million vehicles will be on Chinese roads, and annual vehicle sales are forecast to reach 35 million units.

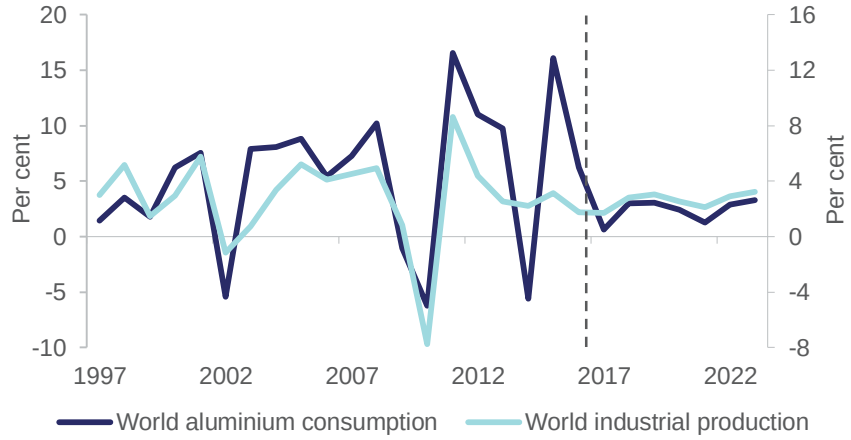
In the US, vehicle sales are proportionately more important for aluminium demand, given the larger size of the average US vehicles. Sales have been recovering since 2010, supported by the economic recovery. Vehicle sales increased by 0.5 per cent to 17.5 million units in 2016, and are forecast to continue to grow for the next few years, due to the ongoing strengthening in the economy.

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: Department of Industry, Innovation and Science (2017); Thomson Reuters (2017) Oxford Economics; World Bureau of Metal Statistics (2017)

'Lightweighting' will increase the use of aluminium in automotive manufacturing. Aluminium is becoming more attractive in vehicle production, as it is a safe and cost-effective way of reducing vehicle weight and meeting government mandated energy-efficiency requirements. Automakers in China, the US, Germany, South Korea, Japan and India are using aluminium at an accelerating rate. The International Aluminium Institute estimates that the use of aluminium in each automotive vehicle will grow by 58 per cent within 13 years, from an average of 158 kilograms in 2012 to 250 kilograms in 2025.

The global construction sector is also expected to contribute to a projected increase in aluminium consumption over the short to medium term. Initiatives to invest in infrastructure in Emerging economies are likely to see an increase in the demand for aluminium. In the US, an ambitious infrastructure program pledged by the Trump Administration before the November 2016 election is likely to boost the demand for aluminium.

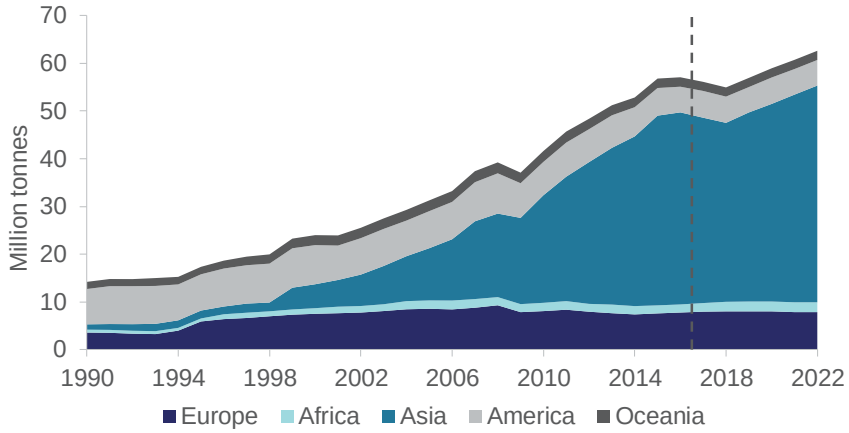
One risk to the outlook is a trade war between the United States and China. Another risk to the assessment is that the Trump Administration in the US is more likely to change tough U.S. emissions regulations previously imposed by the Environmental Protection Agency and the National Highway Traffic Safety Administration. Large automakers in the US have increasingly lobbied the case for a review of emission regulations by President Trump. Any major change is likely to have an impact on the US automotive industry and aluminium consumption and consumption in the US and the world as a whole.

Production

Production to fall in the short-term

World aluminium production rose slightly in 2016, up 0.5 per cent to 58 million tonnes. Over this period, China's aluminium production remained steady at 32 million tonnes, as Chinese smelters responded to the government's 'supply-side reforms' (requiring them to cut production and defer new start-ups). The source of rising global aluminium supply in 2016 was from ex-China Asian countries (up 15 per cent), east and central European countries (up 4 per cent) and the Middle East (up 2 per cent). India's output rose by 13 per cent to over 2.6 million tonnes.

Figure 11.4: World aluminium production



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

In the short term, world aluminium production is estimated to fall by 1.7 per cent in 2017 and by 2.0 per cent in 2018, to 57 and 56 million tonnes respectively, driven by production cuts in China. Faced with worsening smog in major cities, the Chinese Government is taking action to clamp down on polluting industries, including the aluminium industry. Aluminium smelters are asked to cut aluminium output by 30 per cent over the winter season of 2017 and 2018. The policy is estimated to reduce China's annual aluminium production by 7 per cent a year in 2017 and 2018, to 29 and 27 million tonnes, respectively.

Offsetting the estimated fall in China's aluminium production is an expected production increase in ex-China Asian countries (up 22 per cent in 2017 and 11 per cent in 2018) and the Middle East (up 2 and 3 per cent respectively). In the Middle East, Iran's aluminium production is estimated to increase by 20 and 46 per cent in 2017 and 2018, to 382 and 557 thousand tonnes, respectively. The gains will be driven by production increases at the Al-Mahdi and Hormozal aluminium smelters.

Similarly, aluminium production in India is estimated to rise 29 per cent in 2017 and 14 per cent in 2018, to 3.3 and 3.8 million tonnes, respectively. The Jharsuguda (full capacity of 1.8 million tonnes per year) and Korba (full capacity of 567 thousand tonnes a year) expansion projects began to ramp-up production in April 2016, and are expected to add over 700 thousand tonnes to India's aluminium production in 2017.

Production to rise modestly in the medium term

Global aluminium production is projected to resume growing after 2018, reaching 63 million by 2022, supported by the addition of new capacity. China, other Asian countries and the Middle East, are expected to add new capacity to global aluminium supply. New plants are more efficient and lower cost than most existing capacity.

In China, aluminium production is forecast to increase moderately, rising from 29 million tonnes in 2019 to 33 million tonnes in 2022. China State Power Investment Corporation plans to start work on its 800 thousand tonnes per annum Baiyinhua aluminium smelter in Inner Mongolia in mid-2017, and commence production by mid-2019. Other greenfield and brownfield aluminium projects in China expected to come online over this forecast period include Xinjiang Yulian (600 thousand tonnes), Shanxi Tongde (500 thousand tonnes), and Guizhou Jinxing (500 thousand tonnes).

Outside of China, capacity in the Middle East region is projected to increase at an annual rate of 10 per cent in 2019 and 2020, to 6.0 and 6.6 million tonnes. Output should reach 7 million tonnes in 2022. Indonesia's aluminium production is forecast to rise from 300 thousand tonnes in 2019 to over 500 thousand tonnes by 2022. Vietnam is expected to manufacture its first aluminium in 2019, with an annual capacity of 110 thousand tonnes, before reaching 330 thousand tonnes of annual capacity in 2022.

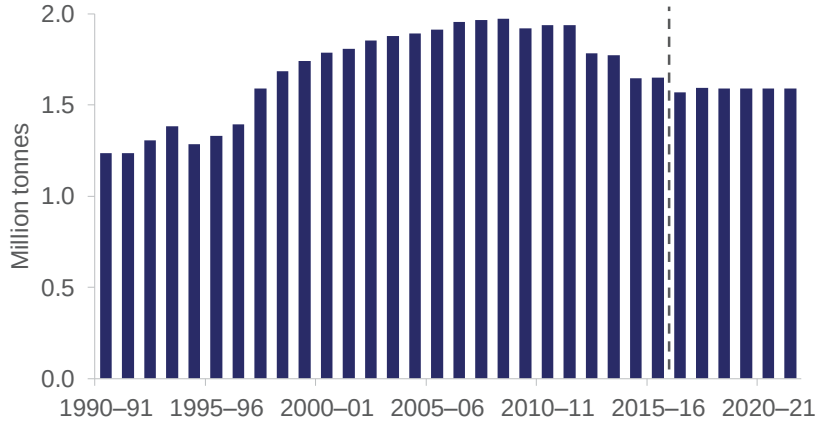
The risk to the medium term aluminium production outlook is the uncertainty of China's 'air pollution control' policy – that is, whether aluminium smelters will need to repeat the 2017-18 cut in production of 30 per cent. Any decision to extend the policy beyond 2018 will have a profound impact on global aluminium production.

Australia's production and exports

Production to remain steady but facing challenges

In 2015–16, Australia's aluminium production remained steady at 1.64 million tonnes, with no major additions or closures. However, production for 2016–17 is forecast to fall by 4.9 per cent to 1.57 million tonnes. The fall will be driven by Portland smelter's power outage in December 2016, and Rio Tinto's decision to cut 14 per cent of its Boyne Island production in Queensland, due to higher power prices. The power supply failure caused damage to Portland's production lines, and reduced the operating capacity of the smelter by more than 50 per cent. Portland accounts for about 18 per cent of Australia's annual aluminium production. An agreement between Portland, the Commonwealth Government and the Victorian Government was reached in mid-January 2017, under which the smelter received a $200 million assistance package from the Commonwealth and the State of Victoria towards subsidising the smelter's power agreement with AGL. The assistance package is conditional on operations at the smelter continuing until the end of 2020-21, and maintaining production at a minimum 90 per cent of pre-outage levels.

Figure 11.5: Australia's aluminium production



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

As a result, Australia's aluminium production is forecast to grow by 1.5 per cent to 1.59 million tonnes in 2017–18, and will remain at this level until 2021–22, supported by the return of full production from the Portland smelter.

Energy security and operation costs are likely to be significant risks to Australian smelters. The Portland power outage in December 2016 highlights the potential disruption of electricity supply shocks to aluminium production, and the uncertainty of power supply during extreme weather conditions. Together they undermine the competitiveness and sustainability of the Australian aluminium industry.

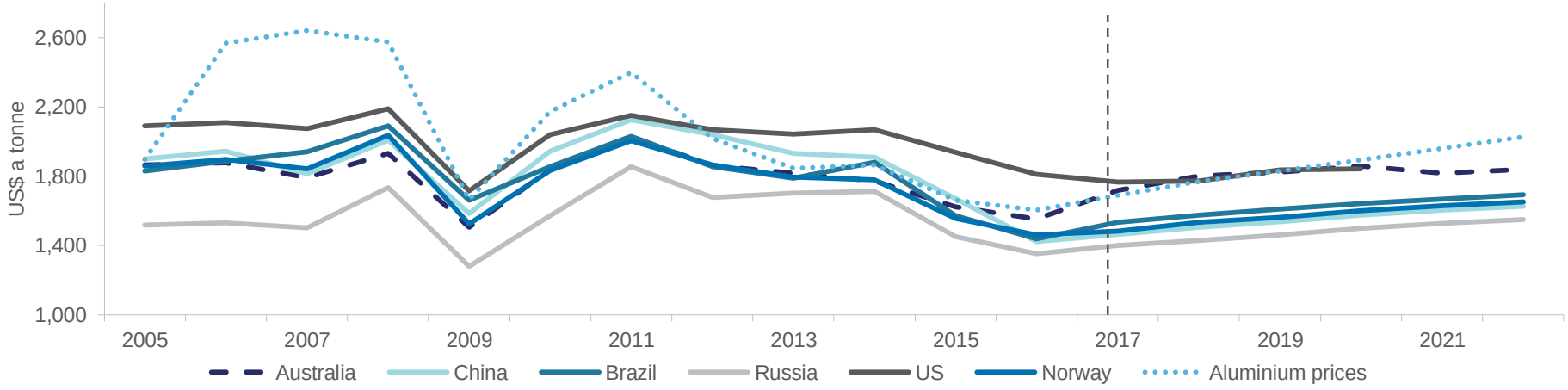
Aluminium smelter cash costs in Australia are forecast to increase by 11 per cent in 2017 and 5 per cent in 2018 to US$1,720 and US$1,801 a tonne, respectively. The cost rises are projected to moderate from 2019 onwards, on the assumption that energy security and affordability is dealt with in the next two years. Given the estimated average LME aluminium prices of US$1,690 a tonne in 2017 and US$1,769 a tonne in 2018, Australian smelters will be operating at a loss. Figure 11.6 shows aluminium smelter cash costs for Australia, China, Brazil, Russia, Norway and the US from 2005 and 2022. Australia's aluminium cash costs were very competitive from 2005 to 2015, ranking below the US and China. However, driven by predicted higher energy costs, Australia's cash costs position is soon likely to be higher than other major producers. A breakdown of cost components (Figure 11.7) indicates that power costs will account for over 30 per cent of operational costs. As a result, Australia is forecast to become a high-cost aluminium producer.

Weak export outlook for Australian exporters

Australia's aluminium exports increased by 0.7 per cent to 1.44 million tonnes in 2015–16, as the closure of vehicle manufacturing plants in Victoria and South Australia diverted locally-produced aluminium to export markets. However, export earnings dropped by 16 per cent to $3.3 billion over this period, as aluminium prices fell.

In 2016–17, Australia's aluminium exports are forecast to decrease by 2.2 per cent to 1.41 million tonnes, as the power outage at Portland Aluminium in December 2016 and the Boyne Island's production cuts reduce exports. Nonetheless, aluminium export values are estimated to rise by 1.2 per cent to $3.33 billion (2016–17 dollars), driven by higher aluminium prices.

Figure 11.6: Aluminium smelter cash costs — selected countries

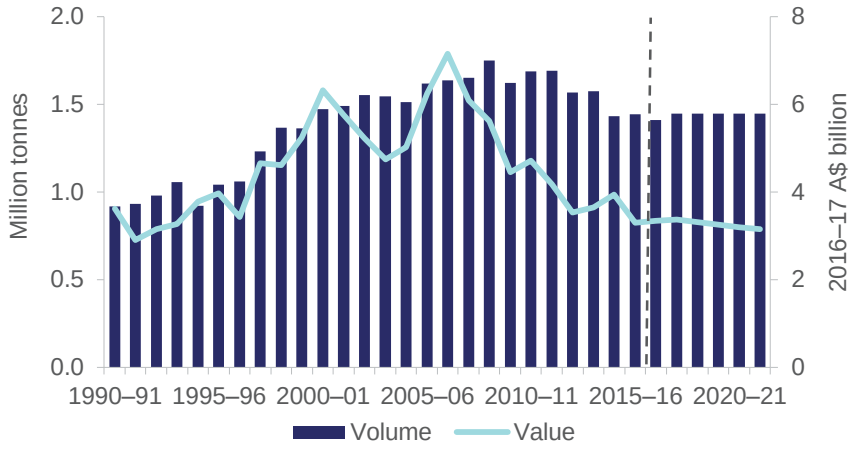


Source: AME Group (2017); Department of Industry, Innovation and Science (2017)

In 2017–18, Australia's export volumes and values are forecast to rise by 2.7 and 0.9 per cent, respectively, to 1.44 million tonnes and $3.36 billion (2016–17 dollars). As part of the government bailout conditions, Portland Aluminium is required to return to full production in July 2017, thereby providing additional export capacity that was lost during the power outage in December 2016. Aluminium prices are forecast to rise further, and this will improve the earnings for Australian aluminium exporters. The outlook for global motor vehicle sales is very positive, with a forecast of a 3 per cent rise in 2018. This, in turn, will provide more support and opportunities for Australian aluminium exports.

