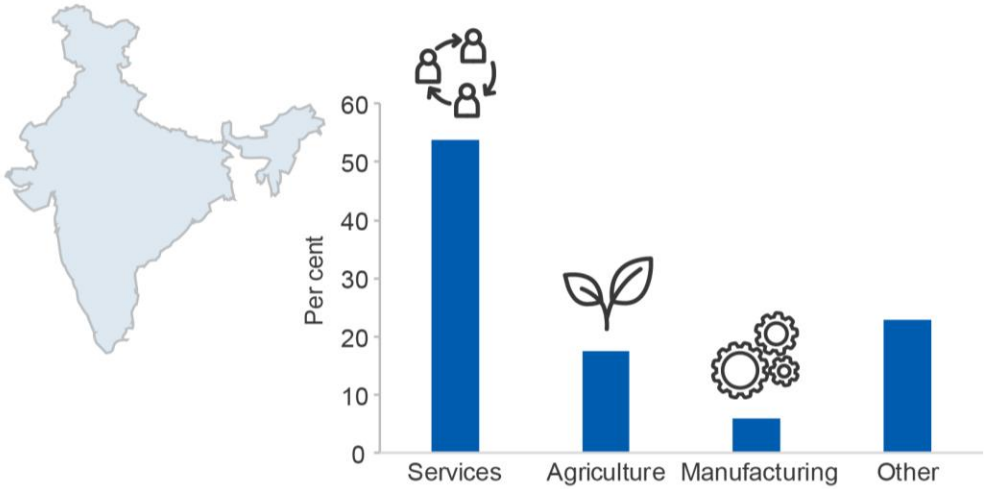
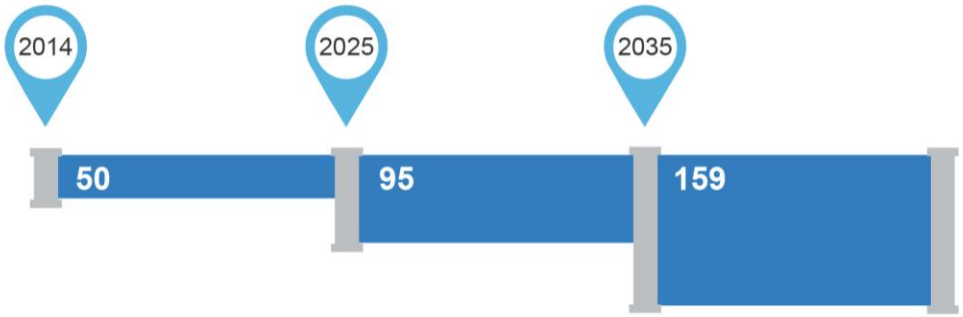
India – the other population superpower

Resources and Energy Quarterly September 2017

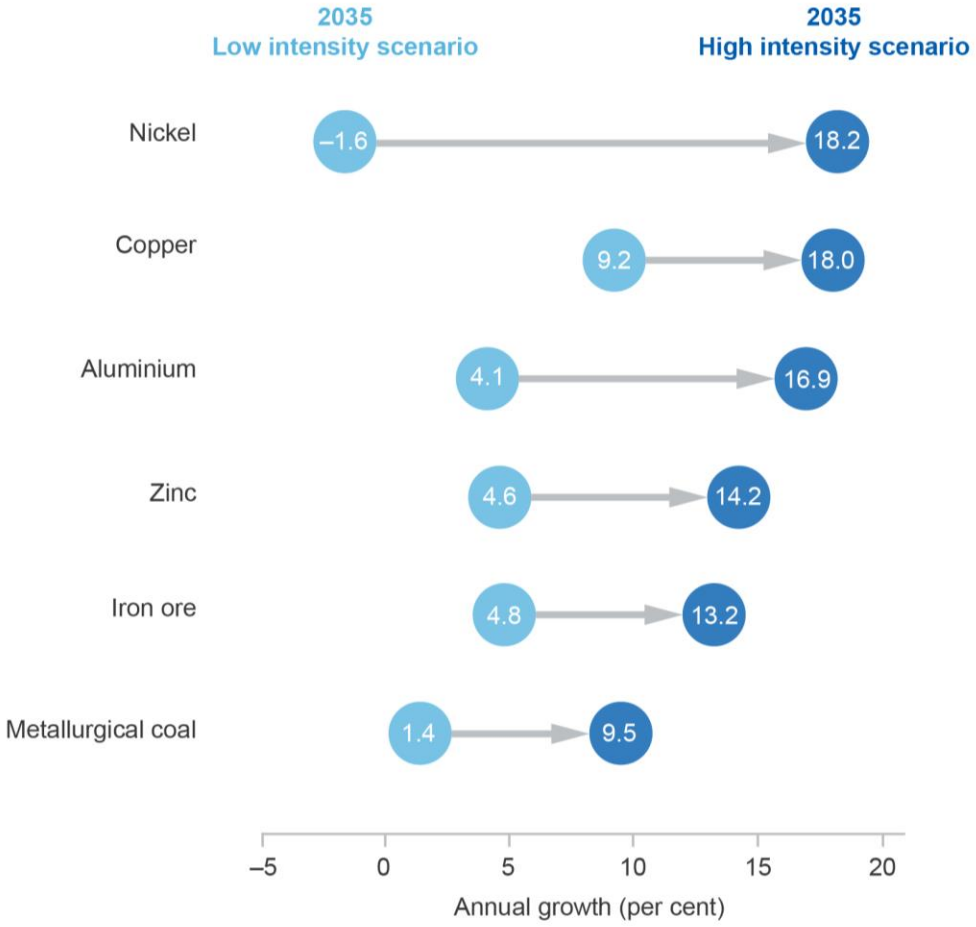
India's GDP by industry share



India's projected gas consumption (billion cubic meters)



At what rate will India's commodity use grow?



