

PILBARA QUARTERLY ECONOMIC UPDATE

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Key Messages

The Pilbara economy has continued to strengthen in the 2019 September quarter. The possible capital investment over the medium term continues to rise and estimates are that it is in excess of \$90 billion. In this regard critical investment decisions are anticipated in 2020 for Liquefied Natural Gas (LNG), fertiliser and iron ore.

Although during the September quarter **some commodity prices have fallen**, notably iron ore, no change is expected to investment or production levels. Costs have been reduced to such an extent by the iron ore operators that even were prices to fall further in the future they are likely to remain in a relatively strong financial position. However, the broader cost outlook indicates that, inevitably, **costs are rising and the labour market is tight.**

Western Australia's mining industry has seen a boost in employment numbers that has reached new levels. The figures for the 2018/2019 period revealed in the Department of Mines, Industry Regulation and Safety's latest statistics release, highlighted a significant year for the state's mining sector. It included a period in which the average number of **individuals employed in the minerals sector surged to 124,010**, up from 112,008 in the previous year. It

Legislation

The Western Australian Government has released a new greenhouse gas emissions policy for major projects assessed by the Environmental Protection Authority (EPA). The state government has reiterated its commitment to achieving net zero greenhouse gas emissions by 2050. This policy falls in line with the Federal Government's target of reducing emissions by 28% by 2030.



should be noted that there has been a very significant increase in contract employment since 2012/13.

At the same time, Western Australia's mineral and petroleum industry recorded **record sales of \$145 billion** over the last 2018/19 financial year. The bulk of the \$30 billion increase on the 2017/2018 period was the result of improved iron ore prices and increasing LNG volumes as projects continued to move towards capacity.

According to the Australian Mines and Metals Association, the impact of the current upturn in the resources sector is also reflected in estimates that at least an **extra 10,679 workers** will be needed by 2024. Seven big iron ore projects in the Pilbara by the mining majors account for more than half the workers needed, but lithium and gold also feature prominently, with eight and five projects respectively.

The downside risks flagged in previous reports **have increased:** Global and Chinese economic growth is slowing sharply; international trade disputes are seriously impacting growth in manufacturing; geopolitical risks have increased, notably in the Middle East; and levels of debt continue to rise in major

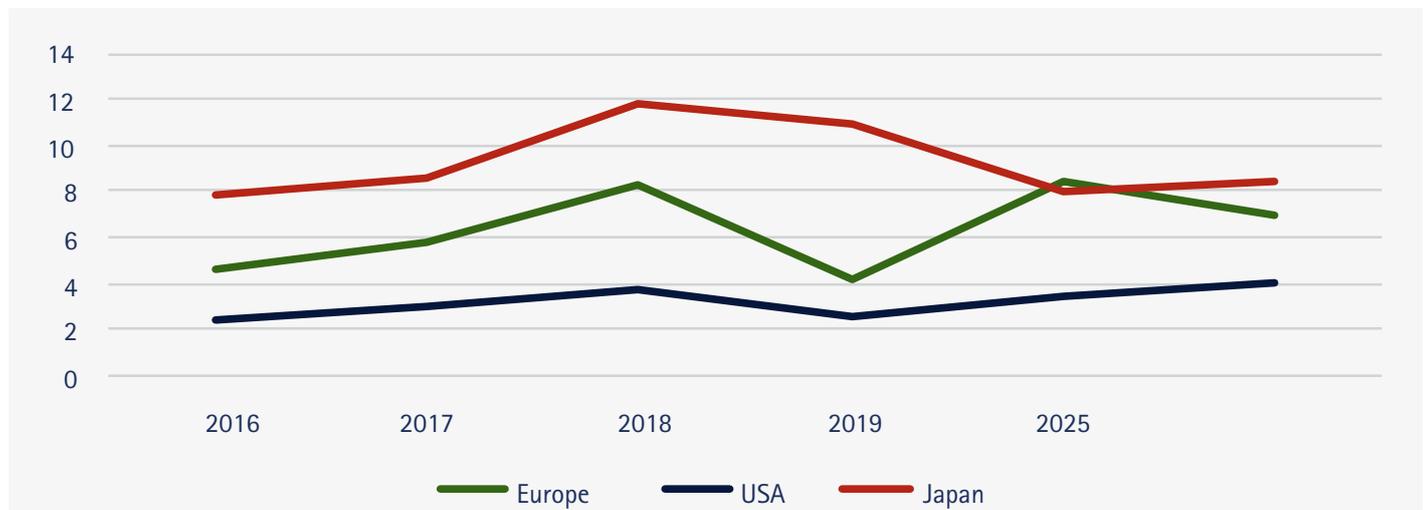
economies. However, continuing **diversification in the Pilbara** in the resources sector, and other sectors, has increased the **resilience of the economy** to these external shocks.