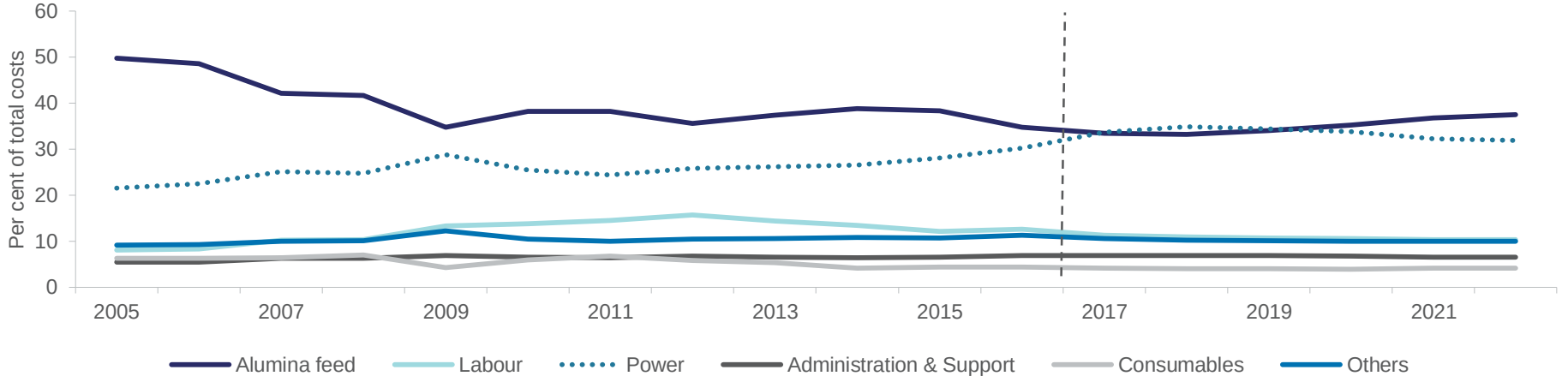
Over the remainder of the medium term, Australia's aluminium exports are projected to remain steady, at an annual volume of 1.44 million tonnes. The majority of Australia's production is destined for export markets. Although there are emerging opportunities for Australia from the projected increase in global demand, exports will be constrained by capacity limits and increased competition from lower-cost producers in other nations. Export values are projected to fall by an average 1.5 per cent annually to nearly $3.16 billion (2016–17 dollars) by 2021–22.

Figure 11.8: Australia's aluminium exports



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

Figure 11.7: Australia's aluminium smelter cash cost components



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

Alumina

Market summary

The outlook for Australia's alumina exports remain positive, supported by production cuts in China and higher demand from the Middle East. Although there are emerging opportunities for exporting more Australian alumina to overseas markets, alumina exports are likely to be constrained by production capacity limits, with no major capacity additions scheduled before 2022. As a result, alumina exports are forecast to rise by 1.6 per cent in 2016–17, but grow at a slower pace over the medium term to just above 18 million tonnes a year by 2021–22. However, reflecting softer prices, export earnings are revised down from the five-year outlook in March 2016, and are now projected to decrease at an annual average rate of 2 per cent to about $5.4 billion (2016–17 dollars) by 2021–22.

Prices

Alumina prices recovered in 2016

The FOB Australian alumina price recovered strongly in 2016, from a multi-year low of US$200 a tonne in January 2016 to average US$259 a tonne in real terms, down by 17 per cent for the year. Driving the price recovery was aluminium production restarts in China.

Prices to increase strongly in the short term

Alumina prices are estimated to increase by 10 per cent in 2017 and 0.1 per cent in 2018, to average US$283 and US$284 a tonne (FOB Australia) in real terms. The price rise will be driven by an expected cut to alumina refining capacity in China, the world's largest alumina producer. The Chinese central and local governments are intensifying their effort to tackle smog and air pollution in major cities, and are ordering Chinese aluminium smelters to cut production by 30 per cent over the 2017–18 winter period. It is estimated that China's alumina refining capacity will be reduced by 7 per cent in 2017 and by 12 per cent in 2018. With a forecast of only a modest rise in production from Australia (the world's second largest alumina producer), alumina prices are likely to move upward over the short term.

Figure 11.9: Annual alumina price

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

Prices continue to rise over the medium-term

Over the medium term, FOB Australia alumina prices are projected to increase at an annual average rate of 0.5 per cent, to US$290 a tonne in real terms in 2022. Upward price pressure will come from higher aluminium output (due to and stronger economic growth) and increased production costs. The upside risk to the assessment is the possibility of the 'air pollution control' policy in China being extended past 2017–18.

Consumption

Growth in alumina consumption in line with aluminium production

In 2016, world alumina consumption grew by 1 per cent to 110 million tonnes, supported by a modest rise in global aluminium production wholly outside of China. There was no growth in alumina consumption in China (the world's largest alumina consumer, accounting for more than 56 per cent of world consumption), because of unchanged aluminium

production. Chinese aluminium smelters responded to the government's 'supply side reforms' policy implemented in late 2015. Under this policy, aluminium producers are required to cut production and defer new start-ups. The main drivers of consumption growth in 2016 were Malaysia (up 102 per cent), India (up 9 per cent) and the Middle East (up 1.6 per cent).

Global demand for alumina is forecast to decrease at an average annual rate of 1 per cent over the next two years, to 108 million tonnes by 2018. 'Air pollution control' policies introduced by the Chinese government in February 2017, will have a significant impact on China's aluminium production and alumina demand. It is estimated that the policy will reduce China's annual aluminium production by 7 per cent a year, and China's alumina consumption by 11 per cent in 2017 and 6 per cent in 2018. In contrast, alumina consumption from India and the Middle East is forecast to increase at an average annual rate of 15 and 5 per cent a year, respectively. In India, increased public investment in infrastructure, and reforms in the power sector, are expected to see the country's aluminium production rise by 29 per cent in 2017 and by 14 per cent in 2018. In the Middle East, Iran's aluminium production is forecast to increase by 20 per cent in 2017 and 46 per cent in 2018, driven by a production increase at the Al-Mahdi and Hormozal aluminium smelters.

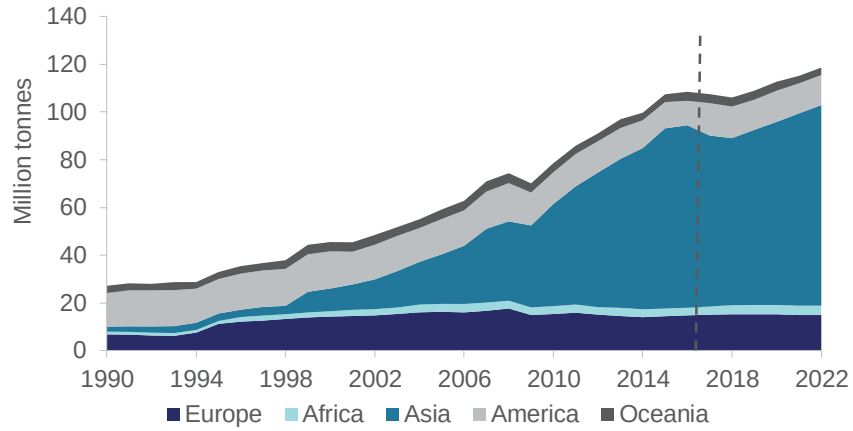
Medium term alumina demand is driven by aluminium production. Global aluminium production is projected to increase at an annual average rate of 3 per cent, driven by the addition of new capacity in China, the Middle East and other Asian countries. As a result, the demand for alumina is projected to increase by about 3 per cent a year (in line with aluminium production growth), to 120 million tonnes in 2022.

Production

Alumina production to fall until 2018

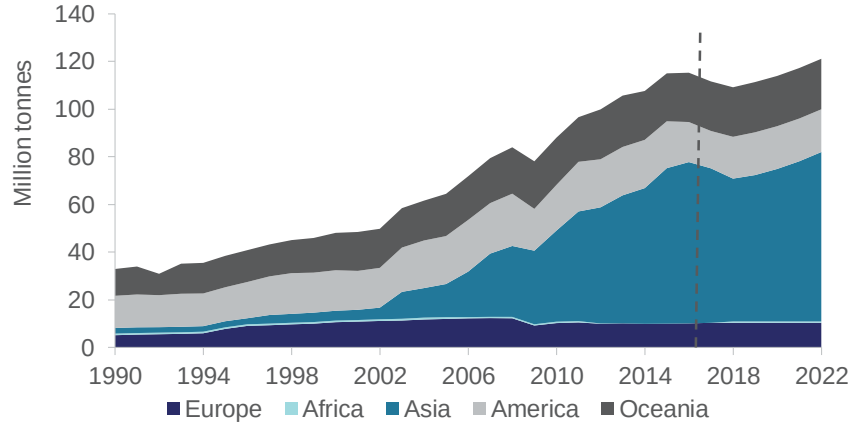
World alumina production increased by 0.2 per cent in 2016 to 115 million tonnes, as alumina production in China grew moderately (up 3.1 per cent to nearly 61 million tonnes). Despite higher aluminium prices in 2016, alumina production from new and restarted capacity did not grow as strongly as expected. About 8 million tonnes of alumina refining capacity was restarted or commenced in the first quarter of 2016, and

Figure 11.10: World alumina consumption



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

Figure 11.11: World alumina production



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

another 3 million tonnes in the third quarter of 2016. Chinese alumina refineries suffered several challenges, including bauxite supply issues and stricter environmental rules from the Chinese government. Outside of China, alumina production in Australia increased by 2.9 per cent to 20.6 million tonnes, supported by increased production from Rio Tinto's refineries. Alumina production in the North American region decreased by 36 per cent in 2016 to 4 million tonnes, driven by refinery closures in the US. Alcoa closed its 2.3 million tonnes Point Comfort operations at the end of June 2016, and Glencore closed its 1.4 million tonnes Sherwin refinery at the end of September 2016.

In the short term, global alumina production is estimated to fall by 3.2 per cent in 2017 and by 2.2 per cent in 2018, to 111 and 109 million tonnes, respectively, driven by alumina production cuts in China. The Chinese Government is taking action to reduce smog in major cities by clamping down on polluting industries, including the alumina industry. The government has implemented the 'air pollution control policy' whereby alumina refineries are ordered to cut alumina output by 30 per cent over the winter season of 2017 and 2018. It is estimated that the policy will reduce China's annual alumina production by 7.5 per cent in 2017 and 12.5 per cent in 2018, to 56 and 49 million tonnes, respectively.

In contrast, Australia's alumina production is estimated to rise by 0.8 per cent in 2016–17 and by 0.2 per cent in 2017–18 (to 20.7 million tonnes), driven by Rio Tinto's plan to increase its alumina output. Strong growth is also forecast for other Asian (ex-China) nations (up 28 and 11 per cent, respectively) and the Middle East (up 17 and 73 per cent, respectively). India's alumina production is estimated to increase by 18 per cent in 2017 and 3 per cent in 2018, driven by production growth of 38 per cent by Damanjodi Alumina in 2017 to over 2.7 million tonnes a year, and a 14 per cent rise in production from Lanjigarh Mettur Alumina in 2018, to 1.6 million tonnes annually. The Nhan Co refinery in Vietnam and the Well Harvest refinery in Indonesia, are expected to add a combined output of 1.6 million tonnes of alumina to the region by 2018. In the Middle East, the Ma'aden Ala Refinery in Saudi Arabia will reach full production capacity of 1.8 million tonnes in 2017, up 20 per cent from 2016. The Al Taweelah Alumina project in the United Arab Emirates is expected to begin operation in 2018, with start-up capacity of 1.5 million tonnes and full production of 3 million tonnes in 2021. Another significant rise in production is in Jamaica, where the 1.6 million tonnes a year Alpart Alumina project is expected to come online in 2017.

The risk to the assessment is the possible delay of the Emirates Global Aluminium's 2 million tonnes a year Al Taweelah refinery project until 2018 or beyond, and the impact of the Chinese government's 'air pollution control' policy on the output at the Hongqiao Group's Shandong refineries. The company has invested heavily in Guinea and has embarked on expanding bauxite exports from Guinea into China.

Moderate production growth over the medium term

Beyond 2018, world alumina production is projected to resume growing, reaching 121 million tonnes in 2022, driven by the expansion and addition of existing and new capacity. In China, the Chalco Hebei Huanghua project is expected to commence operation in 2018, with a start-up capacity of 1 million tonnes and full production of 3.5 million tonnes in 2021. The East Hope Jinzhong Alumina facility is forecast to reach full production of 2.4 million tonnes in 2019. In South America, the CVG Bauxilum operation in Venezuela is projected to reach full production capacity in 2019, from 800 thousand tonnes in 2018 to 1.2 million tonnes in 2019. In the Middle East, the 1 million tonne Persian Gulf Alumina project in Iran is expected to come online in 2021. In Asia, the 1 million tonne Korba Alumina project in India and the 1 million tonne Bintan Shandong project in Indonesia are planned to begin production in 2019 and 2020, respectively.

The downside risk to the medium term alumina production outlook is the uncertainty of China's 'air pollution control' policy – whether Chinese alumina refineries will need to repeat the 2017–18 cut in production of 30 per cent. Any decision to extend the policy beyond 2018 will likely have a profound impact on global alumina production.

Australia's production and exports

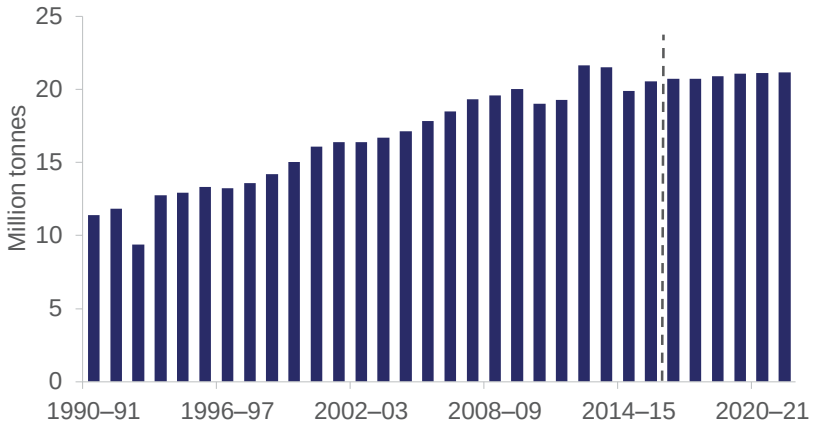
Australia's alumina production to remain steady

In 2015–16, Australia's alumina production increased by 3.3 per cent to 20.5 million tonnes, driven by increased production at Rio Tinto's Yarwun refinery (up by 13 per cent to 3.1 million tonnes) and South 32's Worsley refinery (up by 3.7 per cent). Other refineries in Western Australia and Queensland recorded small rises in production.

Over the short to medium term, production is forecast to increase by 0.8 per cent in 2016–17 to 20.7 million tonnes, and grow at a slower pace from 2017–18 and onwards. Output should reach 21 million tonnes by 2021–22. Efficiency improvements at Australian refineries are expected to be the main catalyst for future production increases in Australia.