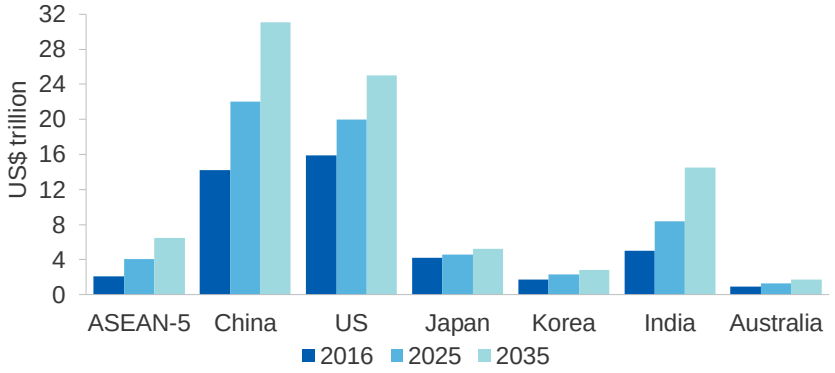
India — prospects for resource commodity usage

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

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

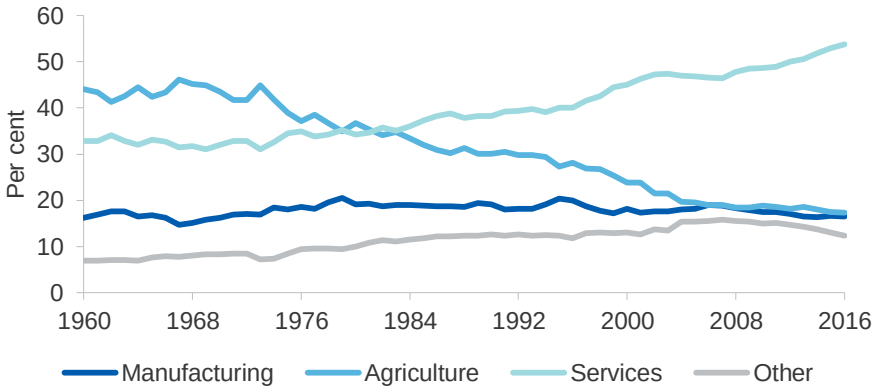
As well as being a large consumer of some resource commodities, India is also a significant producer — and holds large reserves — of some of those resource commodities. For example, State-owned Coal India is the world's largest coal producing entity; however, India's coal reserves are of relatively low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

Figure 15.1: GDP



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

Figure 15.2: India — industry share of GDP



Source: World Bank (2017) World Development Indicators

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

Economic and political context

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

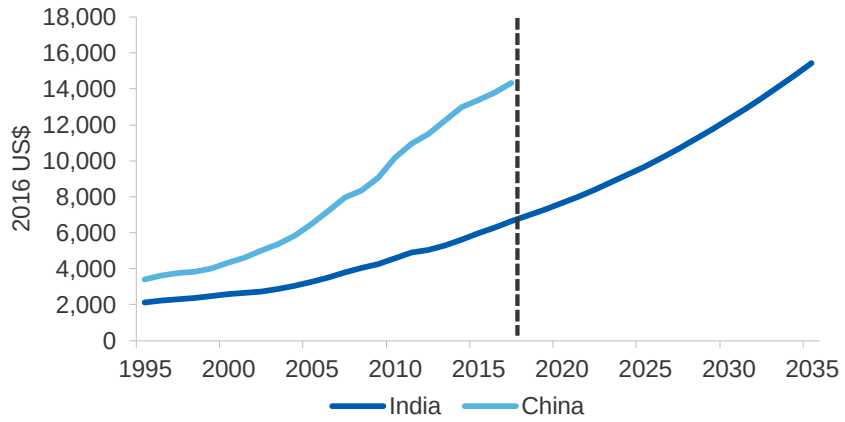
India is a rapidly growing, middle-income country; Indian GDP per capita was around $US6,600 in 2016 — roughly equalling China's level of GDP per capita in 2005. Like many other middle-income nations, India's economy is largely services based. The *financial, real estate professional services* and *trade,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

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

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

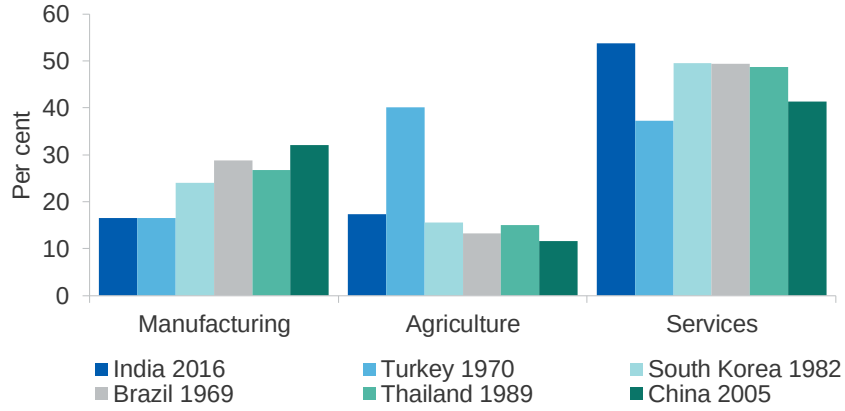
2. *Between 1995 and 2015, the urban population of China rose by over 400 million, or 22 million persons per year*

Figure 15.3: Gross Domestic Product per capita



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

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



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

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

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

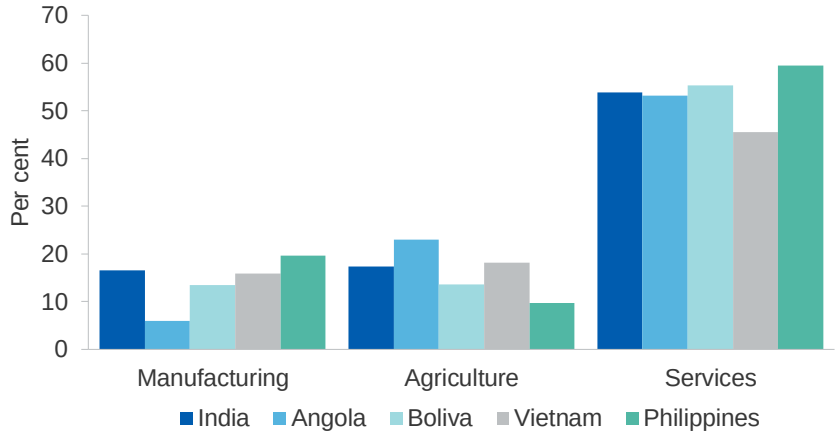
It is likely that India's construction and manufacturing sectors will largely determine India's overall demand for metals and the commodities used to make them. As middle-income nations develop, they typically invest heavily in construction (to spur infrastructure development), and in manufacturing,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