The prospects for the economy of the Pilbara are increasingly linked **to further investments in LNG and renewables**. In this issue we provide **a closer look at the energy sector**.



Commodity Prices and Resource Sector Investments

LNG PRICES: EUROPE, USA, JAPAN - 2016 TO SEPTEMBER 2019 (US \$MMBtu)



SOURCE: WORLD BANK

LNG & Renewables

- Over the last quarter LNG prices continued to soften, with spot prices on Asian markets falling to about US\$5 per MMBtu and low prices in Europe and the United States have persisted. LNG supplies have increased and demand has been weaker. In 2019 investments in LNG since the start of the year have hit an all-time high of US\$50 billion, according to the International Energy Agency. The bulk of the investments have been in the United States and Canada. Not surprisingly, the driver of this growth in investments is growing demand for the fuel in Asia, with China still expected to overtake Japan as the world's top importer of LNG. **In the short-term supplies are likely to exceed demand, before prices move up again, after 2021.** The World Bank forecast to 2030 is that prices will rise modestly in all of the major markets.

Lower prices short term, price recovery medium term, possible large-scale investments?

- The future outlook for additional investments in energy in the Pilbara depends on a number of variables during a period of **exceptional change** as the world searches for a cleaner, greener environment.
- The scale and scope of developments in wind, solar, biofuels, hydrogen and other renewable energy sources is formidable. Private enterprise is increasingly investing in these renewables. Although still comprising a small percentage of total global energy supply renewables are considered the future for energy supply.
- Estimates by the World Bank (September 2019) indicate that **\$US1.9 trillion of investment in climate adaptation between 2020 and 2030 could generate \$US7 trillion in total net benefits.**

- **A new U.S. Department of Energy study** shows that the cost of generating more power through wind turbines is cheaper now than buying fuel from an equivalent natural gas plant. That means wind energy will become even more competitive in capturing more power capacity in coming years with natural gas expected to lose market share over time. Solar power is also now on the same playing field as wind, and is also expected to see real growth.
- **Hydrogen** once touted as the fuel of the future and then slipping into near oblivion as battery powered electric cars gained popularity, may still have a future as a fuel. The main benefits of hydrogen are its abundance and the fact it emits no harmful chemicals. The challenges are cost and scalability. Hydrogen could become the preferred fuel for a category of vehicles that currently account for a significant share of oil demand - long-haul trucks. China wants to have 1 million hydrogen vehicles on its roads by 2030. That's up from only 1,500 at present. Early 2017 saw the **launch of the Hydrogen Council**, a group involving several leading automakers as well as Shell and Total, seeking ways to make hydrogen more commercially viable. The council has allocated US\$1.4 billion in the medium term for the development of energy storage and fuel cell development.
- On the other hand, in a few years' time **insufficient oil supply may drive prices higher**, particularly as a slowdown of U.S. shale production growth is possible. **Global oil consumption may continue to increase**, at least in the next decade, due to demand from petrochemicals, trucking, and aviation. The oil industry will need to double the number of approved conventional oil projects in order to meet the expected growth, the International Energy Agency (IEA) said in its latest World Energy Outlook published in November 2018.
- Given the lower levels of Greenhouse Gas emissions by LNG in comparison with coal and oil, **natural gas is viewed as a large scale "bridging" energy source** in the overall strategy to phase out fossil fuels over time. In this regard, 2019 is likely to become a record year for final investment decisions on new greenfield LNG projects worldwide, with total capital expenditure, including LNG plant and upstream infrastructure, exceeding US\$200 billion between 2019 and 2025.
- **What does all this mean for the Pilbara?** Very importantly, **increased demand for LNG** over the next decade and a half is also likely, anticipated to rise from 320 million tons (mt) in 2018, to 465 mt by the mid-2020s, and exceeding 630 mt by the mid-2030s, and LNG investors in the Pilbara are likely to take this longer-term view of LNG demand.