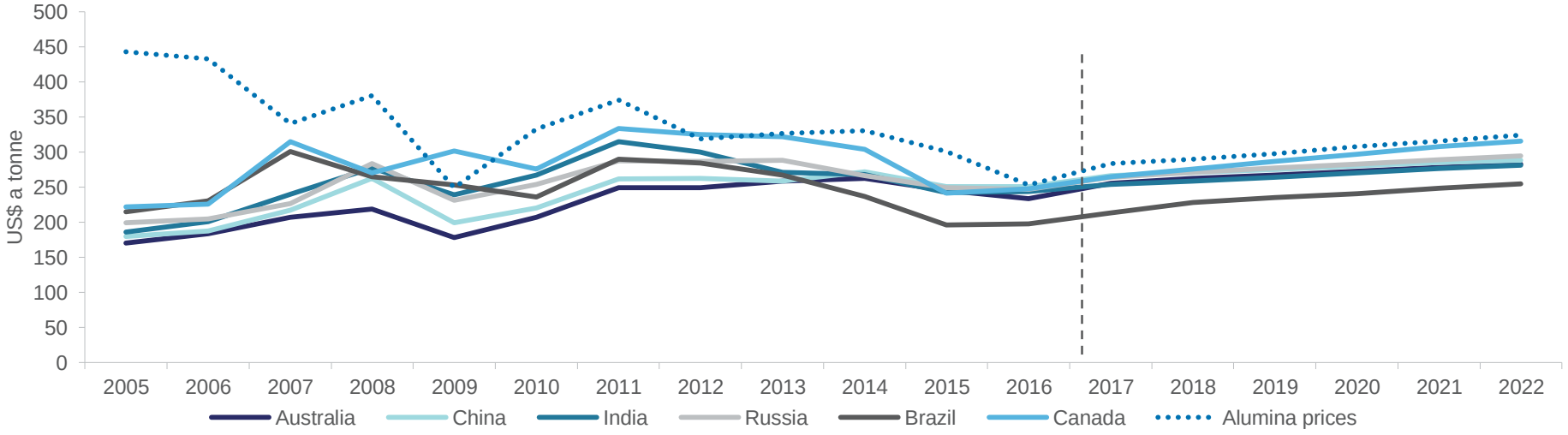
Australian alumina refineries are amongst the most competitive in the world. A comparison of refinery cash costs between Australia and other major global alumina producers (such as China,

Figure 11.12: Australia's alumina production



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

Figure 11.13: Alumina refinery cash costs – Selected countries



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

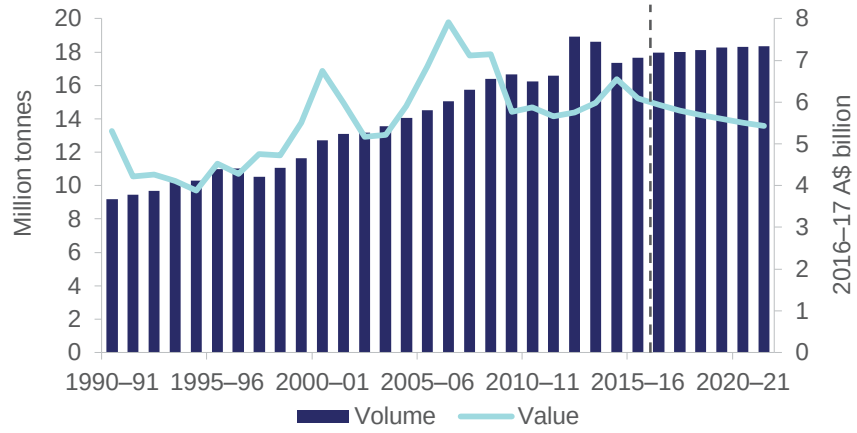
India, Russia, Brazil and Canada) from 2005 to 2022 shows that Australia's refinery costs were the lowest among the group until 2013, but have been higher than Brazil since then.

Exports to rise modestly

Australia's alumina exports increased by 1.8 per cent in 2015–16 to 17.7 million tonnes, underpinned by increased demand from China following aluminium production restarts in the first-half of 2016. Australia is the principal alumina supplier to China, accounting for 55 per cent of China's total imported alumina. However, export earnings decreased by 6.9 per cent in 2015–16 to below $6.1 billion, because of lower alumina prices in the second-half of 2015. In 2016–17, Australia's alumina exports are estimated to increase by 1.6 per cent to nearly 18 million tonnes, supported by higher alumina demand from China. However, over the forecast period, export earnings are estimated to fall by 2.5 per cent to $5.9 billion (2016–17 dollars), due to a 7.5 per cent drop in alumina prices in the first quarter of 2016–17.

Australia exports more than 86 per cent of its alumina production, with most going to China, South Korea, and the Middle East. Chinese refineries have been asked to cut alumina production by 30 per cent during the 2017–18 winter season. Alumina demand in the Middle East is expected to grow strongly (aluminium production is forecast to increase by 20 per cent in 2017 and by 40 per cent in 2018). Although there are emerging opportunities for Australia from these markets, alumina exports are likely to be constrained by production capacity limits, with no major additions scheduled before 2022. As a result, Australia's alumina exports are projected to increase modestly, to around 18 million tonnes. However, the value of these exports is projected to decrease at an annual average rate of 2 per cent to about $5.4 billion (2016–17 dollars) by 2021–22.

Figure 11.14: Australia's alumina exports



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

Bauxite

Market summary

The outlook for Australia's bauxite exports is positive, but the sector is facing challenges in the medium term, because of the easing of the bauxite export ban in Indonesia in January 2017, and a possible lifting of mining ban in Malaysia in the September quarter of 2017. Together with the rise of Guinea as a major global bauxite producer and exporter, the competition for global export markets, mainly China, will get tougher. As a result, Australia's bauxite export volumes and values have been revised down from the five-year outlook published in March 2016. Export volumes are projected to increase moderately; at an average annual rate of 3.4 per cent, from 2017–18 to 29 million tonnes in 2021–22. Export earnings are projected to rise at an average annual rate of 4.9 per cent over the forecast period, to $1.3 billion (2016–17 dollars) by 2021–22.

Production

World bauxite production decreased sharply in 2016

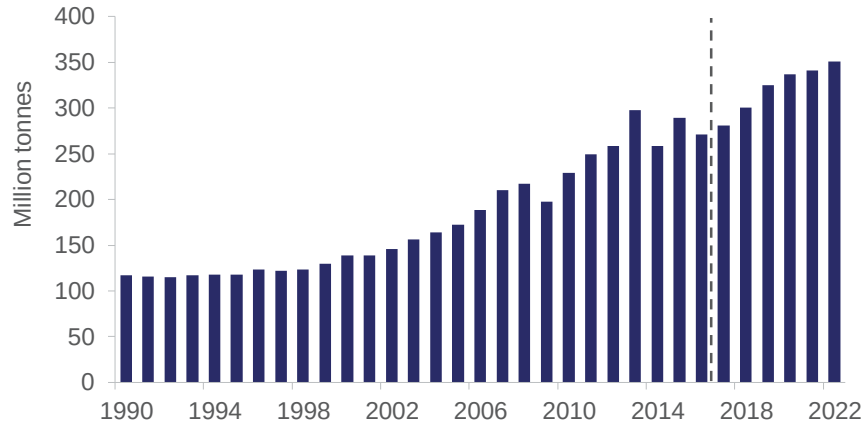
World bauxite production decreased by 6.2 per cent in 2016 to 271 million tonnes, driven by decreased production from Malaysia (down 68 per cent) and Brazil (down 8 per cent). The big fall in Malaysian production reflected the Malaysian government's decision to limit production to address socio-environmental concerns. The government imposed a complete mining ban at the start of 2016. The ban has been extended four times, and is currently in place until the end of the June quarter 2017. In Brazil, the world's third largest bauxite producer, political and economic instability in 2016 has impacted on the country's bauxite production. Production in China - the world's second largest bauxite producer - remained steady in 2016 at 65 million tonnes. Offsetting supply reductions from Malaysia and Brazil was the rise of bauxite production in Australia, the world's largest bauxite producer, up by 1.5 per cent in 2016 to 82 million tonnes. In Guinea, a newly-emerging major global bauxite producer, production jumped by 47 per cent in 2016 to 27 million tonnes.

Production to rise strongly in the short to medium term

Over the short to medium term, global bauxite production is forecast to increase at an average rate of 5.5 per cent a year, reaching 372 million tonnes in 2022. The declining quality of domestic bauxite and the depletion of resources in China, will be the main factor for increased global production for export. The drivers of production growth will be Africa, (including Guinea), and 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 2 per cent to 96 million tonnes by 2021–22.

In Africa, the remarkable rise of Guinea's bauxite production will lift African production by 30 per cent annually for the next few years, and by about 10 per cent a year from 2020 and onwards to 62 and 84 million tonnes, respectively. A growing pipeline of bauxite projects with high grade reserves is bolstering Guinea's bauxite productive capacity. The SMB-WAP bauxite project in north-western Guinea commenced operation in mid-2015. The project is a joint-venture between local Guinean producers and China Hongqiao Group, the world's largest aluminium producer and one of the world's largest alumina producers. It

Figure 11.15: World bauxite production



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

is estimated that from 2017 the SMB-WAP plant will export 30 million tonnes of bauxite a year back to Hongqiao's alumina refinery facility in China. Hongqiao imports 35 million tonnes of bauxite annually, and accounts for 70 per cent of China's total annual bauxite imports. This production and export strategy will lead to Hongqiao's self-sufficiency in terms of bauxite supply, and elevate Guinea to the principal source of China's bauxite imports.

In January 2017, the Indonesian government announced an easing of the bauxite export ban that was implemented from early 2014. The removal of the export ban is likely to be a stimulus for increased production in Indonesia. Indonesia's bauxite production was 57 million tonnes in 2013, before it fell 99 per cent in 2015, to just 471,000 tonnes after the export ban was imposed.

Australia's production and exports

Australia's production to increase in the short to medium term

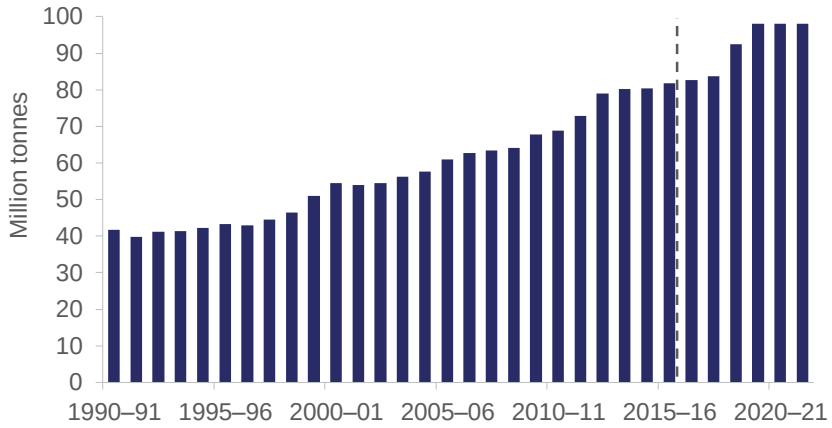
Australia's bauxite production increased by 1.8 per cent in 2015–16 to nearly 82 million tonnes. Driving the rise was a production record at Rio Tinto's Weipa's bauxite operation, up 2.4 per cent to 28 million tonnes. Additional demand from China and the fall in exports from Malaysia and Indonesia (due to export bans) were key influences.

From 2017–18, growth in Australia's bauxite production is projected to pick up pace as new projects come on line. These new projects include Metro Mining's Bauxite Hills project (5 million tonnes a year at full production) in the last quarter of 2017–18, and Rio Tinto's Amrun project (23 million tonnes a year) in the third quarter of 2018–19. As a result, Australia's bauxite production is projected to grow at an average annual rate of 6 per cent for the next three financial years to 98 million tonnes in 2019–20, and will remain at that level until 2021–22.

Exports to rise in 2016–17, but at a slower pace in the medium term

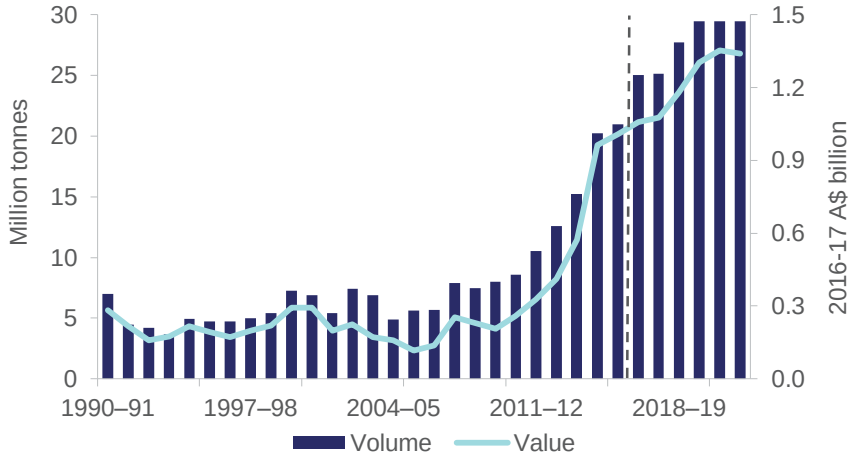
In 2015–16, the volume of Australia's bauxite exports increased by 3.8 per cent to nearly 21 million tonnes. Export earnings rose by 4.8 per cent to more than $1 billion (2016–17 dollars), driven by increased demand from China. The bauxite export bans in Malaysia and Indonesia provided opportunities for Australia's bauxite producers to increase export to overseas markets.

Figure 11.16: Australia's bauxite production



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

Figure 11.17: Australia's bauxite exports



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

In the first half of 2016–17, export volumes rose by 22 per cent year-on-year, as the Malaysian and Indonesian governments extended their export bans into 2017. For the 2016–17 as a whole, Australian bauxite exports are estimated to increase by 19 per cent to 25 million tonnes, due to lower domestic consumption and higher overseas demand. Export earnings are forecast to grow by 5 per cent in this financial year to $1.06 billion (2016–17 dollars).

Despite increased production capacity from the development of the Bauxite Hills and Amrun projects, Australian bauxite exports are forecast to grow at a much slower pace in the medium term. The slowdown will be driven by higher production in Guinea, the lifting of the bauxite export ban in Indonesia in January 2017, and a possible lifting of the mining ban in Malaysia in the September quarter of 2017. In 2015, Malaysia exported 24 million tonnes of bauxite to Chinareplacing Indonesia as the principal source of China's bauxite imports. The resumption of Malaysian production is likely to increase the supply available for China's bauxite import markets and put further pressure on Australia's bauxite exporters.

The volume of Australia's bauxite exports are projected to increase at an average annual rate of 3.4 per cent from 2017–18 to 29 million tonnes in 2021–22. Export earnings are projected to rise at an average annual rate of 4.9 per cent over this forecast period, to $1.3 billion (2016–17 dollars) by 2021–22.

The risk to the assessment is the uncertainty of how much bauxite will be exported from Indonesia, because of the conditions attached to the easement of the bauxite export ban. Notably, only producers in the process of building a processing plant will be allowed to export a limited amount of bauxite, provided it is washed and has an alumina content of greater than 42 per cent. Permission is dependent on meeting operational requirements within five years.