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

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

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

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



Source: World Bank (2017) World Development Indicators

India's desire for self sufficiency

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

India is committed to growing its manufacturing industry

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

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

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

Ambitious plans to boost infrastructure spending

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

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

Metals intensity

Metals usage rises as middle-income countries like India develop

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

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

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

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

The intensity of metal consumption varies noticeably across nations

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

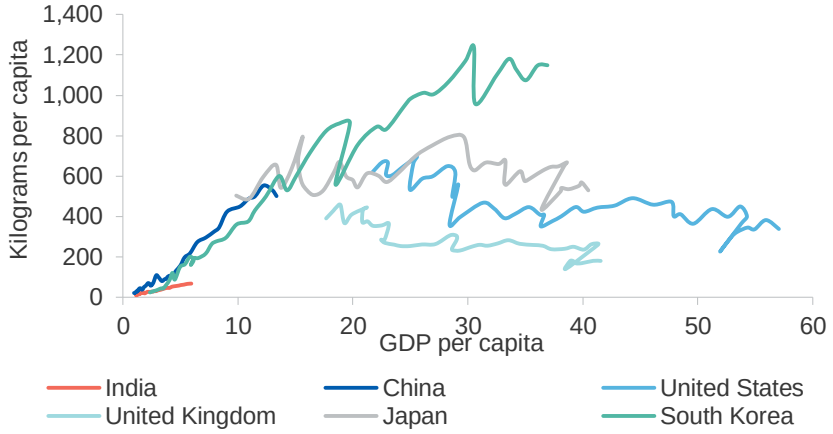
One reason for the strong metal consumption of East Asia is that globalisation has driven a shift in manufacturing activity toward East Asia and away from the rest of the world in recent decades. This trend appears to have impacted other middle-income nations more than high-income nations in Western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

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

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

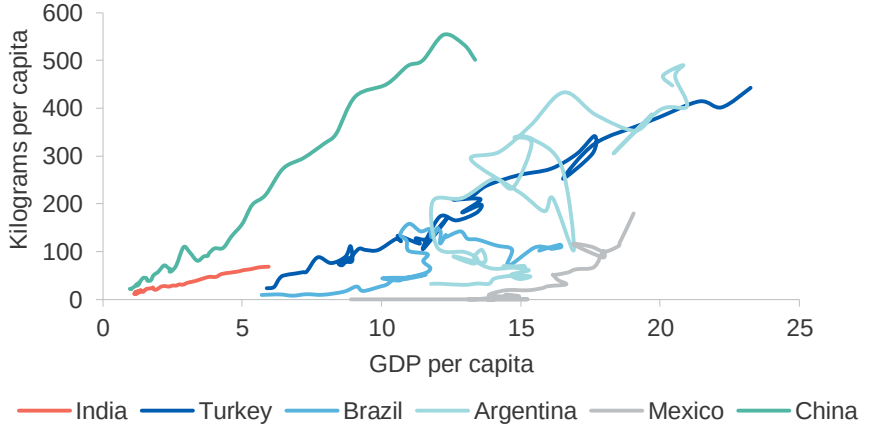
Nickel, which is mainly used to make stainless steel, is a late development cycle metal. Stainless steel has many applications, including various household items, industrial equipment, surgical instruments, and as an automotive and aerospace structural alloy. Similarly, aluminium — mainly used in manufacturing,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

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



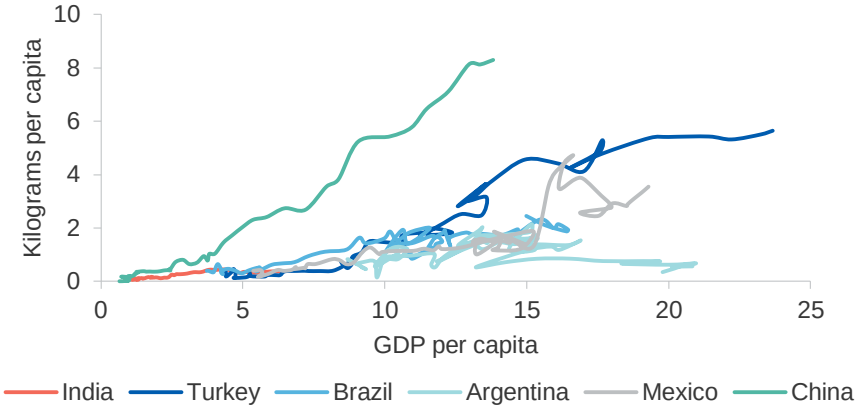
Source: World Steel Association; The Conference Board (2017) Total Economy Database

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



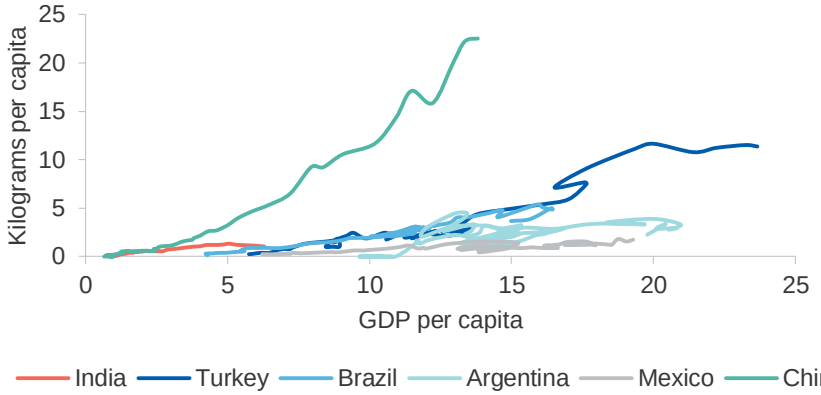
Source: World Steel Association; The Conference Board (2017) Total Economy Database