- The **proposed development of the Scarborough and Browse basins by Woodside is part of the Burrup Hub concept** involving an additional 20 to 25 trillion cubic feet of gas resources. It builds on the existing Pluto LNG and North West Shelf projects, linking two of WA's largest pieces of economic infrastructure to increase the scale of the regional LNG production centre.
- Should the developments go ahead **businesses in Karratha could benefit from over \$86 million per year** of direct localised spending required to operate the Burrup Hub, with 4,600 construction workers required and 450 operational workers.
- **Woodside will make final investment decisions on developing the Browse and Scarborough fields in 2020.**
- Should Woodside go ahead with these developments a new 2,500-bed camp will be constructed in Karratha, however, the policy of the company is to move away from fly-in fly-out arrangements with the aim for employees to be in residential accommodation by 2025.
- There are many factors in play that will determine the investment decisions outcome:
 - The licenses over the offshore fields come up for renewal in 2020 and the regulators are said to have signalled they may not be renewed unless concrete steps are taken to bring the gas online.
 - Asian customers that import the bulk of LNG production from Australia are intent on negotiating revised prices that move towards spot prices that are much lower at present than long term contract prices.
 - During the previous LNG investment boom, cost overruns globally averaged 33%, while Australian projects saw costs above budget by some 40%. Since the cost structure of the Pilbara is on the rise again, this is an issue that needs to be dealt with.
 - Price forecasts may be impacted by geo-political risks, mainly concentrated in the Middle East. A spike in oil prices and further unrest will support LNG prices going forward should the risks in the Gulf escalate.
- **Other fossil fuel** energy developments in the Pilbara include a long-term gas purchase agreement between **South32 and Woodside Energy** for the Worsley Alumina bauxite mine with the supply of around 40 Petajoules of pipeline gas from its portfolio of gas facilities in WA, including the North West Shelf, Pluto and Wheatstone. **Carnarvon Petroleum** has announced a placement and share purchase plan to raise around \$84 million for further appraisal and development of its Dorado oil and gas opportunity.

- **Renewable energy developments** in the Pilbara include:

- **Yara Fertilisers and the French company Engie may build the world's biggest renewable hydrogen plant**, integrating a green hydrogen plant into Yara's existing ammonia plant on the Burrup Peninsula, with a 50 to 60 MW electrolyser, powered by more than 100 MW of solar panels to produce enough hydrogen for 28,000 tonnes a year of ammonia nitrate. Ammonia is the perfect high density "vehicle" to transport hydrogen. The feasibility study is almost complete and site selection is well advanced. The required tie-ins at the ammonia plant are already in place and the process for permitting/approvals are underway.
- **Woodside** is undertaking a new study to **determine the viability of a green hydrogen project**, with Korea Gas Corporation incorporating production, storage, transport and distribution.
- **The Asian Renewable Energy Hub** is looking at a very large-scale production facility east of Pardoo in the East Pilbara using wind and solar to generate up to 15 GW. The partners include InterContinental Energy (developing several renewable energy hubs around the world); CWP Energy Asia (has created over