Table 11.1: Aluminium, alumina and bauxite outlook

World	unit	2016	2017f	2018f	2019z	2020z	2021z	2022z
Primary aluminium								
Production	kt	58,162	57,201	56,036	58,031	60,041	61,815	63,714
Consumption	kt	57,768	59,489	61,295	62,768	63,558	65,398	67,548
Closing stocks b	kt	2,761	2,705	2,651	2,598	2,546	2,495	2,445
- Weeks of consumption		2.5	2.4	2.2	2.2	2.1	2.0	1.9
Prices World aluminium c								
- nominal	US$/t	1,604	1,690	1,769	1,829	1,893	1,959	2,028
- real d	US$/t	1,640	1,690	1,731	1,746	1,766	1,789	1,813
Alumina spot								
- nominal	US$/t	253	283	290	298	308	316	324
- real d	US$/t	259	283	284	285	288	289	290
Australia	**unit**	**2015–16**	**2016–17f**	**2017–18f**	**2018–19z**	**2019–20z**	**2020–21z**	**2021–22z**
Production								
Primary aluminium	kt	1,649	1,569	1,589	1,589	1,589	1,589	1,589
Alumina	kt	20,550	20,720	20,759	20, 915	21,071	21,121	21,172
Bauxite	Mt	81.7	82.7	83.7	92.4	98.1	98.1	98.1
Consumption								
Primary aluminium	kt	207	159	145	141	141	141	141
Exports								
Primary aluminium	kt	1,442	1,410	1,448	1,448	1,448	1,448	1,448
- nominal value	A$m	3,241	3,337	3,439	3,459	3,487	3,518	3,554
- real value e	A$m	3,296	3,337	3,366	3,308	3,253	3,203	3,155
Alumina	kt	17,676	17,955	17,991	18,135	18,262	18,298	18,335
- nominal value	A$m	5,995	5,944	5,915	5,951	5,999	6,053	6,113
- real value e	A$m	6,097	5,944	5,791	5,690	5,597	5,509	5,427
Bauxite	kt	20,971	25,042	25,113	27,723	29,433	29,433	29,433
- nominal value	A$m	992	1,059	1,099	1,233	1,396	1,486	1,509
- real value e	A$m	1,009	1,059	1,076	1,179	1,302	1,352	1,340
Total value								
- nominal value	A$m	10,228	10,339	10,453	10,644	10,882	11,057	11,176
- real value e	A$m	10,402	10,339	10,233	10,177	10,153	10,064	9,922

*Notes: **b** Producer and LME stocks; **c** LME cash prices for primary aluminium; **d** In 2017 calendar year US dollars; **e** In 2016-17 financial year Australian dollars; **f** Forecast; **z** Projected*

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

Market summary

World copper supply and consumption are expected to rise over the next five years, with the market tightening significantly towards the end of the outlook. Real prices are expected to fall towards 2018, and rise thereafter, as consumption growth outpaces supply growth. Australia's copper exports have been revised up by 480 million in 2016–17 to $8.1 billion, due to higher prices. Export earnings are projected to rise by 1.2 per cent annually over the outlook period, reaching $8.6 billion in 2021–22. The projection is $490 million less than previously expected this time last year. In metal-content terms, Australia's total copper export volumes are forecast to increase by 0.6 per cent annually over the outlook period, with peak volumes reaching 1.0 million tonnes in 2020–21.

Prices

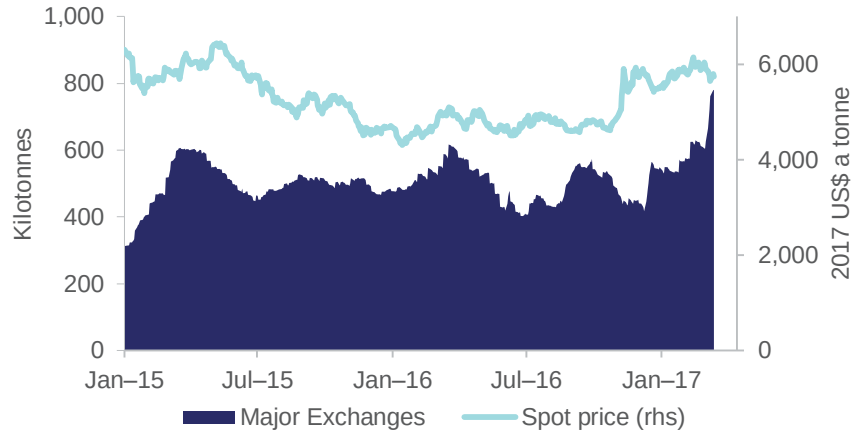
Copper prices hit a near two year high in the first quarter 2017

Copper prices rose further in the March quarter 2017, to be at their highest level in almost two years. The London Metal Exchange (LME) copper price briefly reached a 20-month high of US $6,145 a tonne in February, before falling back. The rise late last year was driven by expectations of broadly improving economic conditions. Recent price strength derives from supply disruptions at three of the world's largest mines — Escondida in Chile, Grasberg in Indonesia and Cerro Verde in Peru.

Recent leading indicators suggest that, in the short term, stronger consumption growth can be expected in China, Europe and the United States in the short term. In March, China's Purchasing Manufactures Index (PMI) indicated an expansionary economic environment for the eight consecutive month, and the US Institute of Supply Management manufacturing index rose to a two-year high.

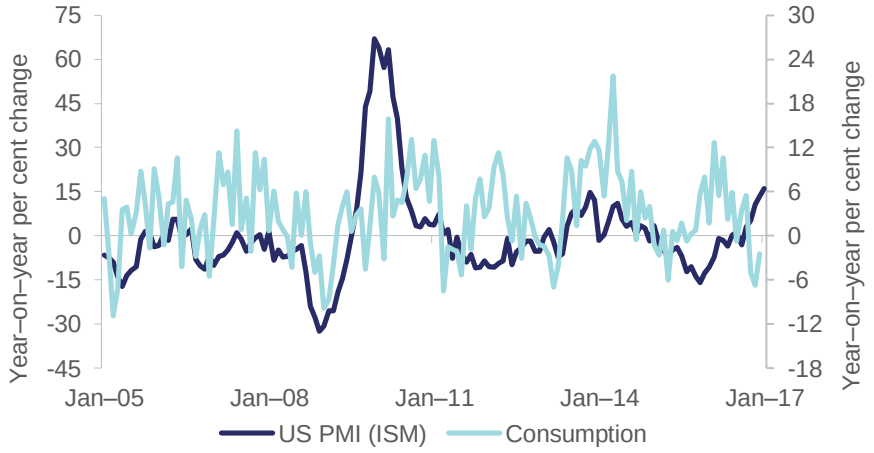
Nonetheless, supply disruptions and signs of higher consumption failed to draw down copper inventories in the first quarter of 2017. Copper stocks at the major exchanges (LME, Shanghai Futures Exchange and COMEX), increased by 28 per cent in the year to mid March 2017, to almost 800,000 tonnes. This put global exchange stocks at a 3-1/2 year high. Chinese bonded warehouse stocks also rose in the March quarter, despite the apparent tightening in supply conditions.

Figure 12.1: Recent copper prices and stocks



Source: LME (2017) spot price ; Bloomberg Major Exchanges

Figure 12.2: Copper consumption and PMI, YoY growth



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

Prices are expected to dip before rising over the medium term

Prices are forecast to average US$5,879 a tonne in 2017, before drifting lower to US$5,565 a tonne in 2018. In the short term, ample inventories and a rising US dollar — making copper more expensive to non-US consumers — will weigh on the copper price. Consumption growth is expected to rise, driven by stronger industrial production globally. However, consumption will be outpaced by production in 2018. Substantial new large scale mines — such as Cobre Panama — and several mine expansions, are expected to add 1 million tonnes to mine production in 2018.

Copper prices are expected to drift higher from 2019 onwards, as consumption growth starts to outpace supply. Over the medium term, copper prices are projected to increase to US$6,431 a tonne in 2022. After 2020, copper inventories are expected to gradually fall, leading to a shortage of copper throughout 2021 and 2022. Total copper consumed is expected to rise over the outlook period, driven by higher industrial production and increased investment in infrastructure.

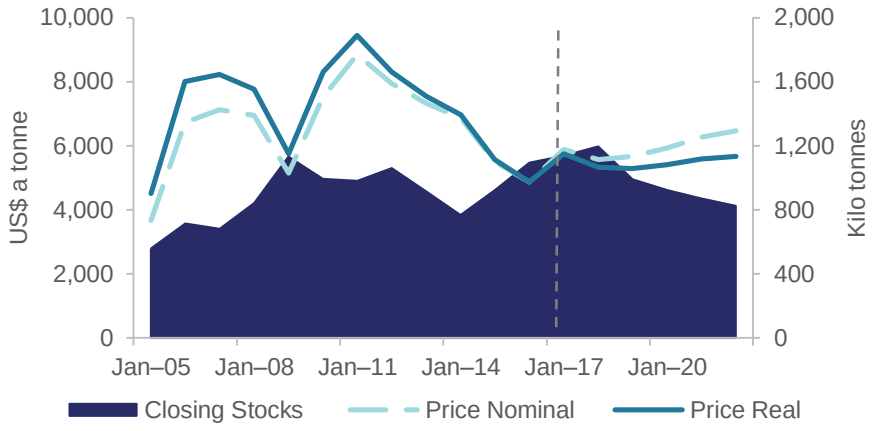
World consumption

Copper consumption increases for 15th consecutive year

World refined copper consumption increased by 3 per cent in 2016, to 23.4 million tonnes — continuing 15 years of continuous consumption growth. Consumption in China increased by 3 per cent in 2016, to over 11,600 tonnes (representing half the world's total), boosted by government stimulus in the construction sector in early 2016. Consumption growth in China's residential construction sector is expected to moderate in 2017, as the government takes new measures to cool the property market. However, China intends to invest in large infrastructure projects, which will offset the decline in residential construction and boost demand for copper over the outlook.

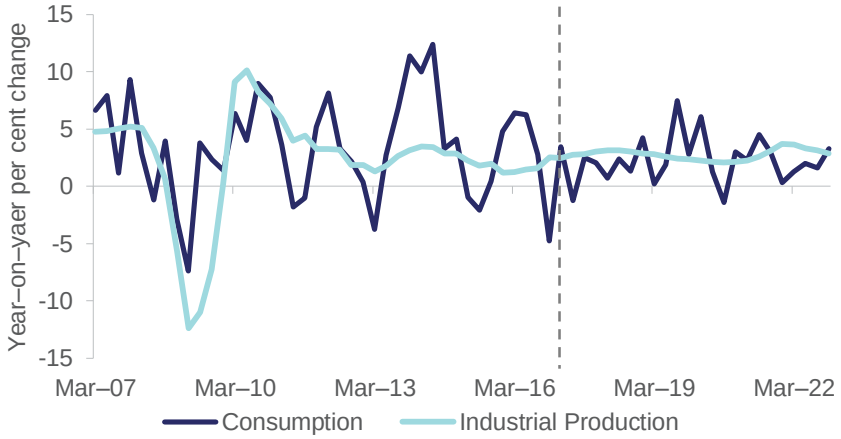
Global vehicle sales reached over 83 million in 2016, rising by 4 per cent. The rise was led by a 13.7 per cent rise in sales in China, where 28 million vehicles were sold in 2016. Growth in China's vehicle sales will be a key driver of copper consumption over the outlook period. Growth in electric vehicles sales — currently a small proportion of total sales — will also boost copper consumption.

Figure 12.3: World copper price and stocks



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

Figure 12.4: World copper consumption and industrial production



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

Several estimates suggest an average electric car contains between 80 to 90 kilograms of copper, compared to an estimated 25 kilograms for a conventional passenger car. Growth in sales of SUVs will also be an important source of copper demand over the outlook period. In 2016, sales of SUV's in China rose 44 per cent, compared to 15 per cent rise in passenger car sales. SUV's are typically larger than the average passenger car, and contain more copper.

In Europe, copper consumption increased by 4 per cent in 2016. The increase was led by Germany and Russia, which increased consumption by 6.2 and 15.2 per cent, respectively. Industrial production growth in Europe has been steadily improving since 2012, and is expected to strengthen further over the short term. The Eurozone Composite PMI has continued to rise in recent months, suggesting that economic conditions should improve steadily in the next few months at least.

Consumption growth to increase over the medium term

Over the forecast period, world refined copper consumption is projected to increase at an annualised rate of 2.1 per cent, to reach 26.4 million tonnes in 2022. Rising consumption will largely be driven by world industrial production growth, which is forecast to average around 2.8 per cent over the outlook period. Strong economic growth in Emerging economies, coupled with higher demand from the energy sector, will underpin growth in copper consumption over the outlook period.

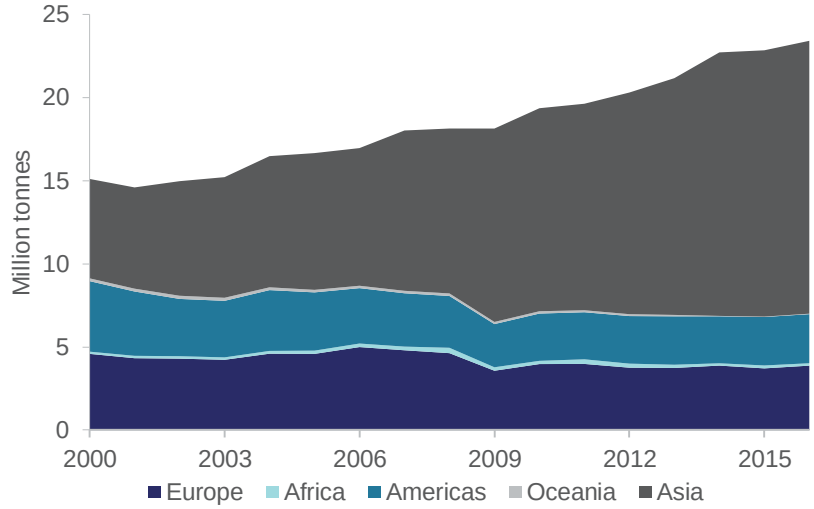
Growth in global investment in energy infrastructure and rising demand for renewable energy technologies are expected to add to copper consumption. Some estimates put global investment in new power-generating capacity over the next ten years at US$4.4 trillion, with around US$570 billion to be spent on solar panels. Global solar capacity is expected to grow by over 600 gigawatts by 2021, which is estimated to require an additional 2.4 million tonnes of copper.

China, South Korea and Vietnam are expected to contribute heavily to stronger copper consumption over the outlook period. China continues to invest heavily in its power grid, to keep pace with rising electricity demand. Total capital investment in Chinese power grid construction increased by 18 per cent in 2016, and is expected to rise strongly over the outlook period.

India, which currently accounts for 2 per cent of world copper consumption, is projected to show strong demand for copper over the medium term, driven by strong economic growth and rising urbanisation. Economic growth in India is expected to average 7.8 per cent annually over the outlook period. The UN expects India's urban population to exceed 1 billion people in 2020; rising urbanisation is generally accompanied by increasing construction and infrastructure investment, which can be copper-intensive.

In the US, copper consumption declined by 1 per cent to 1.8 million tonnes in 2016. US production of electrical equipment, vehicles and farm wheel tractors still remain below pre-global financial crisis (GFC) levels. Copper consumed in the US remains 40 per cent lower than the 2000 peak, largely due to a sectoral shift away from manufacturing. Growth in these sectors is expected to be mostly flat over the outlook period. In contrast, infrastructure investment in the US is expected to increase copper consumption from 2018 onwards.

Figure 12.5: Copper consumption by region



Source: World Bureau of Metal Statistics (2017)

World production

World mine production higher in 2016

World mine supply increased by 7 per cent to reach 20.6 million tonnes in 2016. The rise in production was led by Peru and Indonesia, which increased output by 632,000 and 186,000 tonnes on 2015 levels. Copper production in Chile — the world's largest producer — declined by 4 per cent to 3.8 million tonnes in 2016, due to declining ore grades. In contrast, Peru has benefited from an additional 330,000 tonnes of new supply from Las Bambas and an extra 245,000 tonnes from the expansion of Cerro Verde.

2017 production lower than expected due to mine disruptions.

World mine supply is forecast to rise by 0.3 per cent in 2017, constrained by supply disruptions at Escondida, Grasberg and Cerro Verde — estimated to have reduced supply by 200,000 tonnes in the first half of 2017. BHP's Escondida ceased production on the 9th of February 2017, as workers went on strike over wages and conditions. It is estimated that 125,000 tonnes of copper output were lost during the strike which ended on the 25th of March.

Due to export restrictions, production at Freeport's Grasberg has been reduced by 40 per cent, in order to match the lower capacity of the local Gresik refinery in Indonesia. The company and the Indonesian Government are yet to reach agreement with regards to the terms of the company's export licence, while the Indonesian Government seeks to make Freeport divest 51 per cent ownership of the mine. The situation at Grasberg could potentially endure a lengthy litigation process, and hamper any return to full production in the short term.