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



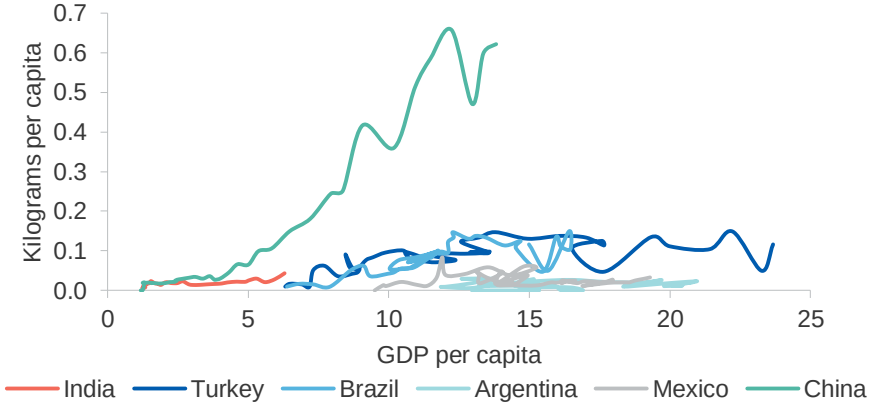
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

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



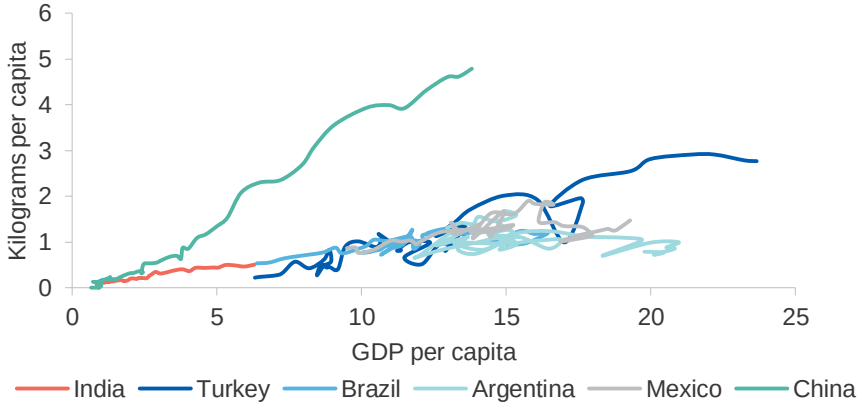
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

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



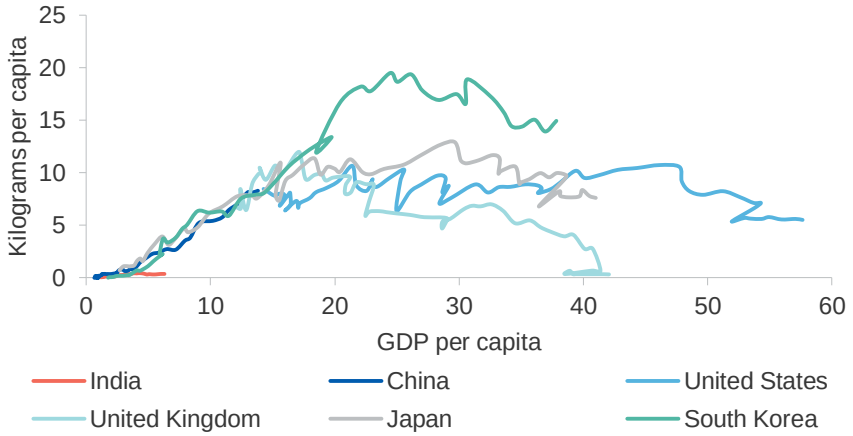
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

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



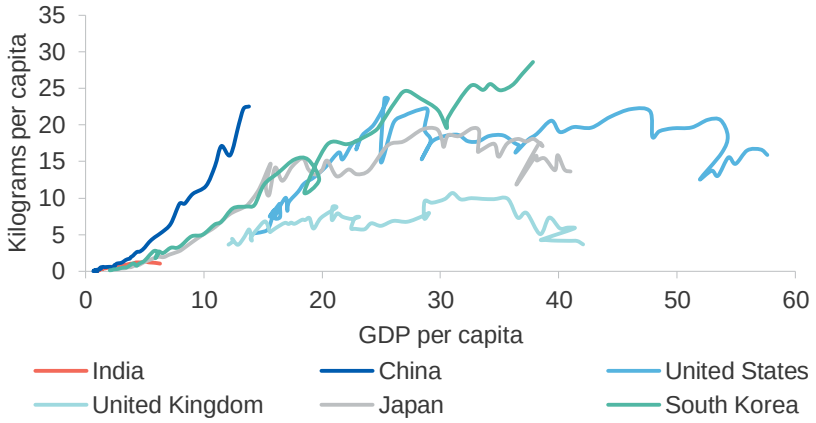
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

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



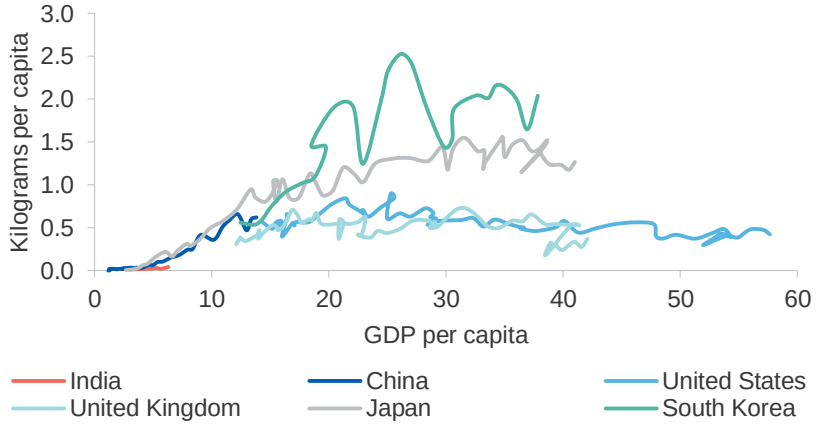
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

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



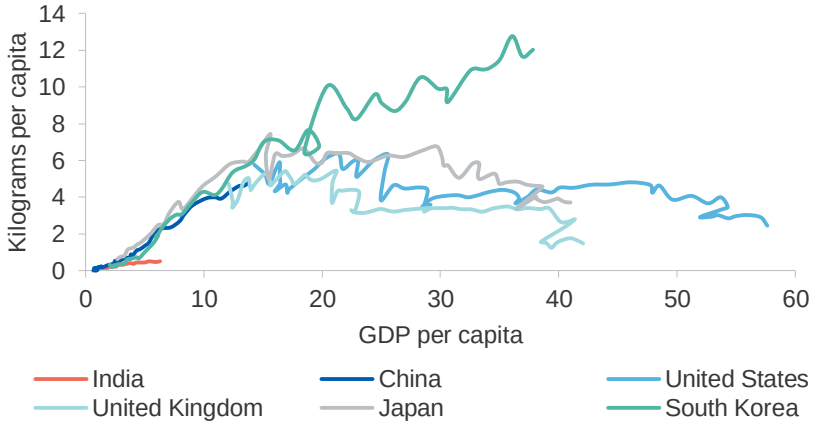
Source: World Bureau of Metal Statistics; The Conference Board (2017) Total Economy Database