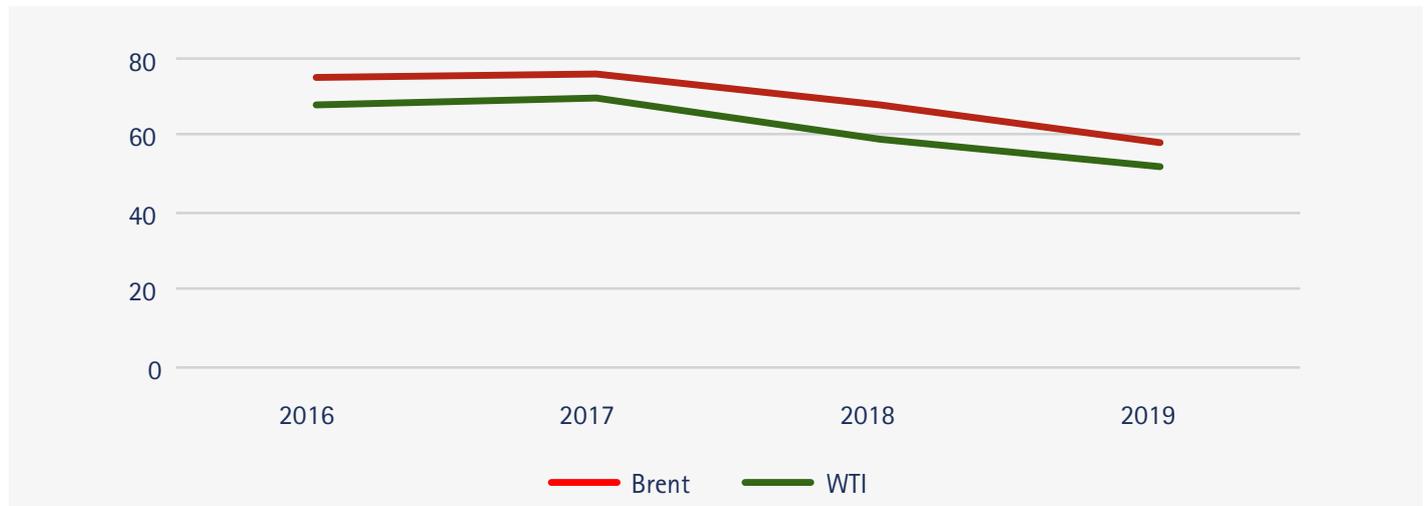
2,000 MW of renewable energy generation capacity in seven countries); Vestas (87 GW of wind turbines installed in 76 countries); and the Macquarie Group. The capital cost of the project is estimated to be some \$30 billion with the potential to generate 50 terawatt hours of electricity a year and is expected to create significant new manufacturing opportunities. Additionally, approximately 3,000 direct jobs would be created during the 10-year project construction period, and over 400 jobs for the 50-year operational period.

- **The creation of a business park** for innovative emerging industries on the outskirts of Karratha could generate more than 400 jobs and inject more than \$200 million into the local economy, according to a business case report on the **City of Karratha's proposed EcoHub**, comprising 131ha of land near Karratha Airport that would be dedicated to renewable energy-based enterprises. **The supply of solar energy to the Karratha airport** now constitutes a significant proportion of total energy consumed. **Pilbara Solar** has ambitions to develop renewable energy for local industry in the Pilbara and is about to start their first project. **The City of Karratha** will be finalising its **Sustainability Strategy in 2020**.



Oil

OIL PRICES: 2016 TO SEPTEMBER 2019 (US\$/bbl.)



SOURCE: WORLD BANK

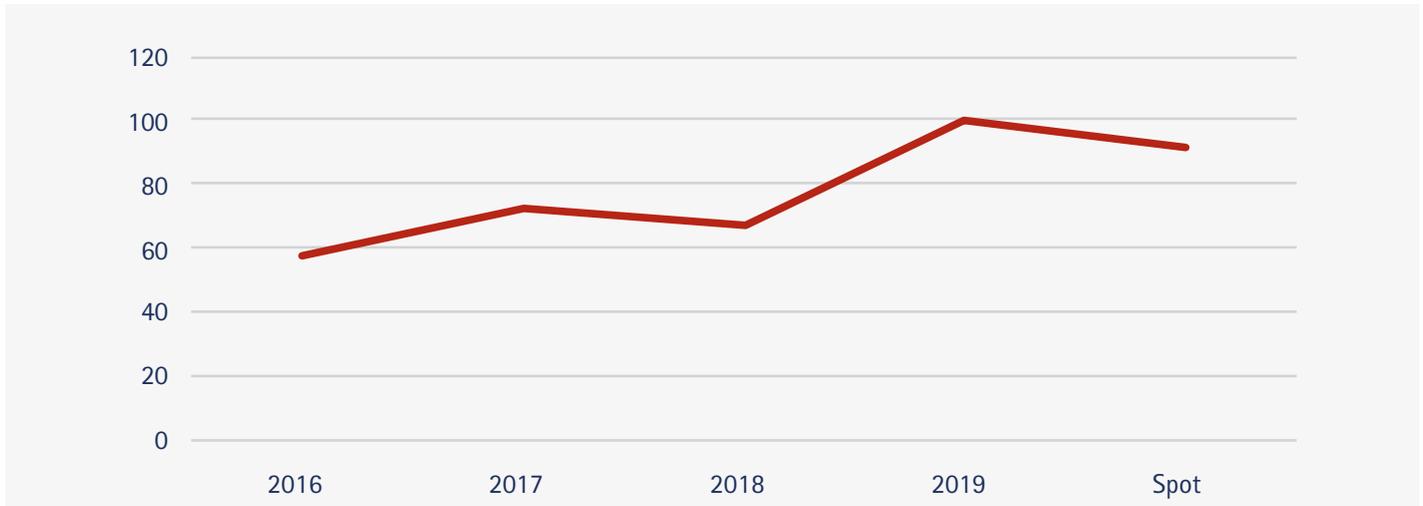
Fluctuating prices, globe awash with supplies, demand less certain, geopolitics.