In March 2017, production at Freeport's Cerro Verde operation in Peru was disrupted, as workers went on strike over pay and conditions. The mine produced 503,000 tonnes of copper in 2016. The strike (which began on the 10th of March) will likely reduce world supply by 7,000 tonnes each week.

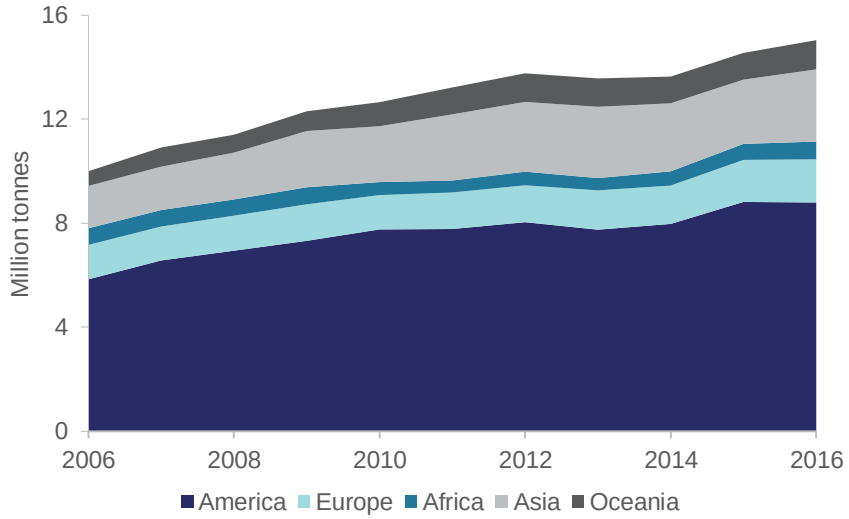
World supply to rise over the medium term

World mine supply is projected to rise by 1.8 per cent annually over the forecast period, to reach 23 million tonnes in 2022. The production gains come as several large scale mines and expansions come online between 2018 and 2020.

Despite declining ore grades — due to the maturity of many large mines — Chile will remain the world's largest producer over the outlook period. BHP's Escondida mine is expected to increase production to just under 1 million tonnes in 2022. Chile will also benefit from expansions at Sierra Gorda and Spence, which are expected to increase production capacity by 120,000 and 200,000 tonnes, respectively, in 2020.

Production in Peru expanded rapidly over the last few years, but is expected to plateau over the outlook period. The Toquepala expansion is expected to add an extra 100,000 tonnes of capacity in 2018, while expansion works at Toromocho will add a similar amount in 2019.

Figure 12.6: Copper production by region



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

World mine supply will be adversely impacted by declining average ore grades over the outlook period. Copper ore grades have declined by 1.7% a year over the past decade, averaging 0.6% in 2016. The decline is due to falling grades at some of the world's largest and oldest copper mines, as well as the development of low grade projects. A notable example is First Quantum's Cobre Panama mine, which is expected to add 330,000 tonnes to new mine supply in 2018, at grades of around 0.4% copper.

World refined copper production capacity set to rise in 2017

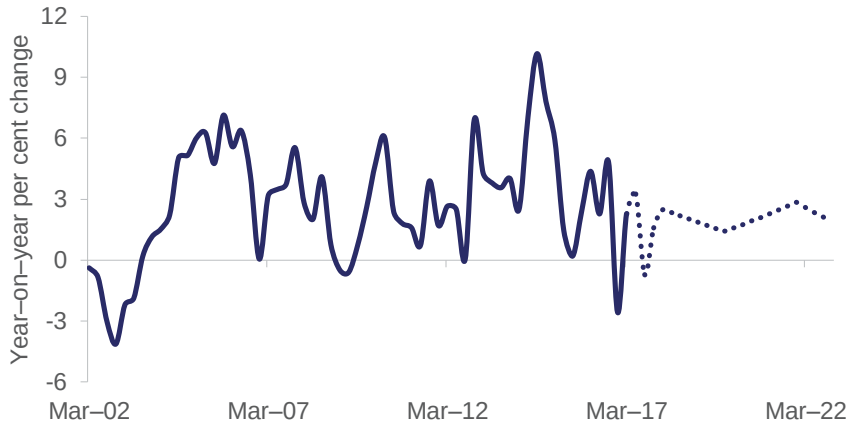
World refined copper production is forecast to rise by 2 per cent in 2017, driven by capacity expansion projects. Worldwide, an additional 768,000 tonnes of refining capacity is expected to come online in 2017, and around 76 per cent of this will be in China. In 2017, expansions at China's Huludao Hongyue and Qinghai Copper are expected to add an extra 150,000 tonnes and 135,000 tonnes of production, respectively.

In March, China's Jiangxi Copper — the world's third largest copper refinery in 2016 — announced plans to increase production to full capacity of 1.36 million tonnes in 2017, rising from about 1.2 million tonnes produced in 2016.

Over the medium term, an additional 991,000 tonnes of capacity is expected to come online in 2018, and a further 900,000 tonnes by 2020. The majority of capacity comes from expansion projects at existing refineries in China and India, as well as the re-opening of Luilu in the Democratic Republic of Congo — which will add an extra 300,000 tonnes in 2018.

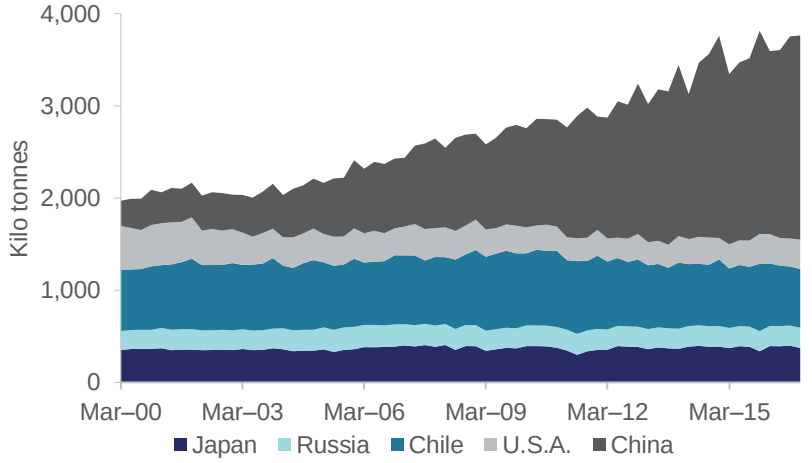
As world mine supply rises, refined production is forecast to increase by 2 per cent annually over the outlook, reaching 26.4 million tonnes in 2022.

Figure 12.7: Refined production growth



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

Figure 12.8: Quarterly refined production by country



Source: World Bureau of Metal Statistics (2017)

Australia's exploration, production and exports

Exploration expenditure increases for third consecutive quarter

Australia's copper exploration expenditure increased by 12 per cent year-on-year in 2016, to over $135 million — the first yearly rise since the peak in 2012. The increase was largely due to increased expenditure in Western Australia, which rose 71 per cent to over $47 million. In 2016, copper accounted for 60 per cent of total exploration expenditure on base metals and 9.5 per cent of total expenditure on minerals in Australia. Despite improving in 2016, copper exploration remains at historically low levels: expenditure is around 60 per cent lower than 2012 levels. Expenditure is expected to rise in 2017, as higher prices encourage new exploration.

Production forecast to rise

Australian production is forecast to peak in 2021, and decline slightly in 2022. The 2022 decline will be due to the expected closure of Western Australia's largest copper mine in 2021 — DeGrussa operated by Sandfire Resources, with an average annual production of 65,000 tonnes.

Several projects currently in 'exploration' and 'feasibility' stages are a key risk to the production forecast. In 2016, seven copper projects at the feasibility stage were estimated to be worth A$2,641 million. Notably, REX Mineral's Hillside, OZ Mineral's Carrapateena and KGL Resources' Jervios are expected to contribute a combined 116,000 tonnes in 2020. In addition, Altona's Little Eva project in Queensland is expected to commence production in 2021, with output of 40,000 tonnes annually for 11 years.

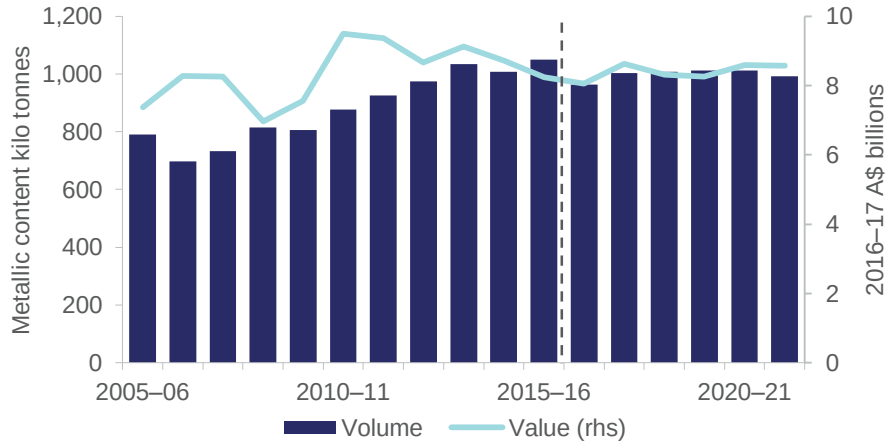
Production at Olympic Dam — Australia's largest copper mine — increased by 10 per cent year–on–year in 2016, despite fourth quarter production declining due to a State-wide power outage. Olympic Dam is expected to increase production over the outlook, reaching 210,000 tonnes in 2022, due to higher grade ores.

Refined copper exports to fall

Australia's copper exports (in metal content terms) increased by 4 per cent in 2015–16. Export volumes were boosted by higher output at Olympic Dam during the last half of 2015. Refined copper exports increased by 19 per cent, more than offsetting a 9.1 per cent decline in the export volume of copper ores and concentrates. Despite the higher export volumes, the value of Australia's copper exports declined by 4.2 per cent, due to lower prices throughout the 2015–16 financial year.

Australia's copper exports (in metal-content terms) are forecast to rise by 0.6 per cent annually over the outlook period. Exports of ores and concentrates are expected to reach a peak of 518,500 tonnes (in metal-content terms) in 2019–20, while exports of refined copper are expected to peak in 2020–21, reaching just under 450,000 tonnes. Copper exports are expected to be supported by increased consumption in China and other emerging Asian nations, where strong demand remains due to growing energy infrastructure and industrial production. The value of Australia's copper exports are forecast to grow by 3.7 per cent annually over the outlook period, largely due to rising prices towards the end of the outlook period. Copper exports are forecast to reach $8.6 billion in 2021–22, with the volume of total copper exports (in metal content terms) reaching 991,000 tonnes.

Figure 12.9: 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

World	unit	2016	2017f	2018f	2019z	2020z	2021z	2022z
Production								
– mine	kt	20,656	20,718	21,184	21,531	21,927	22,486	22,988
– refined	kt	23,458	23,825	24,361	24,761	25,216	25,859	26,437
Consumption	kt	23,400	23,783	24,303	24,966	25,283	25,912	26,483
Closing stocks	kt	1 095	1 138	1 196	991	924	871	825
– weeks of consumption		2.4	2.5	2.6	2.1	1.9	1.7	1.6
Price								
– nominal	US$/t	4,863	5,879	5,565	5,672	5,922	6,265	6,474
	US$/lb	221	267	252	257	269	284	294
– real b	US$/t	4,970	5,879	5,445	5,415	5,525	5,721	5,786
	US$/lb	225	267	247	246	251	259	262
Australia		**2015–16**	**2016–17f**	**2017–18f**	**2018–19z**	**2019–20z**	**2020–21z**	**2021–22z**
Mine output	kt	990	937	989	993	997	996	975
Refined output	kt	514	482	480	478	478	478	470
Exports								
– ores and cons c	kt	1,870	1,766	1,915	1,937	1,953	1,951	1,903
– refined	kt	507	447	448	448	448	448	440
Export value								
– nominal	A$m	8,110	8,064	8,822	8,701	8,891	9,479	9,688
– real d	A$m	8,248	8,064	8,637	8,319	8,295	8,628	8,602

*Notes: **b** In 2017 calendar year US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2016–17 financial year Australian dollars; **f** Forecast; **z** Projection.*

Source: Sources: 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

Market summary

Australia's nickel export earnings are forecast to decline by 25 per cent to $2.2 billion in 2016–17, reflecting a decline in export volumes. Over the next five years, a moderate increase in prices and slightly higher volumes are expected to see Australia's nickel exports grow by an average annual rate of 6.8 per cent, to reach $3.1 billion in 2021–22.

The forecasts for the value of Australia's nickel exports in 2016–17 and 2017–18 remain broadly unchanged. The outlook for 2018–19 and beyond has been revised up slightly, owing to an upward price revision.

Prices and stocks

Nickel price forecast to increase over the outlook period

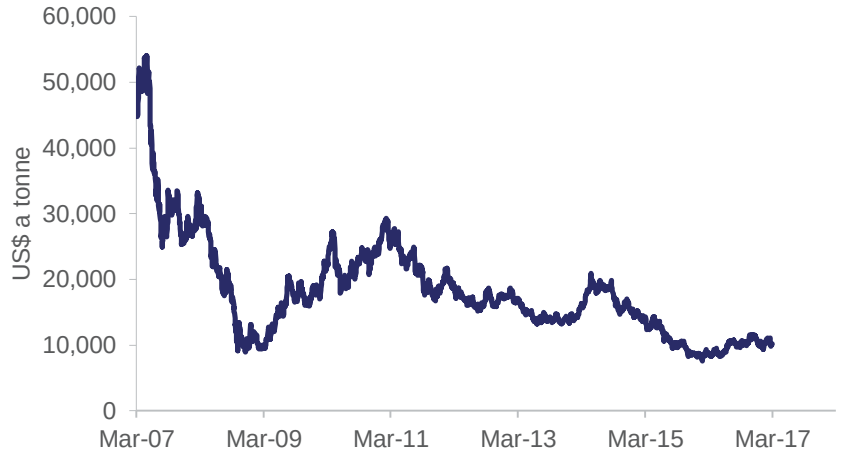
Nickel prices have been slowly recovering since averaging US$8,498 a tonne in the March quarter 2016 — the lowest price in real terms since the December quarter 2001. Nickel prices are projected to continue to recover over the next five years, to average US$14,409 a tonne in 2022.

At current prices, around half of the world's finished nickel producers are operating at a cash loss. It is expected that some high-cost production will exit the market, and that global nickel demand will continue to grow over the outlook period; both these influences will act to push the price higher.

Increasing capital costs may also place some upward pressure on prices, although this will become more of an issue beyond the five year projection horizon. This is because more global nickel supply will come from capital intensive nickel laterite production in the coming years, with lower capital cost nickel sulphide deposits facing depletion.

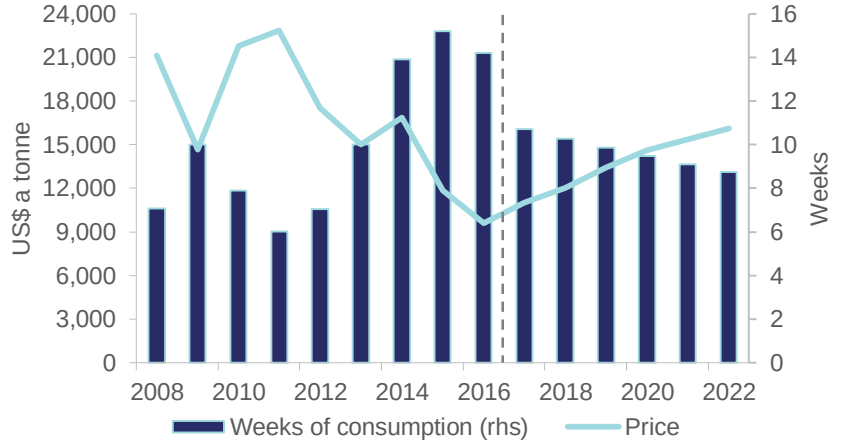
The London Metal Exchange (LME) nickel price averaged US$10,315 a tonne in the March quarter 2017, down 4.7 per cent quarter-on-quarter. Putting downward pressure on prices in February was the partial lifting of nickel export bans in Indonesia. However, by the end of March, nickel prices had recovered to US$11,000 a tonne, following the announced closure of 23 mines in the Philippines — mostly nickel laterite mines — equivalent to over half of the country's output.