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



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

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



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

Overview of India's commodity consumption

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

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

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

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

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

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

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

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

Prospects by commodity

1. Iron ore

India's iron ore production depends largely on government policy

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

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

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

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

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

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

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

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

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

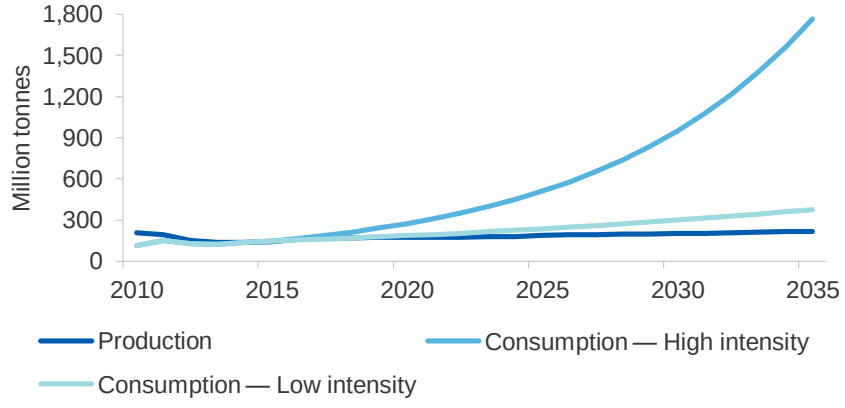
There are opportunities for growth in Australia's iron ore exports to India

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

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

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

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



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

2. Aluminium

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

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

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

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

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

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

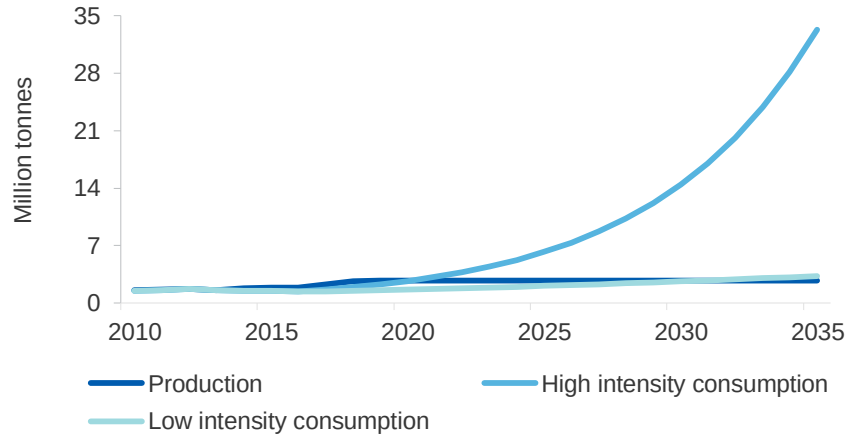
Australia's aluminium exports to India are small in quantity

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

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

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

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



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

3. Copper

Consumption set to rise

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

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

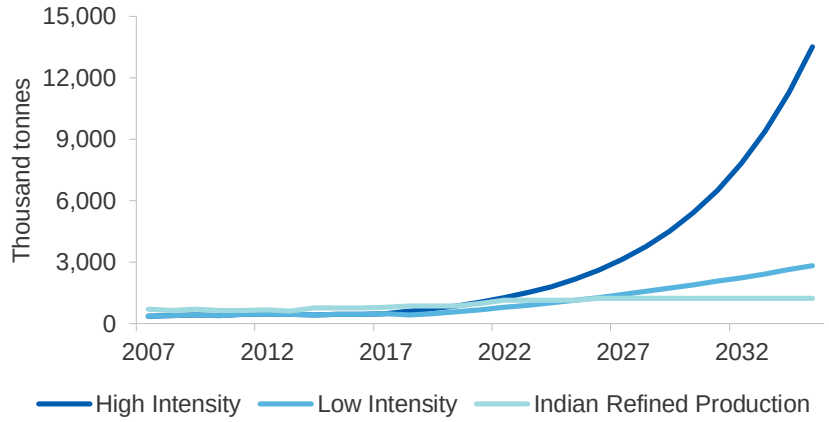
India has historically consumed far less copper than China. In 1995, India consumed 13 per cent of China's total copper consumption; in 2016, this figure was just 4 per cent. The high intensity copper consumption projection for India (of 13,536,000 tonnes) is modeled on China's growth in copper consumption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

Production projected to rise to 2026, then plateau

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

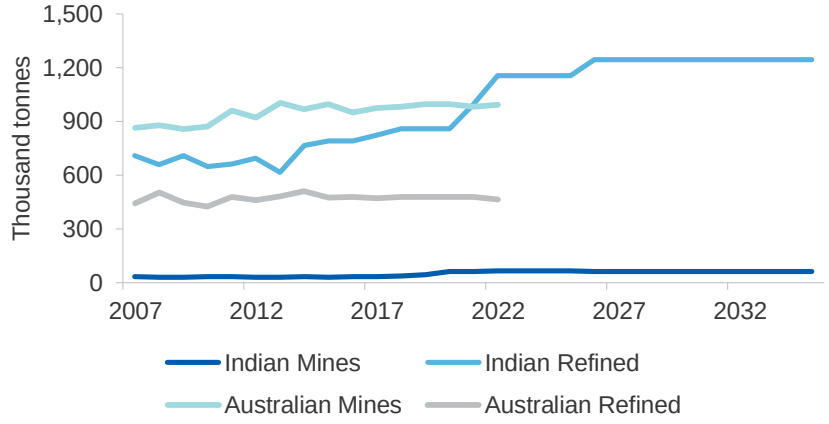
Lack of domestic supply obliges India to import most of its copper ores and concentrates. So there are likely to be major opportunities for Australian copper ore and concentrate producers over the coming two decades. In 2015–16, India was Australia's third largest export destination for copper ores and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

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



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

Figure 15.19: Mine and refined copper production



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

Energy use in India

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

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

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

4. Thermal coal

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

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

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

Table 15.2: IEA's coal demand projections for India

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

Source: IEA World Energy Outlook, 2017

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

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

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

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

The import outlook remains highly uncertain

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

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

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

India currently has 29 operating HELE coal-fired power plants, with a further 29 under construction and 106 planned. To realise the full benefits and efficiencies of HELE power plants (including reduced air pollution), high-energy coal is required. India's indigenous coal supply consists of mainly low quality (low energy, high ash) coal.