- **After rising in early 2019 prices have continued to fluctuate in the September quarter, with an overall downward trend** that was only arrested through the Organisation of the Petroleum Exporting Countries (OPEC) actions to curb production. On the supply side the USA is set to account for 61% of all new oil and gas production over the next decade and the global oil industry is set to see about US\$123 billion worth of new offshore oil projects being developed.
- **However, oil prices spiked** after 10 drones attacked the world's biggest crude-processing facility and its second-biggest oil field, both in Saudi Arabia. After the attacks, Brent crude surged with the biggest price jump since 2008. The threat to global oil supplies was highlighted by Citibank in late September 2019 "No matter whether it takes Saudi Arabia five days or a lot longer to get oil back into production, there is but one rational takeaway from this weekend's drone attacks on the Kingdom's infrastructure – that infrastructure is highly vulnerable to attack, and the market has been persistently mispricing oil."
- **In the Pilbara**, Woodside Energy's \$1.9 billion Greater Enfield project has produced oil for the first time through the Ngujima-Yin floating production storage and offloading vessel (FPSO).



Iron Ore

IRON ORE PRICE: 2016 TO SEPTEMBER 2019 (US\$ DMT 62% FINES)



SOURCE: WORLD BANK AND BUSINESS INSIDER

Relatively high prices, investments in replacement mines, possible investments in new production

- **Prices have fallen during the quarter**, as Vale in Brazil started to resume production and the Chinese economy slowed further. However, in relative terms prices remain high, particularly in Australian dollars and international price decreases should have **little impact on current investments or planned investments**. In fact the level of investment may increase, given current planning by iron ore operators in the Pilbara.
- **Possible new investments in the Pilbara**, in addition to those flagged in the last quarterly economic update, include the **Flinders Mine Balla Balla initiative**. The company has made a non-binding agreement with the BBI Group that could provide funding and a logistical solution leading to a final investment decision on the project for a \$10 billion rail and port project. **BHP has released**

details of its 50 to 100 year strategic mining proposal, consisting of new and existing mines within the region, alongside a vision to create tens of thousands of jobs in WA. The Environmental Protection Authority (EPA) has recommended environmental approval of BHP's strategic proposal with conditions attached. The **Australian Aboriginal Mining Corporation (AAMC)** has secured \$27.1 million in debt funding for the development of the First Iron project outside of Newman. The company will create 120 jobs during mine development and 120 permanent positions once First Iron is operational. First Iron is forecast to be a low-cost iron ore operation with an initial mine life of 11 years. The company expects to deliver ore to Fortescue Metals Group's Cloudbreak hub during first quarter 2020.



Lithium

LITHIUM PRICE: 2018 TO SEPTEMBER 2019 (US\$/tonne)



SOURCE: TRADINGECONOMICS.COM | OTC

Short term prices falling, long term increase in demand & prices, increased investment medium term