Figure 13.1: Nickel LME spot price



Source: Bloomberg (2017) London Metal Exchange

Figure 13.2: Nickel stocks and price



Source: Bloomberg (2017) London Metal Exchange; International Nickel Study Group (2017); Department of Industry, Innovation and Science (2017)

Following declines in 2016, global exchange stocks of nickel remained relatively stable in the March quarter. An increase in LME nickel stocks offset a decline in SHFE nickel stocks during the quarter. Further drawdowns in global stocks are forecast in 2017, as consumption outstrips supply.

World consumption

World nickel consumption to grow through to 2022

World nickel consumption grew by a robust 12 per cent in the year to the December quarter 2016, and by 8 per cent over the 2016 calendar year, rebounding from the slow growth of 0.5 per cent in 2015.

Nickel consumption growth in 2016 was supported by a recovery in stainless steel production (63 per cent of world nickel use is in the manufacture of stainless steel). In the first three quarters of 2016, stainless and heat-resisting crude steel production grew by 7.0 per cent, following a slight decline in output in 2015. Nearly all of the growth in stainless steel production in 2016 occurred in China and, to a much lesser extent, the rest of Asia. China has been the sole driver of world stainless steel production in recent years, due to its use in the construction and manufacturing sectors.

World consumption of nickel is projected to grow by 5.6 per cent in 2017 and by an average annual rate of 5.7 per cent in the five years to 2022. The outlook for global nickel demand over the next five years is generally more positive than that for other metals, such as steel and copper. This is because nickel is a late-development cycle commodity. China, in particular, is likely to consume more nickel, as it transitions to a consumption-based economy.

World production

World mine production fell in 2016, but will be supported by ramp up in Indonesia and New Caledonia in 2017

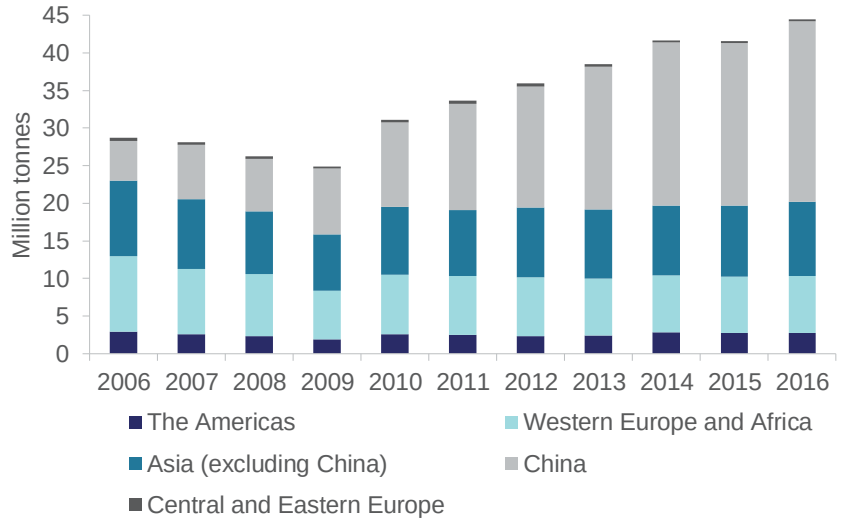
World mined nickel production continued its decline in the December quarter 2016 — down 3.0 per cent year-on-year. Declining production in Russia and the Philippines in the December quarter was partially offset by increased output in Indonesia. Mined nickel output was down 7.4 per cent for the year as a whole.

The Philippines has been the world's largest nickel ore producer since it increased the export of low grade ore in response to an Indonesian export ban in 2015. However, about half of the country's output may close.

Following the appointment of Regina Lopez — an anti-mining advocate — as Secretary of the Department of Environment and Natural Resources in June 2016, production at a number of nickel mines in the Philippines was suspended, pending the final results of an audit of mines in the country. The final results of the audit were delivered on 2 February 2017, which recommended the closure of 23 mines — most of which were nickel laterite mines.

It is not yet certain that the Philippines Government will not grant a reprieve to any company whose operations have been threatened with closure.

Figure 13.3: World stainless steel production



Notes: 2016 is an estimate based on three quarters of data
Source: International Stainless Steel Forum (2016) Meltshop Production Statistics

In January, Indonesia announced that its nickel ore export ban would be partially lifted. While the details on how much Indonesian exports will be affected remains unclear, it is expected that the impact on global mined supply will not be enough to offset the Philippine mine closures. This should provide support to nickel prices in 2017.

Global mine supply will also increase outside of Indonesia, particularly from Australia and New Caledonia. On a net-basis, global mine supply is forecast to increase by 5.5 per cent in 2017, and by 8.8 per cent a year in the five years to 2022.

Refined production growth to remain solid

World refined nickel production increased by 9.7 per cent year-on-year in the December quarter 2016, to 539,000 tonnes. Refined nickel production increased a more modest 0.5 per cent in 2016 as a whole.

The increase in refined nickel production in the December quarter was attributable to increased output of 38,000 tonnes in China and 25,000 tonnes in Indonesia, which were partially offset by a 17,000 tonne reduction in Russian output.

Global refined nickel production is forecast to grow by 2.7 per cent in 2017, before averaging 6.9 per cent growth in the five years to 2022.

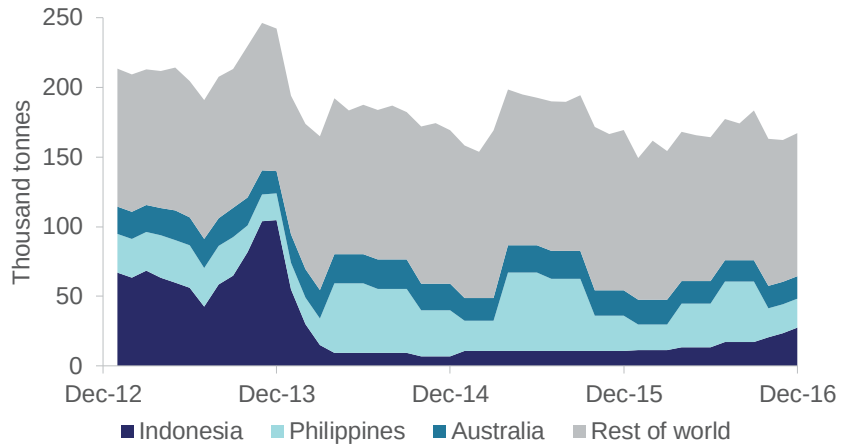
Australia's exploration, production and exports

Exploration expenditure

Nickel and cobalt exploration expenditure increased by 23 per cent year-on-year to $18 million in the December quarter 2016 — the largest increase since June 2011, following sharp declines in recent years. Despite the recent increase, exploration expenditure remains close to historical lows.

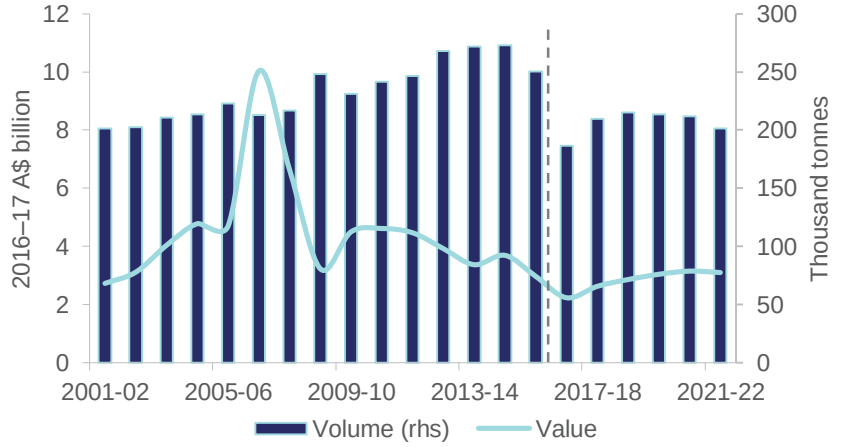
While nickel prices are projected to increase over the outlook period, price growth is not expected to be sufficient to incentivise substantive increases in exploration in the next five years.

Figure 13.4: World mined nickel production, monthly



Source: International Nickel Study Group (2017)

Figure 13.5: Australia's nickel export volumes and values



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

Production

Australia's mined nickel production is forecast to increase by 0.5 per cent to 218,000 tonnes in 2016–17. Refined production is forecast to decline by 18 per cent to 166,000 tonnes, because of the closure of Queensland Nickel's Yabulu refinery — which used imported nickel ore.

Production growth over the five years to 2021–22 is projected to be modest. Both mined and refined output are projected to grow by 0.6 per cent a year.

Reported production at BHP's Nickel West facility increased by 45 per cent year-on-year in the December quarter 2016, as ongoing de-bottlenecking activities supported increased production at the Kwinana refinery.

Mincor's care and maintenance program for its Kambalda nickel operations continued in December quarter 2016. Nickel production at First Quantum's Ravensthorpe facility has been lower throughout 2016, due to maintenance and repairs to the high pressure acid leaching circuits. Similarly, own-sourced nickel production at Glencore's Murrin Murrin was 6 per cent lower in 2016, reflecting maintenance throughout the year.

Export volumes and values

The effects of mines and refineries placed on 'care and maintenance' (due to low prices), has been reflected in declining nickel export volumes. In the December quarter, Australia's nickel exports were down 42 per cent year-on-year. In 2016–17, the volume of Australia's nickel exports are forecast to decline by 25 per cent. Nickel export values are also forecast to decline by 25 per cent, to $2.2 billion.

It is anticipated that export volumes will partially recover in 2017–18. Export volumes are projected to grow by a modest 1.5 per cent a year in the five years to 2021–22, while values are projected to grow by an average annual rate of 6.8 per cent to reach $3.1 billion.

Table 13.1: Nickel outlook

World	unit	2016	2017 f	2018 f	2019 z	2020 z	2021 z	2022 z
Production								
– mine	kt	1,990	2,100	2,500	2,605	2,708	2,819	2,932
– refined	kt	1,984	2,008	2,220	2,313	2,404	2,503	2,603
Consumption	kt	2,033	2,116	2,209	2,302	2,394	2,492	2,593
Stocks	kt	554	435	435	435	435	435	435
– weeks of consumption		14.2	10.7	10.2	9.8	9.4	9.1	8.7
Price LME								
– nominal	US$/t	9,599	11,028	12,004	13,424	14,634	15,359	16,120
	USc/lb	435	500	544	609	664	697	731
– real b	US$/t	9,810	11,028	11,745	12,816	13,652	14,025	14,409
	USc/lb	445	500	533	581	619	636	654
Australia	**unit**	**2015–16**	**2016–17 f**	**2017–18 f**	**2018–19 z**	**2019–20 z**	**2020–21 z**	**2021–22 z**
Production								
– mine cs	kt	216	216	253	282	273	267	223
– refined	kt	142	116	119	118	118	118	118
– intermediate	kt	44	39	41	40	40	40	40
Export volume ds	kt	250	187	210	215	214	212	201
– nominal value s	A$m	2,922	2,237	2,686	2,995	3,262	3,464	3,496
– real value es	A$m	2,972	2,237	2,629	2,863	3,043	3,153	3,104

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 2016–17 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

Market summary

The outlook for zinc demand is strong at present, with solid Chinese demand underpinning increased global usage. Mine closures mean that supply continues to struggle to keep up with demand, leading to a drawdown of inventories and a likely rise in prices over the rest of 2017 and into 2018.

Despite improved prospects for zinc demand in Emerging economies in the next five years, mine closures will prevent Australian producers from fully capitalising on these opportunities. Australia's zinc exports are projected to increase slightly, to 1,150,000 tonnes by 2021–22. Export revenue forecasts for 2016–17 remain virtually unchanged at $2.2 billion. Although export quantities are constrained, price changes are expected to see Australia's zinc export values grow at an average annual rate of 3.9 per cent, to reach $2.6 billion (2016–17 dollars) in 2021–22.

Price and stocks

Zinc prices have surged due to supply constraints and higher demand

The LME zinc price averaged US$2,091 a tonne in 2016, 8 per cent higher than 2015. The LME zinc price started under $2,000 a tonne, but rose strongly through the year, reaching over $US2,700 a tonne by the end of the year.

A substantial increase in Shanghai Future Exchange (SHFE) stocks at the start of 2017 came as a surprise. Global stocks are expected to decline in 2017, given the production shortfall expected. Uncertainty prevails regarding the magnitude of zinc stocks being held outside of exchange warehouses.

The zinc price is expected to rise over the rest of 2017, in line with changes to global fundamentals, averaging over US$2,700 a tonne for the year.

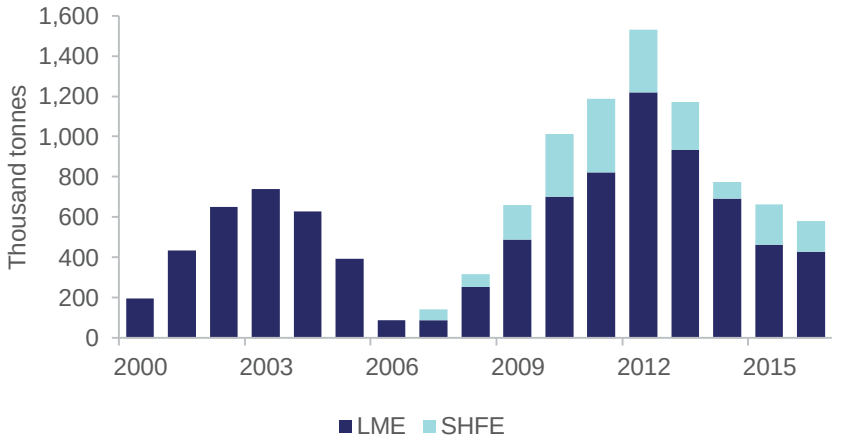
In 2018, prices will be supported by constrained production and modest consumption growth in the automobile and infrastructure sectors.

The responsiveness of producers to recent high prices presents a significant risk to the outlook. If prices stay strong, production at existing operations, particularly in China, will increase substantially.

Figure 14.1: Zinc price, monthly average

Source: LME (2016) *Zinc spot price.*

Figure 14.2: Zinc stocks, annual



Source: LME (2016) *Zinc closing stock*; SHFE (2016) *Zinc deliverable stocks.*

World consumption

Automobile and infrastructure sectors to support consumption growth

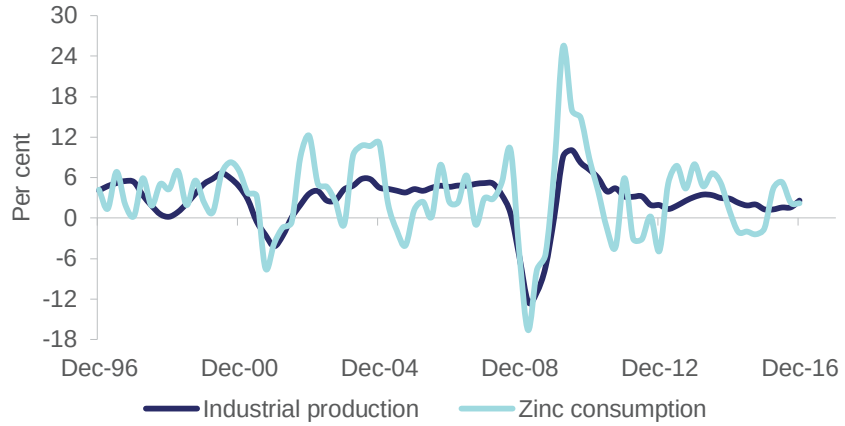
Refined zinc consumption was virtually unchanged in 2016, at 14.0 million tonnes. Growth is expected to resume in 2017, due to renewed demand in China — which currently consumes about half the world's refined zinc. Further out, consumption is projected to increase at an average annual rate of 2.1 per cent, to reach 15.8 million tonnes in 2022.