India's Draft National electricity plan projects a rapid move to renewable power. Nevertheless, it forecasts that by 2021–22, India will require anywhere between 727 to 797 million tonnes of coal, varying depending on the quantity of renewable energy (which is expected to be between 125–175 GW). By 2026–27, the plan projects installed capacity of renewable energy of 275 GW, and a coal requirement of 901 million tonnes for power generation needs. The same plan projects 50 million tonnes in coal imports under every renewable energy scenario in 2021–22 and 2026–27.To put this in context, India's thermal coal imports have grown at an average annual rate of 32 per cent between 2004 and 2014, before declining to 152 million tonnes in 2016.

Australia could be a significant exporter of thermal coal to India, but many variables are in play

India's projections for cuts in imports to 50 million tonnes are likely to face headwinds, given India's thermal coal import history, the relatively low quality of its domestic coal reserves, and the increase in the number of HELE power plants in operation over the next 10 years.

Should India succeed in cutting imports to 50 million tonnes — and making those imports high quality coal — Australia should be very well placed to meet the majority of this demand. Investment in the large Carmichael mine in Australia's Galilee Basin by India's Adani power conglomerate may also play a role.

Australia will not be the only exporter vying for more market share in India. South Africa, which also holds high energy coal reserves, exported 35 million tonnes of thermal coal to India (24 per cent) in fiscal 2016–17, and may play a larger role out to 2026–27. India is also a large importer of Indonesian thermal coal. In fiscal 2016–17, Indonesia supplied 65 per cent of India's total thermal coal (or 97 million tonnes).

However, Indonesian coal by itself (with no blending with high energy content coal) is generally not of sufficient quality to provide the best option for HELE plants. Indonesia could also move to raise the Domestic Market Obligation requirement, under which an increasing amount of domestic production would be forcibly retained for domestic usage.

The coastal location of many of India's coal fired power plants improves the competitiveness of imports across the board, but given the number of variables at play, the ultimate magnitude of growth in imports is difficult to predict.

5. Metallurgical coal

India will need high quality metallurgical coal for its infrastructure needs

India's metallurgical coal demand is projected to increase significantly between 2017 and 2035, driven by infrastructure needs, economic growth, and a prospering steel sector. The majority of metallurgical coal demand is expected to be met through imports, since India possesses few high quality metallurgical coal reserves. India currently produces roughly 20 per cent of its metallurgical coal needs and imports the remaining 80 per cent (roughly 80 million tonnes in 2016). The majority (80 per cent) of these imports come from Australia.

Opportunities exist for Australian exports

Under a high-intensity scenario, India is projected to go from consuming 104 million tonnes of metallurgical coal in 2016 to 619 million tonnes in 2035. Under the low intensity scenario, demand is projected to rise to 134 million tonnes. Under the low intensity scenario, it is projected that at least 70 to 80 per cent of India's demand will be met by imports in 2035, and that Australia could continue to maintain the largest share of India's imports at around 80 per cent (roughly 86 million tonnes). India is looking to diversify its sourcing of metallurgical coal, to ensure supply reliability — impacted in recent months by Cyclone Debbie in Australia.

The high intensity scenario does not take into account substitutes for metallurgical coal in the steel making process — the Indian Government is reported to be undertaking research and development to reduce the use of metallurgical coal in steel production in the longer term. Ignoring this, under a high intensity scenario, Australia would need to export roughly 396 million tonnes to maintain its current market-share level of 64 per cent of India's total metallurgical imports. This would require current Australian production levels to double.

According to AME, Australia's exports of metallurgical coal are projected to grow at an average annual rate of 2.3 per cent between 2022 and 2030, suggesting Australia's metallurgical coal export capacity could increase to 275 million tonnes in 2030. Assuming an average annual growth rate of 2.3 per cent between 2030 and 2035, Australia could be exporting up to 309 million tonnes by 2035. Provided Australia exported metallurgical coal solely to India, this 309 million tonnes of metallurgical coal exports would represent only 50 per cent of India's metallurgical coal imports under a 'high intensity' scenario.

6. Uranium

Nuclear power generation is expected to expand strongly over time

India has significant plans underway to diversity its energy grid, with large investments expected in nuclear power. This investment is driven partly by the need for secure baseload power generation and partly by a push for cleaner energy to meet climate change commitments and reduce air pollution, which presently results in more than 1 million premature deaths in India each year.

India has 6,780MWe of nuclear output at present, spread across more than 20 nuclear power plants. There are well-advanced plans underway to build a further 10 large pressurised heavy water reactors, which woulod add a further 7,000 MWe of generation.

But long-term plans go far beyond this, with the Government's latest Draft National Energy Policy proposing to expand nuclear generation almost ten-fold, to more than 60,000 MWe by 2030. While it is not yet clear that the entire target will be met, there is a certainty of a very significant expansion in India's nuclear generation capacity over the next 20 years.

Further out still, India is seeking to develop thorium power. India holds abundant domestic reserves of thorium, and sees nuclear power as a means to develop the expertise and tools to unlock thorium's potential as an energy source. This would help India to achieve greater energy independence over the longer term.

India looks for partners that can package uranium exports with reactor research and technology that can be used to develop its domestic nuclear generation program.