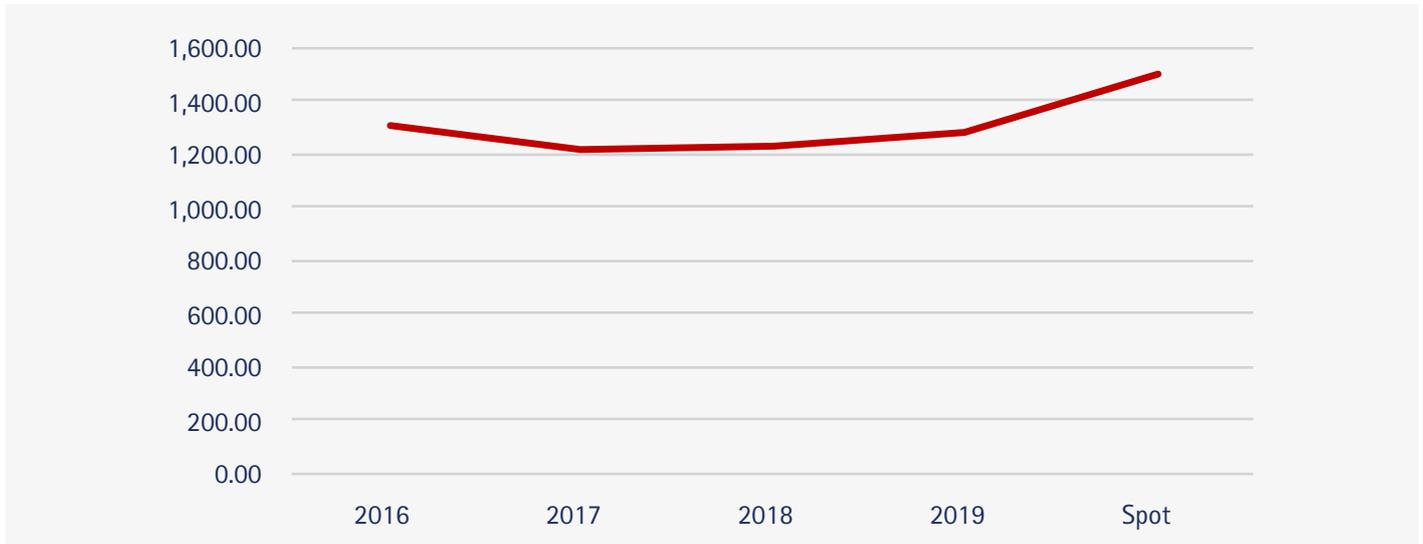
- **The steady fall in Lithium prices** since early 2018 have continued. Although over the last month prices have stabilised, **spodumene prices have fallen by about 40%** over the last year. An oversupply of lithium products, caused largely by increased production in Australia and Chile, has outpaced mineral/chemical conversion capacity in China and the rate of demand growth for Electric Vehicles (EV) has slowed, as a result of cuts in subsidies for electric cars and the slowing economy in China. However, although the market will likely remain in oversupply in the near-term, **forecasts are that demand will outpace supply after 2020**, primarily due to accelerated uptake of EVs across the globe.
- In response to falling prices **companies in the Pilbara are cutting back production, delaying capital expenditure, restructuring debt and laying off workers.** Investment developments include:
 - Mineral Resources has a new arrangement with Albemarle for the partial sale of the Wodgina lithium project and acquisition of an interest in the Kemerton hydroxide facility. Albemarle will pay US\$820 million in cash and transfer a 40% interest in the first two 25,000 tonnes per annum lithium hydroxide conversion units currently being built by Albemarle in Kemerton, near Bunbury. Once complete, the Kemerton operation will be capable of processing spodumene produced at Wodgina.

- China's largest lithium-ion EV battery manufacturer Contemporary Amperex Technology (CATL) will become a significant shareholder in Pilbara Minerals under a plan to raise up to \$111.5 million. The funds will be used to strengthen the Pilgangoora lithium project south east of Port Hedland. Recently, Pilbara Minerals cut back its export expansion plans, and lithium miner Alita Resources went into voluntary administration last month with its debt taken over by Galaxy Resources.
- Altura Mining is expanding its tenement holding in the Pilbara, through investing in the exploration portfolio of emerging lithium miner Sayona Mining. The tenement package consists of around 1,806 km², with proximity to Altura's existing mining and processing infrastructure.
- **Elsewhere in WA, Tianqi Lithium** has put its second stage expansion of its \$700m Kwinana lithium hydroxide plant on hold amid weak market conditions. While Australian lithium miners are cutting back sales and expansion plans, **SQM in Chile is planning to increase production**, with sales in 2020 expected to be 30% higher than 2019.