More than half of the world's zinc product is used to galvanise steel for construction. As Emerging economies industrialise further, urbanise and generally improve their living standards, there will be increased development of public and residential buildings, and the adoption of better quality construction practices and materials. Steel lasts 12 times longer when galvanised, and the corrosion resistant property of galvanised steel will become an increasingly important issue over the medium term, particularly in areas with high air pollution.

Consumer spending on high value, zinc intensive goods, is also expected to increase, driven by rising household incomes in China and India in particular. Higher incomes, combined with projected low fuel prices, are also expected to support a rapid increase in automobile production and sales. The rates of car ownership in Emerging economies are relatively low. Where the US has around 800 cars per 1,000 people, China has around one-quarter of this, while India has less than one-twentieth. While increased car usage in these countries is likely to support zinc demand, there is also an increased drive for fuel efficiency in light of growing pollution in urban areas. This may increase aluminium substitution in vehicles, which would lower demand for steel and zinc (which is used to galvanise steel).

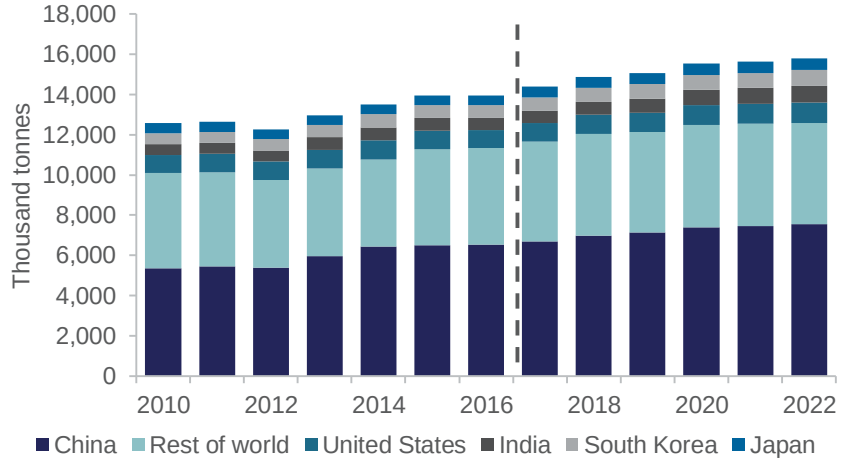
Efforts to reduce urban pollution are also driving investment in mass transit systems in China: this is likely to raise zinc consumption. Zinc is used to improve corrosion resistance in train carriage bodies and rails. In India, corrosion currently reduces the life of rail by half, and interferes with daily operations, as tracks need regular replacement. India's Government plans to invest $142 billion to expand and modernise the country's railway system over the next 5 years. China is investing $US117 billion in rail infrastructure in 2017 alone.

Figure 14.3: Global industrial production and zinc consumption, year-on-year growth



Source: International Lead Zinc Study Group (2017); Bloomberg (2017) Netherlands CPB

Figure 14.4: World zinc consumption by country, annual



Source: International Lead Zinc Study Group (2017), Department of Industry, Innovation and Science (2017).

World production

World mine output stable in 2016 , but good prospects for future growth

In 2016, zinc mine production rose to 13.7 million tonnes. Increased production at existing mines was largely offset by the scaling back or closure of operations — owing to ore depletion at major mines. World zinc mine output is forecast to remain constrained in the short term because of reduced production, continued closures and the curtailment of previous expansion plans (due to earlier softness in global prices).

Over the forecast period, zinc mine production is projected to grow at an average annual rate of 2.5 per cent, to reach 16.0 million tonnes in 2022.

Refined production constrained by mined supply

Refined zinc production was largely steady in 2016 at 14.3 million tonnes. Production was constrained to some extent by mine closures and the suspension of smelter operations due to operational issues (including difficulties in accessing concentrates). However, this was offset by the commissioning of new refined zinc capacity, primarily in China.

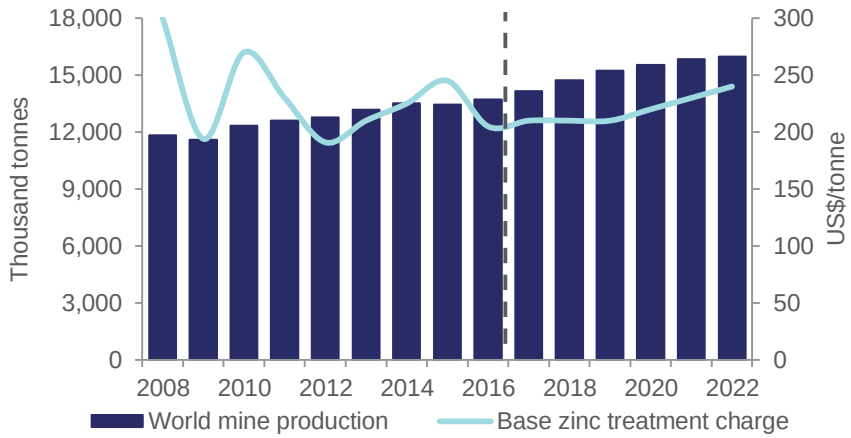
Over the medium term, refined zinc production is projected to increase at an average annual rate of 1.9 per cent a year, to 15.9 million tonnes in 2022. A factor supporting this growth is expected higher output at newly built zinc smelters in China. Production growth will be moderated by constrained mined supply, with some smelters operating at below capacity due to the difficulty of obtaining feedstock.

Australia's exploration, production and exports

Australian mined production forecast to decrease due to ore depletion and low prices

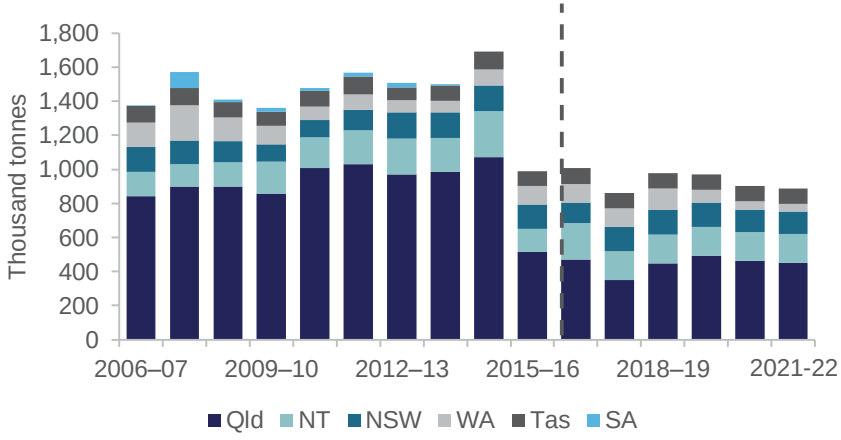
Australia's mined zinc production is forecast to edge up slightly, to 1,010,000 tonnes in 2016–17.

Figure 14.5: World mine production and base treatment charge



Source: AME Group (2017); International Lead and Zinc Study Group (2017).

Figure 14.6: Australian mine production volumes



Source: ABS (2017) Mineral and Petroleum Exploration 8412.0; LME (2017) Zinc spot price.

Australia's mine production is subsequently projected to edge up marginally, reaching 1,148,000 tonnes in 2021–22. New mines scheduled for completion — including MMG's Dugald River, KBL's Sorby Hills and Independence Group's Stockman operation — will offset planned closures of Endeavour, Cannington, Golden Grove and Jaguar, as they reach the end of their operating life.

The prospect of higher prices sustains exploration expenditure

Australia's expenditure on zinc, lead and silver exploration decreased by 9 per cent in 2016, totalling $46.5 million over the year. Although expenditure remains relatively low, there was a notable rise in the December quarter (to $13.4 million).

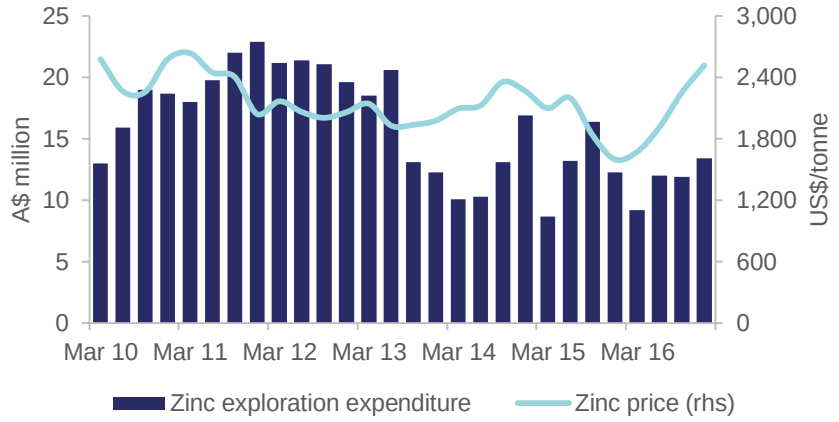
Australia's zinc exports constrained despite emerging opportunities

The projected increase in zinc consumption in Emerging economies, and tightening availability of mined zinc, will support strong demand for Australia's exports. Despite these opportunities, Australia's export capacity will be constrained by the capacity of the remaining mines — the closure of MMG's 500,000 tonne Century mine in early 2016 lowered the ceiling for potential exports.

Export volumes remain constrained, but values have risen

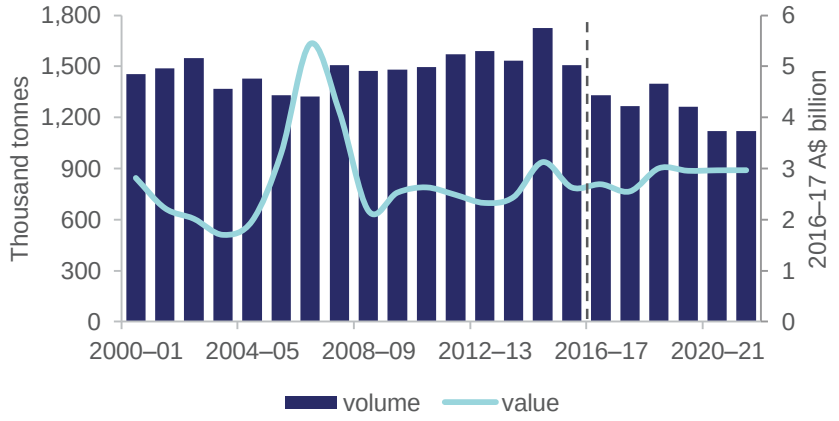
Australia's zinc export volumes are projected to decline as a result of falls in domestic production, dropping to 1,140,000 tonnes (metallic content) in 2021–22. However, strong growth in prices is expected to support export earnings, with $2.6 billion in revenue expected in 2016–17, growing to almost $3 billion by 2021–22.

Figure 14.7: Australia's zinc exploration expenditure vs price



Source: Company reports; Department of Industry, Innovation and Science (2016).

Figure 14.8 Australia's zinc export volumes and values



Source: ABS (2017) *International trade 5465.0;* Department of Industry, Innovation and Science (2016).

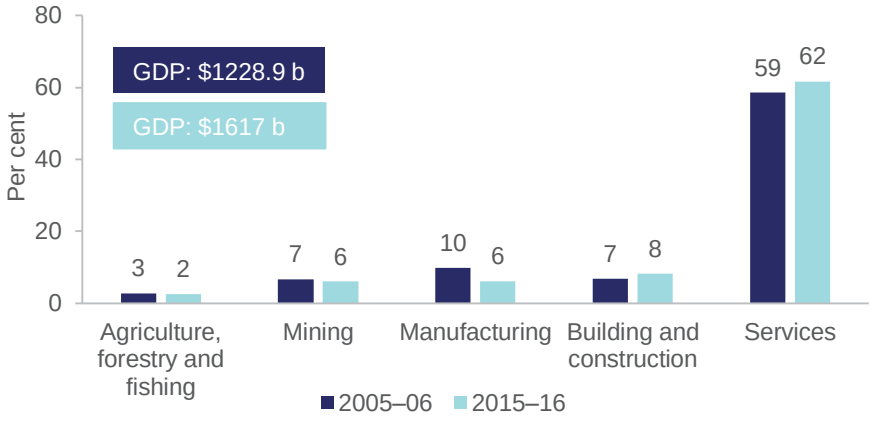
Table 14.1: Zinc outlook

World	unit	2016	2017f	2018f	2019z	2020z	2021z	2022z
Production								
– mine	kt	13,734	14,144	14,732	15,232	15,524	15,844	15,965
– refined	kt	14,250	14,535	15,006	15,349	15,619	15,920	15,920
Consumption	kt	13,968	14,577	14,880	15,075	15,438	15,634	15,797
Stocks	kt	1,884	1,842	1,968	2,242	2,423	2,708	2,830
– weeks of consumption		7.0	6.6	6.9	7.7	8.2	9.0	9.3
Price LME								
– nominal	US$/t	2,098	2,720	2,723	2,560	2,480	2,450	2,420
	USc/lb	95	123	123	116	112	111	110
– real b	US$/t	2,144	2,720	2,664	2,444	2,314	2,237	2,163
	USc/lb	97	123	121	111	105	101	98
Australia	**unit**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-21**
Mine output	kt	1,155	1,010	1,059	1,064	1,066	1,082	1,114
Refined output	kt	459	469	509	509	506	503	503
Export volume								
– ore and conc. c	kt	2,222	1,669	1,673	1,853	1,885	1,882	1,902
– refined	kt	497	395	459	458	455	455	455
– total metallic content	kt	1,507	1,329	1,268	1,397	1,262	1,120	1,140
Export value								
– nominal	A$m	2,628	2,691	2,552	3,005	2,955	2,964	2,966
– real d	A$m	2,672	2,691	2,498	2,804	3,368	3,293	3,270

*Notes: **b** In 2017 calendar year US dollars; **c** Quantities refer to gross weight of all ores and concentrates; **d** In 2016–17 financial year Australian dollars; **f** Forecast; **s** Estimate; **z** Projection.*
Source: ABS (2017) International Trade, 5465.0; Company reports; Department of Industry, Innovation and Science; International Lead and Zinc Study Group (2017); LME (2017); World Bureau of Metal Statistics (2017).