India is likely to become a key uranium market over the next 20 years

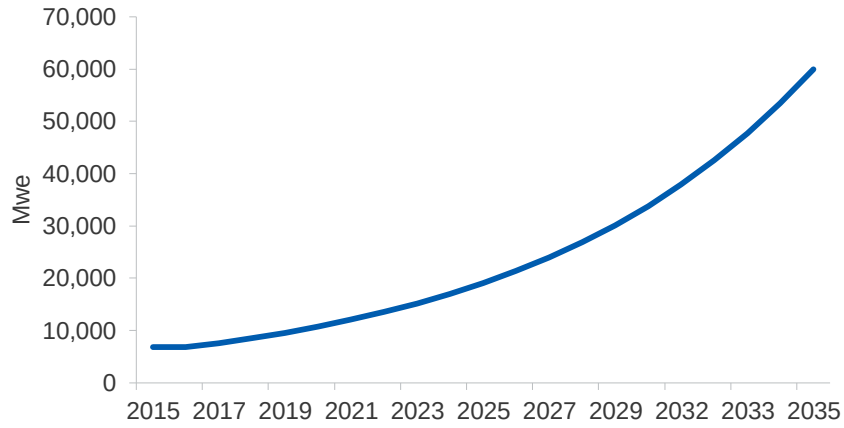
Although long-term energy independence is a high priority for the Indian Government, its need for nuclear power over the next 20 years is likely to be met mainly through imports. This opens significant opportunities for Australia, which has uranium reserves that are more abundant, more concentrated, and closer to the surface than uranium deposits in India.

Australia has recently signed a cooperation agreement with India which provides a framework for supplying uranium. Price negotiations are already underway with Australian companies, who are expected to supply India with around 1,500 tonnes of uranium over the next five years. There is potential for larger agreements over time, as Indian demand grows.

Long-term prospects for uranium exports to India are difficult to predict. New uranium mines in Western Australia have been banned by the West Australian Government, which will constrain supply growth to a degree. At the same time, falling solar prices may lead to some encroachment by solar power into the potential future market for nuclear energy. The Indian Government is also undertaking a large-scale review into its existing reactors to ensure environmental safeguards are sufficient.

The long-term growth trajectory for uranium exports to India is thus very strong, but with significant risks and potential for downsides to emerge.

Figure 15.20: Indian nuclear capacity projections



Source: Indian Draft National Energy Policy (June 2017)

7. Gas

Gas consumption in India is expected to triple

Gas currently accounts for a relatively small share of India's overall energy mix (5 per cent in 2014). Most of India's natural gas consumption is accounted for by industry, with power generation the next largest consuming sector. India is regarded as a price sensitive user of gas. In recent years, a large proportion of India's gas-fired power plants have stood idle, as a result of gas being unable to effectively compete with other fuels. Indian gas demand has also been constrained by poor infrastructure, with India's gas pipeline network reaching only a small number of Indian States.

Under the IEA's New Policies Scenario, India's natural gas consumption is expected to increase rapidly, from 50 billion cubic metres in 2014 to 159 billion cubic metres by 2035. The increase will be partly driven by the Indian Government's desire to diversify the country's energy sources and to reduce air pollution and carbon emissions. Strong economic growth is also likely to support this increased gas consumption, with gas consumed in power generation expected to be the main driver of growth. The availability of relatively low cost LNG — at least over the medium term — should also support increased gas consumption.

India could meet future gas demand from a number of sources, including domestic gas production, pipeline gas imports, and imports of LNG.

India's domestic production is unlikely to meet demand

India has considerable reserves of natural gas and India's domestic production is expected to increase over the outlook period. Under the IEA's New Policies Scenario, Indian gas production rises from 33 billion cubic metres in 2014 to 75 billion cubic metres in 2035. The Indian Government's Draft National Energy Policy states that India has the potential to produce 95 billion cubic metres of gas on a business-as-usual basis, and up to 124 billion cubic metres under the 'ambitious' scenario.

However, India faces a number of challenges when it comes to the development of its natural gas reserves. Much of India's gas reserves are unconventional ones, including coal seam gas and shale gas, so the extent to which India can increase its domestic gas production will depend on the quality of these reserves and how the costs of these technologies change over time relative to the cost of imported gas.

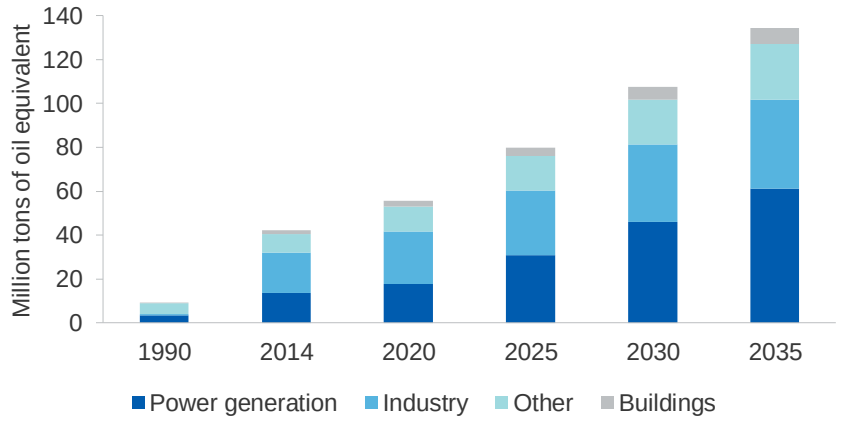
Another complicating factor is the limited precompetitive geoscience information on sedimentary basins, which makes exploration more difficult and imposes a higher risk on companies. India's Draft National Energy Policy makes several recommendations aimed at addressing these issues.

In addition, regulatory and social licence issues are expected to pose challenges for onshore unconventional gas development. Regulation of the price of domestically produced gas is currently inhibiting investment in the sector.

India is set to increase its gas imports

Given Indian gas demand is expected to outstrip domestic production (even under an ambitious domestic production scenario), India seems likely to require increased gas imports. India imported 24 billion cubic metres of LNG in 2016 (18 million tonnes), making it the fourth largest LNG importer in the world. There are currently no international gas pipelines into India.

Figure 15.21: Indian gas consumption by sector



Source: World Energy Outlook (2016)

The extent of India's LNG requirements will depend, in part, on progress on the Turkmenistan-Afghanistan-Pakistan-India (TAPI) and the Iran-Pakistan-India (IPI) pipelines. Both pipelines have been long delayed, and continue to face economic and geopolitical hurdles — such as financing arrangements and pipeline security. It is difficult to say with certainty whether or not these hurdles will be overcome.