Gold

GOLD PRICE: 2016 TO SEPTEMBER 2019 (US\$/oz)



SOURCE: WORLD BANK

Sharp increase in prices continues, increased investment and employment

- **Gold prices have continued to increase.**

As a result the interest of players in the industry is gathering pace. **Developments in the Pilbara** include:

- **Artemis Resources** has acquired Rincon Resources and its South Telfer project, which lies 12 km from Newcrest Mining's Telfer mine in the Pilbara, with the company expanding its holdings within Paterson Province to 1,140 km².
- **Calidus Resources** has indicated the potential to produce around 100,000 ounces of gold a year at the Warrawoona project (Marble Bar) over an initial six-year mine life. The company's pre-feasibility study for Warrawoona includes a maiden probable JORC reserve of 418,000 ounces of gold from 8.9 million tonnes of ore (1.5 grams per tonne).
- **Capricorn Metals** is to raise \$65 million for development of the Karlawinda gold project (south east of Newman) and **Kairos Minerals** has recovered 223 gold nuggets from a newly identified area at the Croydon project (near Roebourne).
- **De Grey Mining** is moving on to the next phase of expansion with a \$22 million capital raising to fund its acquisition of Indee Gold. The acquisition would consolidate the company's existing Turner River project with the adjacent Indee Gold site in the Pilbara to form a single, 1.4 million ounce per annum project 60 km south of Port Hedland.
- **Newcrest Mining** has released an additional 3,366 metres of drilling results from its Havieron project, near the company's Telfer mine. The drilling programme has defined a series of higher-grade zones.

Copper

COPPER PRICE: 2016 TO SEPTEMBER 2019 (US\$/mt)



SOURCE: WORLD BANK

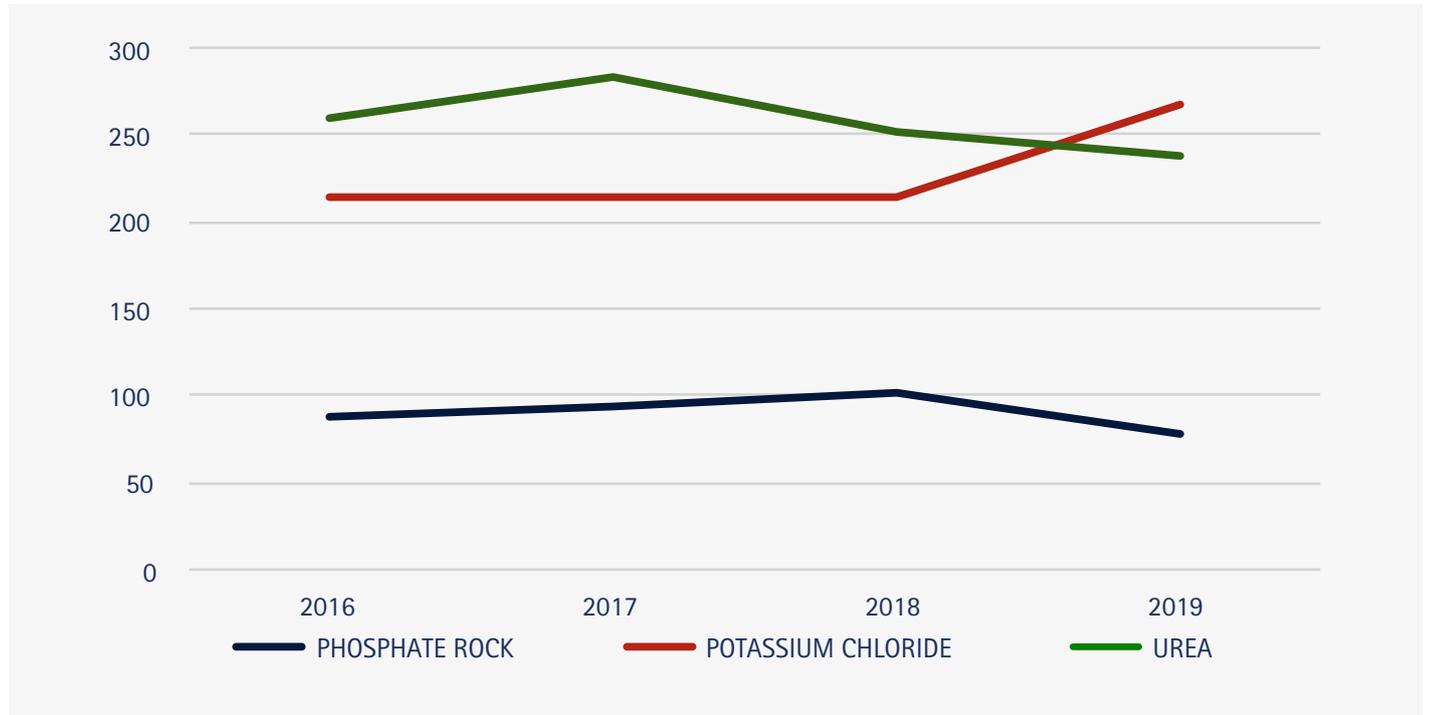
Prices fluctuating/falling, large scale investments possible