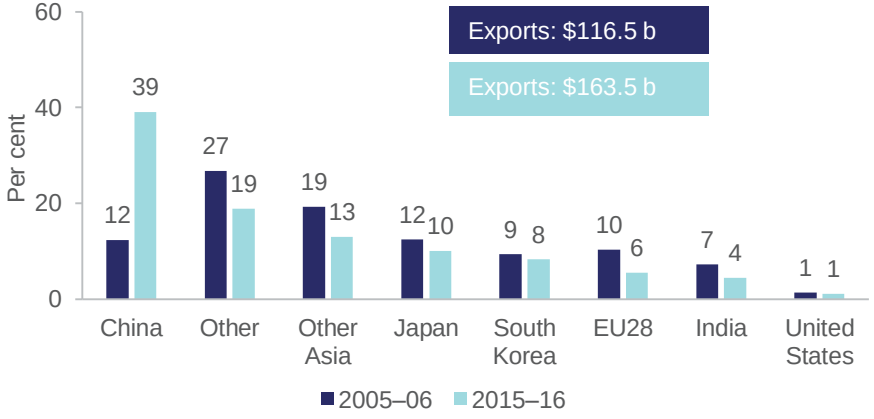

Trade summary charts

Figure 15.1: Contribution to GDP



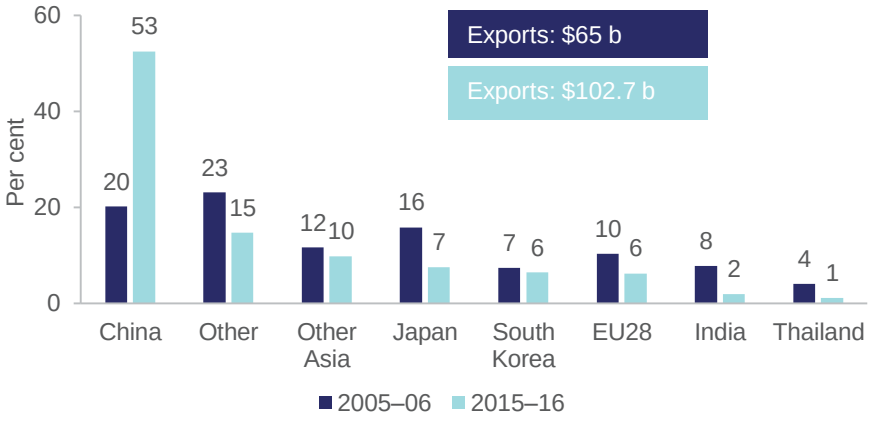
Source: ABS(2016) Australian National Accounts, National Income, Expenditure & Production, 5204.0

Figure 15.2: Principal markets for Australia's resources and energy exports, 2016–17 dollars



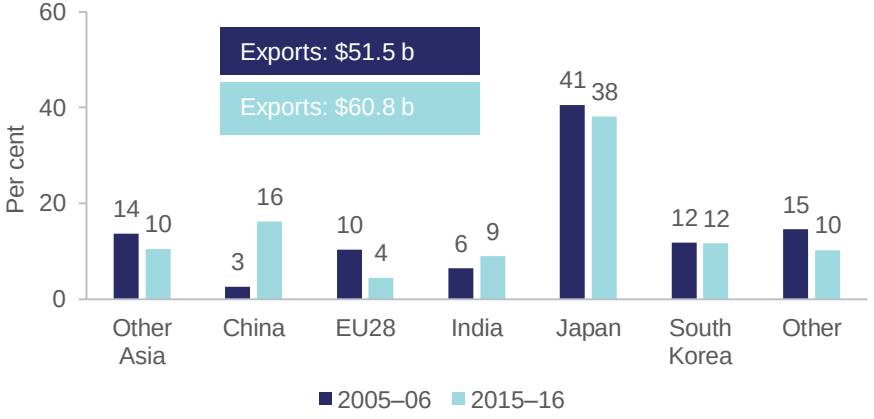
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 15.3: Principal markets for Australia's resources exports, 2016–17 dollars



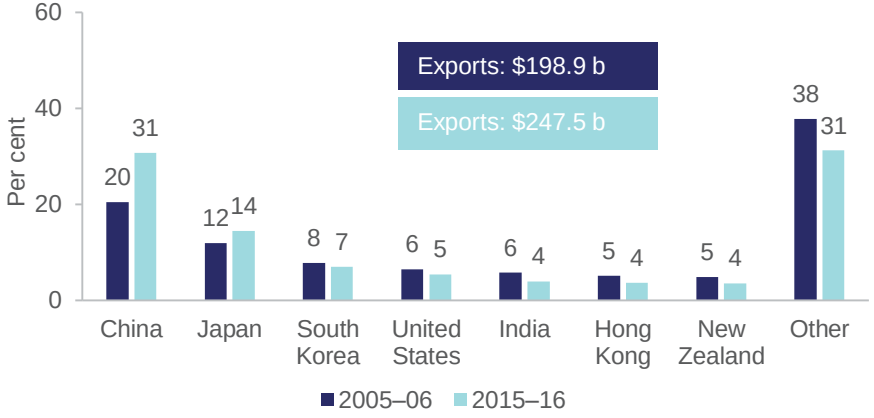
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 15.4: Principal markets for Australia's energy exports, 2016–17 dollars



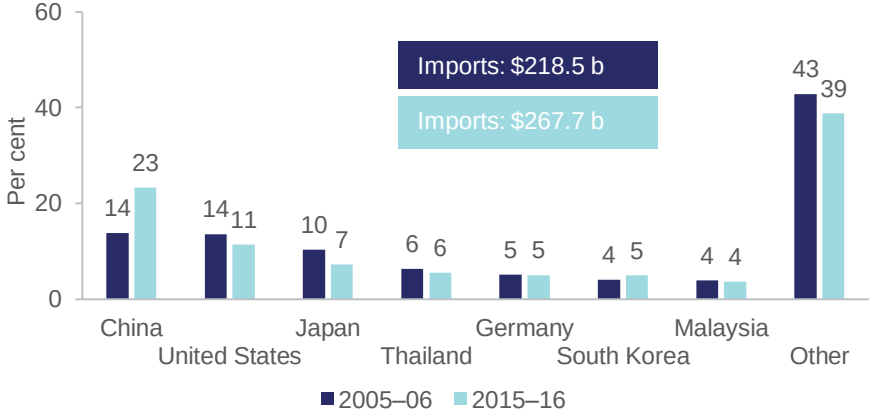
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 15.5: Principal markets for Australia's total exports, 2016–17 dollars



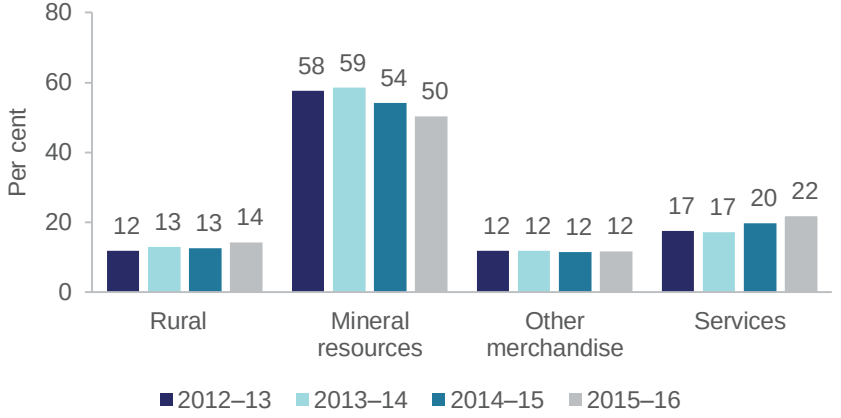
Source: ABS (2017) International Trade in Goods and Services, 5368.0

Figure 15.6: Principal markets for Australia's total imports, 2016–17 dollars



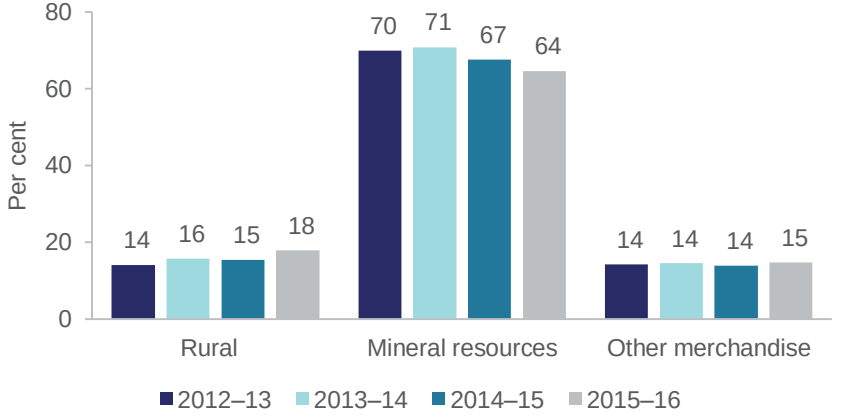
Source: ABS (2016) International Trade in Goods and Services, 5368.0

Figure 15.7: Proportion of goods and services exports by sector



Source: ABS (2017) Balance of Payments and International Investment Position, 5302.0

Figure 15.8: Proportion of merchandise exports by sector



Source: ABS (2016) Balance of Payments and International Investment Position, 5302.0

Table 15.1: Principal markets for Australia's thermal coal exports, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
Japan	$m	9,053	8,331	8,043	7,320	6,958
South Korea	$m	3,234	2,913	2,893	2,752	2,565
China	$m	3,078	3,118	3,623	2,821	1,762
Taiwan	$m	2,002	1,793	1,732	1,822	1,602
Malaysia	$m	392	292	361	602	499
Thailand	$m	188	255	302	281	319
Total	**$m**	**18,961**	**17,455**	**17,518**	**16,567**	**15,001**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.2: Principal markets for Australia's metallurgical coal exports, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
India	$m	7,118	4,941	5,045	5,171	4,690
Japan	$m	9,718	6,415	5,767	4,757	4,435
China	$m	3,947	4,960	6,142	4,922	3,941
South Korea	$m	4,220	2,617	2,577	2,454	2,123
Taiwan	$m	2,024	1,243	1,221	1,175	988
Netherlands	$m	1,396	1,047	1,053	858	930
Total	**$m**	**33,820**	**24,164**	**24,385**	**22,489**	**20,125**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.3: Principal markets for Australia's crude oil and refinery feedstocks, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
China	$m	3,440	2,122	5	27	717
Thailand	$m	1,075	879	1,713	1,300	706
Singapore	$m	2,312	2,390	2,071	1,875	640
South Korea	$m	1,291	1,666	667	1	457
Indonesia	$m	577	324	324	34	360
United States	$m	338	197	0	169	210
Total	**$m**	**13,177**	**11,252**	**11,655**	**8,924**	**5,537**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.4: Principal markets for Australia's LNG, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
Japan	$m	12,193	13,770	15,787	14,759	10,710
China	$m	677	643	669	1,348	2,989
South Korea	$m	292	677	460	980	1,707
Malaysia	$m	0	0	0	115	191
Chinese Taipei	$m	2	281	182	42	163
Total	**$m**	**13,164**	**15,371**	**17,098**	**17,418**	**16,856**

Source: ABS (2017) International Trade in Goods and Services, 5368.0; International Trade Centre (2017) International trade statistics 2001–2016

Table 15.5: Principal markets for Australia's iron ore exports, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
China	$m	47,881	45,171	59,803	43,408	39,432
Japan	$m	11,980	9,280	10,134	6,904	4,761
South Korea	$m	7,124	5,307	6,394	4,172	3,105
Taiwan	$m	1,977	1,612	1,793	1,337	1,039
Indonesia	$m	0	0	116	220	184
India	$m	0	51	43	112	6
Total	**$m**	**69,066**	**61,475**	**78,303**	**56,208**	**48,608**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.6: Principal markets for Australia's aluminium exports, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
South Korea	$m	645	730	714	792	1,134
Japan	$m	1,457	1,081	1,168	1,502	709
Taiwan	$m	410	491	465	504	303
Thailand	$m	361	393	318	295	273
China	$m	209	161	244	52	95
Indonesia	$m	333	268	205	142	96
Total	**$m**	**4,183**	**3,529**	**3,648**	**3,941**	**3,296**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.7: Principal markets for Australia's copper exports, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
China	$m	2,750	3,271	4,130	3,758	3,647
Japan	$m	1,637	1,739	1,703	2,051	1,452
Malaysia	$m	773	729	641	543	628
India	$m	1,599	1,195	991	828	522
South Korea	$m	948	472	613	377	499
Philippines	$m	21	151	299	265	225
Total	**$m**	**9,365**	**8,664**	**9,130**	**8,731**	**8,248**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.8: Principal markets for Australia's gold exports, 2016–17 dollars

	unit	2011–12	2012–13	2013–14	2014–15	2015–16
China	$m	4,695	6,447	8,477	7,169	8,913
United Kingdom	$m	4,982	2,818	671	601	4,005
Hong Kong	$m	180	119	158	195	2,567
Singapore	$m	1,236	1,018	2,384	3,210	1,216
Thailand	$m	1,770	1,369	466	925	258
Switzerland	$m	37	308	361	15	88
Total	**$m**	**17,033**	**16,217**	**13,643**	**13,452**	**15,952**

Source: ABS (2017) International Trade in Goods and Services, 5368.0

Table 15.8: Spot prices, nominal quarterly average

	unit	Sep-16	Dec-16	Mar-17 f	Jun-17 f	Sep-17 f	Dec-17 f	Mar-18 f	Jun-18 f
Alumina fob Australia	US$/t	234	305	298	276	267	293	299	287
Aluminium LME cash	US$/t	1,620	1,710	1,713	1,666	1,653	1,727	1,764	1,766
Copper LME cash	US$/t	4,774	5,281	5,844	6,080	5,870	5,723	5,648	5,558
Gold LBMA PM	US$/t	1,335	1,218	1,215	1,190	1,197	1,203	1,222	1,238
Iron ore fob Australia a	US$/t	53	64	79	68	59	55	52	52
Nickel LME cash	US$/t	10,265	10,810	10,300	11,186	11,272	11,352	11,731	11,889
Zinc LME cash	US$/t	2,253	2,541	2,680	2,750	2,700	2,750	2,740	2,740
LNG fob b	US$/MMBtu	5.8	6.3	6.7	7.5	7.7	7.9	8.0	8.1
Metallurgical coal c	US$/t	137	268	170	155	152	150	141	137
Thermal coal fob Newcastle 6000 kc	US$/t	66	93	80	77	75	75	75	70
Crude oil (WTI)	US$/bbl	46	50	54	56	57	58	59	59
Crude oil (Brent)	US$/bbl	45	49	53	55	56	57	58	58
Uranium d	US$/t	25	19	25	25	27	28	30	30

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*

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 15.9: Australia's export values, quarterly nominal

	unit	Sep-16	Dec-16	Mar-17 f	Jun-17 f	Sep-17 f	Dec-17 f	Mar-18 f	Jun-18 f
Iron ore	$m	13,496	16,271	22,123	19,809	17,477	16,415	14,750	15,201
Gold	$m	5,199	4,377	3,784	3,969	4,020	4,040	4,332	4,387
Copper	$m	1,751	2,006	2,037	2,270	2,346	2,202	2,158	2,116
Alumina	$m	1,405	1,553	1,538	1,424	1,377	1,513	1,545	1,480
Aluminium	$m	803	862	853	830	823	860	878	877
Zinc	$m	490	706	760	735	651	638	621	642
Bauxite	$m	266	258	268	268	268	273	273	286
Nickel	$m	40	62	124	136	138	141	168	172
Other resources	$m	3,866	3,951	3,755	4,138	4,016	4,216	3,786	4,128
Total resources	**$m**	**27,314**	**30,046**	**35,241**	**33,578**	**31,115**	**30,298**	**28,512**	**29,289**
Metallurgical coal	$m	5,498	8,820	12,613	9,643	9,149	8,868	7,325	7,472
Thermal coal	$m	3,885	5,234	4,627	5,175	5,179	5,291	4,921	4,547
LNG	$m	4,605	5,532	6,368	7,149	8,485	9,272	9,039	9,322
Crude oil	$m	1,326	1,487	1,629	1,688	1,945	2,174	2,142	2,102
Uranium	$m	213	224	234	236	238	242	258	258
Other energy	$m	620	746	643	729	623	636	588	674
Total energy	**$m**	**16,147**	**22,043**	**26,114**	**24,620**	**25,619**	**26,483**	**24,272**	**24,375**
Total resources and energy	**$m**	**43,462**	**52,089**	**61,355**	**58,198**	**56,734**	**56,781**	**52,783**	**53,665**

Notes: ***f*** *Forecast*

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 16.1 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.

Real dollars

In this report, all value and price data (unless otherwise specified) is in real 2016–17 Australian dollars or real 2017 US dollars. The conversion from nominal to real dollars is based on the Australian and US consumer price indexes.

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 from Australian to US dollars 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.

Table 16.1: 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)