If international pipeline projects do not materialise, India will require 84 billion cubic metres of LNG imports (62 million tonnes) in 2035 under the IEA's New Policies Scenario. This would represent an average annual increase of 6.8 per cent per year on 2016 levels.

India's price sensitivity may also affect LNG demand in the event that LNG prices rise relative to other energy commodities .

Australia's LNG exports to India will be subject to a range of influences

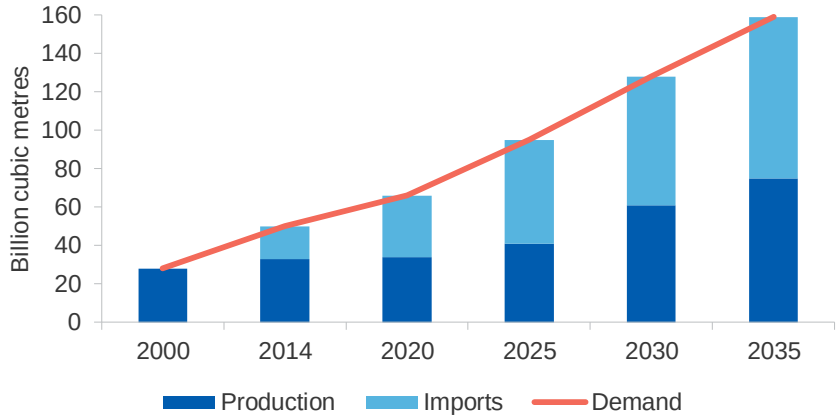
India imports the majority of its LNG from Qatar, mostly under long-term contracts. Australia supplies relatively little LNG to India, with only one contract having been signed with Indian buyers during Australia's recent wave of LNG projects. India's state-owned Petronet has a 20 year contract with ExxonMobil for supply from the Gorgon LNG project offshore Western Australia.

The proportion of Australian LNG in India's future imports will depend in large part on the cost competitiveness of Australian producers. LNG projects on the west coast tend to have the lowest cash costs. These projects are also relatively close to India, reducing shipping costs. Given India buyers have often favoured spot market purchases over long-term contracts, there may be opportunities for Australian projects to sell spot cargoes into India if they can capitalise on their inherent cost advantage.

However, the capital costs of Australian LNG projects are high by global standards. When it comes to signing longer-term contracts where the cost of capital must be recovered, Australian projects could be at a competitive disadvantage. There are also an increasing number of competing supply options, with competition in global LNG markets expected to intensify over the next few years and excess capacity expected to persist until the early to mid-2020s. India has potential supply options in the Middle East and East Africa, and possibly the United States.

Australia's exports to India could also be affected by the level of foreign investment by Indian companies in future Australian LNG projects. Historically, Indian companies have not invested in Australian gas export projects. In contrast, Indian companies have significant interests in LNG projects in East Africa, the US and Russia, supporting future supply agreements.

Figure 15.22: Indian gas demand, production and imports under the IEA's New Policies Scenario



Source: World Energy Outlook (2016)

Conclusion

Commodity producers have good reasons to pay attention to India, and not merely because India is set to become the world's most populous nation. There are sound reasons to believe that India's growth path may be potentially game-changing.

Where previous trailblazers like China built their growth on centrally planned, export-intensive, high-manufacturing models, India is likely to be fundamentally different. Entire phases of resource-intensive technological change may skipped. India will almost certainly not become highly manufacturing-intensive, in part due to global shifts away from labour-intensive manufacturing methods, and in part due to infrastructure issues and highly regulated labour laws. India is instead likely to progress straight into a services-intensive economic model, which will require significantly less commodity inputs.

Technological change will also encourage large leaps for consumers: India may, for example skip over much of the computer age involving lengthy cable lines and large devices, shifting straight to an economy dominated by wireless devices and mobile phones.

As a result, commodities will be used differently in India: copper is likely to play a much smaller role in wiring and telecommunications, but a larger role in emerging technology such as mobile phones and electric vehicles. Zinc will be less used in cars, due to the push for lighter weight vehicles to limit air pollution; but it will be highly sought after in public transport, as India seeks to repair, expand and improve more than 65,000 kilometres of rail lines. Changes in the form of use will have significant implications for commodity producers and supply chains.

It is certain that base metal use will step up in India, as infrastructure is upgraded. However, the precise pace of this infrastructure rollout is difficult to assess, due to the complexities of infrastructure rollouts in a vast and complex nation such as India. As a result, high- and low-intensity scenarios for iron ore and metallurgical coal remain hugely divergent. The greatest rewards will flow to commodity firms that embody flexibility and capacity to respond quickly to changes in policy.

Probably the best prospects for Australian resource commodity producers is in steel-making inputs. The degree of success of India's goal to be self sufficient makes the demand for iron ore imports a little uncertain. However, India's lack of metallurgical coal resources probably provides the best upside of any Australian resource commodities.

The prospects for producers of energy commodities are good. India is already underway with large scale expansions in capacity for HELE coal and nuclear power, and Australia has significant natural advantages as a provider of both. There are also likely to be opportunities for gas producers, although Australia's entry in this field is likely to require more disruption of India's well-established gas import chains.

Yet even providers of energy commodities will face some uncertainties. India has announced strong commitments to further deploy solar and other renewable energy, and the scale of technological change and price falls among these technologies creates a possibility of huge and unpredictable disruption to traditional energy models.

Much also depends on political factors. As a vibrant democracy with a well-established rule of law, India faces challenges to infrastructure rollout that were not evident in China. Previous reform and infrastructure efforts in India have often stalled as a result.

Yet, there is reason to be optimistic this time. The Government has not merely committed more than $US150 billion to rail and other infrastructure upgrades; it has also adopted new and innovative measures to attract funding from alternative sources, such as 'masala' bonds aimed at foreign investors. This will provide a more robust overall funding model, with greater longevity and predictability. The Government has also achieved some significant reforms already, including the introduction of a national GST, which replaces a slew of inefficient local taxes and better enables goods trading between States.

Technological change will matter in shaping India's commodity needs, as will the Government's ability to withstand pressure and forge ahead on its reform proposals and its long-planned rollout of energy, transport an housing infrastructure. Success in India will not merely change life for its people, but also change the game for commodity producers over the longer term. India's achievements will present the world with a new development model, and blaze a trail for other developing nations to follow. Commodity producers who can harness the opportunities presented by India will have many more opportunities in the future.