- **As the global economy** has slowed the price of copper has fallen over the third quarter 2019. This trend could be reversed if major economies take steps to stimulate infrastructure and manufacturing. Exploration developments include:
 - **Antipa Minerals has started exploration at its Citadel joint venture project in Paterson Province**, with funding provided by Rio Tinto. Antipa intends to find greenfield discoveries and also increase brownfield gold and copper resources during 2019.
 - **Rio Tinto** has released further **promising data** on its drilling programme at its **Winu copper-gold project** in the Yeneena Basin of the Paterson Province and further results will be released in the first quarter of 2020.
 - **Rumble Resources and AIC Mines** have signed an earn-in and exploration joint venture agreement to develop **the Lamil gold-copper project in Paterson Province**. The Lamil project is near Rio Tinto's Winu and Greatland Gold's Havieron discoveries.
 - **Venturex Resources** has received \$US70 million in funding from global commodity trader Trafigura to develop its **Sulphur Springs copper-zinc project near Port Hedland**.



Fertiliser

FERTILISER PRICES: 2016 TO SEPTEMBER 2019 (US\$/mt b)



SOURCE: WORLD BANK

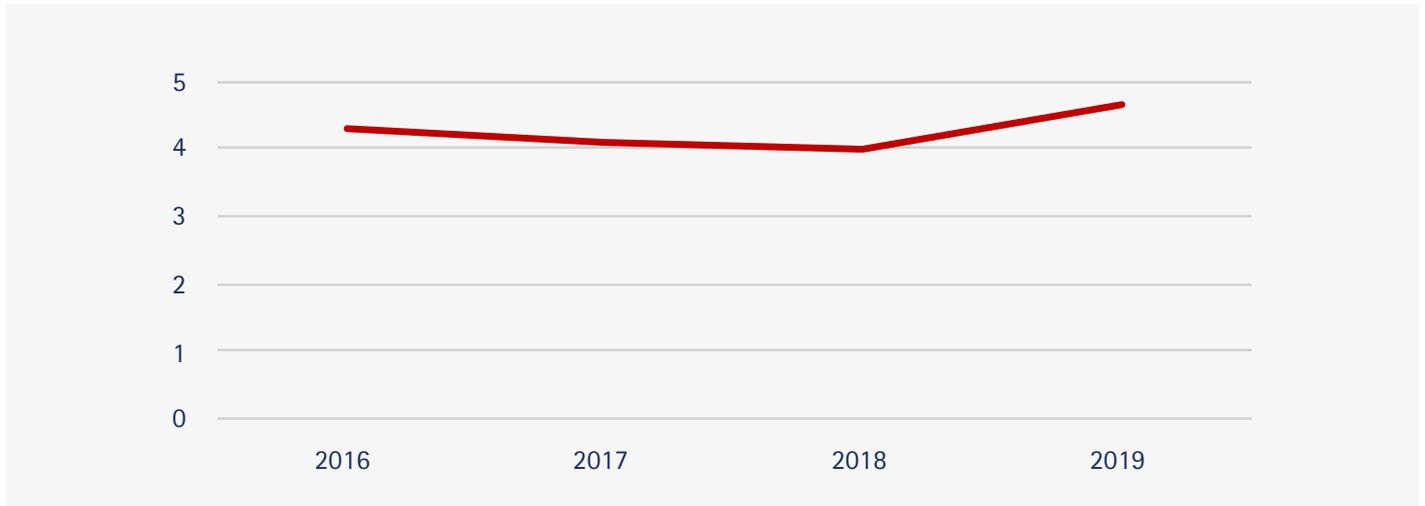
Prices fluctuating, large scale investments likely

- **The price of potassium chloride has been rising.** Other fertiliser prices have been falling in recent quarters.
- **See Quarterly Economic Update No 1** for information on upcoming investments in the Pilbara.



Beef

BEEF PRICE: 2016 TO SEPTEMBER 2019 (US\$/kg)



Prices fluctuating at reasonable levels

- After rising strongly since 2018 beef prices have continued to support the industry in the third quarter of 2019, whilst live cattle prices have been fluctuating in 2019 but at reasonably high levels.

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